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Seagrasses Between Cape York and Hervey Bay, Queensland, Australia

W. J. Lee Long, J. E. Mellors[A] *and R. G. Coles*

Northern Fisheries Centre, Queensland Department of Primary Industries, Box 5396, Cairns, Qld 4870, Australia.
[A] Present address: Environmental Studies Unit, James Cook University of North Queensland, Townsville, Qld 4811, Australia.

Abstract

The area of seagrasses in waters adjacent to the Queensland coast between Cape York and Hervey Bay is approximately 4000 km^2. Seagrasses were found near estuaries, in coastal bays and associated with islands, at sites that provided shelter from the south-easterly trade winds and Pacific Ocean swells. Of the seagrass meadows mapped, 37% had a bottom vegetation cover greater than 50%. Two large continuous areas (total of approximately 2500 km^2) of seagrass of predominantly *Halophila* species were found in deep water in Hervey Bay and between Barrow Point and Lookout Point and may be part of a much larger area of deep-water seagrass habitat not yet surveyed in the Great Barrier Reef province. Fourteen seagrass species were found in the surveyed region, and most were typical of the northern Australian and Indo-West Pacific region. The opportunistic *Halophila* and *Halodule* species were most common, with *Halophila ovalis* (R. Br.) Hook. f. and *Halodule uninervis* (Forsk.) Aschers. each being found in more than 15% of samples. High species richness occurred at depths of less than 6 m, predominantly in sheltered bays at coastal and island locations. Low species richness at estuary-associated sites may be due to stresses caused by low salinity during monsoonal runoff periods or exposure at low tides. *Zostera capricorni* Aschers. was restricted to these areas and may have a competitive advantage over other species with lesser tolerance to varying salinity. Species richness decreased with an increase in both latitude and depth. The latitudinal limits of recorded distributions for some of these tropical seagrasses were confirmed. Seagrass biomass decreased with increasing depth, but parameters of seagrass abundance showed no correlation with latitude, being dependent on a complex of site-related factors. High seagrass biomass occurred at sheltered sites, including estuary-associated, coastal-bay and island-associated sites. The maximum recorded above-ground biomass was 102·9 g m^{-2} for *Zostera capricorni* at Upstart Bay. Shoot densities reached 13 806 shoots m^{-2} for *Halophila ovalis* at Escape River, and the highest leaf area index was 1·81 for *Zostera capricorni* at Upstart Bay.

Introduction

With over 30 (more than half) of the world's seagrass species, Australia's seagrass resources are considered unusually rich (Larkum and den Hartog 1989). Despite a recent surge in research activity, studies of northern Australian seagrasses have remained relatively few in number, as is evident in the treatise on Australian seagrass studies (Larkum *et al.* 1989). Large regions of northern and north-western Australia are still unsurveyed for seagrasses (Poiner *et al.* 1989).

In tropical Australia, seagrasses are essential food for dugong, *Dugong dugon* (Müller), and green sea turtles, *Chelonia mydas* Linnaeus, and are important habitat for juveniles of a number of commercial penaeid prawn species. The importance of seagrass habitat for

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stocks of juveniles of commercial prawn species has been recognized in Australia for at least a decade (Young 1978; Coles and Lee Long 1985; Staples *et al.* 1985). Early studies in eastern Queensland were restricted to Moreton Bay in the south-east (Young and Kirkman 1975; Kirkman 1978).

Apart from studies by Bridges *et al.* (1982) in the Torres Strait, Birch and Birch (1984) at Townsville, Poiner *et al.* (1987) in the Gulf of Carpentaria, and Coles *et al.* (1987*a*) in north-eastern Queensland, there is little information available on the ecology of tropical Queensland seagrasses. Summaries of northern (Poiner *et al.* 1989) and north-eastern (Coles *et al.* 1989) Australian studies provide excellent cornerstones on which continuing research will be based.

Recognition of the economic value of seagrass habitats as nursery grounds for juvenile penaeid prawns led to extensive Queensland Department of Primary Industries (QDPI) surveys of seagrasses in Queensland in the 1980s (Coles *et al.* 1985*a*, 1985*b*, 1987*a*, 1987*b*). Areas surveyed by QDPI between Cape York and Hervey Bay include most of the eastern Queensland coastal waters and island areas. This paper describes the major areas and types of seagrass habitat surveyed and addresses latitudinal and depth-related distributions of the species found. Eastern Queensland seagrasses are also discussed within the context of other documented descriptions of Indo-West Pacific and northern Australian seagrass communities.

Materials and Methods

Sampling Area

The eastern Queensland coast from Cape York (11°S) to Hervey Bay (25°S) borders a continental-shelf lagoon sheltered from South Pacific Ocean swells by the complex reef system of the Great Barrier Reef (Fig. 1). Beyond the southern limit of the Great Barrier Reef, Fraser Island shelters Hervey Bay from oceanic swells. Most of the coast has numerous northerly projecting peninsulas and islands that create sheltered, northerly opening bays. The bathymetry, sediments, hydrology, tides, coastal topography and climate patterns for the eastern Queensland coast and shelf were described extensively by Maxwell (1968).

