

Supplementary Information

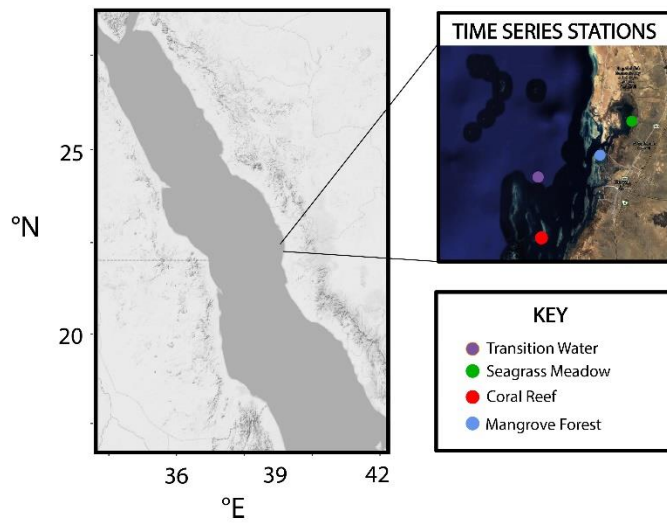


Figure S1. Positions of the four time series stations overlaid on a map of the Red Sea produced using © Stamen Design LLC, © Google Maps and R software.

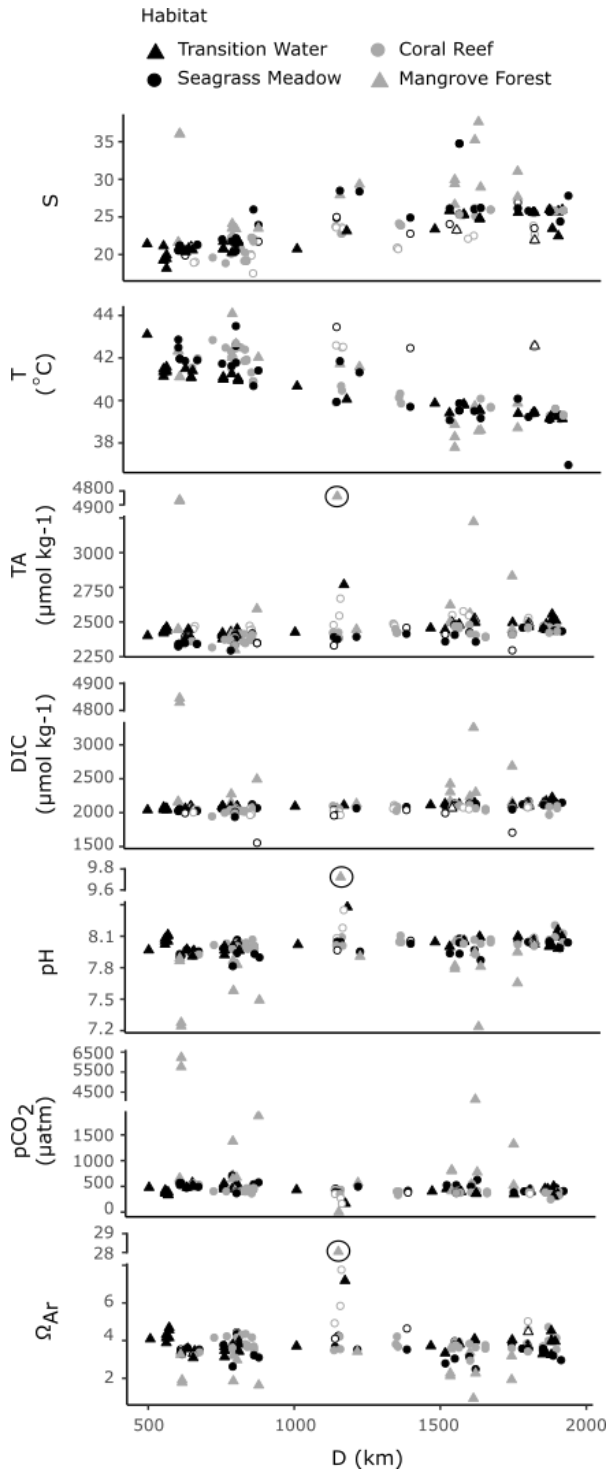


Figure S2. Observations of S , T and carbon variables at four coastal habitats are presented against distance along the south-north central axis (D) on an expanded scale. The circle indicates the location of one outlying mangrove forest observation of TA and DIC that produces un-realistic values of other carbon parameters. Note that observations from time series stations are excluded. Hollow symbols indicate coastal summer observations.

