Electronic Supplemental Material

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Table S 1. Seagrass species and cover (mean ± SD) at study site location

Study site	Longitude	Latitude	**All species present**	**Dominant seagrass species**	**Seagrass genus**	**Seagrass cover (%)**
Changi Beach Park	104.00212	1.38461	Halophila, Ruppia sp.	Halophila ovalis	Halophila sp.	47.00 ± 19.24
Chek Jawa	103.99102	1.4104	Halophila, Ruppia sp., Halodule, Zostera, Heterozostera, Syringodium, Cymodocea sp.	Halophila ovalis	Halophila sp.	80.15 ± 12.53
Tanah Merah	103.98373	1.31677	Amphibolis, Thalassia, Phyllospadix, Posidonia, Enhalus sp.	Thalassia hemprichii	Thalassia sp.	53.75 ± 20.66
Eagle Bay	103.8545	1.229	Amphibolis, Thalassia, Phyllospadix, Posidonia, Enhalus sp.	Thalassia hemprichii	Thalassia sp.	70.00 ± 23.58
Cyrene Reef	103.755458	1.259039	Halodule, Zostera, Heterozostera, Syringodium, Cymodocea sp.	Cymodocea rotundata	Cymodocea sp.	27.25 ± 23.09
Labrador Nature Reserve	103.800937	1.266452	Halodule, Zostera, Heterozostera, Syringodium, Cymodocea sp.	Cymodocea rotundata	Cymodocea sp.	81.67 ± 5.59

Species presence and dominant species were compiled from field observations and site records, and seagrass cover values were compiled from literature (Alemu et al., 2022)

Table S3

Table S3. Summary of sediment properties in the upper 0–25 cm (dry bulk density and mud fraction) by site (a) and geomorphology (b; mean ± SD; min–max; n cores). Values are calculated from depth-resolved measurements aggregated within 0–25 cm. Units used: stocks in Mg Corg ha−1, CO2 in mg m−2 h−1, CH4 in µg m−2 h−1, refusal depth in cm, conductivity in mS/cm, dissolved oxygen in % saturation.

site_id	geomorphology	variable	n	mean ± SD	min_max
CBP	Estuarine	Dry bulk density (g cm-3), 0-25 cm	11	1.486 ± 0.080	1.375-1.627
CJ	Estuarine	Dry bulk density (g cm-3), 0-25 cm	15	1.280 ± 0.190	1.007-1.499
CR	Reef-associated	Dry bulk density (g cm-3), 0-25 cm	9	1.404 ± 0.181	1.014-1.570
EB	Lagoonal	Dry bulk density (g cm-3), 0-25 cm	9	1.553 ± 0.113	1.344-1.744
LNR	Reef-associated	Dry bulk density (g cm-3), 0-25 cm	9	1.151 ± 0.242	0.850-1.507
TM	Lagoonal	Dry bulk density (g cm-3), 0-25 cm	9	1.238 ± 0.152	0.993-1.454
CBP	Estuarine	% mud, 0-25 cm	11	68.266 ± 21.527	30.387-97.901
CJ	Estuarine	% mud, 0-25 cm	15	22.073 ± 10.868	7.202-42.021
CR	Reef-associated	% mud, 0-25 cm	9	11.652 ± 4.660	5.895-17.095
EB	Lagoonal	% mud, 0-25 cm	9	5.135 ± 1.515	2.497-7.652
LNR	Reef-associated	% mud, 0-25 cm	9	21.599 ± 5.129	13.923-29.030
TM	Lagoonal	% mud, 0-25 cm	9	9.996 ± 2.825	5.689-15.843

geomorphology	variable	n	mean ± SD	min_max
Estuarine	Dry bulk density (g cm-3), 0-25 cm	26	1.367 ± 0.183	1.007-1.627
Lagoonal	Dry bulk density (g cm-3), 0-25 cm	18	1.396 ± 0.208	0.993-1.744
Reef-associated	Dry bulk density (g cm-3), 0-25 cm	18	1.278 ± 0.245	0.850-1.570
Estuarine	% mud, 0-25 cm	26	41.616 ± 28.163	7.202-97.901
Lagoonal	% mud, 0-25 cm	18	7.565 ± 3.330	2.497-15.843
Reef-associated	% mud, 0-25 cm	18	16.626 ± 6.985	5.895-29.030

Table S4

Table S4. Summary of plot-level environmental parameters by site and geomorphology (mean ± SD; min–max; n plots). Values are computed as plot means of low-tide measurements.

