The following supplement accompanies the article

Additive effects of emersion stressors on the ecophysiological performance of two intertidal seaweeds

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Fig. S1. Photo of the experimental setup.

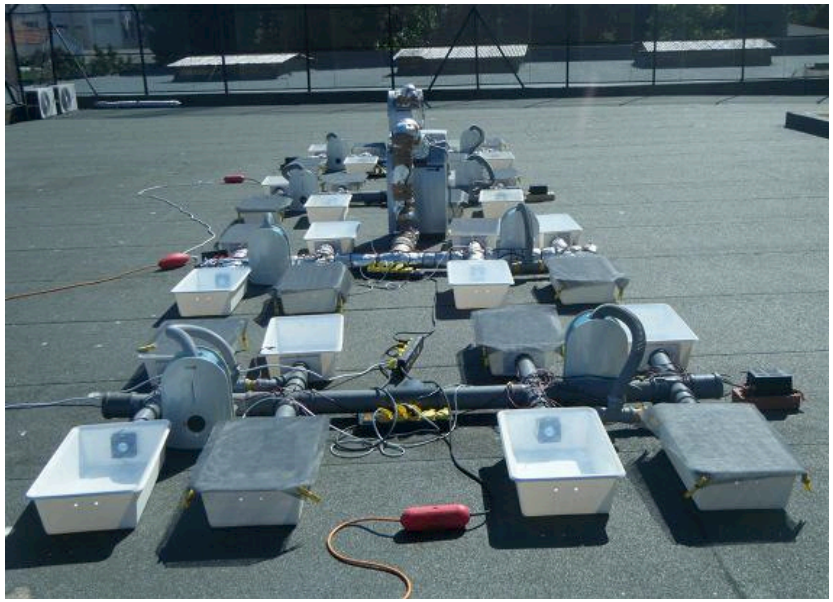

Table S1. ANOVAs of the effect of the exposure conditions (exposed vs. covered, fixed) on temperautre, desiccation state and *Fv/Fm* (initial and recovery) in two different fucoid algae species (*Fucus serratus* and *F. spiralis*, fixed) from Amorosa or Viana (population, fixed) in November 2008, March 2009 and September 2009 (Date, random) in the field experiment.

		Temperature			**Desiccation**			**Initial *Fv/Fm***			***Fv/Fm* recovery**		
	df	***MS***	***F***	***p***	***MS***	***F***	***p***	***MS***	***F***	***p***	***MS***	***F***	***p***
Population – P	1	3.004	0.01	0.936	6.397	<0.001	0.959	0.021	10.86	0.081	0.035	0.36	0.611
Date – D	2	**817.418**	**1543.27**	**<0.001**	**3123.550**	**72.05**	**<0.001**	**0.019**	**5.51**	**0.005**	**0.203**	**40.51**	**<0.001**
Species – Sp	1	0.871	0.22	0.688	618.890	1.37	0.363	0.005	1.30	0.372	0.167	3.61	0.198
Exposure – Ex	1	29.160	2.09	0.285	**59385.223**	**140.84**	**0.007**	0.004	1.54	0.340	0.368	18.31	0.051
P x D	2	**365.767**	**690.56**	**<0.001**	**1881.504**	**43.40**	**<0.001**	0.002	0.57	0.570	**0.098**	**19.66**	**<0.001**
P x Sp	1	5.290	0.23	0.681	463.720	4.16	0.178	0.001	0.24	0.675	0.011	5.08	0.153
D x Sp	2	**4.034**	**7.62**	**0.001**	**452.546**	**10.44**	**<0.001**	0.004	1.14	0.323	**0.046**	**9.22**	**<0.001**
P x Ex	1	17.640	1.70	0.322	499.932	0.46	0.568	0.000	0.00	0.996	0.009	0.43	0.579
D x Ex	2	**13.930**	**26.30**	**<0.001**	**421.644**	**9.73**	**<0.001**	0.003	0.77	0.466	0.020	4.02	0.020
Sp x Ex	1	0.111	5.97	0.135	336.325	5.83	0.137	0.015	6.93	0.119	0.115	5.19	0.150
P x D x Sp	2	**23.356**	**44.10**	**<0.001**	111.418	2.57	0.081	0.005	1.47	0.234	0.002	0.41	0.662
P x D x Ex	2	**10.376**	**19.59**	**<0.001**	**1086.527**	**25.06**	**<0.001**	0.003	0.81	0.449	0.021	4.25	0.016
P x Sp x Ex	1	0.028	0.30	0.641	332.363	2.09	0.285	0.015	7.44	0.112	0.015	1.03	0.416
D x Sp x Ex	2	0.019	0.04	0.965	57.683	1.33	0.268	0.002	0.63	0.537	0.022	4.43	0.014
P x D x Sp x Ex	2	0.094	0.18	0.838	158.914	3.67	0.028	0.002	0.58	0.562	0.014	2.89	0.059
RES	120	365.77			1881.50			0.005			0.014		

