SUPPLEMENTARY MATERIAL

TABLES

Table S1. (A) The ratio between surface area to % cover foundation species was +/– 5.8% for control or removal pools as well as designation for sampling day. Tide pools 1-16 were on sampling day 1 and night 2 and tide pools 17-32 were on sample day 2 and night 1. (B) Tide pool physical parameters for all pools.

A.

Pool ID	Type	% cover surfgrass or mussel	SA to % cover	Removal
1	Surfgrass	65.6	18.17	N
2	Surfgrass	51.6	25.99	Y
3	Surfgrass	76.2	14.35	Y
4	Surfgrass	72.6	59.07	N
5	Surfgrass	83.99	54.79	N
6	Surfgrass	77.0	112.74	Y
7	Surfgrass	58.9	19.7	Y
8	Surfgrass	55.7	62.9	N
9	Mussel	88.3	13.68	N
10	Mussel	78.8	38.6	Y
11	Mussel	98.9	93.13	Y
12	Mussel	45.3	17.75	N
13	Mussel	80.9	19.45	N
14	Mussel	92.8	159.18	N
15	Mussel	61.1	57.1	Y
16	Mussel	77.3	11.24	Y
17	Mussel	49.3	44.53	Y
18	Surfgrass	49.5	9.83	N
19	Mussel	82.1	15.09	N
20	Surfgrass	68	14.63	Y
21	Surfgrass	100	45.88	Y
22	Surfgrass	96.4	23.91	N
23	Mussel	57	35.85	Y
24	Mussel	51.7	52.76	Y
25	Mussel	71.6	62.64	N
26	Surfgrass	58.9	48.96	Y
27	Surfgrass	53.9	46.31	N
28	Surfgrass	72.8	31.15	Y
29	Surfgrass	76.8	102.4	N
30	Mussel	81.5	51.42	N
31	Mussel	96.3	28.93	N
32	Mussel	95.3	29.75	Y

B.

	Surfgrass Control	Surfgrass Removal	Mussel Control	Mussel Removal
Tide pool physical parameters	Before removal period			
Surface area (m^2)	0.75–5.04	0.68–5.31	0.58–6.45	0.98–6.88
Volume (m^3)	0.05–0.36	0.03–0.65	0.04–0.75	0.07–0.67
Tide height (m)	0.78–1.62	0.71–1.14	0.90–1.33	0.88–1.77
SA:V	7.12–17.15	8.18–41.00	8.38–18.92	8.97–24.23
	After removal period			
Surface area (m^2)	0.75–5.04	0.68–6.15	0.58–6.45	1.30–7.54
Volume (m^3)	0.05–0.36	0.03–0.78	0.04–0.75	0.07–0.87
Tide height (m)	0.78–1.62	0.71–1.14	0.90–1.33	0.88–1.77
SA:V	7.12–17.15	7.91–29.91	8.38–18.92	6.92–25.11

Table S2. Community composition by functional group for both surfgrass and mussel tide pools at Otter Rock (n=16 surfgrass; n = 16 mussel). (A) sessile functional group list, (B) mobile functional group list. Macrophytes were grouped based off Steneck and Dethier (1994) as follows: (1) microalgae, (2) filamentous algae, (3) foliose algae, (4) corticated foliose algae, (5) corticated macroalgae, (6) leathery macrophytes, (6) articulated calcareous algae, and (7) crustose algae. Seaweeds that had filamentous thalli that were mainly uncorticated (e.g. *Polysiphonia*) were considered filamentous (Broitman et al. 2001, Nielsen 2003, Liuzzi et al. 2011). Sessile and mobile invertebrates were grouped based off trophic level groups determined by life history on public databases (e.g. AlgaeBase and WoRMS) and Russell et al. (2006),unless they were the only organism within that trophic level (e.g. anemones).

A.

Sessile Functional Groups

Microalgae
Diatoms
Algae film

Filamentous Algae
Acrosiphonia coalita
Cladophora columbiana
Centroceras or Ceramium
Chaetomorpha linum
Savoiea robusta
Polysiphonia spp.
Turf Algae
Callithamnion pikeanum

Foilose Algae
Pyropia spp.
Ulva spp.
Smithora naiadum
Scytosiphon lomentaria

Corticated Foliose Algae
Halosaccion glandiforme
Leathesia marina
Mazzaella splendens
Mazzaella oregona
Mazzaella flaccida
Palmaria hecatensis
Schizymenia pacifica

Corticated Macrophytes
Ptilota spp.
Mastocarpus spp.
Farlowia mollis
Analipus japonicus
Cryptosiphonia woodii
Cumagloia andersonii
Erythrophyllum delesserioides
Halosaccion glandiforme
Cryptopleura spp.
Odonthalia floccosa
Odontalia washingtoniensis
Neorhodomela larix
Plocamium spp.
Osmundea spectabilis
Endocladia muricata
Microcladia borealis

Leathery Macrophytes
Fucus gardneri
Laminaria setchellii
Costaria costata
Phyllospadix spp.

Crustose
Non-coralline crusts
Crustose corallines

Articulated Corallines
Bossiella spp.
Calliarthron tuberculosum
Corallina vancouveriensis
Corallina spp.

Suspension Feeders
Mytilus californianus
Chthamalus spp.
Semibalanus cariosus
Balanus nibulis
Balanus glandula
Pollicipes polymerus
Tubeworm
Clathria pennata
Halichondria spp.
Haliclona permollis
Stylantheca spp.

Anemones
Anthopleura elegantissima
A. xanthrogrammica
A. artemisia
Urticina coriacea
Epiactis prolifera

B.

Mobile Functional Groups

Herbivore	Omnivore	Carnivore
Micrograzer	Brittle Star	*Nucella ostrina*
Littorina spp.	*Hemigrapsus nudus*	*Nucella canaliculata*
Lottia spp.	*Pachygrapsus crassipes*	*Paciocinebrina lurida*
Acmaea mitra	*Heptacarpus stichensis*	*Ceratostoma foliatum*
Fissurella volcano	*Pagurus* spp.	*Nucella lamellosa*
Amphissa spp.	*Pugettia producta*	*Lirabuccinum dirum*
Bittium eschrichtii	*Diodora aspera*	*Alia carinata*
Cyanoplax hartwegii	Gunnel	*Peltodoris nobilis*
Idotea spp.	Sculpin	*Aeolidia papillosa*
Katharina tunicata		*Acanthodoris nanaaimoensis*
Lepidochiton spp.		*Hermissenda opalescens*
Mopalia spp.		*Diaulula sandiegensis*
Nuttalina spp.		*Cancer* spp.
Tonicella spp.		*Pisaster ochraceus*
Mesograzer		*Leptasterias hexactis*
Tegula funebralis		*Henricia* spp.
Petrolisthes spp.		
Strongylocentrotus purpuratus		
Callistoma canaliculata		

Table S3. Range of chemical parameters from all tide pools (n =31) during (A) day and (B) night sampling in both time periods (before and after) from both removal and control pools of surfgrass (*Phyllospadix* spp.) and mussels (*M. californianus*).
A. Day sampling biogeochemistry

