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Supplementary Materials for

Disease epidemic and a marine heat wave are associated with the continental-scale collapse of a pivotal predator (*Pycnopodia helianthoides*)

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Table S1. Summary of results of the candidate hierarchical ordinal regression models. In each model, abundance category for a given survey site and date was modeled as a function of: the specified temperature metric in the specified time period prior to each survey; the number of days between the survey date and date that the temperature metric maximum occurred; and the year. Latitude and month were included as random effects. We used the Akaike information criterion (AIC) as a measure of model fit where the model with the lowest AIC value indicated the best-fit model (bold).

Model number	Time period (days)	Temperature metric	AIC
1	30	Maximum SST	19080.05
2	60	Maximum SST	19071.23
3	90	Maximum SST	19081.63
4	180	Maximum SST	19023.78
5	360	Maximum SST	18955.57
6	30	Maximum SST anomaly	17008.31
7	60	Maximum SST anomaly	16998.6
8	90	Maximum SST anomaly	17008.46
9	180	Maximum SST anomaly	17005.54
10	360	Maximum SST anomaly	17003.1
11	**60***	**Maximum SST anomaly**	**16693.01**

*Model 11 did not include the covariate for days between the survey date and date that the temperature metric occurred.

Table S2. Parameter estimates, SEs, and 95% confidence interval of the selected ordinal model linking the reporting of ACs 0 to 4 in the shallow nearshore roving-diver surveys and maximum temperature anomalies from within 60 days before each survey. The variance for the random intercepts of latitude and month were 0.962 and 0.003, respectively.

Parameter	Estimate	SE	Zvalue	95% CI
θ_1	-0.804	0.074	-10.832	(-0.949 - -0.658)
θ_2	-0.55	0.074	-7.423	(-0.695 - -0.405)
θ_3	0.81	0.074	10.888	(0.664 - 0.956)
θ_4	2.997	0.088	34.221	(2.825 - 3.169)
60 SST anomaly	-0.055	0.024	-2.333	(-0.101 - -0.009)
$Year_{2007}$	-0.225	0.076	-2.97	(-0.373 - -0.076)
$Year_{2008}$	-0.328	0.079	-4.158	(-0.483 - -0.174)
$Year_{2009}$	-0.334	0.073	-4.586	(-0.477 - -0.191)
$Year_{2010}$	-0.032	0.071	-0.448	(-0.17 - 0.107)
$Year_{2011}$	-0.17	0.073	-2.318	(-0.314 - -0.026)
$Year_{2012}$	0.024	0.07	0.349	(-0.112 - 0.16)
$Year_{2013}$	-0.103	0.07	-1.482	(-0.24 - 0.033)
$Year_{2014}$	-1.078	0.074	-14.528	(-1.223 - -0.932)
$Year_{2015}$	-2.123	0.085	-25.061	(-2.289 - -1.957)
$Year_{2016}$	-1.943	0.083	-23.529	(-2.105 - -1.781)
$Year_{2017}$	-2.073	0.09	-23.124	(-2.249 - -1.898)

