

Table S1A: Dry matter of different macrophytes in beach wrack sampled in August 2012, related to length of beach line [kg m⁻¹]

Site	A. Fucus	B. Zostera	C. Ulva	D. other Chloro- phyta	E. Rhodo- phyta	F. other Phaeophyta	Opportunists (sum of C to F)	Total
Glücksburg	2.054	0.018	0	0	0.828	0	0.828	2.900
Neukirchen	0.031	0.002	0	0.005	0.022	0	0.027	0.060
Wackerballig	0.376	9.621	0	0.019	0	0	0.019	10.015
Schönhagen	0	0.043	0	0.009	0.012	0	0.022	0.065
Kiekut	3.833	0.118	0	0.092	2.190	0	2.282	6.233
Strande	4.084	6.709	0	7.743	0.103	0.006	7.852	18.645
Mönkeberg	0.010	0	0.312	0	0	0	0.312	0.322
Stein	0.017	1.848	0	0.070	0.122	0	0.192	2.056
Brasilien	0	0.006	4.6E-06	0.006	0.330	0	0.336	0.342
Hohwacht	0.019	0.469	0	1.789	6.283	0.003	8.075	8.563
Grüner Brink	0.275	0.056	0	0.139	0.106	0.026	0.272	0.602
Kellenhusen	0	0.009	0	0.846	0.772	0	1.619	1.628
Brodten	0.001	0.022	0	0.002	0.004	0.551	0.557	0.580
Mean	0.823	1.455	0.024	0.825	0.829	0.045	1.722	4.001

Table S1B: Relative contribution [%] of different macrophytes to dry weight of beach wrack sampled in August 2012.

Site	A. Fucus	B. Zostera	C. Ulva	D. other Chlorophyta	E. Rhodophyta	F. other Phaeophyta	Opportunists (sum of C to F)
Glücksburg	70.8	0.6	0.0	0.0	28.5	0.0	28.5
Neukirchen	52.2	2.6	0.0	8.4	36.8	0.0	45.2
Wackerballig	3.8	96.1	0.0	0.2	0.0	0.0	0.2
Schönhagen	0.0	66.5	0.0	14.6	18.9	0.0	33.5
Kiekut	61.5	1.9	0.0	1.5	35.1	0.0	36.6
Strande	21.9	36.0	0.0	41.5	0.6	0.0	42.1
Mönkeberg	3.1	0.0	96.9	0.0	0.0	0.0	96.9
Stein	0.8	89.9	0.0	3.4	5.9	0.0	9.3
Brasilien	0.0	1.9	0.0	1.8	96.3	0.0	98.1
Hohwacht	0.2	5.5	0.0	20.9	73.4	0.0	94.3
Grüner Brink	45.6	9.3	0.0	23.1	17.7	4.3	45.1
Kellenhusen	0.0	0.6	0.0	52.0	47.4	0.0	99.4
Brodten	0.2	3.7	0.0	0.3	0.7	95.0	96.1
Mean	20.6	36.4	0.6	20.6	20.7	1.1	43.1

Table S2A: Dry matter of different macrophytes in beach wrack sampled in August/September 2013, related to length of beach line [kg m⁻¹]

Site	A. Fucus	B. Zostera	C. Ulva	D. other Chloro- phyta	E. Rhodo- phyta	F. other Phaeophyta	Opportunists (sum of C to F)	Total
Glücksburg	2.327	0	0	0.024	0	0	0.024	2.351
Neukirchen	0.173	0.518	0	0	0	0	0	0.691
Wackerballig	0	5.878	0	0	0	0	0	5.878
Schönhagen	0	0	0	0	0	0	0	0
Kiekut	0.694	0.694	0	0	0	0	0	1.387
Strande	0.819	1.228	0	0	0	0	0	2.046
Mönkeberg	0	0	0.177	0	0	0	0.177	0.177
Stein	0	3.295	0.069	0.035	0.069	0	0.173	3.468
Brasilien	0	0	0	0.319	1.275	0	1.594	1.594
Hohwacht	0.159	0	0.040	0.198	1.587	0	1.825	1.984
Grüner Brink	0.212	1.062	0.159	0	3.876	0	4.035	5.310
Kellenhusen	0	0	0	0.645	0.215	0	0.860	0.860
Brodten	0	0	0	5.310	0	0	5.310	5.310
Mean	0.337	0.975	0.034	0.502	0.540	0	1.077	2.389

Table S2B: Relative contribution [%] of different macrophytes to dry weight of beach wrack sampled in August/September 2013.