Seagrass Sampling

Four survey regions were chosen to approximate the northern, central, southern and southern reefless physiographic regions identified by Maxwell (1968) (Fig. 1, Table 1). The northern region, from Cape York to Cairns, is typical Great Barrier Reef lagoon with no major river systems and little influence from coastal sediments. The central region, from Cairns to Bowen, has short perennial rivers and the large Burdekin River system and includes the major provincial ports of Cairns and Townsville. The southern region, from Bowen to Water Park Point, is an area of high (up to 10 m) tidal range. The southern reefless region, from Water Park Point to Hervey Bay, is exposed north of the coastal town of Bundaberg and sheltered in the southern part by the Fraser Island sand mass.

The four major regions were surveyed once only in four separate cruises. Except for the survey of waters between Bowen and Water Park Point in March 1987, regional surveys were completed in the months of October and November (Table 1). Additional deep-water areas between Barrow Point and Lookout Point (latitudes 14°21′S–14°50′S, in the Cape York to Cairns region) were surveyed in September/October 1989. Samples of seagrass biomass were not taken in this survey.

The method for extensive surveys and mapping of seagrass habitat was based on that described in Coles *et al.* (1987*a*). The survey pattern included dives at intervals of 250 to 400 m along transects that were perpendicular to the shore. Transects were placed between 5 and 20 km apart, being more frequent where coastal topography was varied, particularly in bays. Transects continued seaward until either no seagrass was found or the depth limit for safe diving was reached (usually 15–20 m). Between transects, dives were made at least every one nautical mile at varied depths and distances from shore, including in the entrances of rivers and inlets, to check for continuity of bottom vegetation. Factors that affected the spatial regularity of diving sites included weather conditions and constraints on compressed-air diving time. In shallow, clear-water areas, the distribution of bottom vegetation was also recorded from surface observation.

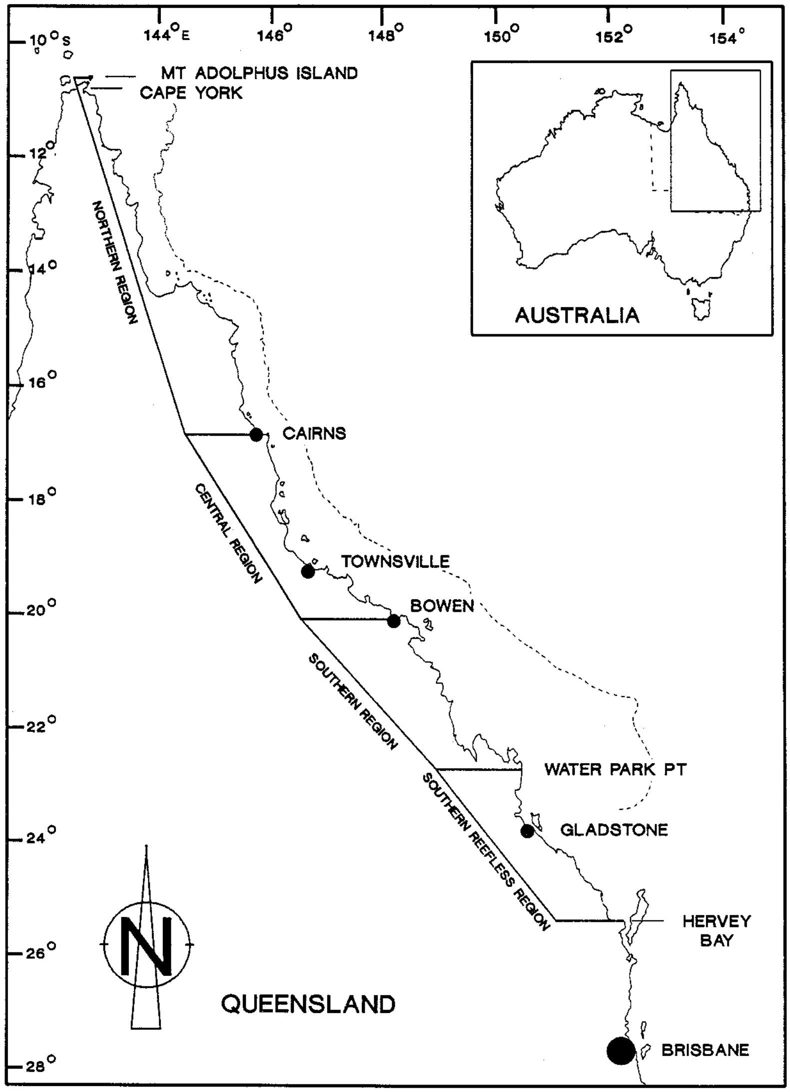


Fig. 1. Survey regions between Cape York and Hervey Bay.

