Supplement

Table S1: Coordinates of sensor deployment locations.

Estuary	Site code	Latitude (decimal)	Longitude (decimal)
Akaroa	AKA	-43.7514	172.9355
Avon-Heathcote	AVO	-43.5508	172.7378
Delaware	DEL	-41.1639	173.4609
Jacobs River	JAC 1	-46.345	167.9914
	JAC 2	-46.3483	167.9999
Mahurangi	MAH 1	-36.4942	174.7375
	MAH 2	-36.4836	174.7131
	MAH 3	-36.4492	174.7306
Manukau	MNK 1	-37.1325	174.6931
	MNK 2	-37.1314	174.6969
New River	NEW	-46.4881	168.3094
Raglan	RAG	-37.8039	174.8672
Tauranga	TAU 1	-37.6486	176.0414
	TAU 2	-37.4914	175.9519
Whangārei	WGR 1	-35.7651	174.3569
	WGR 2	-35.9625	174.5372
Whitianga	WHI 1	-36.8411	175.7117
	WHI 2	-36.8744	175.6936
Waikawa	WKW 1	-46.6256	169.1431
	WKW 2	-46.6253	169.1383
Waimea	WMA	-41.2925	173.185
Whangateau	WTA	-36.3171	174.7697

Table S2: Summary of benthic photosynthesis-irradiance curves of unvegetated sediment found within published literature. NS = not specified.

Location	% mud	Method	Light saturation (I_K)	Reference
Subtidal				
Southern Baltic Sea	5-10, 30-90	*In situ* and lab cores, O_2 by titration	300	(Meyercordt & Meyer-Reil, 1999)
Lake Illawarra, Australia	< 25	Lab core, O_2 probe	19, 117	(Qu et al. 2004)
Bodden estuary, South Baltic sea	NS	Lab core O_2 microprofile	10, 22, 32, 54, 86, 106, 116, 152	(Gerbersdorf et al. 2005)
Bay of Brest, France	29	*In situ* benthic chambers, O_2 probe	57, 74, 83	(Longphuirt et al. 2007)

Intertidal: Emersion				
Tagus estuary, Portugal	NS - mudflat	*In situ* ^{14}C radiotracer	750	(Perkins et al. 2001)
Bay of Somme, France	2	*In situ* benthic chambers, CO_2 infrared gas analysis	102, 102, 131, 151, 198, 246, 310	(Migné et al. 2004)
Roscoff Aber Bay, France	NS - fine sand	*In situ* benthic chambers, CO_2 infrared gas analysis	341, 389, 443, 495, 553, 639, 901	(Hubas & Davoult 2006)
Seine estuary, France	15, 50	*In situ* benthic chambers, CO_2 infrared gas analysis	199, 204, 498	(Spilmont et al. 2006)
Eastern English Channel	NS	*In situ* benthic chambers, CO_2 infrared gas analysis	91, 125, 146, 202, 217, 218, 405, 580	(Migné et al. 2007)
Bay of Somme, France	2	*In situ* benthic chambers, CO_2 infrared gas analysis	131, 309, 402, 414	(Spilmont et al. 2007)
Canche estuary, English Channel	88 – 92	*In situ* O_2 microprofile	575	(Denis & Desreumaux, 2009)
Mont Saint-Michel Bay, France	80	*In situ* benthic chamber, CO_2 infrared gas analysis	129, 266, 283, 314, 754	(Migné et al. 2009)
Tachia estuary, Taiwan	9, 28	*In situ* benthic chamber, CO_2 infrared gas analysis	~ 200	(Lee et al. 2011)
Daebu Island, Korea	88	Lab core O_2 microprofile	161, 233, 244, 250, 333	(Kwon et al. 2014)
Daebu Island, Korea	88	Lab core O_2 microprofile	7 – 1666 mean 504	(Kwon et al. 2018)
Intertidal: Immersion and emersion				
Canche estuary, English Channel	NS- sandy	*In situ* O_2 microprofile	315, 427	(Denis et al. 2012)
Skallingen, Denmark	5	*In situ* O_2 microprofile	220	(Walpersdorf et al. 2016)
Rance estuary, France	0	*In situ* benthic chambers: immersion DIC, emersion CO_2 infrared gas analysis	100, 130	(Migné et al. 2018)

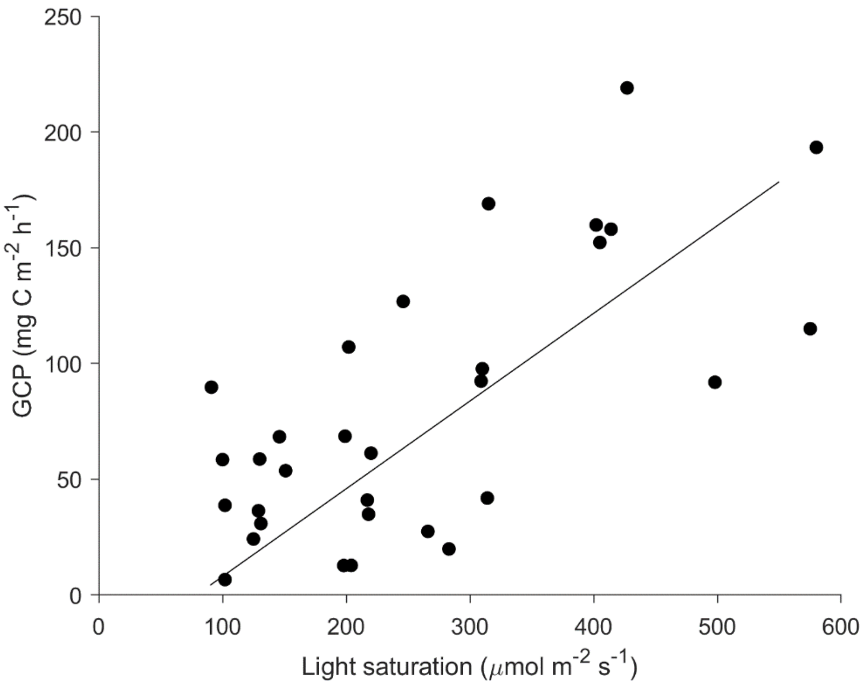

Figure S1: Correlation between literature derived intertidal MPB light saturation values and maximum rate of gross community primary production (GCP) (Pearson's $r = 0.7$, $p < 0.001$).

Text S1. Hypsometry curves

Hypsometry curves are calculated using bathymetric grids and show the total area within each estuary occurring below a given depth relative to mean sea level. Bathymetry data for DEL and WMA were provided by the Sustainable Seas - Forecasting Contamination project (Ben Knight, Cawthron) and for the three Southland estuaries (NEW, JAC, WKW) by Environment Southland (Keryn Roberts). For these five estuaries, a hypsometry curve was constructed by calculating the cumulative distribution of surface area at a given depth. Hypsometry curves from seven of the study estuaries (AVO, MAH, RAG, TAU, WGR, WHI and WTA) were taken directly from Dejeans (2015). MNK (insufficient data) and AKA (low percentage of intertidal area within (3 %)) were omitted from this analysis.

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