site_id	geomorphology	variable	n	mean ± SD	min_max
CBP	Estuarine	Redox (mV)	9	-91.648 ± 219.160	-396.500-59.600
CJ	Estuarine	Redox (mV)	9	65.204 ± 9.344	52.767-86.733
CR	Reef-associated	Redox (mV)	9	156.704 ± 43.087	107.300-208.460
EB	Lagoonal	Redox (mV)	9	74.752 ± 14.301	56.000-100.667
LNR	Reef-associated	Redox (mV)	9	44.967 ± 4.657	41.533-56.333
TM	Lagoonal	Redox (mV)	9	151.863 ± 11.501	139.000-164.700
CBP	Estuarine	pH	9	7.889 ± 0.253	7.533-8.190
CJ	Estuarine	pH	9	7.733 ± 0.374	7.467-8.340
CR	Reef-associated	pH	9	7.067 ± 0.447	6.570-7.675
EB	Lagoonal	pH	9	7.725 ± 0.707	6.000-8.250
LNR	Reef-associated	pH	9	6.907 ± 0.480	6.580-7.633
TM	Lagoonal	pH	9	7.081 ± 0.115	6.940-7.193
CBP	Estuarine	Salinity (psu)	9	30.359 ± 2.103	25.003-32.113
CJ	Estuarine	Salinity (psu)	9	29.882 ± 0.613	28.467-30.467
CR	Reef-associated	Salinity (psu)	9	30.057 ± 1.381	28.016-31.820

EB	Lagoonal	Salinity (psu)	9	30.236 ± 1.196	28.730-32.170
LNR	Reef-associated	Salinity (psu)	9	31.350 ± 0.505	30.497-32.183
TM	Lagoonal	Salinity (psu)	9	22.475 ± 2.613	19.450-26.133
CBP	Estuarine	Water temperature (°C)	9	30.092 ± 1.132	28.693-32.077
CJ	Estuarine	Water temperature (°C)	9	30.115 ± 2.738	28.100-34.113
CR	Reef-associated	Water temperature (°C)	9	27.478 ± 0.249	26.950-27.696
EB	Lagoonal	Water temperature (°C)	9	29.954 ± 1.327	28.160-31.680
LNR	Reef-associated	Water temperature (°C)	9	28.984 ± 0.336	28.467-29.340
TM	Lagoonal	Water temperature (°C)	9	28.367 ± 0.166	28.187-28.653
CBP	Estuarine	Dissolved oxygen (% saturation)	9	105.711 ± 27.700	75.500-156.333
CJ	Estuarine	Dissolved oxygen (% saturation)	9	67.322 ± 34.357	39.000-140.000
CR	Reef-associated	Dissolved oxygen (% saturation)	9	56.353 ± 9.962	43.100-70.630
EB	Lagoonal	Dissolved oxygen (% saturation)	9	34.922 ± 2.862	29.900-39.667
LNR	Reef-associated	Dissolved oxygen (% saturation)	9	54.204 ± 21.802	41.933-107.000
TM	Lagoonal	Dissolved oxygen (% saturation)	9	42.193 ± 14.311	24.633-57.900
CBP	Estuarine	Conductivity (mS/cm)	9	48.261 ± 8.170	37.963-62.100
CJ	Estuarine	Conductivity (mS/cm)	9	46.818 ± 4.219	40.267-54.067
CR	Reef-associated	Conductivity (mS/cm)	9	43.702 ± 5.167	33.644-48.840
EB	Lagoonal	Conductivity (mS/cm)	9	47.027 ± 4.765	42.233-55.410
LNR	Reef-associated	Conductivity (mS/cm)	9	46.973 ± 2.761	41.147-49.410
TM	Lagoonal	Conductivity (mS/cm)	9	33.416 ± 4.265	28.793-40.910