Table 1. Dates of seagrass surveys for regions between Cape York and Hervey Bay

Region surveyed	Latitudes	Survey dates
Cape York to Cairns	10°40′S–16°55′S	October/November 1984
Cairns to Bowen	16°55′S–20°S	October/November 1987
Bowen to Water Park Point	20°S–23°S	March 1987
Water Park Point to Hervey Bay	23°S–25°15′S	October/November 1988

At selected sites, divers investigated bottom type and vegetation over an area of at least 5 m^2. The area observed was greater than 5 m^2 when underwater visibility was good. On each dive, sediment type and estimates of seagrass cover were recorded and samples of seagrasses were taken for later identification. Estimates of seagrass bottom cover were in categories of 0–10%, 10–20%, 20–30%, etc.

Standardizations of bottom-cover estimates were maintained by frequent review between divers. Where weather and sea conditions allowed, four $0 \cdot 25$-m^2 quadrats of seagrass roots and leaves were collected from randomly selected positions at the site for biomass measurements in the laboratory.

Seagrasses collected were identified according to classifications used by den Hartog (1970), Lanyon (1986) and Kuo and McComb (1989). Areas of seagrass were mapped onto navigation charts in three categories of bottom vegetation cover (<10%, 10–50% and >50% cover). The areas of seagrass meadows were measured by using the 'Bioquant' software system. Measures of seagrass biomass, shoot numbers and leaf areas were obtained from the quadrat samples according to the methods described by Coles *et al.* (1987*a*).

Results

Seagrass Areas and Distribution

Areas where major seagrass habitat was found are marked in Fig. 2. Within the study

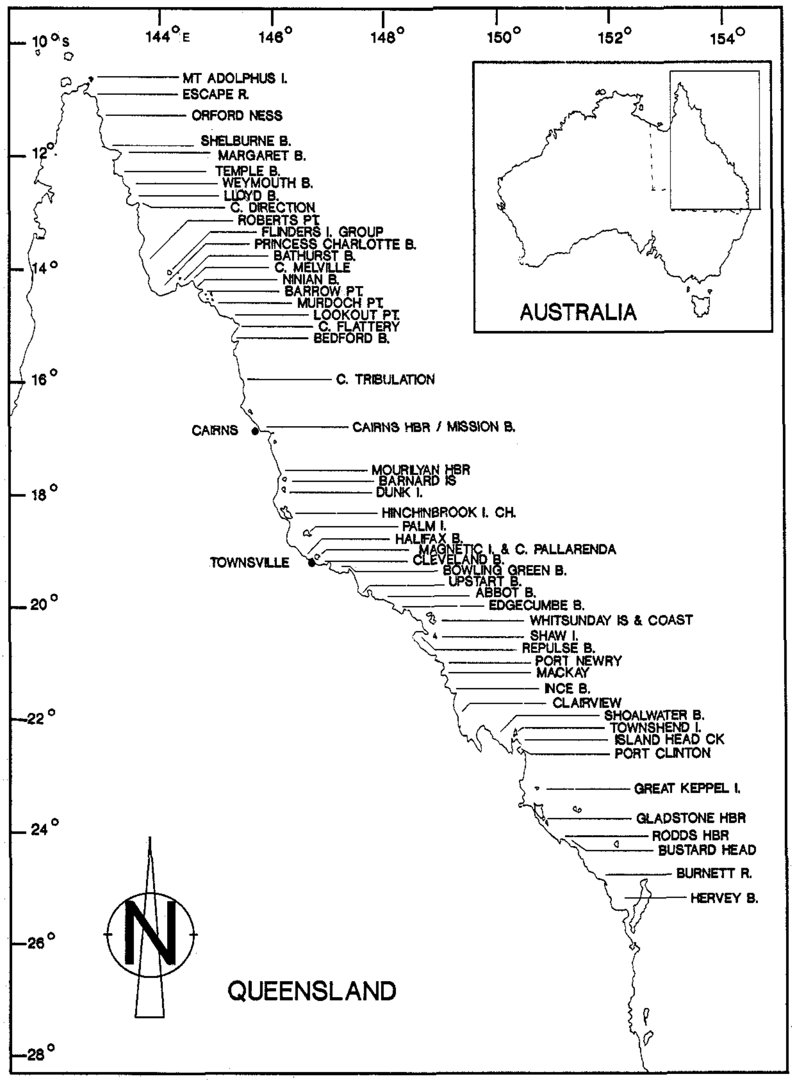
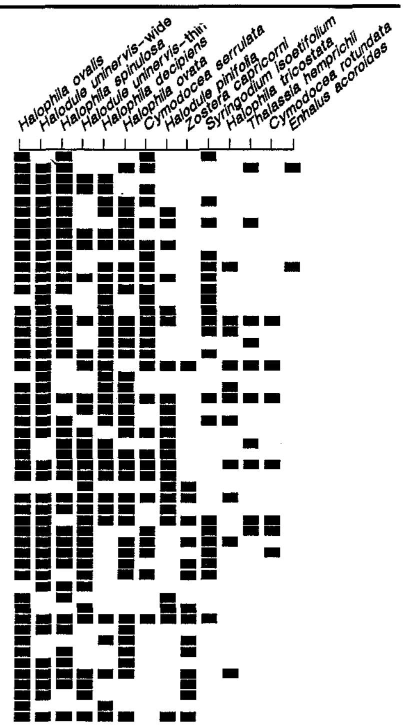


