

## Coffin Bay coastal waters baseline study – interim report



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## Overview

The six coastal components that formed the basis for the Coffin Bay coastal waters study included the following habitats and sites: seagrass, 8 sites; mud/sandflat, 7 sites; subtidal soft sediment, 6 sites; rocky shore, 6 sites; saltmarsh, 6 sites; and sandy beach, 11 sites (see Figure 1). Salinity transects were also undertaken throughout Kellidie Bay along the south-eastern shoreline close to the Coffin Bay township where the underground aquifer lens most likely seeps into the bay (Figure 1). Each of the habitats were sampled in each of the different Marine Park zones, viz. Sanctuary Zones (SZ), Habitat Protection Zones (HPZ) and General Managed Use Zones (GMUZ) in both semi-closed (SC) and open (O) bays (Figure 1). Three habitats (mudflat, rocky shore and saltmarsh) could not be sampled in Sanctuary Zones in Open Bays, as these habitats were not represented in the particular bay type or sanctuary zone (Figure 1). Several habitats in particular Marine Park zones and bay types were sampled at multiple sites of interest to gain a better spatial representation (i.e. multiple locations such as Mt Dutton and Kellidie Bays) of baseline information for those habitats from a natural resource management perspective (Figure 1, Table 1). All sampling was completed in early September 2016.

The total number of replicates taken for each habitat component varied, depending on the method used for each per site. Seagrass samples ( $n = 10$ ) were taken across 1 m transects by using a metal rake (0.5 m width) to remove seagrass and attached epiphytes from the benthos. Subtidal sediment samples ( $n = 10$ ) were obtained by benthic grab (Ekman grab 225 cm<sup>2</sup> surface area) with sediments rinsed over a 500 µm sieve to remove fine sediments and retain infauna. Mudflat sediment samples ( $n = 10$ ) were obtained with a PVC corer (83.32 cm<sup>2</sup> surface area) and rinsed over a 500 µm sieve to retain benthic infauna. Rocky shore fauna and algae were sampled ( $n = 10$ ) with photo quadrats (0.25 m<sup>2</sup>) and timed searches. Beaches were rapid-sampled for morphologies with transects ( $n = 3$ ) across each beach from low to high tide which included sediment core samples (83.32 cm<sup>2</sup> surface area) at the low and high tide zones ( $n = 4$ ). Other beach characteristics were also recorded in the field including photopoints for wrack presence, presence of animal tracks and human beach usage (e.g. evidence of vehicles, people walking). Saltmarsh was recorded with video transects ( $n = 10$ ). Salinity transects ( $n = 4$ , 200 m length) were taken in Kellidie Bay parallel to the shoreline at every 50 m interval with salinity, temperature and dissolved oxygen levels sampled at the water surface and with a Niskin bottle at the seafloor in water depths of 1 to 4.5 m).

Habitat	Marine Park zone		SC		O	
	SZ	HPZ	SC	O	SC	O
Seagrass	✓✓	✓	✓✓	✓	✓✓	✓
Subtidal sediment	✓	✓	✓	✓	✓	✓
Mudflat	✓✓	✓✓	✓	✓✓	✓	✓
Rocky shore	✓	✓	✓	✓✓	✓	✓
Beach	✓	✓	✓	✓✓✓✓✓✓	✓	✓
Saltmarsh	✓✓	✓	✓	✓	✓	✓