Site	A. Fucus	B. Zostera	C. Ulva	D. other Chlorophyta	E. Rhodophyta	F. other Phaeophyta	Opportunists (sum of C to F)
Glücksburg	99.0	0.0	0.0	1.0	0.0	0.0	1.0
Neukirchen	25.0	75.0	0.0	0.0	0.0	0.0	0.0
Wackerballig	0.0	100.0	0.0	0.0	0.0	0.0	0.0
Schönhagen							
Kiekut	50.0	50.0	0.0	0.0	0.0	0.0	0.0
Strande	40.0	60.0	0.0	0.0	0.0	0.0	0.0
Mönkeberg	0.0	0.0	100.0	0.0	0.0	0.0	100.0
Stein	0.0	95.0	2.0	1.0	2.0	0.0	5.0
Brasilien	0.0	0.0	0.0	20.0	80.0	0.0	100.0
Hohwacht	8.0	0.0	2.0	10.0	80.0	0.0	92.0
Grüner Brink	4.0	20.0	3.0	0.0	73.0	0.0	76.0
Kellenhusen	0.0	0.0	0.0	75.0	25.0	0.0	100.0
Brodten	0.0	0.0	0.0	100.0	0.0	0.0	100.0
Mean	14.1	40.8	1.4	21.0	22.6	0.0	45.1

Table S3A: Mean dry matter of different macrophytes in beach wrack sampled in 2012 and 2013, related to length of beach line [kg m⁻¹]

Site	A. Fucus	B. Zostera	C. Ulva	D. other Chloro- phyta	E. Rhodo- phyta	F. other Phaeophyta	Opportunists (sum of C to F)	Total
Glücksburg	2.191	0.009	0	0.012	0.414	0	0.426	2.625
Neukirchen	0.102	0.260	0	0.003	0.011	0	0.013	0.375
Wackerballig	0.188	7.749	0	0.010	0	0	0.010	7.947
Schönhagen	0	0.021	0	0.005	0.006	0	0.011	0.032
Kiekut	2.263	0.406	0	0.046	1.095	0	1.141	3.810
Strande	2.451	3.969	0	3.871	0.052	0.003	3.926	10.346
Mönkeberg	0.005	0	0.244	0	0	0	0.244	0.249
Stein	0.008	2.571	0.035	0.052	0.096	0	0.183	2.762
Brasilien	0	0.003	2.3E-06	0.163	0.802	0	0.965	0.968
Hohwacht	0.089	0.235	0.020	0.994	3.935	0.002	4.950	5.274
Grüner Brink	0.243	0.559	0.080	0.070	1.991	0.013	2.153	2.956
Kellenhusen	0	0.005	0	0.746	0.494	0	1.239	1.244
Brodten	0.001	0.011	0	2.656	0.002	0.276	2.933	2.945
Mean	0.580	1.215	0.029	0.663	0.684	0.023	1.400	3.195

Table S3B: Average contribution [%] of different macrophytes to dry weight of beach wrack sampled in 2012 and 2013.

Site	A. Fucus	B. Zostera	C. Ulva	D. other Chlorophyta	E. Rhodophyta	F. other Phaeophyta	Opportunists (sum of C to F)
Glücksburg	83.4	0.3	0.0	0.4	15.8	0.0	16.2
Neukirchen	27.2	69.2	0.0	0.7	2.9	0.0	3.6
Wackerballig	2.4	97.5	0.0	0.1	0.0	0.0	0.1
Schönhagen	0.0	66.5	0.0	14.6	18.9	0.0	33.5
Kiekut	59.4	10.6	0.0	1.2	28.7	0.0	29.9
Strande	23.7	38.4	0.0	37.4	0.5	0.0	37.9
Mönkeberg	2.0	0.0	98.0	0.0	0.0	0.0	98.0
Stein	0.3	93.1	1.3	1.9	3.5	0.0	6.6
Brasilien	0.0	0.3	0.0	16.8	82.9	0.0	99.7
Hohwacht	1.7	4.4	0.4	18.8	74.6	0.0	93.9
Grüner Brink	8.2	18.9	2.7	2.4	67.4	0.4	72.9
Kellenhusen	0.0	0.4	0.0	59.9	39.7	0.0	99.6
Brodten	0.0	0.4	0.0	90.2	0.1	9.4	99.6
Mean	18.2	38.0	0.9	20.8	21.4	0.7	43.8