Significant differences at $\alpha < 0.01$ are shown in bold.

Table S2. ANOVAs of the effect of irradiance, air temperature, humidity and wind treatments (all of them was fixed factor) on temperature (ºC), desiccation state (%) and *Fv/Fm* (after 15 min and 20 h recovery periods) in *Fucus serratus* and *F. spiralis* (species, fixed) collected in Amorosa (northern Portugal) in November 2008 and August 2009 (trial, fixed) after the manipulative low tide stress experiment (second, 90 min).

		Temperature			**Desiccation**			***Fv/Fm* 15 min recovery**			***Fv/Fm* 20 h recovery**		
	df	***MS***	***F***	***p***	***MS***	***F***	***p***	***MS***	***F***	***p***	***MS***	***F***	***p***
Irradiance- E	1	**1300.59**	**23.68**	**<0.001**	**11169.38**	**21.57**	**<0.001**	**10.94**	**284.60**	**<0.001**	**6.37**	**79.99**	**<0.001**
Air temperature- Ta	1	**3966.15**	**72.22**	**<0.001**	1133.69	2.19	0.149	**1.46**	**38.03**	**<0.001**	**4.09**	**51.34**	**<0.001**
Humidity- H	1	**766.42**	**13.96**	**0.001**	**17213.65**	**33.23**	**<0.001**	**2.72**	**70.69**	**<0.001**	**2.92**	**36.61**	**<0.001**
Wind- W	1	42.87	0.78	0.384	2938.20	5.67	0.023	0.06	1.47	0.234	0.03	0.40	0.534
Species- sp	1	4.93	1.27	0.267	**341.64**	**13.33**	**0.001**	**0.75**	**42.93**	**<0.001**	**2.01**	**132.34**	**<0.001**
Chamber- C(E x Ta x H x W x trial)	32	**54.92**	**38.92**	**<0.001**	**517.94**	**29.71**	**<0.001**	**0.04**	**5.31**	**<0.001**	**0.08**	**11.18**	**<0.001**
Trial	1	**13210.56**	**240.55**	**<0.001**	1567.36	3.03	0.092	**0.39**	**10.17**	**0.003**	0.08	1.06	0.312
E x Ta	1	13.61	0.25	0.622	71.42	0.14	0.713	0.03	0.71	0.405	**0.80**	**9.99**	**0.003**
E x H	1	6.91	0.13	0.725	**4637.04**	**8.95**	**0.005**	0.20	5.11	0.031	0.17	2.11	0.156
Ta x H	1	112.13	2.04	0.163	15.84	0.03	0.862	0.03	0.90	0.349	0.19	2.41	0.130
E x W	1	54.98	1.00	0.325	594.02	1.15	0.292	0.22	5.74	0.023	0.19	2.40	0.131
Ta x W	1	27.15	0.49	0.487	4.77	0.01	0.924	0.00	0.08	0.783	0.00	0.01	0.915
H x W	1	73.06	1.33	0.257	155.04	0.30	0.588	0.04	1.11	0.300	0.05	0.64	0.431
E x sp	1	6.80	1.76	0.194	26.67	1.04	0.315	0.06	3.58	0.067	**0.21**	**13.55**	**0.001**
Ta x sp	1	1.46	0.38	0.543	34.32	1.34	0.256	0.00	0.19	0.668	**0.19**	**12.53**	**0.001**
H x sp	1	2.15	0.55	0.462	43.47	1.70	0.202	0.04	2.36	0.134	**0.42**	**27.83**	**<0.001**
W x sp	1	0.02	0.01	0.940	0.92	0.04	0.851	0.02	1.15	0.292	0.01	0.75	0.393
sp x C	32	**3.87**	**2.74**	**<0.001**	25.63	1.47	0.056	**0.02**	**2.41**	**<0.001**	**0.02**	**2.13**	**0.001**
E x Trial	1	18.33	0.33	0.567	641.70	1.24	0.274	0.01	0.13	0.719	0.11	1.37	0.251
Ta x Trial	1	75.70	1.38	0.249	7.59	0.01	0.904	0.13	3.43	0.073	0.30	3.77	0.061