	Surfgrass Control	Surfgrass Removal	Mussel Control	Mussel Removal	Surfgrass Control	Surgrass Removal	Mussel Control	Mussel Removal
	Before removal period				After removal period			
Day sampling date	7/8 and 7/9/2019				8/5 and 8/6/2019			
Tide pool chemistry (day)								
Temperature (°C)	12.6–18.5	12.7–19.9	12.8–20.9	12.8–19.3	10.8–15	10.9–18.7	10.9–15.5	10.8–16.5
DO (mg L^{-1})	7.88–17.31	5.25–15.93	5.44–11.76	5.93–10.41	7.24–20.85	7.94–29.86	5–14.64	6.75–31.51
pH_T	7.92–8.83	8.06–8.53	7.39–8.04	7.37–8.0	7.63–8.40	7.78–8.74	7.42–7.96	7.57–8.78
TA (μmol kg^{-1})	1862–2306	1872–2295	1807–2221	1699–2127	2108–2351	1591–2233	1858–2285	1942–2217
DIC (μmol kg^{-1})	1200–2142	1509–2067	1587–2192	1554–2082	1794–2276	1027–2081	1705–2279	1331–2131
pCO_2 (μatm)	28.4–537	85.2–376	326–1721	386–1937	137–1110	30.8–761	419–1796	34.7–1271
NH_4^+ (μmol L^{-1})	1.98–17.19	0.57–14.41	6.62–33.15	4.72–25.50	1.39–10.01	0.78–6.53	5.63–33.93	2.12–13.75
NO_3^- + NO_2^- (μmol L^{-1})	0.24–2.39	0.30–4.58	1.57–12.50	1.33–18.70	0.78–14.80	0.94–7.29	5.79–27.72	0–18.59
PO_4^{3-} (μmol L^{-1})	0.38–2.60	0.49–2.79	0.94–3.61	0.54–4.44	0.55–1.66	0.57–1.94	1.57–6.37	0.96–3.89
N to P Ratio	4.43–19.83	0.71–20.65	8.32–15.67	7.42–24.04	3.76–21.11	2.71–13.71	7.46–17.99	2.35–15.55
NEP (mmol C m^{-2} hr^{-1})	-5.07–7.57	0.54–9.37	-1.07–5.53	-0.02–4.05	-3.02–4.61	4.56–14.61	-1.24–6.66	2.47–13.56
NEC (mmol CaCO3 m^{-2} hr^{-1})	-1.77–3.02	-0.43–2.03	-0.75–4.45	0.50–4.16	-2.88–0.89	1.29–3.23	-1.54–3.08	0.27–2.26

B. Night sampling biogeochemistry

	Surfgrass Control	Surfgrass Removal	Mussel Control	Mussel Removal	Surfgrass Control	Surgrass Removal	Mussel Control	Mussel Removal
	Before removal period				After removal period			
Night sampling date	7/11 and 7/12/2019				8/8 and 8/9/2019			
Tide pool chemistry (night)								
Temperature (°C)	14.4–15.5	14.4–15.6	14.3–15.2	14.5–15.3	10.4–12.4	10.5–12.7	10.5–12	10.4–12.1
DO (mg L^{-1})	2.7–6.96	1.86–6.71	1.86–4.41	1.72–7.31	0.79–6.28	1.03–6.81	0.85–4.23	1.23–6.45
pH_T	7.39–7.99	7.38–8.01	7.31–7.56	7.29–7.53	7.25–7.93	7.30–7.94	7.25–7.57	7.30–7.74
TA (μmol kg^{-1})	1968–2392	1955–2349	1901–2319	1888–2261	2143–2605	2135–2455	2054–2321	2106–2294
DIC (μmol kg^{-1})	1806–2404	1785–2355	1872–2368	1900–2313	2003–2677	1992–2469	2119–2388	2058–2292
pCO_2 (μatm)	438–2178	409–2327	1234–2651	1350–2691	521–2857	502–2485	1263–2669	806–2462
NH_4^+ (μmol L^{-1})	1.43–19.29	2.81–19.29	10.75–45.18	1.96–31.16	1.53–9.79	1.09–8.79	8.56–42.69	0.38–23.62
$NO_3^- + NO_2^-$ (μmol L^{-1})	0–1.01	0.02–2.19	1.02–14.46	0.47–5.19	0.57–6.38	0.58–7.38	3.16–19.92	2.13–14.01
PO_4^{3-} (μmol L^{-1})	0.29–2.05	0.06–2.09	0.63–5.06	0.68–5.00	0.60–3.39	0.60–2.76	1.47–8.39	0.66–5.71
N to P Ratio	0.93–41.90	4.07–30.96	8.67–27.25	1.15–40.24	1.93–10.57	1.14–11.99	6.19–14.98	1.88–16.30
NEP (mmol C m^{-2} hr^{-1})	-14.38–12.01	-10.49–12.97	-16.25–9.74	-12.93–5.44	-11.17–10.93	-11.52–18.37	-7.26–8.01	-8.34–15.72
NEC (mmol CaCO3 m^{-2} hr^{-1}	-7.04–3.85	-5.21–3.25	-7.56–7.45	-5.52–4.75	-7.61–3.65	-5.60–3.67	-4.40–4.38	-6.63–4.43

Table S4. Ocean chemistry from all water sampling days before and after foundation species removal periods.

	Before removal period		**After removal period**	
Day sampling dates	7/8/19	7/9/19	8/5/19	8/6/19
Ocean chemistry (day)				
Temperature (°C)	11.9–13.1	12.3–12.9	10.4–11.3	10.8–11.7
DO (mg L^{-1})	7.79–10.23	9.25–10.1	7.03–11.07	8.57–11.55
pH_T	7.91–8.14	7.92–8.13	7.635–7.98	7.63–8.00
TA (μmol kg^{-1})	2123–2154	2108–2203	2120–2163	2122–2215
DIC (μmol kg^{-1})	1896–1995	1883–2064	1995–2121	1992–2131
pCO_2 (μatm)	301–550	299–545	454–1108	420–1067
NH_4^+ (μmol L^{-1})	2.35–3.35	1.23–6.20	1.69–2.51	1.44–2.14
$NO_3^- + NO_2^-$ (μmol L^{-1})	0.83–1.40	1.87–2.48	7.80–9.24	8.48–9.92
PO_4^{3-} (μmol L^{-1})	0.71–0.79	0.49–0.63	1.62–1.74	1.12–1.82
Night sampling dates	7/11/19	7/12/19	8/8/19	8/9/19
Ocean chemistry (night)				
Temperature (°C)	14.6–14.9	15.2–15.3	11.2–11.4	11.5–11.6
DO (mg L^{-1})	8.4–8.98	7.92–8.3	7.31–8.6	8.11–8.88
pH_T	7.94–7.99	7.93–7.97	7.70–7.87	7.85–7.88
TA (μmol kg^{-1})	1993–2047	1940–2010	2123–2219	2140–2151
DIC (μmol kg^{-1})	1836–1902	1793–1853	2009–2127	2021–2030
pCO_2 (μatm)	443–501	464–510	604–915	592–632
NH_4^+ (μmol L^{-1})	5.11–8.83	3.67–7.52	1.33–4.80	2.22–3.15
$NO_3^- + NO_2^-$ (μmol L^{-1})	0.46–1.33	0.53–0.54	2.79–9.09	2.79–3.43
PO_4^{3-} (μmol L^{-1})	0–0.26	0.61–0.75	0.98–1.16	0.88–1.14

Table S5. Output of PERMANOVA models on surfgrass and mussel sessile and mobile community data. Both surfgrass and mussel mobile matrices were square rooted for the PERMANOVA. Bolded terms indicate significant values.