Fig. 2. Geographical areas and localities where seagrass was found between Cape York and Hervey Bay.

region (Cape York to Hervey Bay), approximately 4000 km^2 of seagrass habitat were mapped (Table 2). This included two large areas of deep-water seagrasses: approximately 1566 km^2 in the Barrow Point to Lookout Point region and approximately 1026 km^2 in Hervey Bay. Seagrasses were most often found in areas that received shelter from the prevailing south-easterly trade winds, such as in bays, behind northerly facing peninsulas, behind islands, reefs and shoals, and on some reef platforms and fringing reefs. Of the total area of seagrasses mapped, 1456 km^2, or 37%, were densely vegetated (>50% bottom vegetation cover; Table 2).

Table 2. Areas of seagrass habitat (by category of bottom vegetation cover) and species occurrence in selected geographical areas between Cape York and Hervey Bay

Geographical Location	Area of seagrass cover (km^2) <10%	10–50%	>50%	Total
MT ADOLPHUS I.			0.98	0.98
ESCAPE R.		4.18		4.18
ORFORD NESS	2.12	4.95		7.07
SHELBURNE B.		1.5	11.1	16.70
MARGARET B.	4.02	5.81	6.08	15.91
TEMPLE B.	24.64			24.64
WEYMOUTH B.			4.14	4.14
LLOYD B.	3.92	8.08		12.00
C. DIRECTION	48.07	71.32		119.39
ROBERTS PT.			159.00	159.00
FLINDERS I. GROUP	5.68		10.15	15.83
PRINCESS CHARLOTTE B.		51.04	16.08	67.12
BATHURST B.	68.75		118.28	187.03
C. MELVILLE		13.41		13.41
NINIAN B.			28.24	28.24
BARROW PT. – MURDOCH PT.	107.07	211.51	43.17	361.75
MURDOCH PT. – LOOKOUT PT.	534.29	502.22	167.52	1204.03
C. FLATTERY	2.16	8.51		10.67
BEDFORD B. – C. TRIBULATION	2.16	1.07	2.53	5.76
CAIRNS HBR.	1.37	7.79	11.85	21.01
MOURILYAN HBR.	0.19	1.12		1.31
BARNARD IS	3.74	4.6		8.34
DUNK I. & COAST	1.39	3.93		5.32
NTH HINCHINBROOK I.	19.19	9.05		28.24
HINCHINBROOK I. & CH.	19.7	5.53	5.15	30.38
PALM I.	1.43	2.05		3.48
HALIFAX B.	16.95	3.44		20.39
C. PALLARENDA	5.92	9.12		15.04
MAGNETIC I.	6.54	4.78	1.56	12.88
CLEVELAND B.	3.22	56.95		60.17
BOWLING GREEN B.	7.15			7.15
UPSTART B.	6.2	20.64	32.33	59.17
ABBOT B.	14.44	15.91	3.0	33.35
EDGECUMBE B.	7.16	3.66	13.35	24.17
WHITSUNDAY COAST	12.41	4.11		16.52
WHITSUNDAY ISLANDS	9.74	7.17	13.06	29.97
SHAW I.	1.22	2.53		3.75
REPULSE B.	4.47	2.28		6.75
PORT NEWRY	4.88	2.53		6.74
MACKAY	5.47	1.64		7.11
INCE B.	5.75	5.49		11.24
CLAIRVIEW	12.93	7.39		20.32
SHOALWATER B.	15.93	21.25		37.18
TOWNSHEND I.	9.96	4.15		14.11
ISLAND HEAD CK	0.6	4.14	0.45	5.19
PORT CLINTON	83.97	65.65	23.19	172.81
GREAT KEPPEL I.	4.44	1.25	0.45	6.14
GLADSTONE HBR	2.85	10.27	4.04	17.16
RODDS HBR	4.29	2.89	0.27	7.45
BUSTARD HEAD		3.07		3.07
BURNETT R.		2.07		2.07
HERVEY B.	21.16	225.5	779.68	1026.34
TOTALS	1117.54	1408.99	1455.65	3982.18



In all, 14 seagrass species were identified in our samples (Table 2). Some specimens within the genus *Halophila* could not be identified to species by using the available taxonomic keys. Correct identifications, or new descriptions, of these specimens await revision of the taxonomy of the genus *Halophila* (Kuo, personal communication). Most of the species collected were widely distributed along the Queensland eastern seaboard. For each of the geographic localities or areas selected, we list the species of seagrass found (Table 2).

