Supplementary Material

1 Supplementary Figures

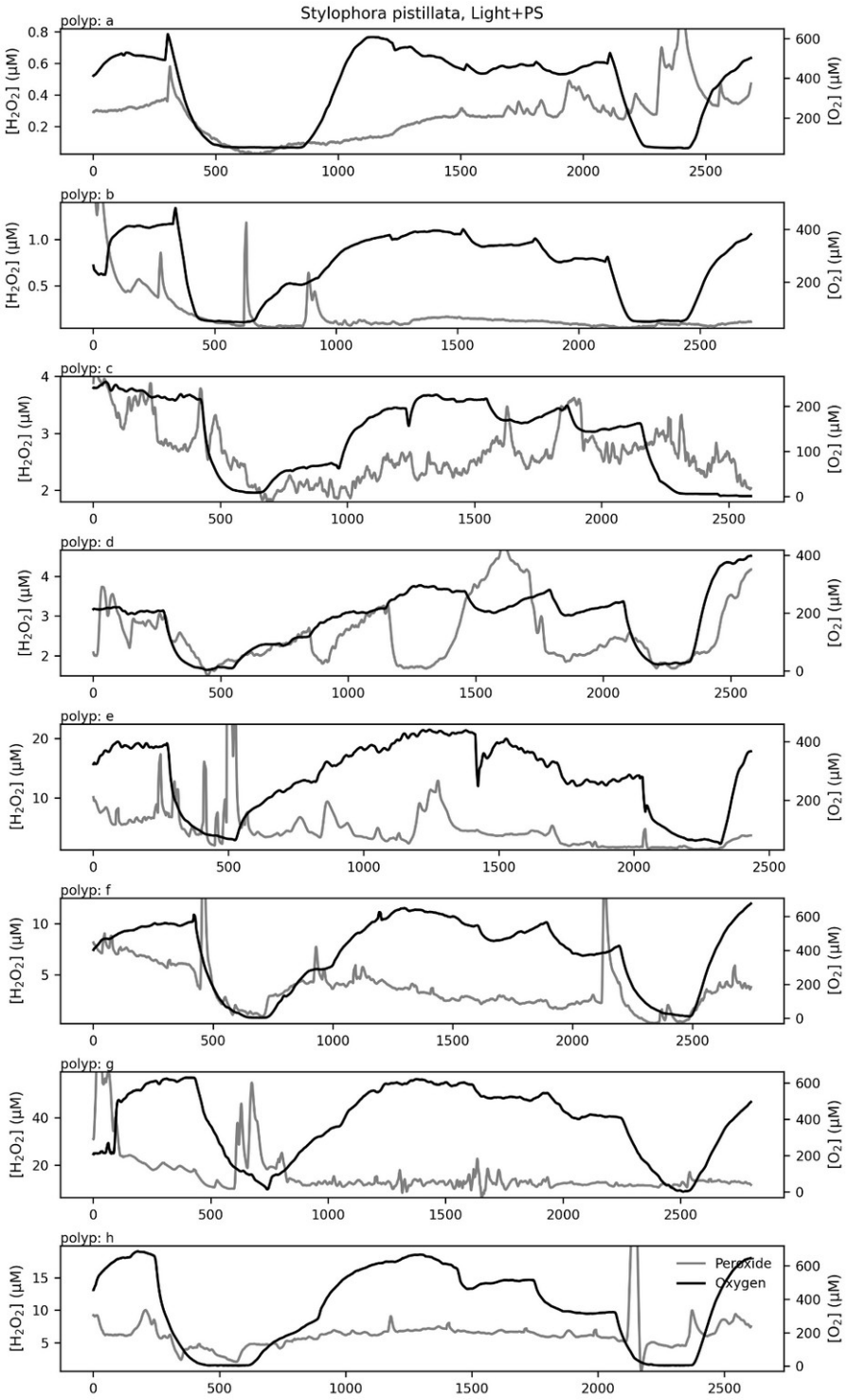

Figure S1: The response of $[O_2]$ and $[H_2O_2]$ at the surface of 8 separate polyps of *Styolophora pistillata* to 5-minute stepwise changes in illumination. When the incident light level was varied (as in Figure 4; not shown here), the $[O_2]$ levels changed according to light levels. The $[H_2O_2]$ responses varied greatly between polyps, note the difference scales of $[H_2O_2]$ axes. Peroxide bursts (see Methods for definition) occurred sporadically but were observed in nearly all polyps measured. For example, Polyp a and b produced relatively "low" levels of baseline peroxide and while bursts occurred, they did not reach above 1 µM. Alternatively, higher baseline levels of $[H_2O_2]$ were observed on polyps g and h with burst amplitude ranging from 15-50 µM.