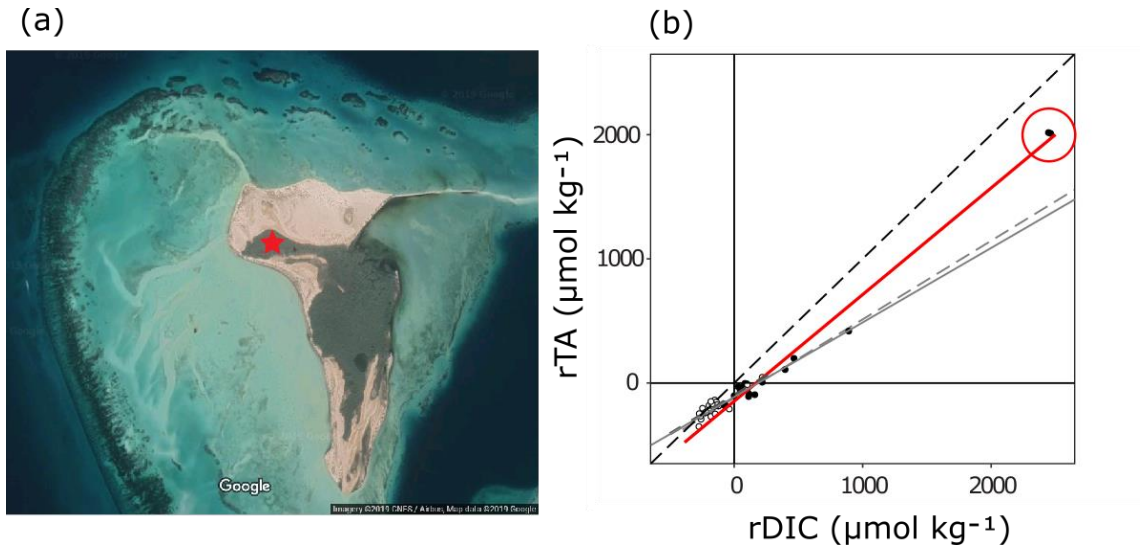


Figure S3. Panel (a) shows a satellite view of the inland-mangrove stand referred to in the text. The picture was obtained using © Google Maps and the red marker indicates the approximate location the two samples that were taken. Panel (b) shows the rTA and rDIC at this mangrove forest site (circled red) against other mangrove forests, in an expanded plot of Figure 8e. The red line indicates the fit of the spatial regression line if this mangrove site is used. All other lines are those displayed in Figure 8e.

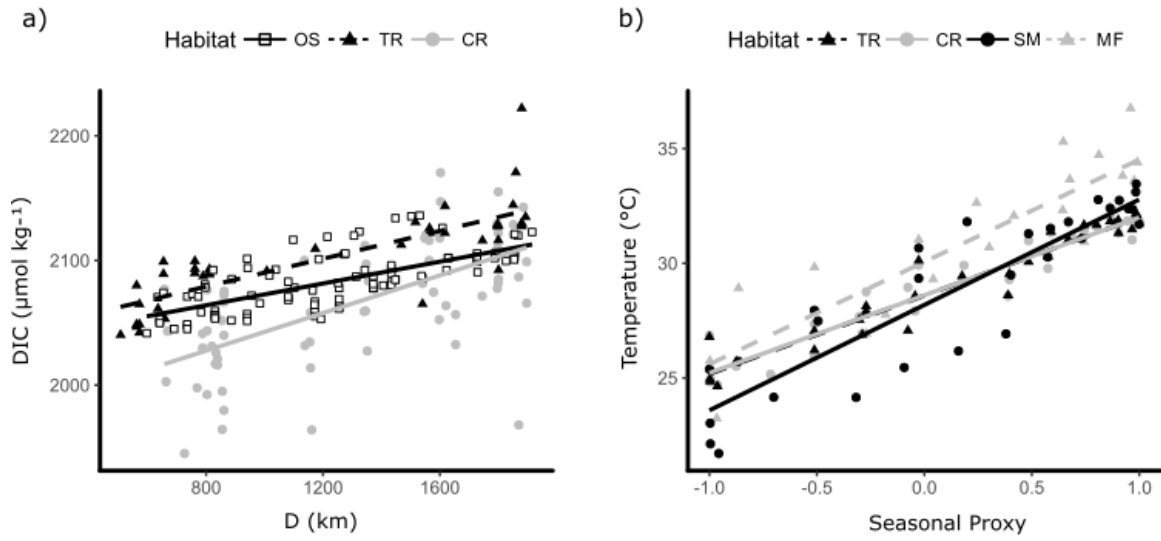


Figure S4. Interaction plots as discussed in the text for a) D and habitat type for DIC and b) the seasonal proxy and habitat type for temperature. The four lines indicate linear trends calculated for offshore water (OF), transition water (TR), coral reef (CR), seagrass meadow (SM) and mangrove forest (MF).