Supplemental Figures

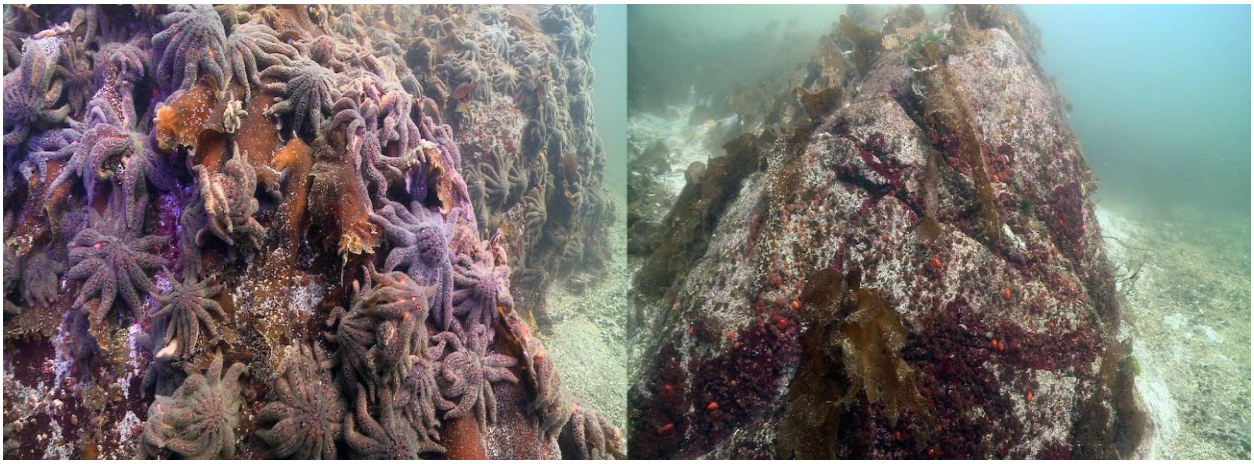

Fig. S1. Massive decline of *P. helianthoides* over 20 days between 9 and 29 October 2013. Photo credit: Neil McDaniel, neilmcdaniel.com

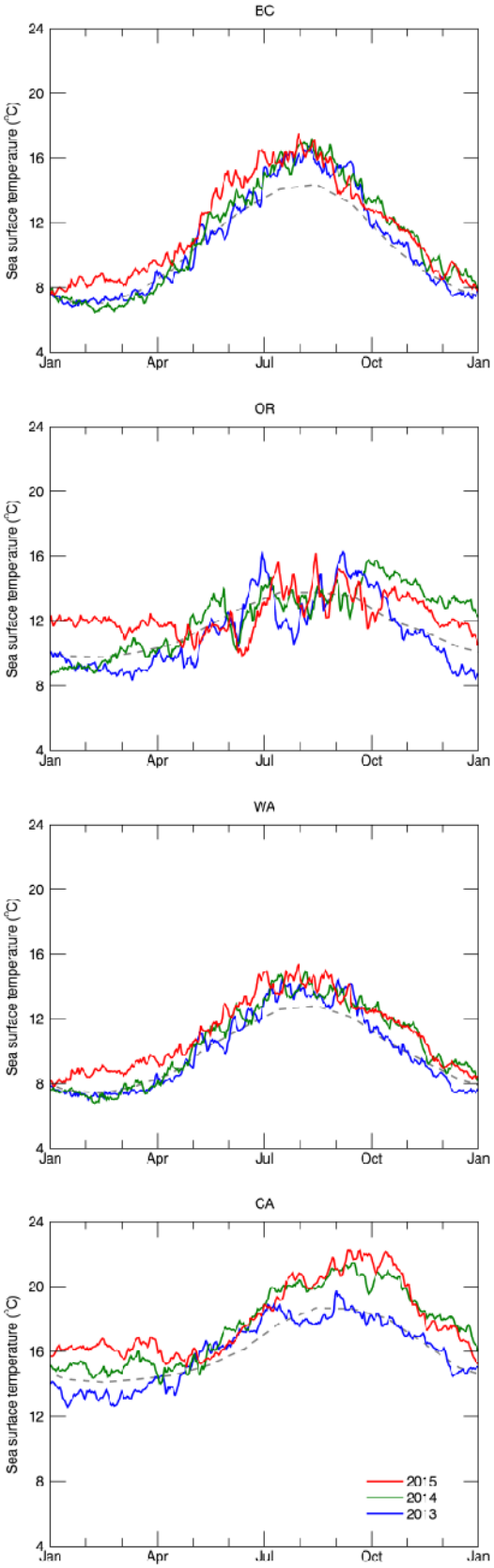
BC
OR
WA
CA
Sea surface temperature (°C)
4
8
12
16
20
24
Jan
Apr
Jul
Oct
Jan
2015
2014
2013

Fig. S2. Annual SST records during 2013, 2014, and 2015 by jurisdiction for British Columbia, Washington, Oregon, and California.