H x trial	1	104.06	1.89	0.178	2610.42	5.04	0.032	0.01	0.30	0.586	0.00	0.02	0.881
W x trial	1	39.85	0.73	0.401	10.01	0.02	0.890	0.04	0.91	0.346	0.03	0.32	0.573
sp x trial	1	1.05	0.27	0.605	113.10	4.41	0.044	0.02	0.94	0.341	0.07	4.59	0.040
E x Ta x H	1	9.66	0.18	0.678	1040.83	2.01	0.166	**0.64**	**16.73**	**<0.001**	0.24	3.06	0.090
E x Ta x W	1	11.31	0.21	0.653	181.78	0.35	0.558	0.01	0.29	0.593	0.00	0.02	0.900
E x H x W	1	146.89	2.67	0.112	6.25	0.01	0.913	0.01	0.24	0.624	0.00	0.02	0.895
Ta x H x W	1	9.66	0.18	0.678	80.48	0.16	0.696	0.01	0.21	0.649	0.16	1.96	0.171
E x Ta x sp	1	0.89	0.23	0.634	20.81	0.81	0.374	0.11	6.30	0.017	0.08	5.39	0.027
E x H x sp	1	1.94	0.50	0.484	0.36	0.01	0.906	0.01	0.67	0.420	0.08	5.19	0.030
Ta x H x sp	1	0.03	0.01	0.928	18.99	0.74	0.396	0.01	0.34	0.563	0.00	0.12	0.733
E x W x sp	1	2.03	0.52	0.474	2.25	0.09	0.769	0.00	0.00	0.951	0.00	0.00	0.959
Ta x W x sp	1	3.90	1.01	0.323	0.62	0.02	0.878	0.00	0.04	0.849	0.00	0.20	0.662
H x W x sp	1	3.74	0.97	0.333	0.14	0.01	0.941	0.00	0.07	0.787	0.01	0.52	0.477
E x Ta x trial	1	2.21	0.04	0.842	275.74	0.53	0.471	0.07	1.83	0.186	0.11	1.39	0.247
E x H x trial	1	66.58	1.21	0.279	339.38	0.66	0.424	0.01	0.25	0.622	0.00	0.02	0.886
Ta x H x trial	1	5.63	0.10	0.751	33.02	0.06	0.802	0.07	1.79	0.190	0.10	1.31	0.260
E x W x trial	1	20.12	0.37	0.549	82.70	0.16	0.692	0.02	0.58	0.452	0.00	0.05	0.832
Ta x W x trial	1	96.70	1.76	0.194	448.50	0.87	0.359	0.24	6.15	0.019	0.05	0.66	0.423
H x W x trial	1	14.53	0.26	0.611	91.07	0.18	0.678	0.05	1.19	0.283	0.09	1.11	0.300
E x sp x trial	1	9.91	2.56	0.119	149.25	5.82	0.022	0.02	0.88	0.354	**0.11**	**7.40**	**0.010**
Ta x sp x trial	1	0.36	0.09	0.763	66.17	2.58	0.118	0.00	0.05	0.823	0.00	0.18	0.672
H x sp x trial	1	7.18	1.86	0.183	25.73	1.00	0.324	0.04	2.47	0.126	0.05	3.61	0.066
W x sp x trial	1	0.82	0.21	0.649	42.80	1.67	0.206	0.00	0.07	0.788	0.01	0.93	0.343
E x Ta x H x W	1	108.06	1.97	0.170	499.59	0.96	0.333	0.07	1.75	0.195	0.14	1.70	0.202
E x Ta x H x sp	1	1.44	0.37	0.546	13.05	0.51	0.481	0.00	0.02	0.880	**0.31**	**20.69**	**<0.001**
E x Ta x W x sp	1	8.67	2.24	0.144	32.43	1.27	0.269	0.00	0.25	0.622	0.01	0.42	0.524
E x H x W x sp	1	0.03	0.01	0.928	1.71	0.07	0.798	0.00	0.00	0.988	0.00	0.22	0.644