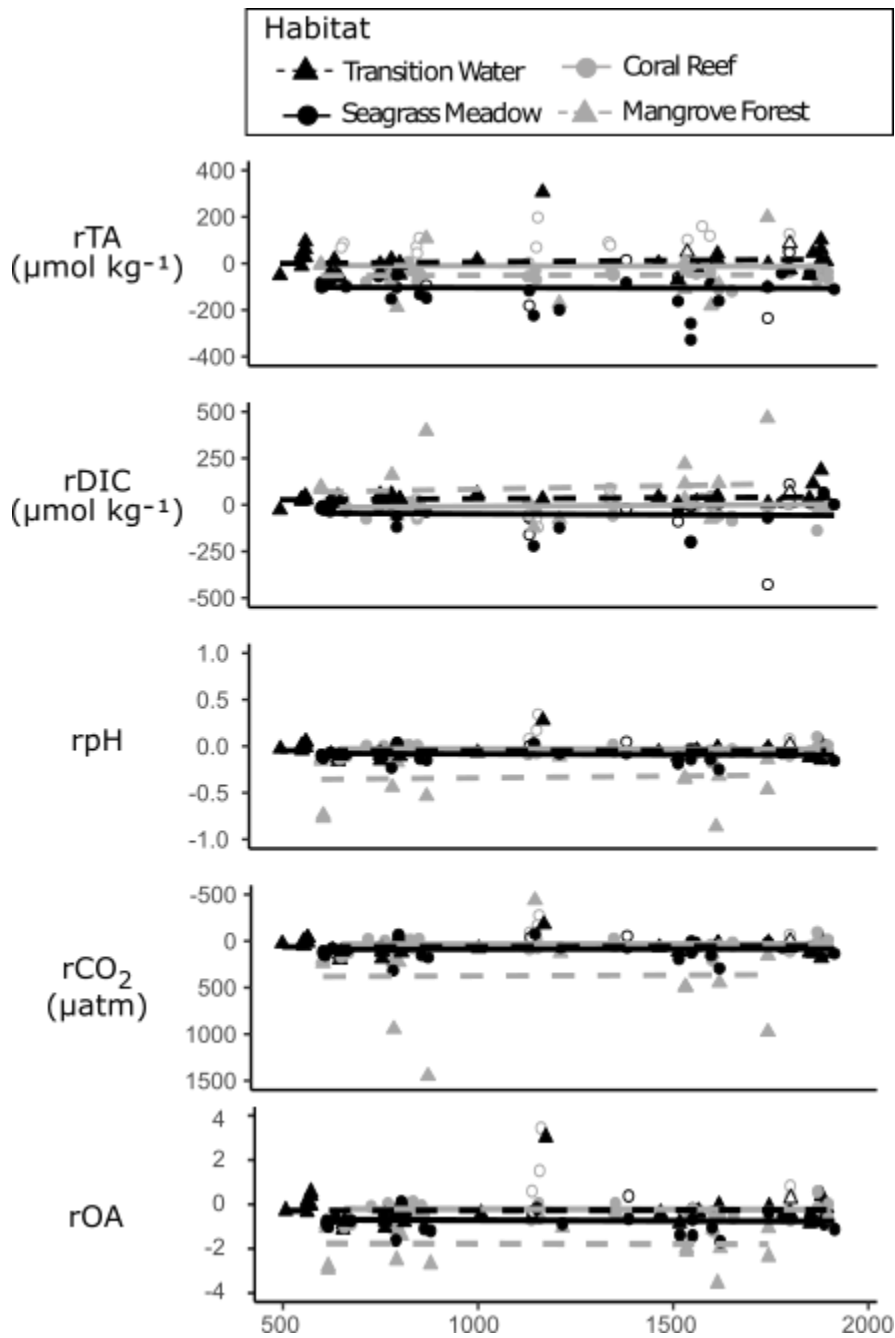


Figure S5. Residual carbon variables observed in the four coastal habitats are presented against distance along the south-north central axis (D). Linear regressions for all combinations of variables are drawn as lines (although none are significant), with associated statistics reported in Table S3. Note that observations from time series stations and the in-land mangroves are excluded. Hollow symbols indicate summer observations.