Thalassia hemprichii (Ehrenb.) Aschers. was common in reef- or island-associated sites. *Zostera capricorni* Aschers. was found almost exclusively at coastal, sheltered, muddy sites. Most other species were found at either coastal or island sites. The opportunistic *Halophila* and *Halodule* species were present at most sites, and *Halophila ovalis* (R. Br.) Hook. f., *Halophila ovata* Gaud., *Halophila spinulosa* (R. Br.) Aschers., and *Halodule uninervis* (Forsk.) Aschers. were the most common species. *Halophila ovalis* and *Halodule uninervis* were each found in more than 15% of samples. *Enhalus acoroides* (L. f.) Royle and *Cymodocea rotundata* Ehrenb. et Hempr. ex Aschers. were the least common species.

Some species were found in our surveys over a limited latitudinal range (Table 2). *Zostera capricorni* was found only south of 16°S (near Cairns). *Cymodocea rotundata* was found predominantly in the central and southern regions between latitudes 16°S and 20°30′S (Shaw Island in the southern Whitsunday Islands), although it was also found on Combe Reef and Mid Reef (midshelf reef platforms in the northern section at latitude 14°30′S) and extensively on reef platforms in the Torres Strait (QDPI, unpublished data). *Enhalus acoroides* did not appear in samples south of the Flinders Island Group (14°12′S). *Halophila tricostata* Greenway was found between the Flinders Island Group (14°12′S) and Gladstone Harbour (23°45′S), including both deep-water and shallow coastal sites. *Thalassia hemprichii* was found only in the northern and central regions, north of Shute Bay (20°15′S). *Cymodocea serrulata* (R. Br.) Aschers. and Magnus and *Syringodium isoetifolium* (Aschers.) Dandy were not found south of Shoalwater Bay (22°15′S).

Species richness, measured as the number of species in samples, decreased with increasing latitude. Sampling sites with five or more species in samples occurred at Margaret Bay, the Flinders Island Group, Bathurst Bay, Ninian Bay, Mission Bay, Dunk Island, Upstart Bay, Whitsunday Islands, Shaw Island, Port Newry and Shoalwater Bay. All of these sites were in water less than 6 m deep.

Seagrass Depth Distribution

Seagrasses were found between 2·2 m above and 28 m below mean sea level (MSL) (Fig. 3). The mean depth (below MSL) of occurrence for each species was less than 7 m and for most species was less than 4 m. Seagrasses occurred in the intertidal zone at sites that were well sheltered and provided some entrapment of water over the substrate during periods of tidal exposure. *Halophila tricostata*, *Halodule pinifolia*, *Cymodocea rotundata*, *Thalassia hemprichii* and *Enhalus acoroides* were not found at sites above MSL, and *Enhalus acoroides* was absent at depths of less than 2 m (Fig. 3).

Only the *Halophila* and *Halodule* species were found regularly at depths greater than 10 m (Fig. 3). *Cymodocea serrulata* was found in deep water (18 m), only at low density and in clear water offshore, in the Barrow Point to Lookout Point region. The deepest sites where seagrass was found in our surveys were between Barrow Point and Lookout Point and in Hervey Bay, where extensive deep-water seagrass meadows were found. Some seagrasses may also be at densities too low, or at depths too deep, to be observed by divers.

Seagrass Abundance

Means and ranges of seagrass biomass per square metre, shoot density, and leaf area index were obtained from pooled data from all regions that were surveyed (Fig. 4). Average species biomasses were all less than 20 g m^{-2}. The maximum recorded above-ground biomass was 102·9 g m^{-2} for *Zostera capricorni* at Upstart Bay. Other species with large biomasses were *Cymodocea serrulata* and *Halophila spinulosa*. Leaf area index was greatest (1·81) for *Zostera capricorni* at Upstart Bay. Maximum leaf area index for *Cymodocea serrulata* was 1·44 at Ninian Bay. Average shoot densities for species were all less than 2000 m^{-2}. The highest recorded shoot density was 13 806 shoots m^{-2} for *Halophila ovalis* at Escape River. Three other species—*Zostera capricorni*, *Halophila decipiens* Ostenfeld and *Halodule pinifolia*—at times had high shoot densities.

Discussion

The species of seagrass found between Cape York and Hervey Bay are common throughout northern Australia, including the Gulf of Carpentaria (Coles and Lee Long 1985; Poiner *et al.* 1987) and the Torres Strait (Bridges *et al.* 1982; QDPI, unpublished information). The same species are also typical of the Indo-West Pacific region and are considered to be tropical species (den Hartog 1970; Fortes 1989). Only *Halophila tricostata* and the unidentified *Halophila* species have not been recorded from other regions. *Enhalus*

