

Macrophyte wrack on sandy beaches of the US Pacific Northwest is linked to proximity of source habitat, ocean upwelling, and beach morphology

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Table S1. Locations and area of the wrack beach survey blocks, including the latitude and longitude of the 50 meter transects, which mostly corresponded to the dune profile transects used in Hacker et al. (2012). The survey blocks in this study were centered on either side of the 50 meter transects. * = new transects that do not correspond to those in Hacker et al. (2012).

Site name and abbreviations	Block	Block area (m ²)	Latitude	Longitude
Washington				
Grays Harbor (GH)	GH18	13084	46° 51' 3.3228"	-124° 6' 47.2674"
	GH05	3700	46° 47' 57.3714"	-124° 5' 57.822"
	GH11	2919	46° 45' 33.2814"	-124° 6' 9.0000"
Long Beach (LB)	LB1020	4611	46° 33' 10.5696"	-124° 3' 42.9186"
	LB05	4052	46° 29' 5.0490"	-124° 3' 33.3396"
	LB36	3011	46° 19' 18.2454"	-124° 4' 6.5238"
Oregon				
Fort Stevens (FS)	FS02	2905	46° 12' 21.2214"	-123° 59' 53.5014"
	FS03	3876	46° 10' 49.134"	-123° 58' 52.4424"
	FS01	3428	46° 8' 56.5512"	-123° 57' 51.3036"
Cape Lookout (CL)	CL03	2516	45° 25' 38.6610"	-123° 57' 37.3644"
	CL02	6889	45° 25' 18.3540"	-123° 57' 39.6900"
	CL01	4754	45° 22' 53.2554"	-123° 57' 59.1300"
Sand Lake (SL)	SL02	1543	45° 17' 8.9520"	-123° 57' 48.8736"
	SL01	4917	45° 16' 55.7076"	-123° 57' 46.7208"
	SL03	4393	45° 16' 52.0062"	-123° 57' 43.7112"
South Beach (SB)	SB03	7720	44° 36' 28.2486"	-124° 4' 6.3582"
	SB02	6376	44° 36' 15.2964"	-124° 4' 1.6068"
	SB01	7125	44° 35' 56.3958"	-124° 4' 2.1462"
Siuslaw South Jetty (SSJ)	SSJ01*	6425	44° 0' 41.1120"	-124° 8' 12.2064"
	SSJ02*	7920	44° 0' 22.2006"	-124° 8' 12.7536"
	SSJ03*	5809	44° 0' 2.4222"	-124° 8' 14.0994"
Umpqua Dunes (UD)	UD02	6562	43° 36' 30.8196"	-124° 13' 6.8880"
	UD01	7487	43° 35' 48.5658"	-124° 13' 17.5758"
	UD03	6961	43° 35' 35.6994"	-124° 13' 21.5364"
North Spit (NS)	NS01*	5477	43° 24' 13.9968"	-124° 18' 17.7012"
	NS02*	3608	43° 24' 7.8696"	-124° 18' 20.1888"
	NS03*	3692	43° 23' 51.7056"	-124° 18' 31.9710"
Bandon (BAN)	BAN-NR3	6463	43° 4' 3.6804"	-124° 26' 17.3970"
	BAN-NR2	6633	43° 3' 57.5208"	-124° 26' 16.8576"
	BAN-NR1	6978	43° 3' 42.6810"	-124° 26' 21.2136"
Floras Lake (FL)	FL01*	3584	42° 54' 12.1386"	-124° 30' 31.2690"
	FL02*	4088	42° 54' 2.2674"	-124° 30' 38.0982"
	FL03*	5328	42° 53' 54.6252"	124° 30' 44.0598"
California				
Cape Mendocino (CME)	CME01*	11061	40° 21' 25.0698"	-124° 21' 46.6626"
	CME02*	6739	40° 21' 1.5408"	-124° 21' 44.3766"
	CME03*	3763	40° 20' 42.0180"	-124° 21' 45.5580"

Table S2. List of the macrophyte species found in wrack samples over the study region (Figure 1), sorted by functional group.