Model	Df	Sum of Squares	Mean Sqaures	F Statistic	R^2	p-value
sessile distance matrix ~ surfgrass loss + vol + tide height						
Surfgrass Loss (%)	**1,15**	**4534.4**	**4534.4**	**4.79**	**0.28**	**0.03**
Volume (m^3)	1,15	86.9	86.9	0.09	0.01	0.97
Tide height (m)	1,15	459.9	459.9	0.49	0.03	0.66
Residuals	12	11354.6	946.20		0.69	
Total	15	3.73			1.00	
mobile dist matrix (no TP 18) ~ surfgrass loss + vol + tide height						
Surfgrass Loss (%)	1,14	88.31	88.31	1.91	0.13	0.15
Volume (m^3)	1,14	41.98	41.98	0.91	0.06	0.42
Tide height (m)	1,14	64.75	64.75	1.40	0.09	0.24
Residuals	11	507.95	46.18		0.72	
Total	14	703.00			1.00	
mobile dist matrix (TP 18) ~ surfgrass loss + vol + tide height						
Surfgrass Loss (%)	1,15	119.17	119.17	2.31	0.09	0.08
Volume (m^3)	1,15	133.38	133.37	2.57	0.10	0.08
Tide height (m)	**1,15**	**411.57**	**411.57**	**7.97**	**0.32**	**0.01**
Residuals	12	619.71	51.64		0.48	
Total	15	1283.82			1.00	
sessile distance matrix ~ mussel loss + vol + tide height						
Mussel Loss (%)	**1,15**	**117.19**	**117.19**	**7.15**	**0.33**	**0.001**
Volume (m^3)	1,15	15.89	15.84	0.97	0.04	0.39
Tide height (m)	1,15	25.91	25.91	1.58	0.07	0.18
Residuals	12	196.6	16.38		0.55	
Total	15	355.53			1.00	
mobile distance matrix ~mussel loss + vol + tide height						
Mussel Loss (%)	1,15	27.86	27.86	0.22	0.01	0.75
Volume (m^3)	1,15	140.00	140.00	1.12	0.06	0.31
Tide height (m)	**1,15**	**651.49**	**651.49**	**5.15**	**0.28**	**0.03**
Residuals	12	1517.11	126.43		0.65	
Total	15	2336.46			1.00	

Table S6. Multiple regression summary output for species richness analysis. (A) Full model summary; (B) individual model responses with coefficients, SE, t-statistic, and p-value. Bolded terms indicate significant values. BT columns are back transformed to the original scale (exponent of the coefficient and SE columns) to be able to interpret the raw values. Bolded terms indicate significant values.

A.

	Sessile richness models	Mobile richness models
Surfgrass models	Change richness~surfgrass loss+Vol+Tide height	Change richness~surfgrass loss+Vol+Tide height
Observations	16	16
R^2	0.27	0.27
Adjusted R^2	0.09	0.08
Residual Std. Error	3.36 (df=12)	3.38 (df=12
F Statistic	1.51 (df=3,12)	1.45 (df=3,12)
p-value	0.26	0.28
Mussel models	**Log change richness~mussel loss+Vol+Tide height**	**Change richness~mussel loss+Vol+Tide height**
Observations	**16**	**16**
R^2	**0.70**	**0.58**
Adjusted R^2	**0.62**	**0.47**
Residual Std. Error	**0.88 (df=12)**	**2.01 (df=12)**
F Statistic	**9.19 (df=3,12)**	**5.42 (df=3,12)**
p-value	**0.002**	**0.01**

B.

Term	Coefficient	BT coefficient	SE	BT SE	T-statistic	P-value
Surfgrass sessile richness						
(Intercept)	7.55		3.89		1.94	0.08
Surfgrass loss (%)	0.01		0.02		0.52	0.61
Volume (m^3)	10.57		5.16		2.05	0.06
Tide Height (m)	-3.23		4.16		-0.78	0.45
Surfgrass mobile richness						
(Intercept)	2.34		3.91		0.60	0.56
Surfgrass loss (%)	-0.03		0.02		-1.66	0.12
Volume (m^3)	6.14		5.19		1.18	0.26
Tide Height (m)	0.84		4.18		0.20	0.85
Mussel sessile richness (log)						
(Intercept)	3.73	41.68	1.15	3.16	3.23	0.01
Mussel loss (%)	**-0.02**	0.98	**0.01**	1.01	**-3.74**	**0.002**
Volume (m^3)	-0.53	0.59	1.00	2.72	-0.53	0.61
Tide Height (m)	-1.91	0.15	1.06	2.89	-1.80	0.10
Mussel mobile richness						
(Intercept)	-6.58		2.62		-2.51	0.03
Mussel loss (%)	-0.01		0.01		-0.823	0.43
Volume (m^3)	-1.24		2.29		-0.54	0.60
Tide Height (m)	**9.34**		**2.42**		**3.86**	**0.002**

Table S7. Multiple regression summary output for light and temperature analysis. (A) Full model summary; (B) individual model responses with coefficients, SE, t-statistic, and p-value. Bolded terms indicate significant values. BT columns are back transformed to the original scale (exponent of the coefficient and SE columns) to be able to interpret the raw values.

A.

	Temperature models
Surfgrass models	**Log change in temp max~surfgrass loss+Vol +Tide height**
Observations	**16**
R^2	**0.72**
Adjusted R^2	**0.65**
Residual Std. Error	**0.40 (df=12)**
F Statistic	**10.27 (df=3,12)**
p-value	**0.001**
Mussel models	**Delta temp max~mussel loss+Vol+Tide height**
Observations	**15**
R^2	**0.69**
Adjusted R^2	**0.61**
Residual Std. Error	**1.18 (df=11)**
F Statistic	**8.17 (df=3,11)**
p-value	**0.004**
	Light models
Surfgrass models	**Log change in percent max light~surfgrass loss+Vol+Tide height**
Observations	**16**
R^2	**0.72**
Adjusted R^2	**0.65**
Residual Std. Error	**2.31 (df=12)**
F Statistic	**10.27 (df=3,12)**
p-value	**0.001**
Mussel models	**Log change in percent max light~mussel loss+Vol+Tide height**
Observations	**15**
R^2	**0.68**
Adjusted R^2	**0.60**
Residual Std. Error	**1.45 (df=11)**
F Statistic	**7.87 (df=3,11)**
p-value	**0.004**

B.

Term	Coefficient	BT Coefficient	SE	BT SE	T-statistic	P-value
Surfgrass log max temp						
(Intercept)	1.19	3.29	0.47	1.6	2.54	0.03
Surfgrass loss (%)	**0.01**	**1.01**	**0.002**	**1.0**	**5.24**	**<0.001**
Volume (m^3)	0.50	1.65	0.62	1.9	0.81	0.43
Tide Height (m)	-1.03	0.36	0.50	1.6	-2.07	0.06
Surfgrass log percent max light						
(Intercept)	-1.05	0.35	2.68	14.59	-3.93	0.7
Surfgrass loss (%)	**0.07**	**1.07**	**0.01**	**1.01**	**5.45**	**<0.001**
Volume (m^3)	3.67	39.25	3.55	34.81	1.03	0.32
Tide Height (m)	-1.13	0.32	2.86	17.46	-0.40	0.70
Mussel max temp						
(Intercept)	-4.29		1.54		-2.80	0.02
Mussel loss (%)	**0.02**		**0.009**		**3.00**	**0.01**
Volume (m^3)	2.09		1.37		1.53	0.15
Tide Height (m)	2.59		1.44		1.80	0.10
Mussel log percent light						
(Intercept)	-4.96	0.01	2.65	14.15	-1.88	0.09
Mussel loss (%)	**0.04**	**1.04**	**0.01**	**1.01**	**3.34**	**0.01**
Volume (m^3)	2.11	8.25	1.68	5.37	1.26	0.23
Tide Height (m)	1.65	5.21	1.77	5.87	0.93	0.37

Table S8. Full output of multigroup structural equation models. (A) surfgrass model and (B) mussel model responses and predictors with both unstandardized estimates and standardized estimates. Bolded values indicate significant values. Duplicate rows indicate a significant day and night interaction, where night values are in gray shading. If standardized estimates differed between day/night, day values are on the left and night values are on the right.