Table S4: Distribution of characteristics over samples of respondents in surveys conducted at Kiel, Schönberg, Eckernförde and in total. Absolute numbers are given if not stated otherwise.

Characteristics	Value	Kiel	Schönberg	Eckernförde	Total ^a
Sample size		60	61	56	177
Gender	Female	35	30	34	99 (55.57%)
	Male	25	31	20	76 (43.43%)
Age in years	Average	47.53	47.36	55.94	50.27
Household size	Average	2.25	2.74	2.34	2.45
Household net income	Median category ^b	2500-2599€	2600-3599€	2500-2599€	2500-2599€
School education	9 years	5	5	6	16 (9.04%)
	10 years	12	24	15	51 (28.81%)
	12-13 years	15	17	17	49 (27.68%)
	Graduated in college	17	10	14	41 (23.16%)
	Missing information	11	5	4	20 (11.29%)

^a If numbers do not sum up to total sample size this is due to missing observations.

^b A number of participants did not provide information on their household's net income.

Table S5: Repeated measures-2-way-ANOVA of the normalized and ranked perception of intensity of odor from six decaying macrophytes. Phylogenetic groups (= PG, green plants, brown algae or red algae) were used as between subject factor and life strategy (= LS, opportunistic or non-opportunistic) was used as within subject factor. See also Figure 4A.

Source	SS	df	MS	F	P
Between subject effects					
Intercept	2840001	179	15866.0	3.80	< 0.0001
PG	187523	2	93761.5	7.27	0.0009
Error	2243180	174	12891.8		
Within subject contrasts					
LS	369139	1	369139.1	88.44	< 0.0001
PG*LS	42493	2	21246.4	5.09	0.0071
Error (LS)	726241	174	4173.8		

Table S6: Repeated measures-2-way-ANOVA of the ranked perception of pleasantness of odor from six decaying macrophytes. Phylogenetic groups (= PG, green plants, brown algae or red algae) were used as between subject factor and life strategy (= LS, opportunistic or non-opportunistic) was used as within subject factor. See also Figure 4B.

Source	SS	Df	MS	F	P
Between subject effects					
Intercept	1982892	179	11077.6	1.82	< 0.0001
PG	130216	2	65108.0	6.37	0.0021
Error	1777907	174	10217.9		
Within subject contrasts					
LS	73720	1	73720.1	12.09	0.0006
PG*LS	1712	2	855.9	0.14	0.8691
Error (LS)	1054794	174	6097.0		

Figure S1: Frequency of wind directions (A), average wind speed from different directions (B) and overall air stream from different directions (C), recorded at 54.5272° N 11.0580° E (meteorological station Fehmarn) between 1st of July and 31st of August in the years 1977, 2012 and 2013. Wind direction was recorded in hourly intervals and in increments of 10°. Wind speed was recorded in the same hourly intervals. Air stream is the overall length of the air stream coming from a given direction that passed the area within the recording period and was calculated by multiplication of data shown in A and B. Data kindly provided by Deutscher Wetterdienst.