Ta x H x W x sp	1	0.06	0.02	0.900	5.80	0.23	0.637	0.01	0.41	0.527	0.02	1.16	0.290
E x Ta x H x trial	1	11.80	0.21	0.646	503.25	0.97	0.332	0.01	0.14	0.710	0.06	0.80	0.377
E x Ta x W x trial	1	1.18	0.02	0.884	71.07	0.14	0.714	0.02	0.43	0.517	0.13	1.66	0.206
E x H x W x trial	1	47.25	0.86	0.361	800.41	1.55	0.223	0.12	3.13	0.086	0.00	0.00	0.974
Ta x H x W x trial	1	13.09	0.24	0.629	201.84	0.39	0.537	0.04	1.08	0.306	0.02	0.28	0.602
E x Ta x sp x trial	1	1.54	0.40	0.533	62.73	2.45	0.128	0.04	2.27	0.142	0.01	0.65	0.424
E x H x sp x trial	1	5.58	1.44	0.238	0.00	0.00	1.000	0.01	0.67	0.419	0.02	1.56	0.221
Ta x H x sp x trial	1	15.80	4.09	0.052	35.77	1.40	0.246	0.00	0.05	0.823	0.08	5.08	0.031
E x W x sp x trial	1	0.13	0.03	0.855	30.83	1.20	0.281	0.01	0.72	0.403	0.01	0.65	0.427
Ta x W x sp x trial	1	5.49	1.42	0.242	137.76	5.38	0.027	0.04	2.55	0.120	0.00	0.00	0.961
H x W x sp x trial	1	1.23	0.32	0.577	5.80	0.23	0.637	0.01	0.59	0.448	0.02	1.11	0.300
E x Ta x H x W x sp	1	4.49	1.16	0.290	1.53	0.06	0.809	0.02	1.26	0.269	0.00	0.00	0.965
E x Ta x H x W x trial	1	8.55	0.16	0.696	176.31	0.34	0.564	0.06	1.59	0.216	0.00	0.00	0.970
E x Ta x H x sp x trial	1	3.86	1.00	0.325	3.80	0.15	0.703	0.05	2.61	0.116	0.04	2.50	0.124
E x Ta x W x sp x trial	1	3.14	0.81	0.375	5.66	0.22	0.642	0.00	0.07	0.799	0.00	0.29	0.595
E x H x W x sp x trial	1	0.36	0.09	0.763	51.19	2.00	0.167	0.00	0.17	0.679	0.01	0.47	0.497
Ta x H x W x sp x trial	1	1.59	0.41	0.526	35.41	1.38	0.249	0.04	2.49	0.125	0.04	2.52	0.122
E x Ta x H x W x sp x trial	1	0.07	0.02	0.896	37.25	1.45	0.237	0.00	0.12	0.728	0.01	0.43	0.519
Residual	256*	54.918			517.94			0.038			0.080		

Significant differences at $\alpha < 0.01$ are shown in bold. * To achieve homogeneity of variances. 4 outliers were replaced by the mean of the group ($df = 246$) for the temperature. 1 for the 15 min recovery data and 5 for the 20 h recovery data.