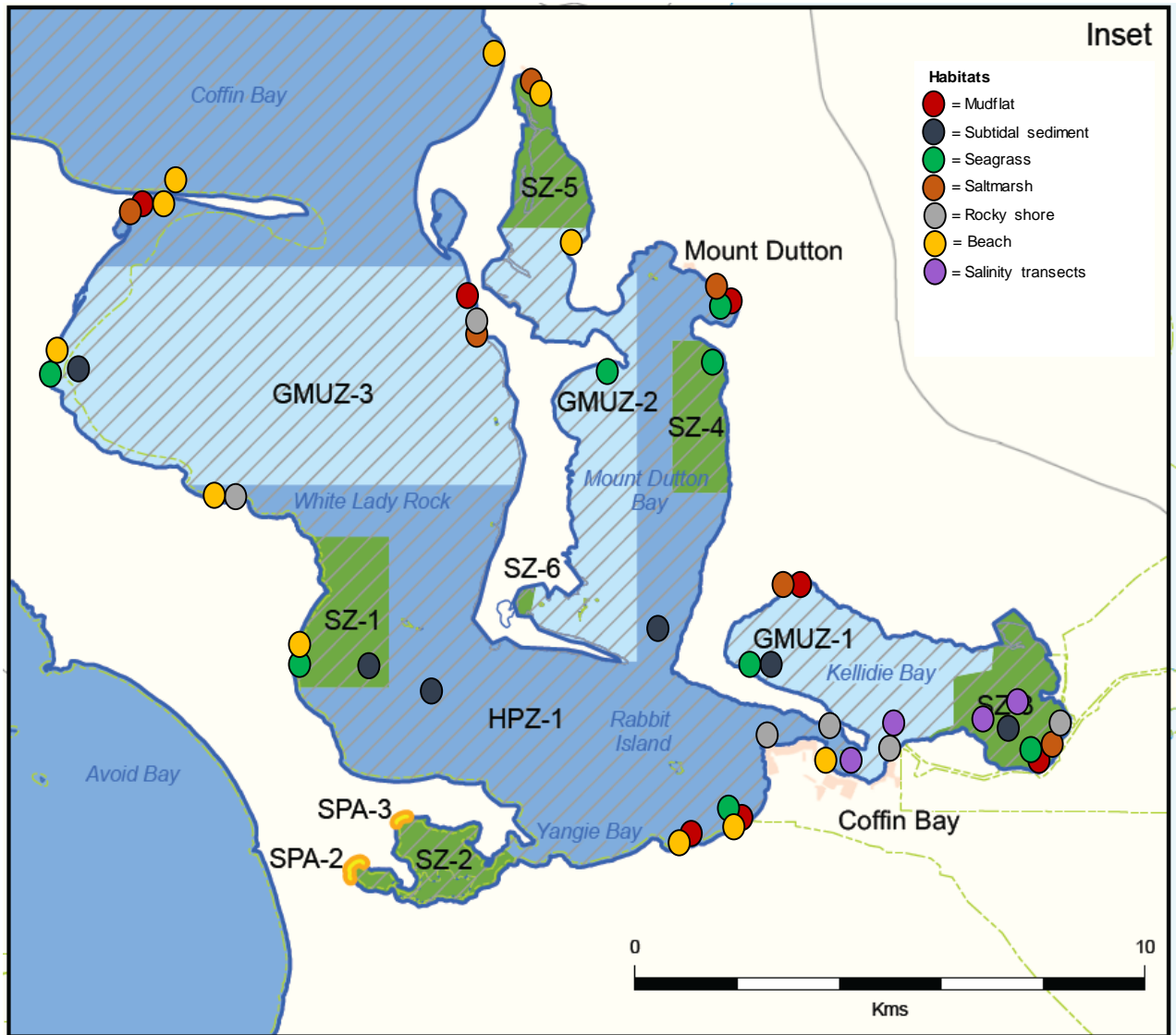


Figure 1: Sampling design used for Coffin Bay coastal waters study of Marine Park zones (SZ, Sanctuary Zone; HPZ, Habitat Protection Zone; GMUZ, General Managed Use Zone) and Bay types (SC, Semi-closed at Kellidie Bay and Mt Dutton Bays; O, open at Pt Longnose, Pt Douglas, Eeely Point to Long Beach) with ticks against various habitat components where sampling sites were located (each single tick represents a sampling station or site). Coffin Bay map shows each site location for each habitat component that was sampled during the September 2016 field trips.

Table 1: Number of replicates taken for each habitat component in each Marine Park zone, bay type and the location of each.

Marine Park zone		SZ			HPZ						GMUZ			
Habitat	Bay type Location	SC		O	SC		EP	CP	O	PD	FB	SC		O
		KB	DB	EP	KB	DB			LB			KB	DB	PD
Habitat	Seagrass	10	10	10		10			10			10	10	10
	Subtidal sediment	10		10		10	10					10		10
	Mudflat	10				10			20	10		10		10
	Rocky shore	10			10			10		10		10		10
	Beach		3	3	3				6	9	3		3	3
	Saltmarsh	10	10			10					10		10	

Site code KB, Kellidie Bay; DB, Mt Dutton Bay; EP, Eely Point; CP, Crinoline Point; LB, Long Beach; PD, Pt Douglas; FB, Farm Beach

## Field observations

### Seagrass

Seagrass sampled from shorelines throughout the different bays consisted of *Zostera* spp. and *Halophila* spp. in water depths up to 1.2 m. Epiphyte load was considerable at multiple sites within SZ, HPZ and GMUZs in Kellidie Bay, Mt Dutton Bay and open bays (e.g. Pt Douglas). One exception was the seagrass site at Long Beach, which had very low epiphyte load in comparison. From our observations it appears that the faunal assemblages vary throughout the different bays, but further analyses of the presence/absence data is required to determine the details of any particular differences between bays and Marine Park zones.

### Subtidal sediment

Subtidal soft sediments were sampled throughout the various bays at depths ranging from 2 to 7.5 m at distances between 200 to 400 m from shore. Most sites had similar sediment consistency of sand with the exception of the Mt Dutton Bay HPZ site, which consisted of anoxic and very fine silt. Most of the subtidal sediment samples consisted of polychaetes, bivalves and amphipods but closer identification to finer taxonomic levels, counting for abundances and sorting of remaining samples is required to determine if there are any differences in community structure between the various bays and Marine Park zones.