geomorphology	variable	n	mean ± SD	min_max
Estuarine	Redox (mV)	18	-13.222 ± 170.752	-396.500-86.733
Lagoonal	Redox (mV)	18	113.307 ± 41.623	56.000-164.700
Reef-associated	Redox (mV)	18	100.835 ± 64.721	41.533-208.460
Estuarine	pH	18	7.811 ± 0.320	7.467-8.340
Lagoonal	pH	18	7.403 ± 0.593	6.000-8.250
Reef-associated	pH	18	6.987 ± 0.457	6.570-7.675
Estuarine	Salinity (psu)	18	30.121 ± 1.523	25.003-32.113
Lagoonal	Salinity (psu)	18	26.355 ± 4.453	19.450-32.170
Reef-associated	Salinity (psu)	18	30.703 ± 1.209	28.016-32.183
Estuarine	Water temperature (°C)	18	30.103 ± 2.032	28.100-34.113
Lagoonal	Water temperature (°C)	18	29.161 ± 1.228	28.160-31.680
Reef-associated	Water temperature (Â°C)	18	28.231 ± 0.826	26.950-29.340
Estuarine	Dissolved oxygen (% saturation)	18	86.517 ± 36.148	39.000-156.333
Lagoonal	Dissolved oxygen (% saturation)	18	38.557 ± 10.688	24.633-57.900
Reef-associated	Dissolved oxygen (% saturation)	18	55.279 ± 16.481	41.933-107.000
Estuarine	Conductivity (mS/cm)	18	47.540 ± 6.351	37.963-62.100
Lagoonal	Conductivity (mS/cm)	18	40.221 ± 8.264	28.793-55.410
Reef-associated	Conductivity (mS/cm)	18	45.337 ± 4.357	33.644-49.410

Figure S1

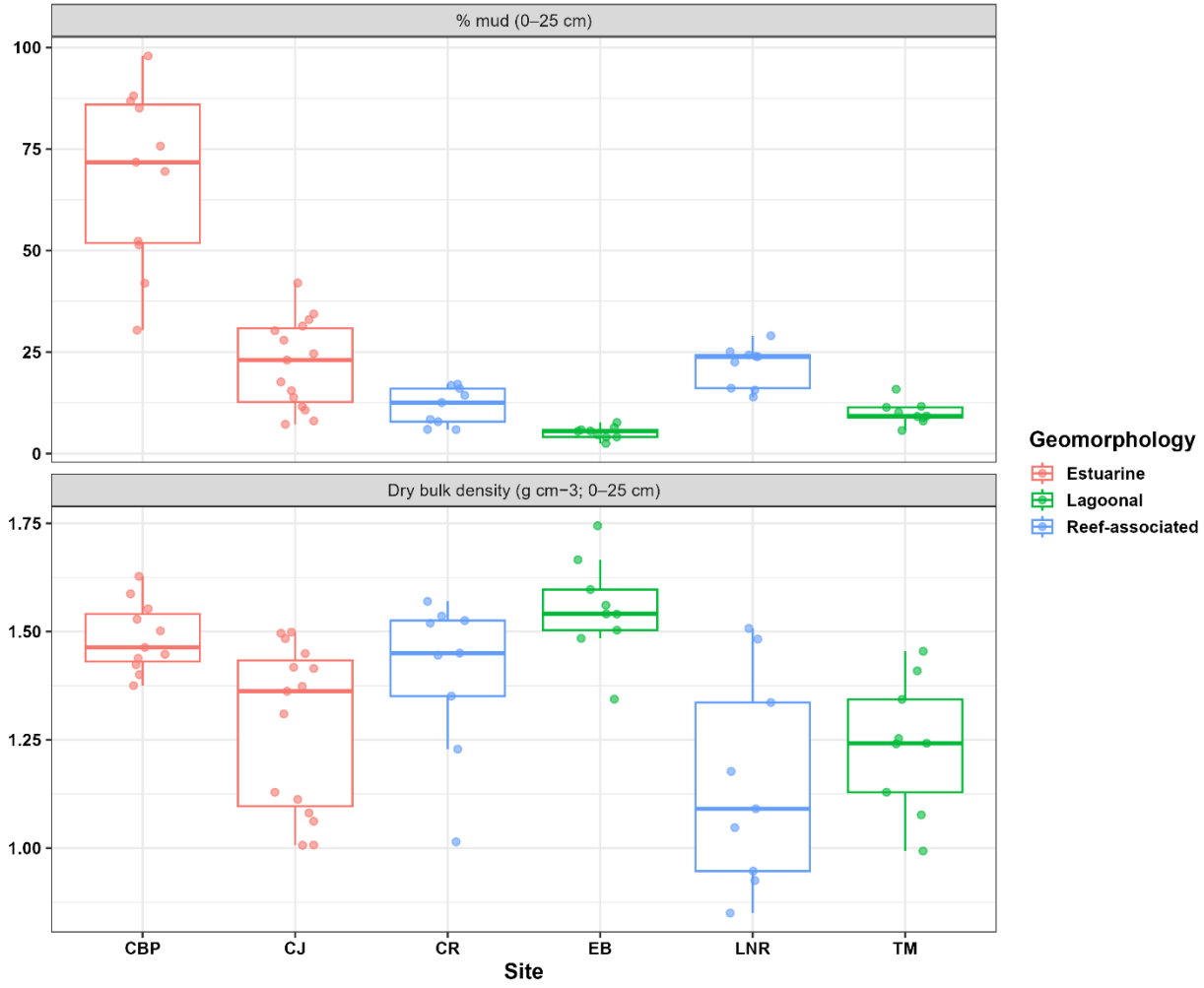

Figure S 1. Soil properties in the upper 0–25 cm (dry bulk density and mud fraction) across sites. Boxplots show distributions of core-level 0–25 cm means; points show individual cores colored by geomorphology.

