

## **Supplementary Figures S1-S6**

“Sudden collapse of a mesopredator reveals its complementary role in  
mediating rocky reef regime shifts”

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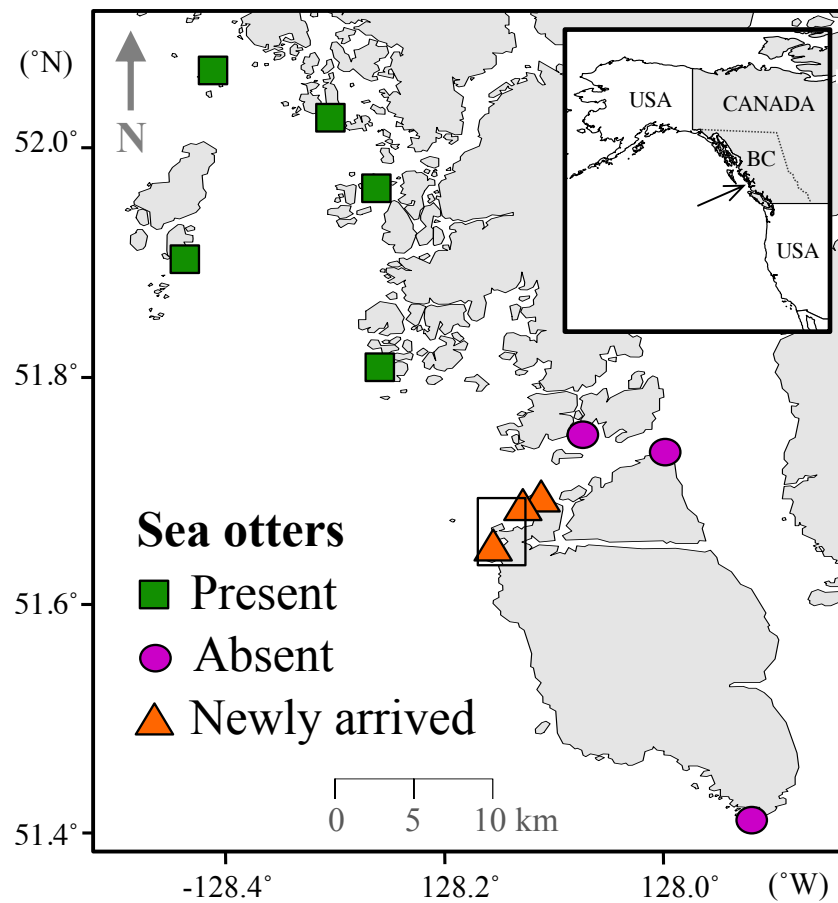
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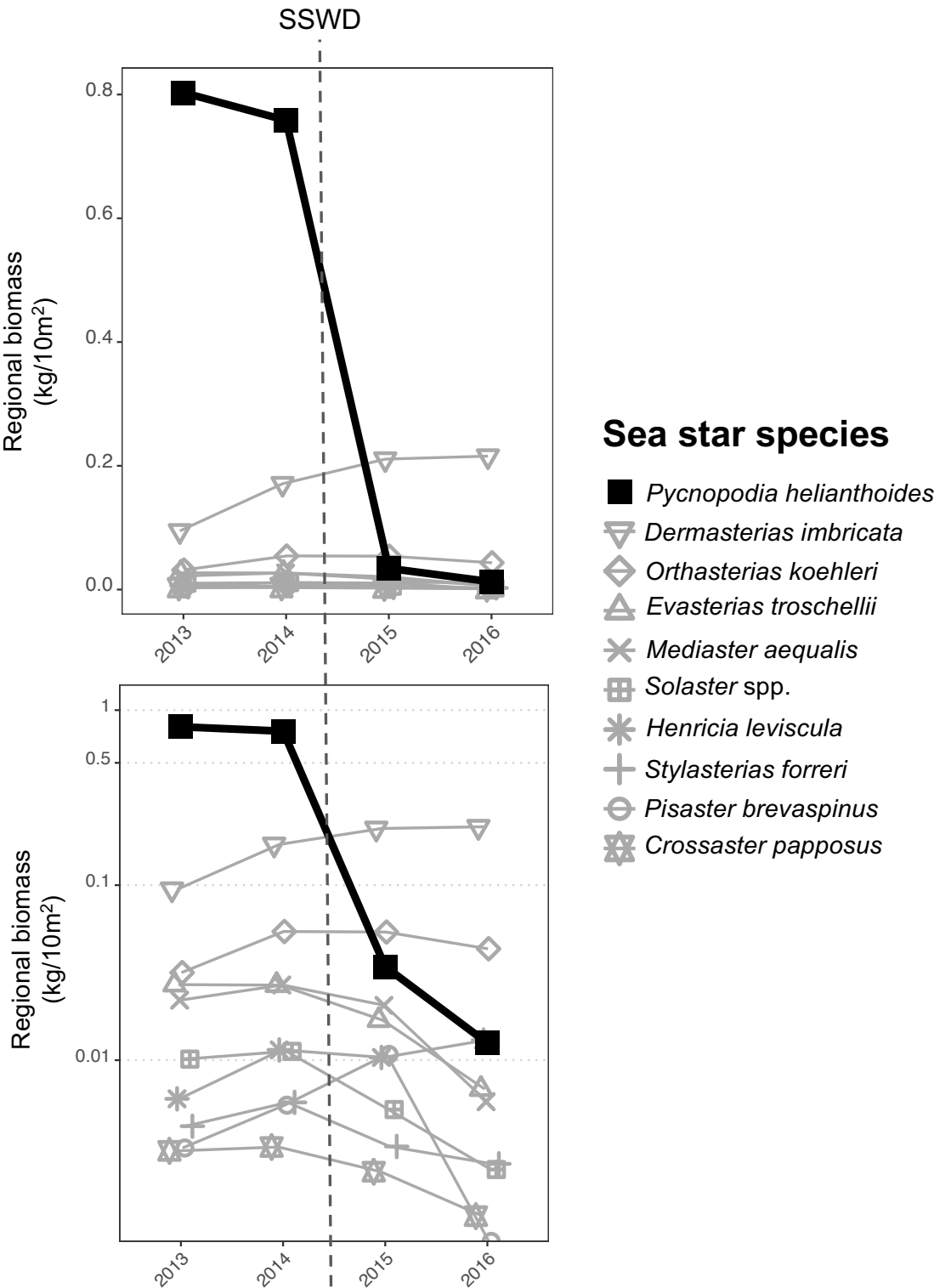
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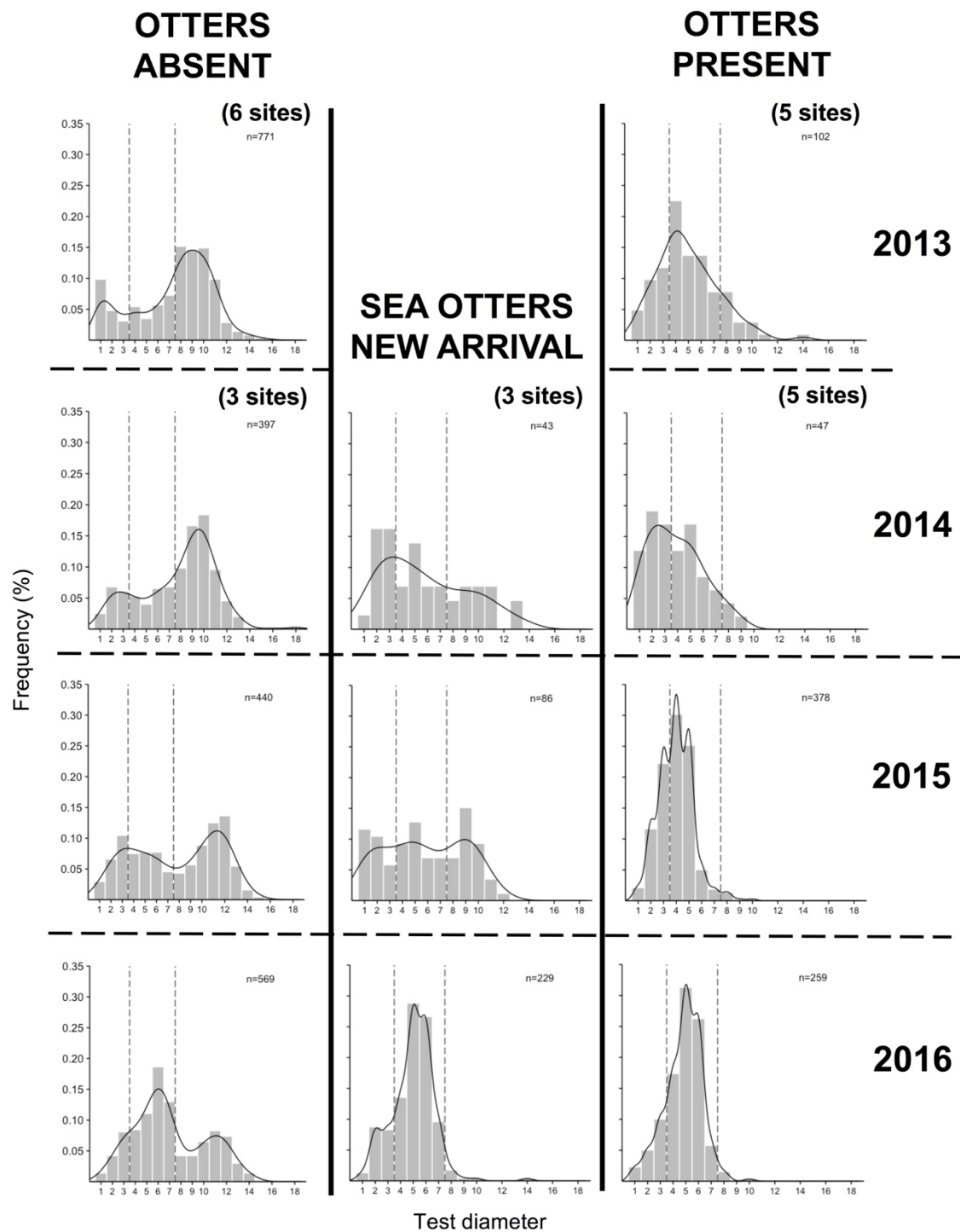
**Figure S1.** Subtidal rocky reef survey sites along the central coast of British Columbia (BC), Canada, varying in sea otter occupation: present (green squares), absent (pink circles), and “newly arrived” in 2013 (orange triangles). Box shows region of aerial kelp canopy mapping.



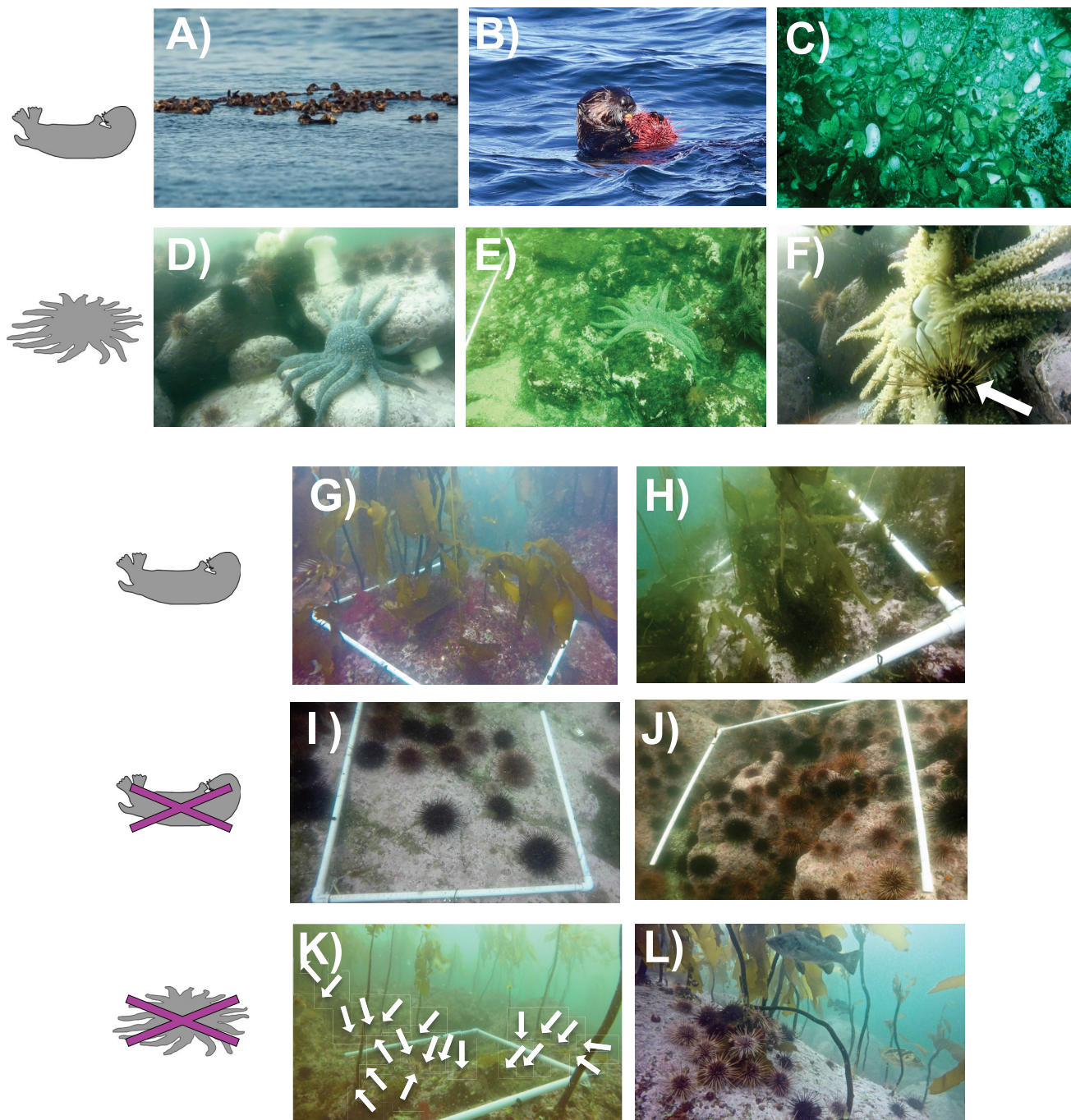