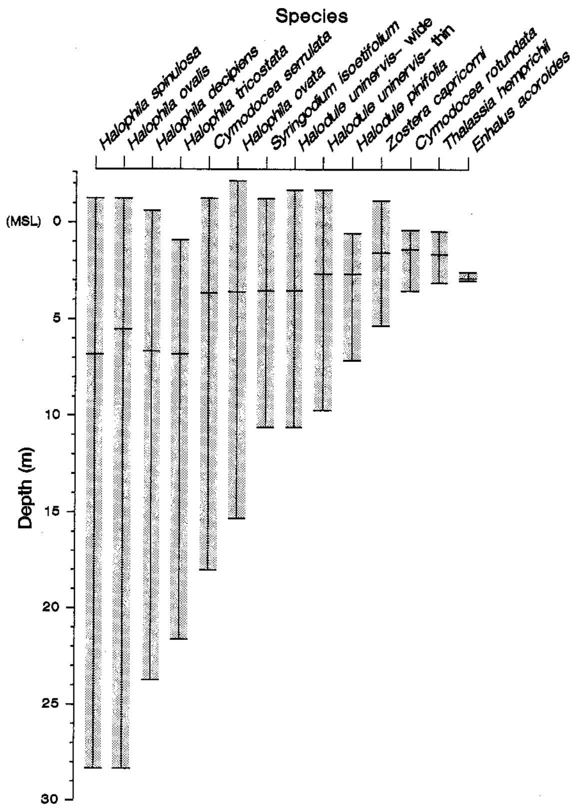


Fig. 3. Means and ranges of depths of occurrence of seagrasses found between Cape York and Hervey Bay. MSL, mean sea level.

acoroides is common in the Torres Strait and the Gulf of Carpentaria (Poiner *et al.* 1987, 1989; QDPI, unpublished information), but we found it to be uncommon south of Cape York. *Thalassodendron ciliatum* (Forsk.) den Hartog was not found in our surveys but has been recorded from coastal locations between Cape York and the Whitsunday Islands (den Hartog 1970). This species is typically found near the margins of reef platforms and is common in the Torres Strait (den Hartog 1970; Bridges *et al.* 1982; QDPI, unpublished information).

The total area of seagrass habitat mapped between Cape York and Hervey Bay (Table 1) alone is close to the total known area of mangrove habitat (at least 3900 km^2) for all of Queensland (Robertson and Lee Long 1991). The regional contribution of these submarine habitats to primary production and habitat for marine fauna is therefore likely to be extremely important.

Localities with very large areas (greater than 150 km^2) of seagrass habitat included Roberts Point, Bathurst Bay, Port Clinton, Barrow Point to Lookout Point, and Hervey Bay (Table 2). The last two localities support the only known extensive meadows of dense seagrass in deep water (>15 m) adjacent to the eastern Queensland coast. Large areas of dense seagrasses have been recorded in the north-western Torres Strait (Poiner *et al.* 1989), but these were in shallow waters usually less than 12 m deep. Large areas of dense seagrass meadows in deep water, dominated by *Halophila* species, may be common in parts of the Great Barrier Reef lagoon that have not yet been surveyed. This type of seagrass habitat has generally been seen in deep-water areas that are sheltered from oceanic swells, including parts of the Torres Strait (QDPI, unpublished data); it has been recorded in few other areas in the Indo-Pacific region. Numerous dugong feeding trails found in the midshelf area

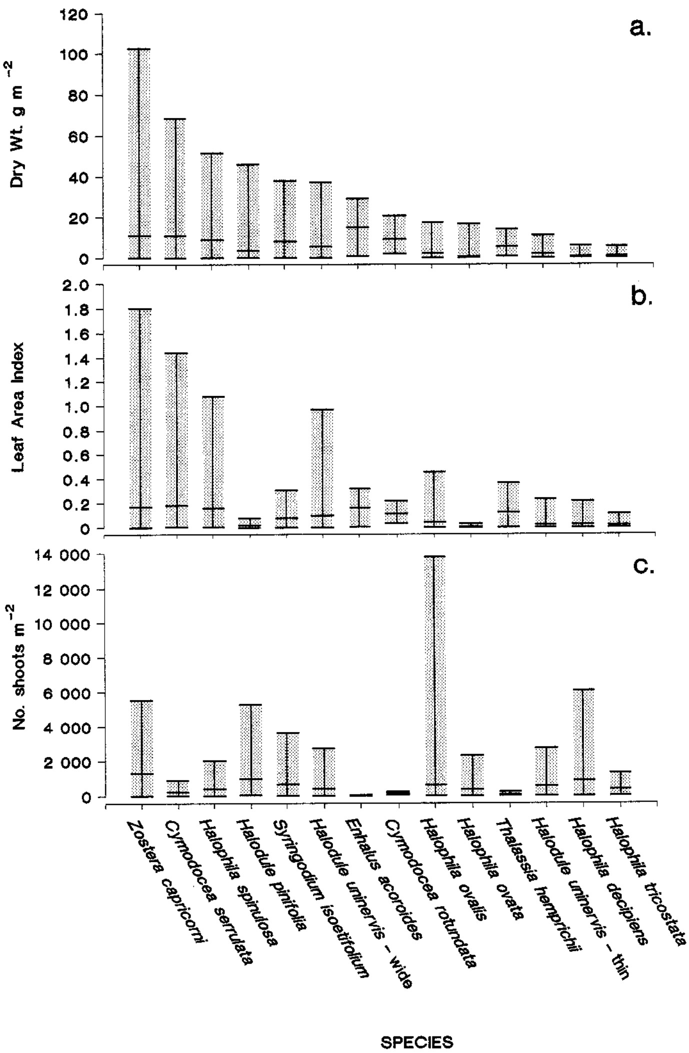


Fig. 4. Means and ranges of (*a*) above-ground (leaves and shoots) biomass, (*b*) leaf area and (*c*) shoot densities of seagrasses sampled between Cape York and Hervey Bay.