FUNCTIONAL GROUP	SPECIES
Kelp	<i>Alaria marginata</i>
	<i>Cystoseira osmundacea</i>
	<i>Egregia menziesii</i>
	<i>Laminaria</i> spp.
	<i>Lessoniopsis littoralis</i>
	<i>Macrocystis integrifolia</i>
	<i>Nereocystis luetkeana</i>
	<i>Saccharina sessilis</i>
Other brown algae	<i>Ahnfeltiopsis gigartinoides</i>
	<i>Analipus japonica</i>
	<i>Coilodesme californica</i>
	<i>Desmarestia</i> sp.
	<i>Dictyoneuropsis reticulata</i>
	<i>Fucus distichus</i>
	<i>Pelvetiopsis limitata</i>
	<i>Postelsia palmaeformis</i>
	<i>Sargassum muticum</i>
	<i>Scytosiphon</i> sp.
	<i>Soranothera ulvoidea</i>
Green algae	<i>Acrosiphonia</i> sp.
	<i>Chaetomorpha</i> sp.
	<i>Cladophora</i> sp.
	<i>Codium fragile</i>
	<i>Ulva</i> spp.
Red algae	<i>Botryoglossum farlowianum</i>
	<i>Callophyllis</i> sp.
	<i>Ceramium</i> spp.
	<i>Chondracanthus canaliculatus</i>
	<i>Corallina</i> sp.
	<i>Cryptopleura</i> sp.
	<i>Cumagloia andersonii</i>
	<i>Endocladia muricata</i>
	<i>Gelidium</i> sp.
	<i>Halosaccion glandiforme</i>
	<i>Hymenena</i> sp.
	<i>Mastocarpus</i> spp.
	<i>Mazzaella</i> spp.
	<i>Microcladia</i> spp.
	<i>Neorhodomela</i> spp.
	<i>Odonthalia</i> spp.
	<i>Osmundea spectabilis</i>
	<i>Pikea pinnata</i>
	<i>Plocamium</i> spp.
	<i>Porphyra</i> spp.
<i>Prionitis</i> spp.	
<i>Pterochondria woodii</i>	
<i>Ptilota</i> sp.	
<i>Smithora naiadum</i>	
Surfgrass	<i>Phyllospadix</i> spp.
Eelgrass	<i>Zostera japonica</i>
	<i>Zostera marina</i>
Other estuary plants	<i>Potamogeton richardsonii</i>
	<i>Myriophyllum spicatum</i>

Table S3. Statistical results from multiple regression analyses of the proportion of wrack, wrack biomass, and total wrack biomass for kelp and eelgrass wrack as a function of distance to the nearest rocky reef (for kelp) or estuary (for eelgrass), ocean upwelling, and their interaction.

Component	Source of variation	df	Kelp Wrack			Eelgrass Wrack		
			F	p	Adj. R ²	F	p	Adj. R ²
Wrack Proportion	Distance	1	6.62	0.0150		25.95	0.0001	
	Upwelling	1	14.03	0.0007		21.08	0.0001	
	D x U	1	7.14	0.0118		15.51	0.0004	
	Residual	32						
	Model	3	12.42	0.0001	0.5379	19.99	0.0001	0.6521
Wrack Biomass	Distance	1	4.79	0.0361		7.75	0.0089	
	Upwelling	1	14.36	0.0006		4.29	0.0465	
	D x U	1	5.27	0.0283		2.87	0.1000	
	Residual	32						
	Model	3	11.24	0.0001	0.5130	8.14	0.0004	0.4330
Total Wrack Biomass	Distance	1	3.99	0.0491		18.51	0.0001	
	Upwelling	1	76.59	0.0001		18.87	0.0001	
	D x U	1	0.75	0.3913		16.11	0.0003	
	Residual	32						
	Model	3	28.17	0.0001	0.7254	9.36	0.0001	0.4675