### Mudflat/sandflat

Mudflats or sandflats varied from extensive tidal flats (e.g. Kellidie Bay) through to much larger extensive tidal flats at Pt Longnose and Long Beach. The tidal flat at Long Beach in particular was very different at the western end (e.g. mainly sandflat only) compared to the eastern end (sandflat mixed with *Zostera* spp. seagrass patches and mussel beds). Mussel beds were also found in tidal flats in Kellidie and Mt Dutton Bays. Macroinvertebrate infauna observed during the field trip and during sorting of a small proportion of samples consisted of mussels (e.g. *Xenostrobus* *inconstans*), other bivalves (e.g. Tellinidae), polychaetes (e.g. *Capitella* spp., Nereididae) and amphipods. Common gastropod species were also found at the sediment surface at most sites (e.g. *Salinator* spp., *Batillaria* spp., *Bembicium* spp.). Further sorting of remaining samples, identification to finer taxonomic level and abundance counts is required to determine how the macroinvertebrate community varies between bays and Marine Park zones.

### Rocky shore

Rocky shores varied throughout the different bays ranging from short, low-lying limestone platforms (e.g. Kellidie Bay) to vertical limestone platforms (e.g. Pt Douglas west) and very rough, eroded, limestone/siltstone (e.g. Pt Douglas east). Mussels (e.g. *Mytilus* sp., *Brachidontes* *erosus*, *Limnoperna* *pulex*) were found along rocky shore sites in Kellidie Bay, Crinoline Point and the western side of Pt Douglas. Common gastropods were observed at all rocky shore sites (e.g. *Siphonaria* *diemenensis*, *Austrocochlea* *constricta* and *Nerita* *atramentosa*). There were also many other species of gastropods

identified from timed searches and photo quadrats, which require enumerating to establish an understanding of the variation between bays and Marine Park zones.

### Beach

Beaches throughout the various bays mainly had reflective or intermediate type morphologies. The two beaches at the outer of Pt Longnose and Farm Beach had higher wave exposure compared to all other beaches within Pt Douglas and Kellidie and Mt Dutton Bays. The beaches along the western shorelines of Pt Douglas and Eely Point were the steepest and quite narrow in width (< 8 to 30 m). Those beaches closest to the Coffin Bay Township (e.g. Long Beach sites, Kellidie Bay entrance) and Farm Beach had the most human traffic with people walking, using 4WDs, boating and/or fishing. Larger terrestrial fauna tracks (e.g. emu, kangaroo) were mainly observed at beaches further away from civilization around Pt Douglas and Pt Longnose. Further analyses of the data obtained from the field trip would determine how much variation there is between beaches between bays and Marine Park zones.

### Saltmarsh

The most extensive areas of saltmarsh were found in sites through the upper reaches of Mt Dutton Bay and the eastern end of Kellidie Bay. At other sites in Kellidie Bay, Pt Douglas and Pt Longnose, the saltmarsh mainly consisted of smaller defined patches. Further species identification of plants (i.e. from frozen samples held at Flinders University) contributing to saltmarsh communities is required to determine the structure of saltmarsh throughout the various bays and Marine Park zones.

### Salinity transects

Salinity transects undertaken in Kellidie Bay had ranges between 32 to 36 ppt., but the difference between salinities of surface and bottom water did not surpass 1 to 2 ppt. Water temperatures ranged between 13 to 16°C and dissolved oxygen was above 90 %. Further analyses is required on the salinity data obtained during the field trip to identify if there is any presence of seepage from the Coffin Bay aquifer lens but at this stage it appears as though there is no evidence from the data obtained. Further works would require more detailed continuous monitoring of water parameters through multiple seasons to establish the dynamics of seepage from the Coffin Bay aquifer.

### ***Further tasks for completion of project***

Laboratory processing on the subtidal sediment and mudflat samples has already started (43 samples sorted out of 130 in total) while in Coffin Bay during the September field trip (see Table 2), but still requires 87 samples still to be sorted and all samples need fauna identified and counted. Beach transects were recorded in the field, so only require data entry. All other habitat components require sorting of samples in the laboratory (e.g. seagrass) or on computer (i.e. rocky shore and saltmarsh for photo quadrats and video transects, respectively).

Data for each of the habitat components still require entry into spreadsheets for graphing and statistical analyses. The full report and interpretation of all field observations and quantitative data with recommendations for future monitoring and research to inform Marine Park and natural resource management will be prepared as required by the contractis still required completion during the middle of 2017.

Table 2: Total sites sampled, sampling method type undertaken, total samples taken and the number of samples already processed and still to be sorted in the laboratory.

	No. sites	No. samples	Sample type	Total # samples	Already sorted	Still to be sorted/analysed
Seagrass	8	10	1 m rakes	80	0	80
Subtidal sediment	6	10	grab samples	60	9	51
Mudflat	7	10	cores	70	34	36
Rocky shore	6	10	quadrats	60	0	60
Beach	11	3	transects	33	33	0
Saltmarsh	6	10	transects	60	0	60