between Barrow Point and Lookout Point at depths down to 23 m indicated for the first time the importance of these deep-water *Halophila* meadows as food for dugong (Lee Long *et al.* 1989). Ephemeral (late spring) meadows of *Halophila tricostata* mixed with *Halophila decipiens* have been described (Kuo *et al.* 1993), but little is known of the ecological importance of these seagrass habitats or of their distribution in deeper waters.

Further surveys are anticipated to investigate reef-platform seagrass habitats and their potential importance to juvenile prawns in the Great Barrier Reef region. These reef-platform environments have been shown to be of major economic importance to the fishery for tiger and endeavour prawns in the Torres Strait (Mellors 1990). Large populations of juvenile western king prawns (*Penaeus latisulcatus*) and red-spot king prawns (*Penaeus *longistylus*) have been sampled from reef-platform seagrass habitats of the Great Barrier Reef (Coles *et al.* 1987*a*). These species are the basis for important commercial fisheries in near-reef areas of the Great Barrier Reef (Robertson and Dredge 1986).

Three general depth zones of seagrass species composition were recognisable, in agreement with the zonation found previously in the northern region (Coles *et al.* 1987*a*). A shallow zone less than 6 m deep contained a high number of species, and all species occurred in these depths. Between 6 and 11 m, the pioneering *Halophila* and *Halodule* species were the most frequently sampled seagrasses. Deeper than 11 m, only *Halophila* species were common. The ability to grow in low light intensities, attributed to the *Halophila* species (Young and Kirkman 1975; Josselyn *et al.* 1986), may give this genus a competitive advantage over other species in deep or turbid waters. Monospecific seagrass meadows were rarely found but occurred over a wide range of depths. They were found mainly in areas of high exposure or high energy (e.g. on open coastlines) or in deep water (at depths >11 m). Within the wide range of latitudes and site types sampled, zonation patterns of seagrass habitat were mostly related to depth zonations. Depth zonation patterns were influenced by the tidal range and levels of exposure and turbidity at each site, a phenomenon noted also by Johnstone (1982) at sites in Papua New Guinea.

Our surveys of seagrasses along the eastern Queensland coast did not always precisely define the seaward limit of seagrass meadows. Attenuation of photosynthetically active radiation with increasing water depth would affect the offshore distribution of seagrasses (Iverson and Bittaker 1986), and it is unlikely that dense meadows would be found deeper than 30 m. Exposure, turbidity and low salinity are thought to limit the nearshore distribution and upper tidal range of seagrasses in the north-eastern Queensland coastal region (Bridges *et al.* 1982; Coles *et al.* 1987*a*).

We observed a decrease in the number of seagrass species in geographic areas and in single sites with an increase in latitude (Table 2). These surveys have also established the known latitudinal ranges for some species on the eastern Australian seaboard. Our most northerly record of *Zostera capricorni* in the surveys was at Port Douglas (16°29′S); however, we have since collected this species in rivers and creeks north to latitude 16°12′S. den Hartog (1970) recorded a few plants of this species at Thursday Island in the Torres Strait, and Johnstone (1982) recorded *Zostera capricorni* at Daru on the southern coast of New Guinea. These sites are north of our study area. There have been no recent records of *Zostera capricorni* from the Torres Strait (Bridges *et al.* 1982; Poiner *et al.* 1989; Coles, unpublished information), and our surveys identify the present northern limit of this species on the eastern Australian coast as approximately 16°S. For a number of other species, we have established the southern limits of recorded distribution on the eastern Australian coast. *Cymodocea rotundata* has so far not been found south of Shaw Island (20°30′S), south of the Whitsunday Group of islands. Hayman Island (20°03′S), also in the Whitsunday Group, was previously the most southern recorded locality for this species (den Hartog 1970). The southern limit of *Enhalus acoroides* on this coast appears to be at the Flinders Island Group (14°12′S), in Princess Charlotte Bay. den Hartog (1970) recorded this species at Thursday Island, at the tip of Cape York. The most southern site recorded for *Halophila tricostata* was Gladstone Harbour (23°45′S) (see also Kuo *et al.* 1993). We found no other published records of this species since the description by Greenway (1979). Our surveys found no evidence of *Cymodocea serrulata* or *Syringodium isoetifolium* south of Shoalwater Bay, but these species are common in Moreton Bay (south of our study area) as single-species stands or in mixed-species communities (Young and Kirkman 1975; Hyland *et al.* 1989). Temperate seagrasses, such as *Posidonia australis* Hook. f. and *Heterozostera tasmanica* (Martens ex Aschers.), do not replace the species identified in our study until south of approximately 30°S (Moreton Bay) on the eastern Australian coast, south of our study area (Larkum and den Hartog 1989).