A. Surfgrass model

Response	Predictor	Estimate	Std Error	DF	Crit Value	P Value	Std Estimate
Micro/macroalgae cover (%)	**Phyllospadix Loss (%)**	**0.36**	**0.10**	**28**	**3.63**	**0.001**	**0.56**
Micro/macroalgae cover (%)	Volume (m^3)	10.51	27.17	28	0.39	0.70	0.06
Micro/macroalgae cover (%)	Tide Height (m)	-26.57	21.93	28	-1.21	0.24	-0.19
Maximum Temperature (°C)	**Phyllospadix Loss (%)**	**0.04**	**0.01**	**12**	**3.94**	**0.002**	**0.72**
Maximum Temperature (°C)	Phyllospadix Loss (%)	0.01	0.00	12	1.05	0.32	0.24
Maximum Temperature (°C)	Volume (m^3)	0.44	1.85	28	0.24	0.81	0.03 | 0.08
Maximum Temperature (°C)	Tide Height (m)	2.23	1.49	28	1.49	0.15	0.21 | 0.50
N to P Ratio	Phyllospadix Loss (%)	-0.01	0.02	28	-0.95	0.35	-0.23 | -0.25
N to P Ratio	Volume (m^3)	1.72	4.12	28	0.42	0.68	0.11
N to P Ratio	Tide Height (m)	1.81	3.33	28	0.54	0.59	0.14
NEP (mmol C m^{-2} hr^{-1})	**Maximum Temperature (°C)**	**1.03**	**0.30**	**27**	**3.39**	**0.002**	**0.54 | 0.43**
NEP (mmol C m^{-2} hr^{-1})	Micro/macroalgae cover (%)	-0.002	0.02	27	-0.09	0.93	-0.01 | -0.02
NEP (mmol C m^{-2} hr^{-1})	**N to P Ratio**	**-0.34**	**0.16**	**27**	**-2.17**	**0.04**	**-0.22 | -0.41**
NEP (mmol C m^{-2} hr^{-1})	Tide Height (m)	-4.30	2.69	27	-1.60	0.12	-0.21 | -0.41
pH_T	NEP (mmol C m^{-2} hr^{-1})	0.02	0.01	11	2.13	0.06	0.42
pH_T	NEP (mmol C m^{-2} hr^{-1})	-0.01	0.01	11	-1.14	0.28	-0.33
pH_T	**Phyllospadix Loss (%)**	**0.002**	**0.001**	**27**	**2.75**	**0.01**	**0.31 | 0.89**
pH_T	Volume (m^3)	-0.01	0.14	27	-0.10	0.92	-0.01 | -0.03
pH_T	TideHeight (m)	0.12	0.11	27	1.08	0.29	0.12 | 0.34
NEC (mmol $CaCO_3$ m^{-2} hr^{-1})	**pH_T**	**5.26**	**1.23**	**28**	**4.29**	**<0.001**	**0.64 | 0.34**
NEC (mmol $CaCO_3$ m^{-2} hr^{-1})	Maximum Temperature (°C)	0.20	0.12	28	1.77	0.09	0.25 | 0.16
NEC (mmol $CaCO_3$ m^{-2} hr^{-1})	**Tide Height (m)**	**-2.20**	**0.96**	**28**	**-2.28**	**0.03**	**-0.26 | -0.39**

B. Mussel model

Response	Predictor	Estimate	Std Error	DF	Crit Value	P Value	Std Estimate
Micro/macroalgae cover (%)	**Mytilus Loss (%)**	**0.71**	**0.13**	**26**	**5.54**	**<0.001**	**0.79**
Micro/macroalgae cover (%)	Volume (m^3)	-4.91	19.99	26	-0.25	0.81	-0.03
Micro/macroalgae cover (%)	**Tide Height (m)**	**-54.78**	**20.97**	**26**	**-2.61**	**0.01**	**-0.39**
Maximum Temperature (°C)	Mytilus Loss (%)	0.01	0.01	26	1.92	0.07	0.34 I 0.62
Maximum Temperature (°C)	Volume (m^3)	-0.21	0.89	26	-0.24	0.81	-0.04 I -0.08
Maximum Temperature (°C)	Tide Height (m)	-0.50	0.93	26	-0.54	0.59	-0.10 I -0.18
N to P Ratio	Mytilus Loss (%)	-0.03	0.02	26	-1.21	0.24	-0.36 I -0.25
N to P Ratio	Volume (m^3)	4.40	3.23	26	1.36	0.18	0.40 I 0.28
N to P Ratio	Tide Height (m)	-4.31	3.39	26	-1.27	0.21	-0.40 I -0.28
NEP (mmol C m^{-2} hr^{-1})	**N to P Ratio**	**-0.33**	**0.14**	**26**	**-2.42**	**0.02**	**-0.20 I -0.53**
NEP (mmol C m^{-2} hr^{-1})	**Micro/macroalgae cover (%)**	**0.11**	**0.02**	**11**	**5.85**	**<0.001**	**0.89**
NEP (mmol C m^{-2} hr^{-1})	Micro/macroalgae cover (%)	-0.02	0.01	11	-1.14	0.28	-0.25
NEP (mmol C m^{-2} hr^{-1})	Tide Height (m)	-4.23	2.26	26	-1.87	0.07	-0.24 I -0.45
pH_T	**Mytilus Loss (%)**	**0.003**	**0.001**	**25**	**3.80**	**0.001**	**0.43 I 0.75**
pH_T	**NEP (mmol C m^{-2} hr^{-1})**	**0.02**	**0.01**	**25**	**3.12**	**0.005**	**0.40 I 0.39**
pH_T	Volume (m^3)	-0.16	0.10	25	-1.60	0.12	-0.16 I -0.29
pH_T	Tide Height (m)	0.22	0.11	25	1.95	0.06	0.23 I 0.40
NEC (mmol $CaCO_3$ m^{-2} hr^{-1})	pH_T	2.45	1.60	26	1.53	0.14	0.41 I 0.24
NEC (mmol $CaCO_3$ m^{-2} hr^{-1})	**Maximum Temperature (°C)**	**-0.69**	**0.28**	**26**	**-2.46**	**0.02**	**-0.61 I -0.34**
NEC (mmol $CaCO_3$ m^{-2} hr^{-1})	Tide Height (m)	-1.54	1.20	26	-1.29	0.21	-0.27