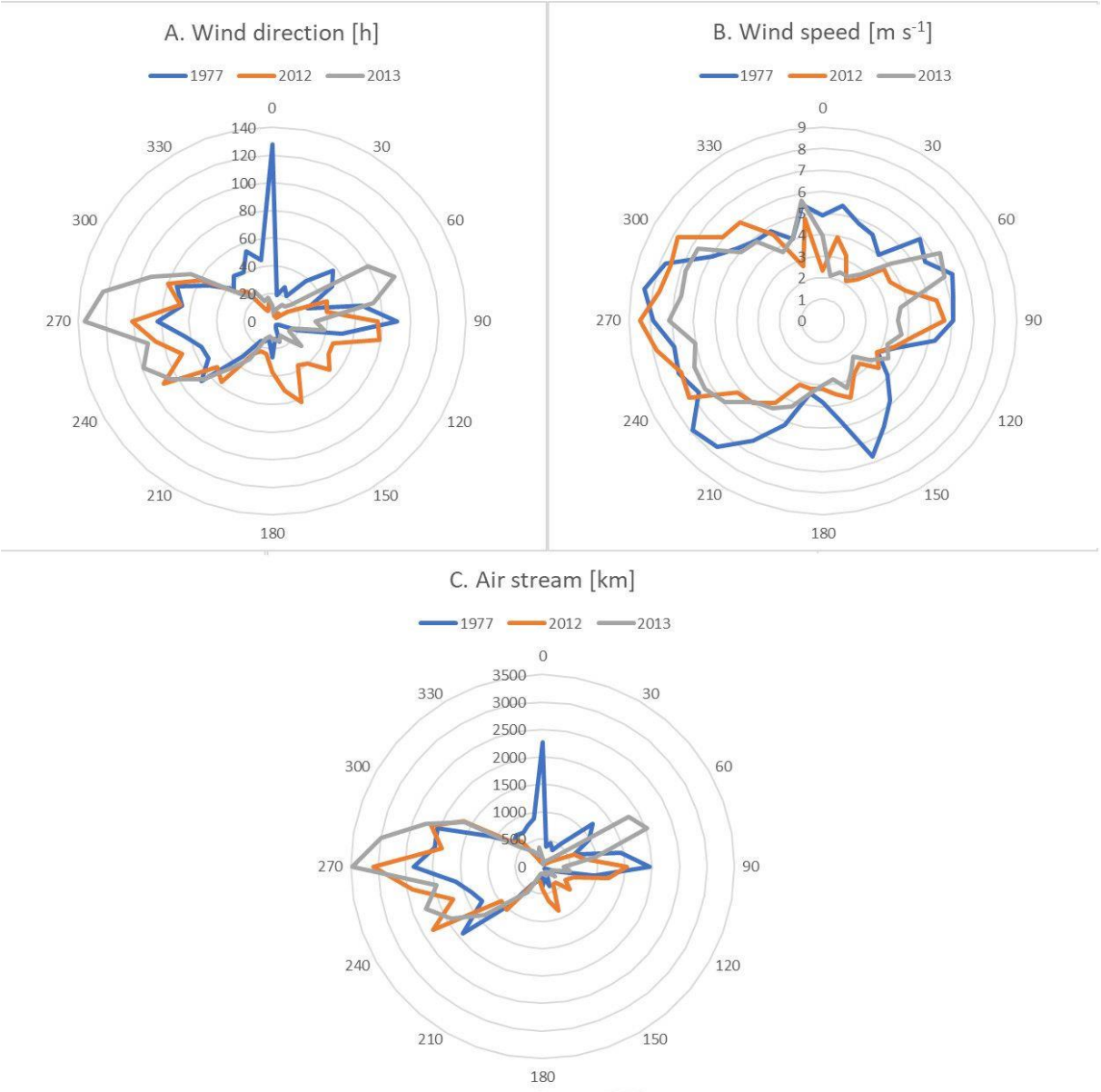


Figure S2: Density of beach wrack (333 g m^{-1} eelgrass + 200 g m^{-1} *Ceramium*) tested for effects on beach visitors in field experiment 1.



Figure S3: Minimal (0 g m^{-1}) and maximal (15600 g m^{-1}) densities of beach wrack tested for effects on beach visitors in experiment 2.



Figure S4: Effect of *Zostera* beach wrack density on (A.) the frequency of beach visitors crossing the beach wrack and (B.) the frequency of these visitors staying in direct vicinity of the beach wrack for 30 s or more time. Altogether 118 repeated measurements were conducted during two consecutive days in time intervals of 30 min on six different beach sections at Eckernförde and biomass densities were determined in parallel. Lines represent best fitting linear functions (calculated in B. from the logarithmic biomass density and the non-logarithmic effect size and in A. from the double-logarithmic dataset), dotted lines indicate their 95 % confidence intervals.