Species towards the limits of their latitudinal ranges did not appear to decrease in abundance. When a species is near its climatic tolerance limits, site conditions at some inshore localities might still be sufficient for that species to establish a dense cover. In a study of seagrasses between Cape York and Cairns, only the common pioneering species of *Halophila* and *Halodule* showed significant differences between latitudes in seagrass shoot density, leaf area and biomass (Coles *et al.* 1987*a*). These differences were considered to be related to site differences rather than trends along the coast. We suspect that more detailed studies of the physiological tolerances and abundance patterns of these seagrasses over their geographical ranges might in fact reveal that many species at the borders of their latitudinal ranges are living well within their tolerance ranges.

The broad-leafed seagrasses *Cymodocea serrulata*, *Halophila spinulosa* and *Zostera capricorni* and the wide-leafed *Halodule uninervis* contributed most to seagrass abundance between Cape York and Hervey Bay. Above-ground biomasses, shoot densities and leaf area indices for these seagrasses are comparable to those in other tropical Indo-West Pacific seagrass habitats (Fortes 1989). Large-biomass meadows of these species and *Enhalus acoroides* are common in bays, in fringing reefs and on platform reefs in the Torres Strait (Bridges *et al.* 1982).

Seagrass Site and Habitat Type Classifications

Seagrasses of the eastern Queensland coast and islands occurred in a wide range of habitat types. These included site groups described in studies of seagrass communities of the Gulf of Carpentaria (Poiner *et al.* 1987) and the southern Torres Strait (Bridges *et al.* 1982) as well as a number of other community types and sites. Seagrass meadows dominated by *Enhalus acoroides*, which were common in shallow, sheltered sites in the Gulf of Carpentaria (Poiner *et al.* 1987) and in the Torres Strait (Bridges *et al.* 1982), were not common on the eastern coast of Queensland. Open-coastline communities typical of the western Gulf of Carpentaria, where *Halophila ovalis* and *Halodule uninervis* dominate intertidally and *Cymodocea serrulata* and *Syringodium isoetifolium* dominate subtidally (Poiner *et al.* 1987), were mostly found on parts of the eastern Queensland coast where streams with freshwater runoff were few in number. Along much of the eastern coastal region, however, freshwater runoff is large, and stress due to low salinities may prevent communities of *Cymodocea serrulata* and *Syringodium isoetifolium* from developing inshore.

Seagrass communities near estuaries with freshwater influence were generally in shallow, intertidal areas. These communities generally did not have a high species richess (number of species) but often had high seagrass shoot densities. Stress due to high turbidities (causing low irradiances) and low salinities associated with estuarine runoff probably have adverse effects on the diversity of seagrasses in these areas. Seagrass communities near inlets, where freshwater influence is less and of shorter duration, sometimes supported many species. These areas included Cairns Harbour and Upstart Bay.

We identified, associated with fringing-reefs and reef platforms, mixed-species seagrass communities which are typical in the Indo-Pacific region, such as along southern Papua New Guinea (Johnstone 1978*a*, 1978*b*), in Palau (Ogden and Ogden 1982), in the southern Torres Strait (Bridges *et al.* 1982) and in the Philippines (Fortes 1989). In contrast to those areas, however, the mixed-species communities in our surveys were not restricted to the confines of fringing reefs. They were also found in sheltered bays at continental-island or coastal localities. Dense seagrass communities of *Cymodocea serrulata* and *Syringodium isoetifolium* as described from Moreton Bay by Young and Kirkman (1975) and Hyland *et al.* (1989) were also found at some coastal and island sites.

Patterns of seagrass abundance are of direct importance for managing these habitats and for maintaining the integrity of coastal zone systems and fisheries stocks. Differences in seagrass abundance and species composition between sites are important in assessing the value of seagrass resources to juvenile prawns and to dugong and turtles. Factors that determine the suitability of seagrass habitats for the survival of juvenile prawns are complex and need to be investigated in detail. These are likely to include physical parameters such as water quality (salinity, etc.) and seagrass habitat structural complexity (Heck and Orth 1980; Gore *et al.* 1981; Bell and Westoby 1987) as well as biological factors such as shelter from predation (Leber 1985; Bell and Pollard 1989), competition, food availability and prawn sediment preferences.

Studies that monitor change in the quality and area of seagrass habitats are required. Seasonal (Mellors *et al.* 1993) and year-to-year changes in seagrass distribution and abundance in the northern Australian region can be large (Poiner *et al.* 1989) and could have far-reaching consequences for juvenile-prawn biology. Temporal changes in seagrass abundance are likely to have important effects on dugong and turtle biology (Lanyon *et al.* 1989).

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