Table S1. Summary of the observations used in this study. Presented is the cruise code, the source of the data, the month and year in which observations were collected and the number of observations that were collected offshore (OS), in transition waters (TR) or at coral reefs (CR), seagrass meadows (SM) and mangrove forests (MF).

Cruise	Source	Month	Year	OS	TR	CR	SM	MF
CSM16	This study	Jan-Apr	2016	13	20	9	11	8
CSM17	This study	Mar	2017	1	5	11	12	9
CCF1	This study	Jan-Mar	2017	0	6	22	5	0
CCF2	This study	Sep-Aug	2017	0	2	17	7	0
CRE	This study	May	2017	1	0	10	2	2
BPC	This study	April	2017	9	6	0	0	0
VOS Pacific Celebes	Hydes et al. (2012)	Nov-Sep	2007-2009	7	1	0	0	0
TARA	Picheral et al. (2014)	Jan	2010	3	0	0	0	0
WHOI	This study	March	2010	53	0	0	0	0
WHOI	This Study	Sep	2011	14	0	0	0	0
STEINER15	Steiner et al. (2018)	Dec-Jan	2015-2016	10	0	0	0	0
STEINER18	Steiner et al. (2018)	March	2018	4	1	0	0	0
Total				115	72	101	69	42

Table S2: Defining statistics for the conservative single-end-member mixing model, as calculated from offshore observations.

	Residual mean	Residual standard deviation	Lower 99% P.I. bound ⁺	Upper 99% P.I. bound ⁺⁺	% offshore observations outside the 99% P.I. (excluding/including outliers)
rTA (μmol/kg)	0	18.37	-47.31	47.31	1.0/4.3
rDIC (μmol/kg)	-0.66	24.59	-64.00	62.68	1.9/4.3
rpH	-3 x10 ⁻⁴	2.61 x10 ⁻²	-6.76 x10 ⁻²	6.70 x10 ⁻²	3.8/6.1
rpCO ₂ (μatm)	-0.23	29.68	-76.70	76.24	3.8/7.0
rΩ _{Ar}	0.0006	0.1816	-0.4672	0.4684	4.8/7.8

⁺ Residual mean – 2.576*Residual standard deviation

⁺⁺ Residual mean + 2.576*Residual standard deviation

Table S3. Descriptive statistics for regressions of different variables against D constructed with observations from offshore waters and the four habitat types. Note that observations from time series stations are not included. Slope (\pm SD), intercept (\pm SD), pearson's correlation coefficient (r^2), the test statistic (F) and p-value (p) are reported for each individual test.

Table S4. Descriptive statistics for carbon variables for coastal observations. Note that observations from time series stations are excluded. The number of observations (n), mean, median, standard deviation, maximum values (max) and minimum value (min) are presented for each habitat group and variable combination.

Table S5. Results of one-way WR-ANOVA and corresponding boot-strapped post-hoc t-tests for differences in medians between habitat groups; offshore waters (OS), transition waters (TR), coral reefs (CR), seagrass meadows (SM) and mangrove forests (MF). Note that observations from time series stations are excluded. Tests statistics (F for WR-ANOVA and Ψ_{hat} for post-hoc) and p-values (p) are reported for each individual test.

Table S6. Statistics for regressions of different variables against the seasonal proxy (SP) at the four time series stations. Pearson's correlation coefficient (r^2), the test statistic (F) and p-value (p) are reported for each individual test.

Table S7. Descriptive statistics for studied variables at the four time series stations. The number of observations (n), mean, median, standard deviation, maximum values (max) and minimum value (min) are presented for each time series station and variable combination.

Table S8. Results from one-way WR-ANOVA and corresponding boot-strapped post-hoc t-tests for differences in medians between the four time series stations; transition water (TR), coral reef (CR), seagrass meadow (SM) and mangrove forest (MF). Tests statistics (F for WR-ANOVA and Ψ_{hat} for post-hoc) and p-values (p) are reported for each individual test.

Supplementary R Code: WRS2_post_hoc.R

This code contains 1) the `med1way.crit` function which is an internal function of the WRS2 package (source: <https://github.com/cran/WRS2/blob/master/R/med1way.crit.R>) and 2) an adapted version of the `mcppb20` function, which is contained in the WRS2 package (source: <https://github.com/cran/WRS2/blob/master/R/mcppb20.R>), that performs bootstrapped t-tests for differences in medians.