FIGURES

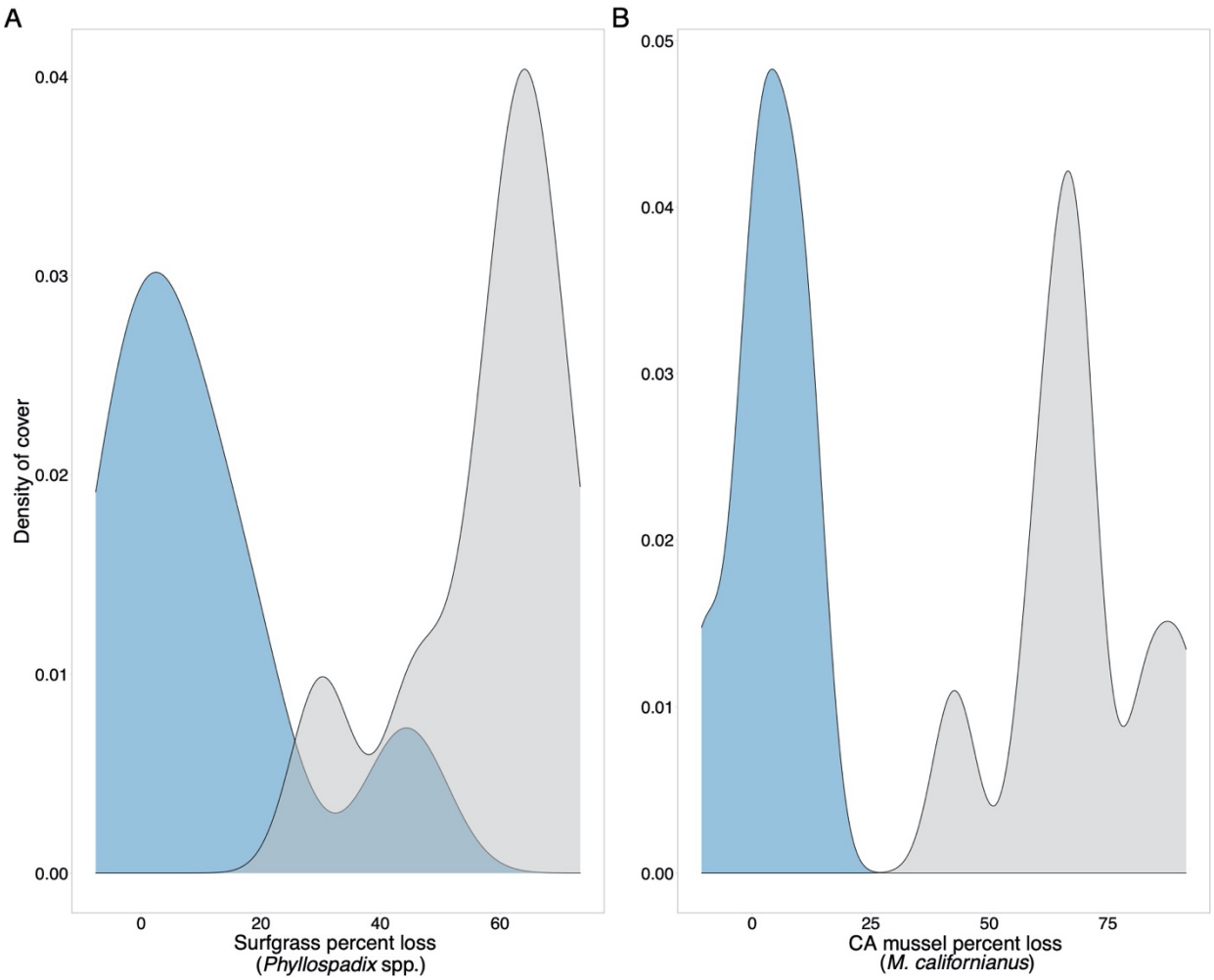

Fig. S1. Distribution of foundation species cover after removal for (A) surfgrass pools and (B) mussel pools. Blue shading represents control pools and grey shading represents removal pools.

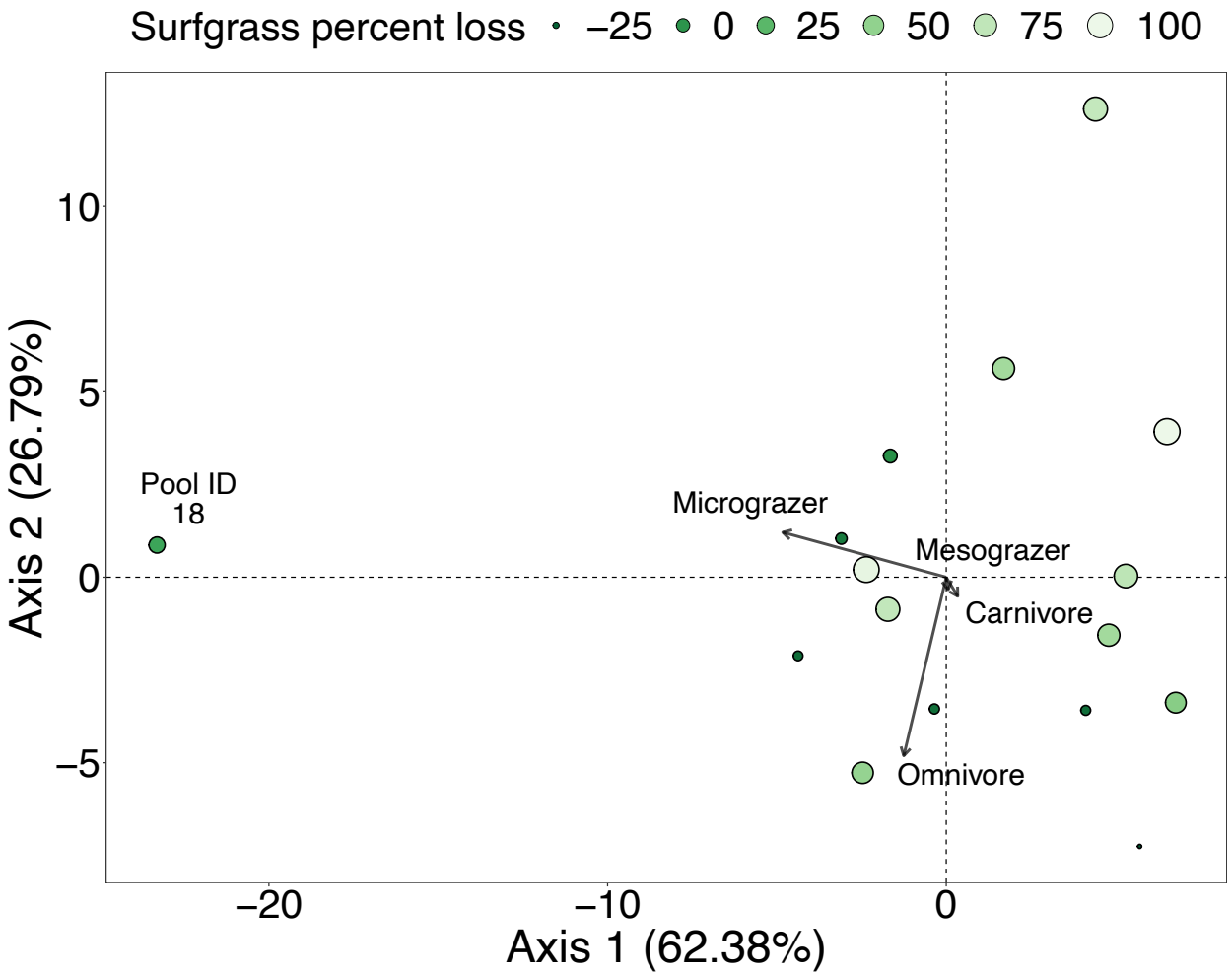

Fig. S2. Principal coordinate analysis plot of change in surfgrass functional mobile groups between before and after-removal period including Pool ID 18. Green dots are shaded and sized by percent of surfgrass loss. The first two axes explain 80.72% of the variation in multivariate space.