**Figure S2.** The decline of *Pycnopodia helianthoides* relative to other sea star species following the onset of sea star wasting disease (SSWD) on the central coast of British Columbia. Species' biomass for each survey year is averaged over 11 subtidal rocky reef sites in the region. Both plots show the same data, except the bottom plot is graphed on a log scale to reveal variation among species with lower biomass.



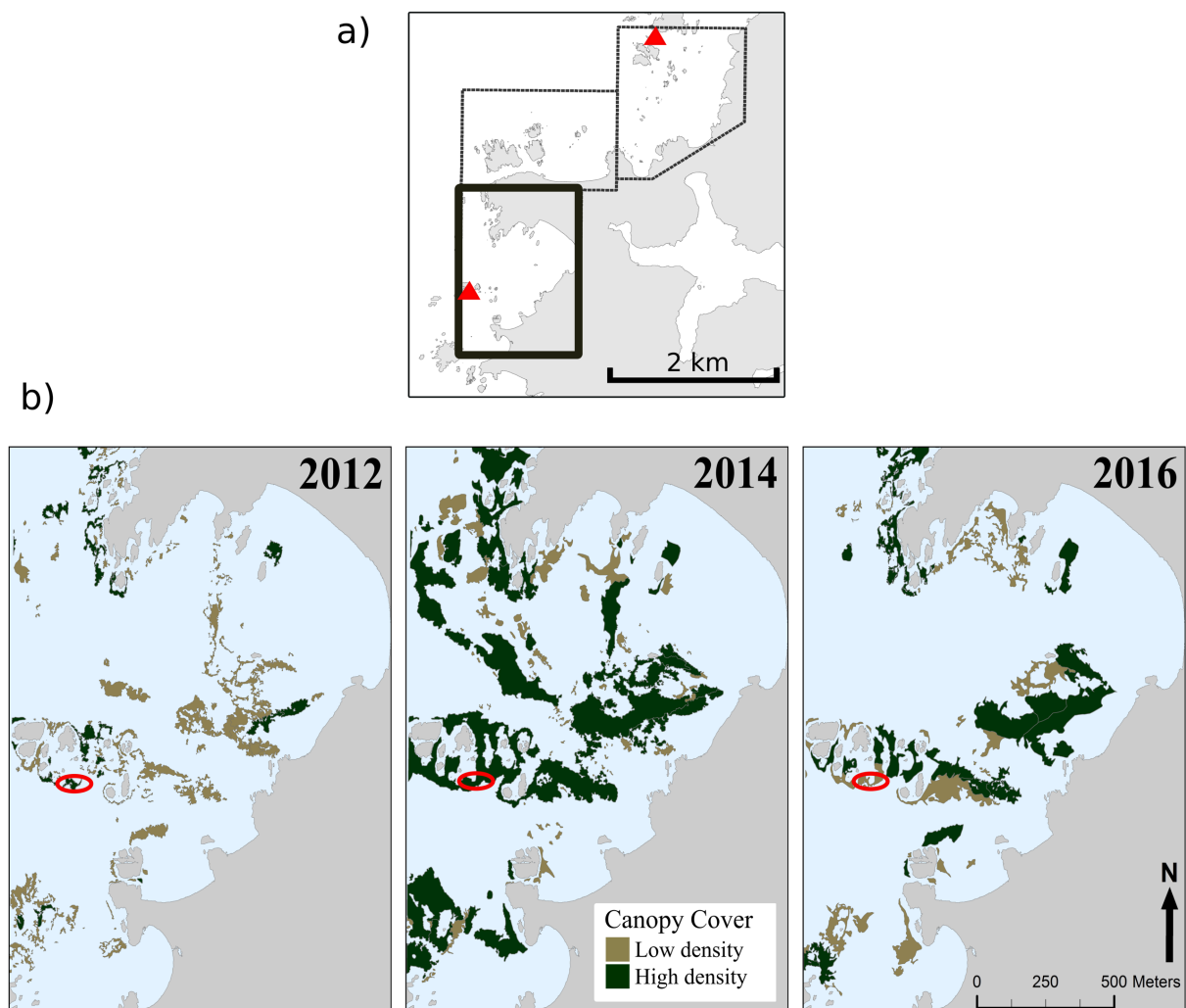
**Figure S3.** Urchin size-frequency histograms for sites grouped by sea otter presence. The dotted lines show the demarcation of our selected urchin size classes, small (<3 cm), medium (4-7 cm), and large (> 8cm). The smoothed curves