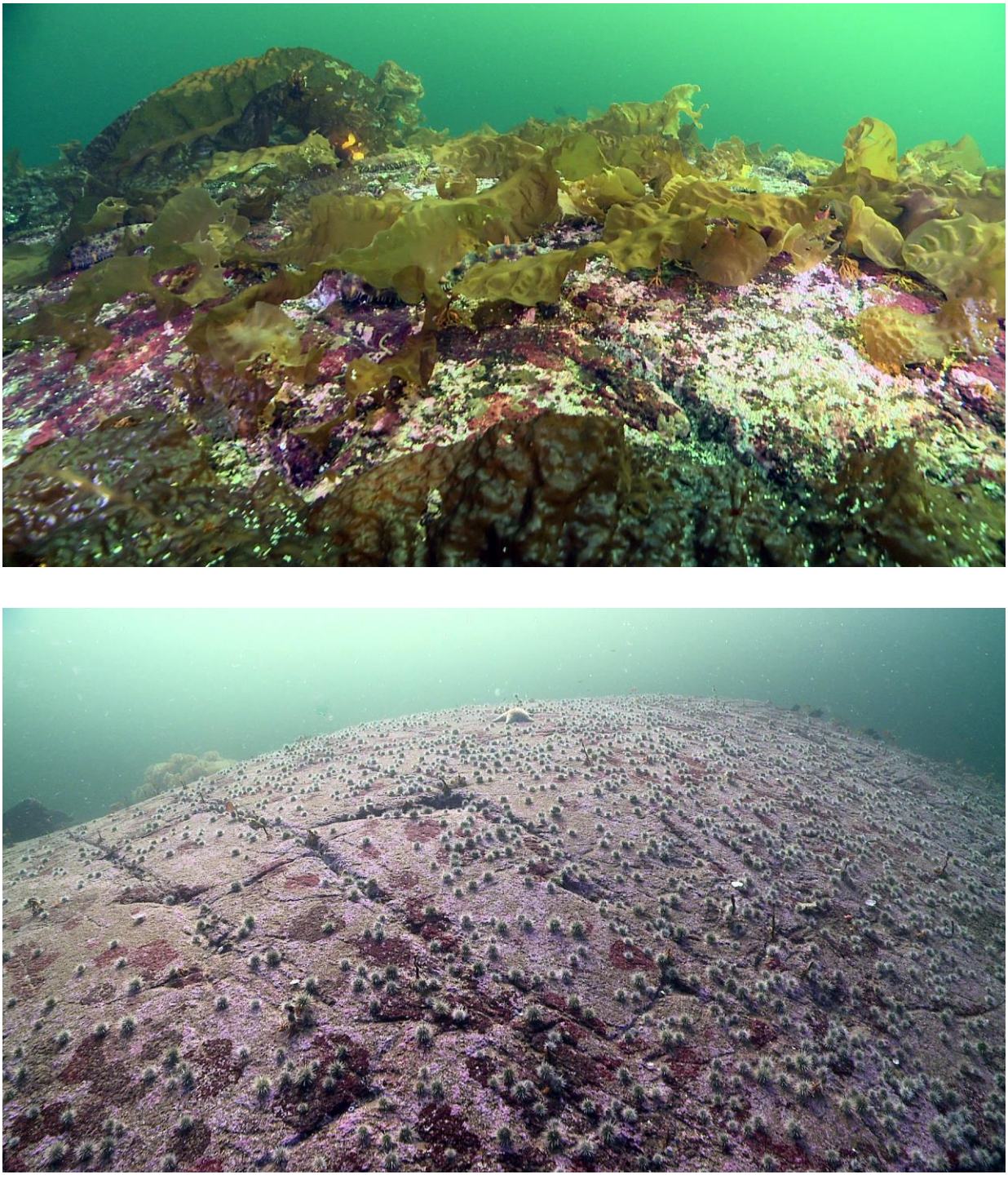

Fig. S3. Sackinaw Rock before and after development of green urchin barrens following decimation of *P. helianthoides*. A) Sackinaw Rock dominated by kelp before recruitment of green sea urchins. **B**) Development of over population of green sea urchins (*Strongylocentrotus droebachiensis*), called an urchin barrens, following

decimation of *P. helianthoides* in southern British Columbia waters. Photo credit: Neil McDaniel, neilmcdaniel.com