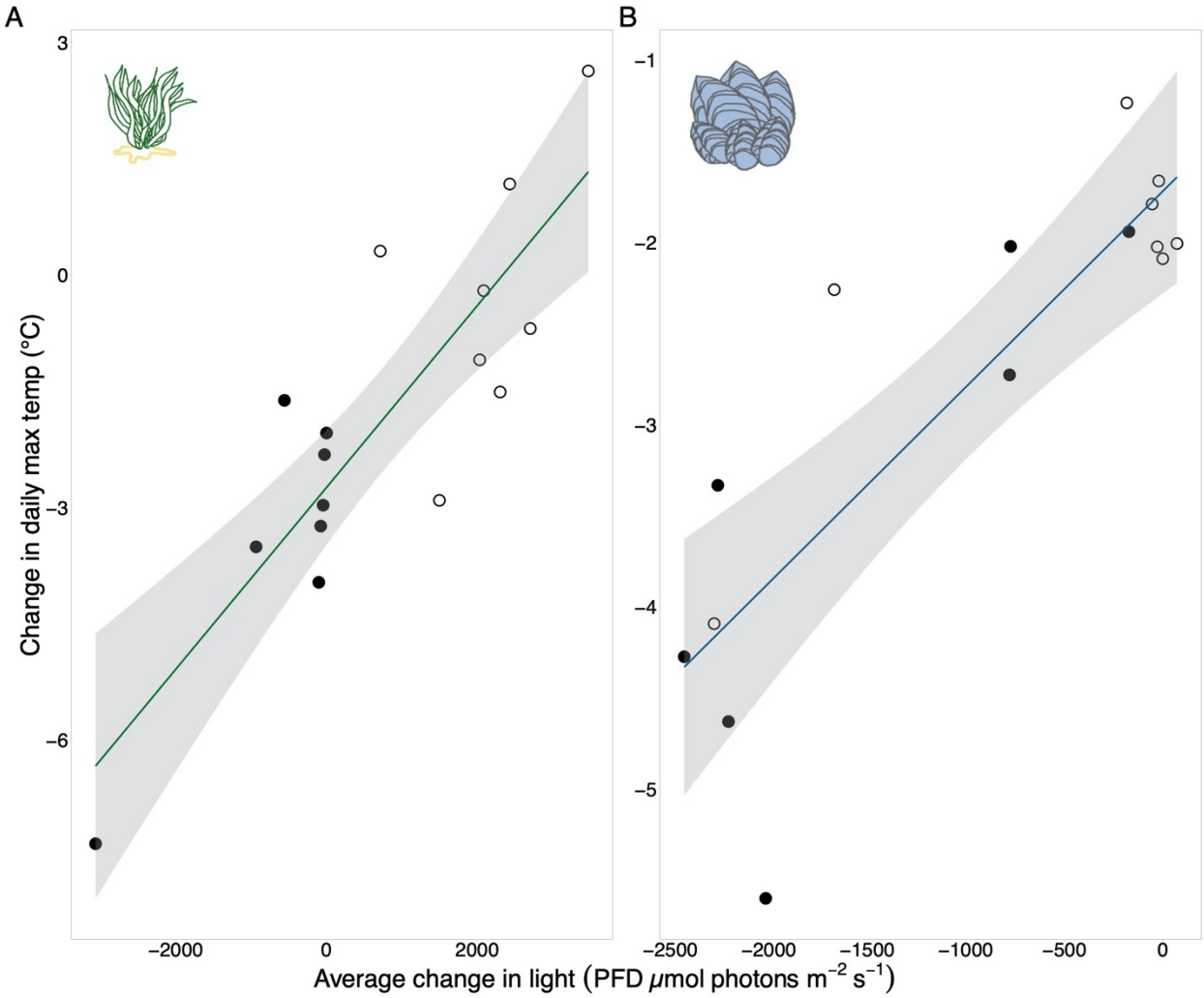

Fig. S3. Relationship between daytime average light and daily maximum temperature values on water sampling days in (A) *Phyllospadix* spp. SEM model and (B) *M. californianus* SEM model. Filled dots are control pools, and empty dots are removal pools and gray shading represents 95% confidence intervals. Light and temperature were positively correlated in (A) (pearson's correlation: t_{14}=6.15, r=0.85, p<0.001) and (B) (pearson's correlation: t_{13}=5.76, r=0.85, p<0.001).

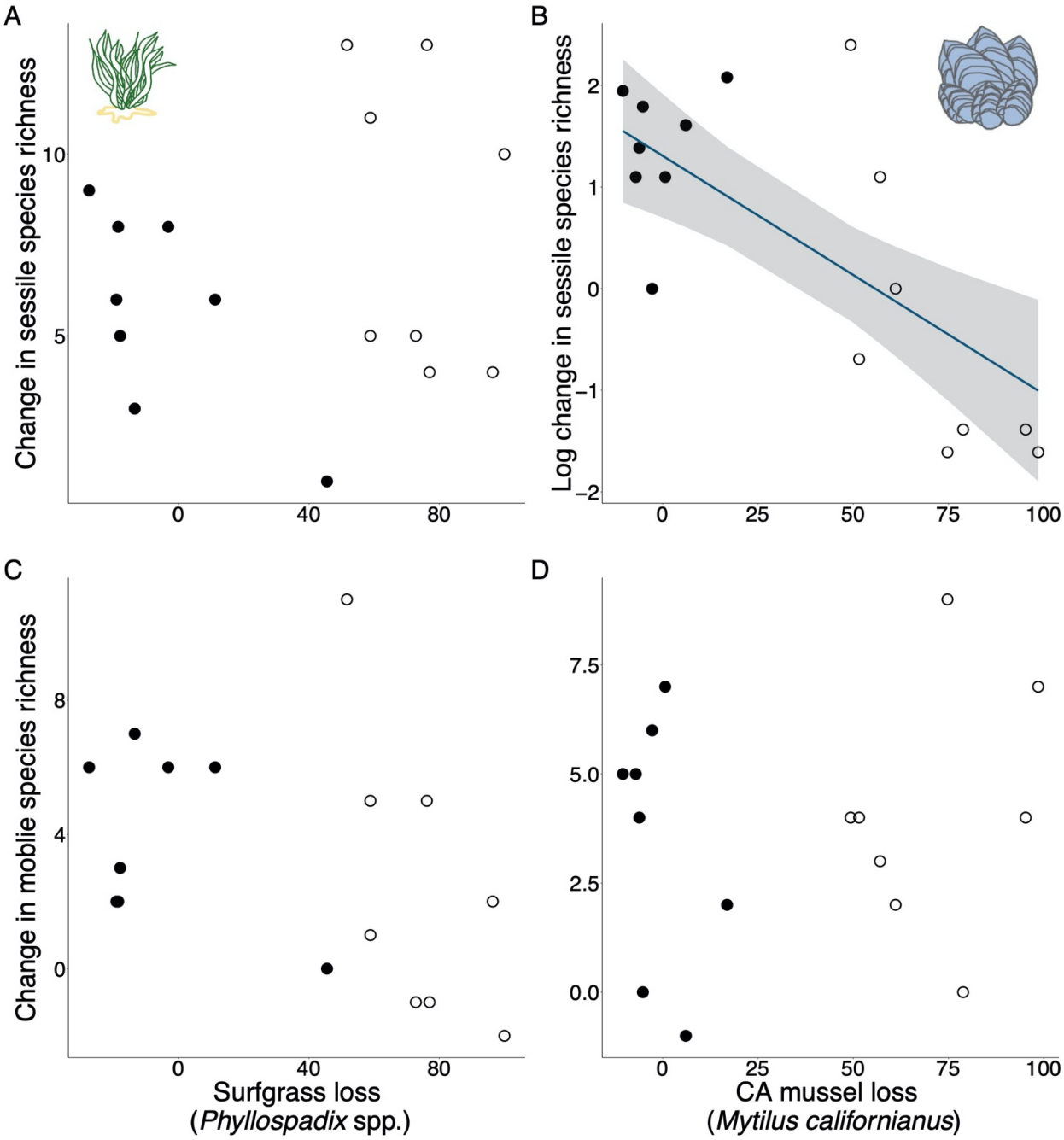

Fig. S4. Relationships between foundation species loss and change in (A & B) surfgrass sessile and mobile species richness and (C & D) mussel sessile and mobile species richness. Solid dots represent control pools, open dots represent removal pools. Solid lines with gray shaded 95% confidence intervals represent significant relationships. Species richness in mussel pools was log-transformed to meet assumptions of normality.