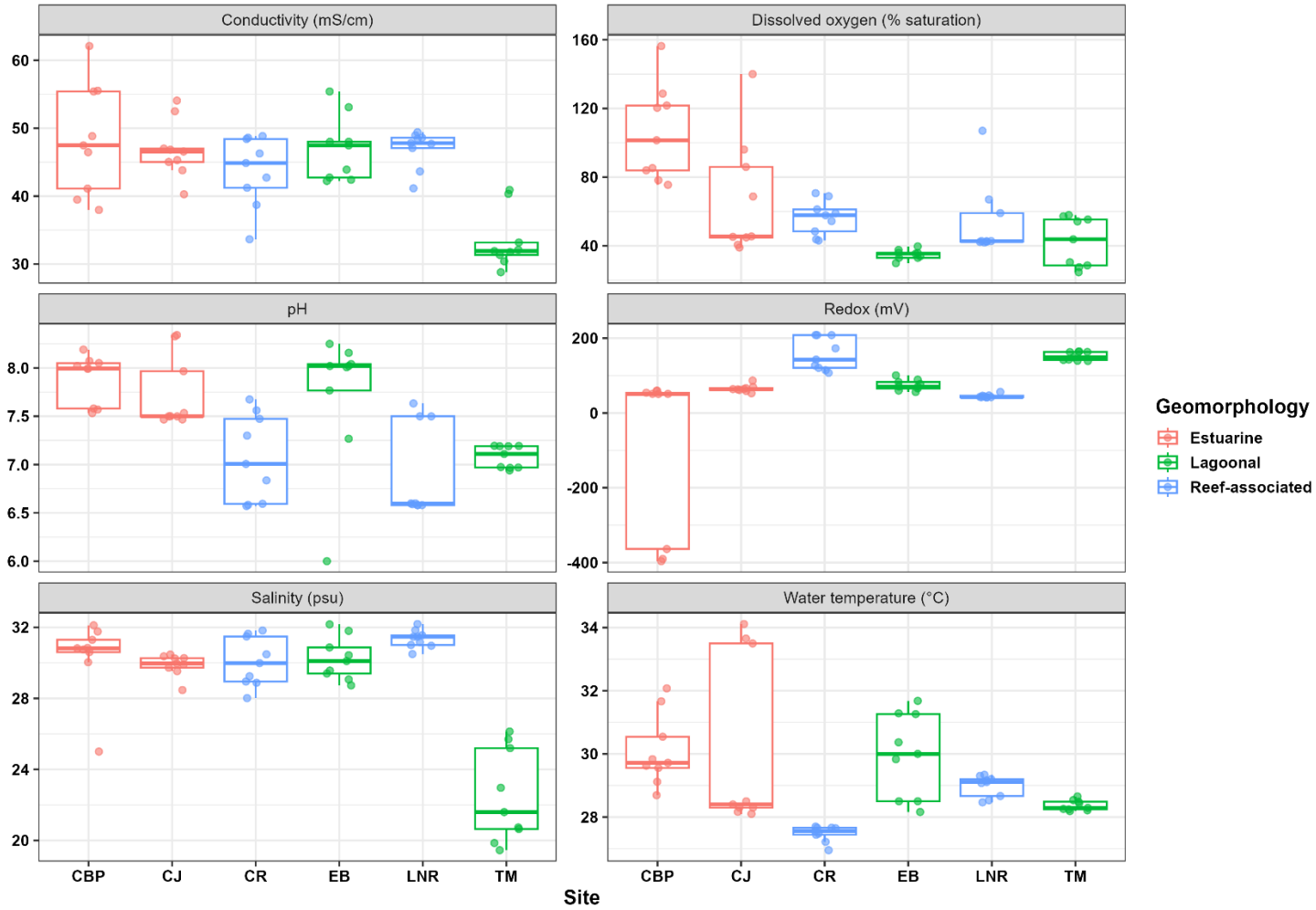

Figure S 2. Plot-level environmental parameters across sites (redox, pH, salinity, water temperature, dissolved oxygen, conductivity). Boxplots show distributions of plot means; points show plots colored by geomorphology.