show the kernel density estimate, using a Gaussian kernel with bandwidth equal to the standard deviation.



**Figure S4.** Images of field observations (all photos except A-B by Jenn Burt). A) The raft of sea otters that arrived and foraged at three previously unoccupied rocky reef sites in 2013 (photo: Grant Callegari), B) Sea otter eating a large red sea urchin (photo: Erin Rechsteiner), C) Piles of discarded red urchin tests accumulated at a rocky reef site following sea otter arrival, D-E) Large *Pycnopodia* at rocky reef sites before SSWD, F) *Pycnopodia* from photo “D” eating a medium-sized red urchin, G-H) Survey quadrats at sea otter-occupied sites, I-J) Survey quadrats at sites not occupied by sea otters, K) Kelp forest site following the onset of SSWD and an increased abundance of medium urchins (white arrows show locations of medium urchins, which are difficult to see in the image), L) Medium urchins grazing kelp (*Pterygophora californica*) at a site occupied by sea otters.



**Figure S5.** (a) Aerial surveys for canopy kelp were conducted in three mapping blocks within the region of northwest Calvert Island where sea otters returned in 2013 (refer to Figure S1). Red triangles show the location two subtidal survey sites. (b) Changes in the spatial extent of canopy kelp within one mapping block (2 km<sup>2</sup>) and red circles show the location and approximate size of one rocky reef survey site (~180 m<sup>2</sup>).





**Figure S6.** Sea surface temperature at the Egg Island Lighthouse Station (51.25 / -127.833, Lat/Long) located on the outer coast just south of this study's rocky reef survey sites. The blue line shows the monthly average ( $\pm$ SD) sea surface temperature during the study period (2013-2016) and the black line shows the historical mean temperature (monthly average between 1970-2016). Arrows depict the start (S) and dissipation (D) of an anomalous marine heatwave affected the study region between Oct. 2015 and summer 2016 (Hunt et al 2016). These data are available on-line from Fisheries and Oceans Canada (<http://open.canada.ca/data/en/dataset/719955f2-bf8e-44f7-bc26-6bd623e82884>, accessed Dec. 20, 2017).