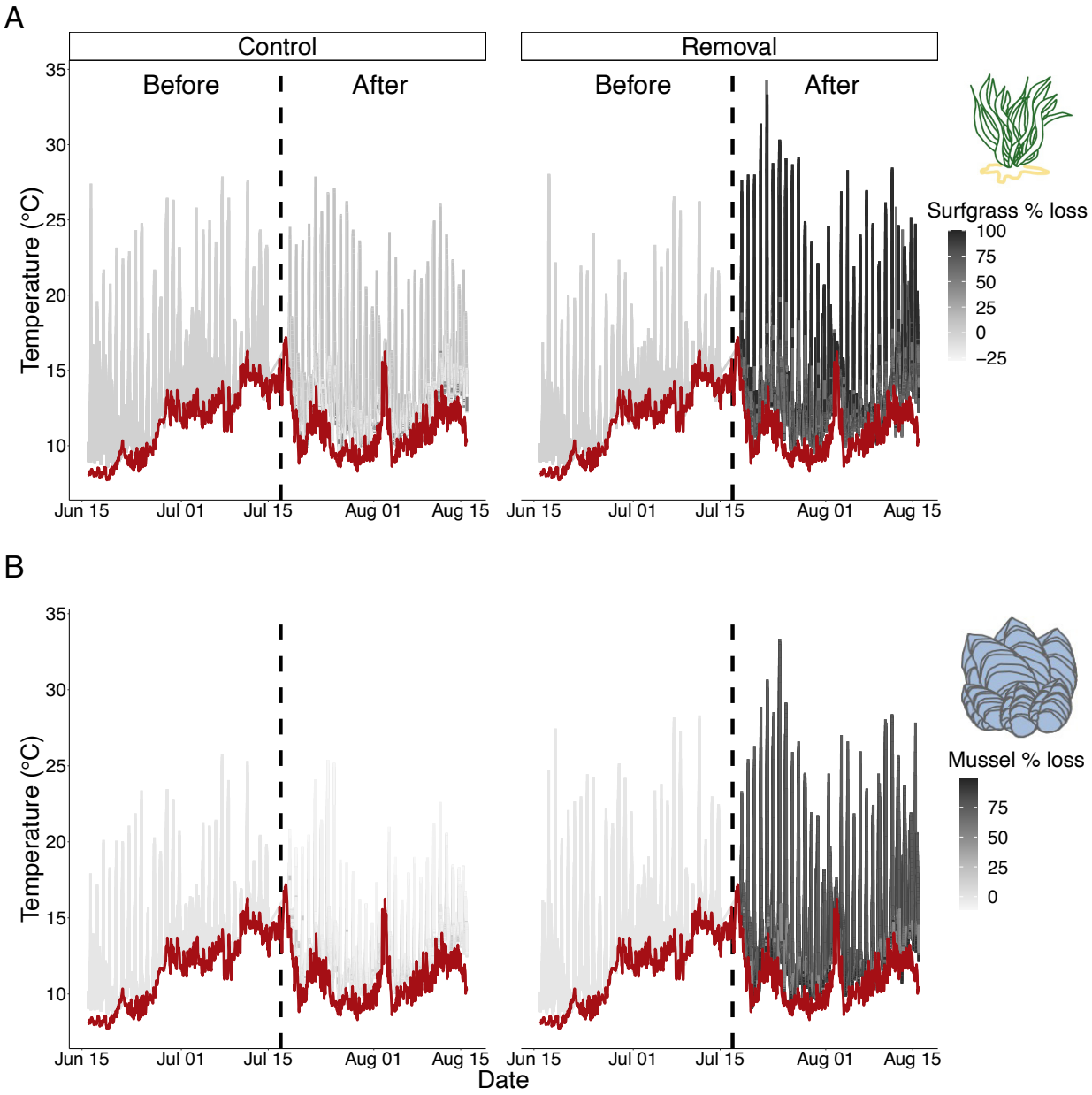

Fig. S5. Time series of one-month before and after foundation species removal temperature values from 15-minute time intervals of (A) surfgrass and (B) mussel tide pools at Otter Rock Marine Reserve, Oregon compared to near-shore ocean temperatures. Tide pools temperatures are shaded by foundation species loss (0 in before period, varying in after period). Hourly ocean temperatures are displayed in red from a nearshore ODFW Marine Reserves mooring sensor at Otter Rock Marine Reserve at 1m in depth. Daily average ocean temperature was 11.35°C (± 0.41°C SE) in the before period and 10.80°C (± 0.24°C SE) in the after period. Average change in daily average between time periods was -0.55 (± 0.43°C SE).

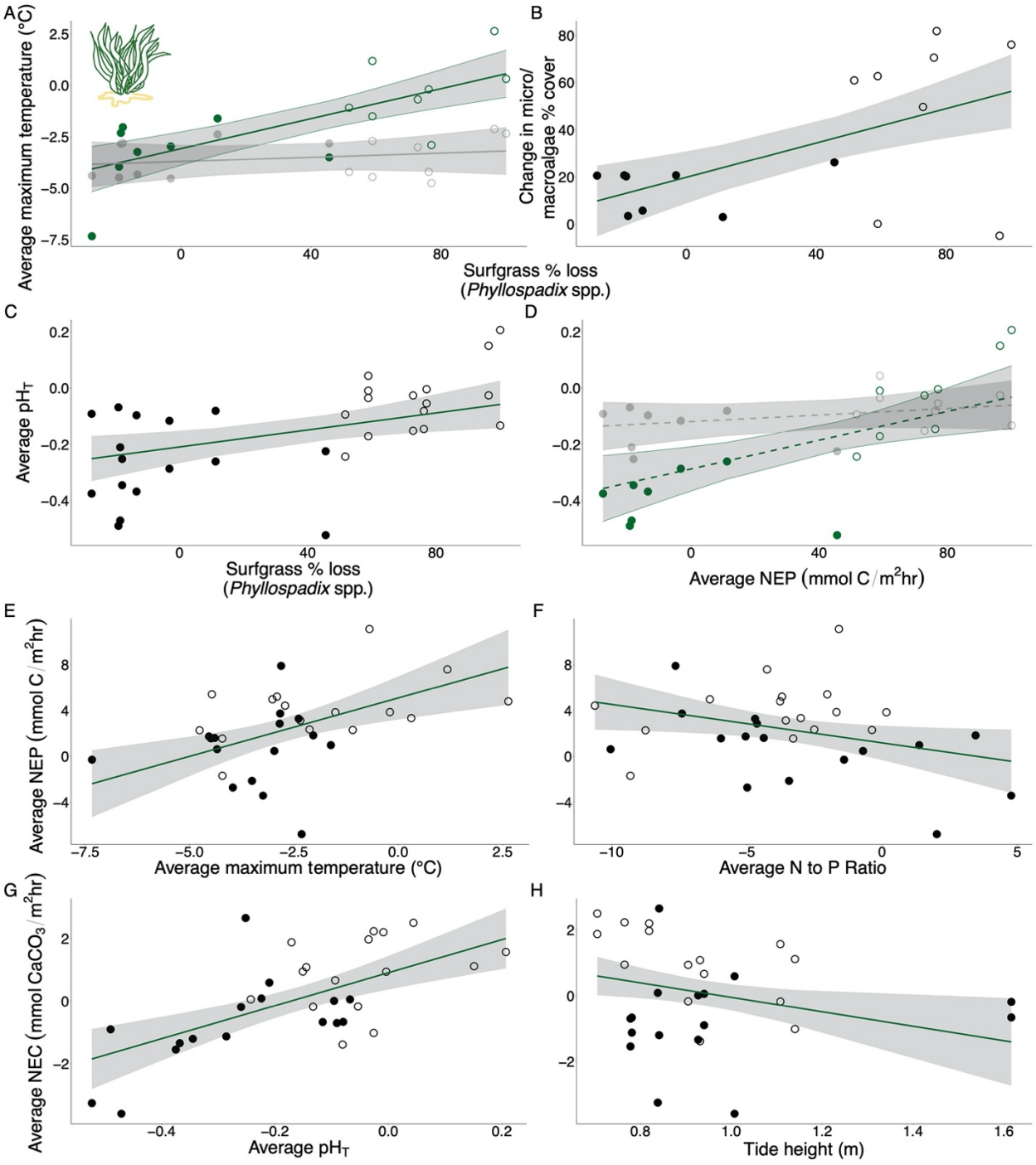

Fig. S6. Estimated marginal effects for significant pathways within the surfgrass structural equation model. All values are the change between before and after-removal period of the average values of each tide pool over the low tide period. Solid dots represent control pools, open dots represent removal pools, and gray areas represent the 95% confidence interval of these relationships. Significant day and night interactions have two lines on the graph, where solid lines indicate a significant pathway, dashed lines are insignificant pathways, and gray lines are night and green lines are day models.

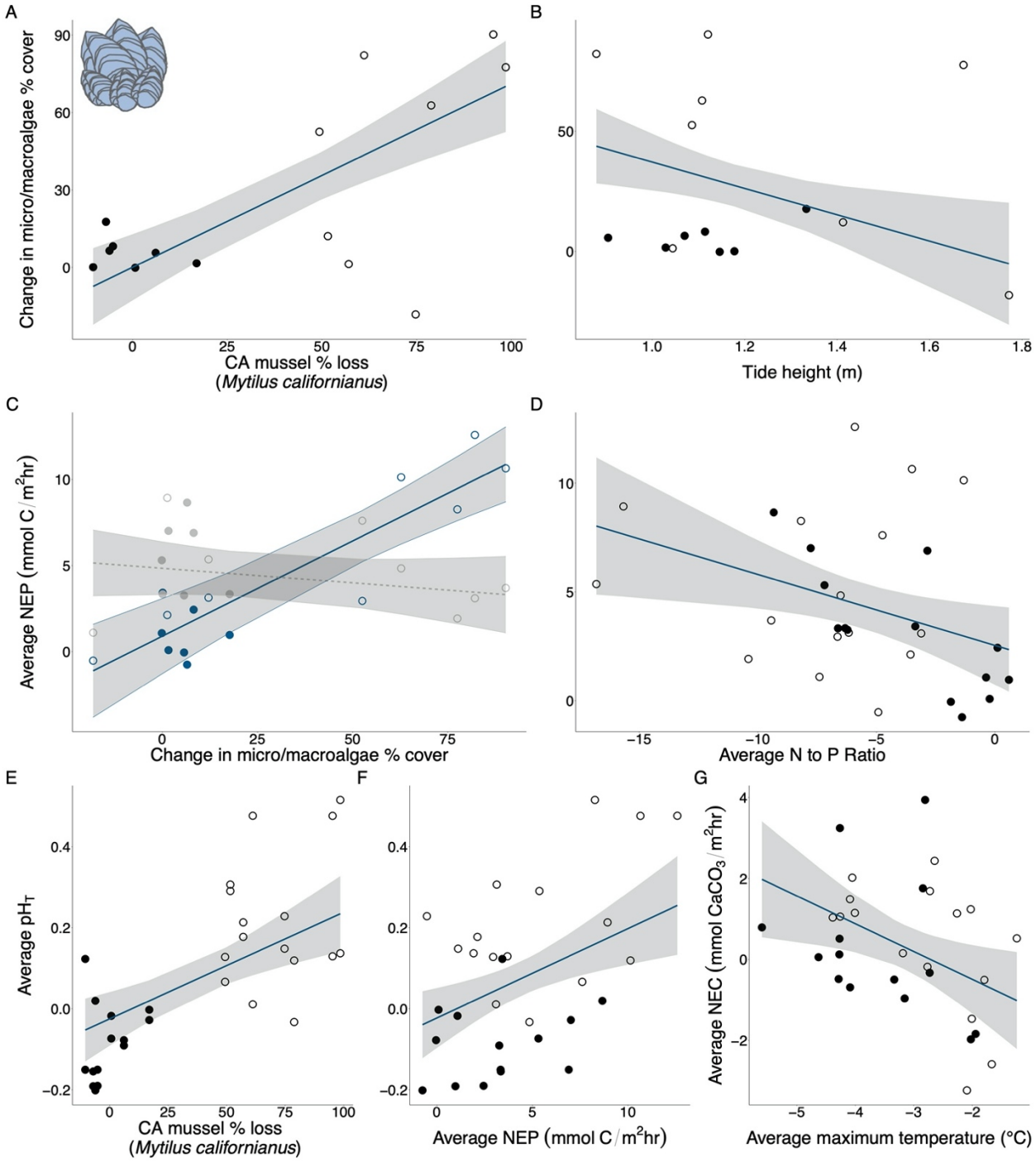

Fig. S7. Estimated marginal effects for significant pathways within the mussel structural equation model. All values are the change between before and after-removal period of the average values of each tide pool over the low tide period. Solid dots represent control pools, open dots represent removal pools, and gray areas represent the 95% confidence interval of these relationships. Significant day and night interactions have two lines on the graph, where solid lines indicate a significant pathway, dashed lines are insignificant pathways, and gray lines are night and blue lines are day models.

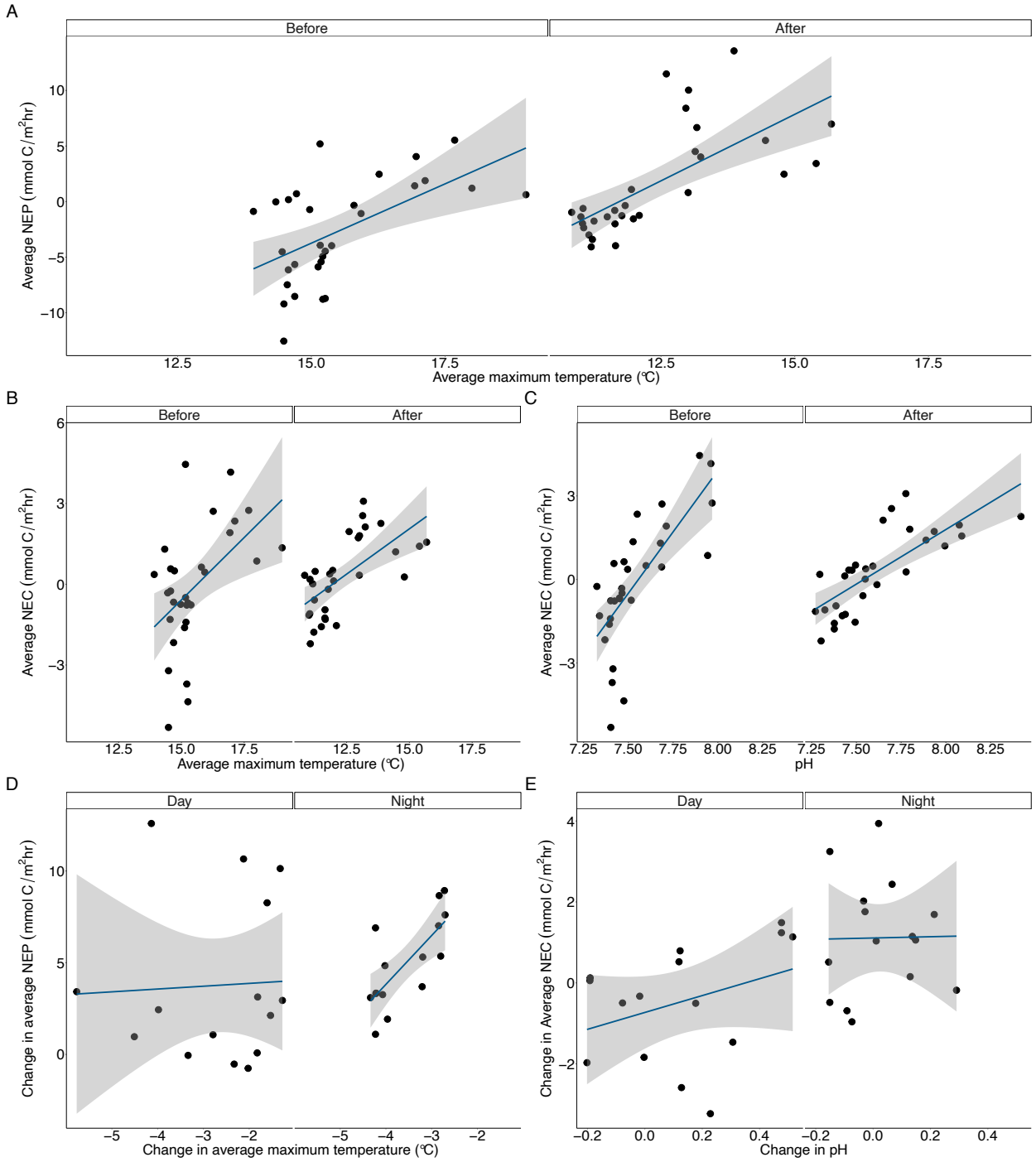

Fig. S8. (A–C) Regression plots of raw environmental relationships rather than change between before and after period within mussel tide pools with temperature and NEP, temperature and NEC, and pH and NEC. (D & E) Show how the trend we saw with the raw values is lost when using the change in those values between the before and after period.