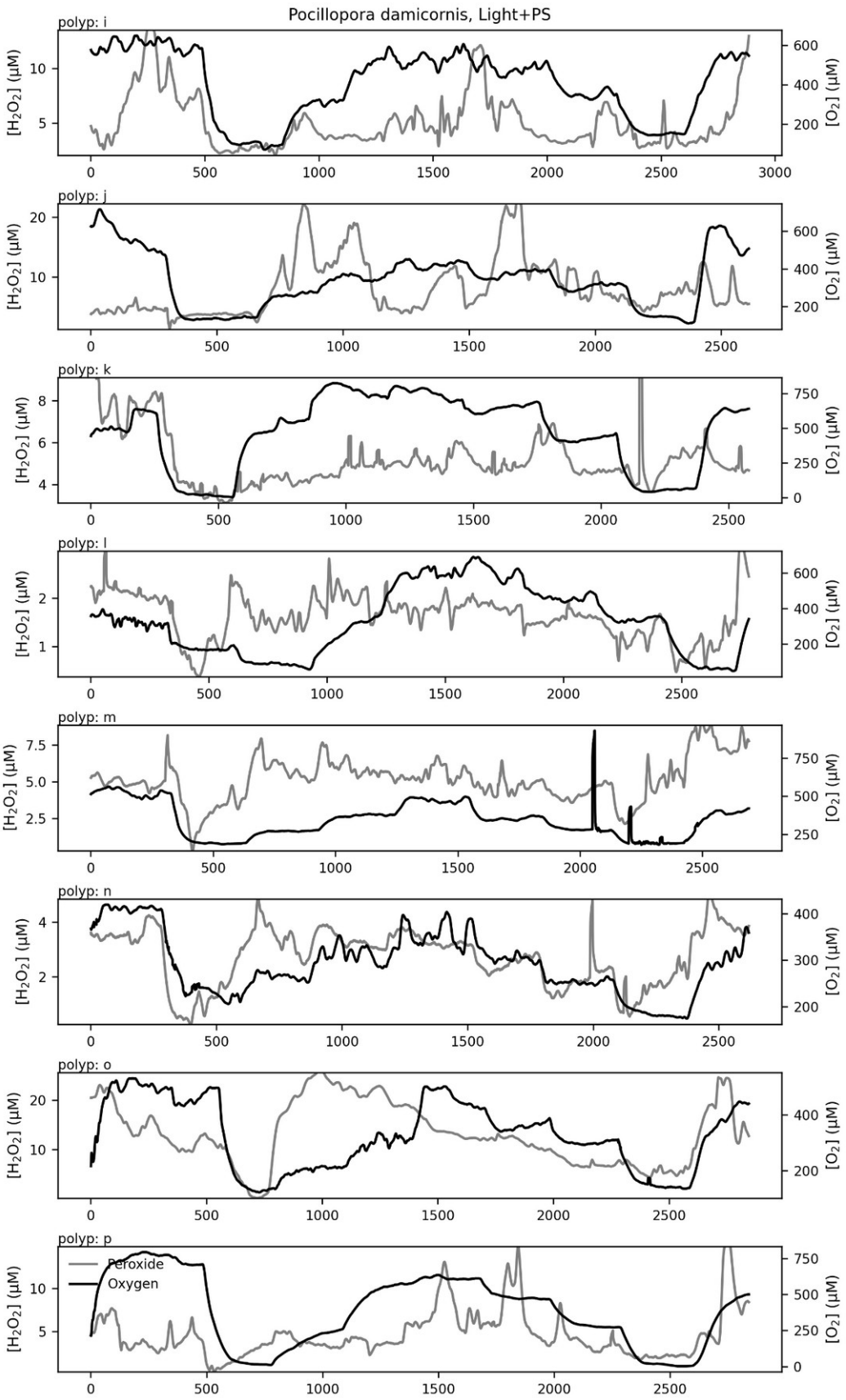

Figure S2: The response of $[O_2]$ and $[H_2O_2]$ at the surface of 8 separate polyps of *Pocillopora damicornis* to 5-minute stepwise changes in illumination. When the incident light level was varied (as in Figure 4; not shown here), the $[O_2]$ levels changed according to light levels. The $[H_2O_2]$ responses varied greatly between polyps, note the difference scales of $[H_2O_2]$ axes. Peroxide bursts (see Methods for definition) occurred sporadically but were observed in nearly all polyps measured.

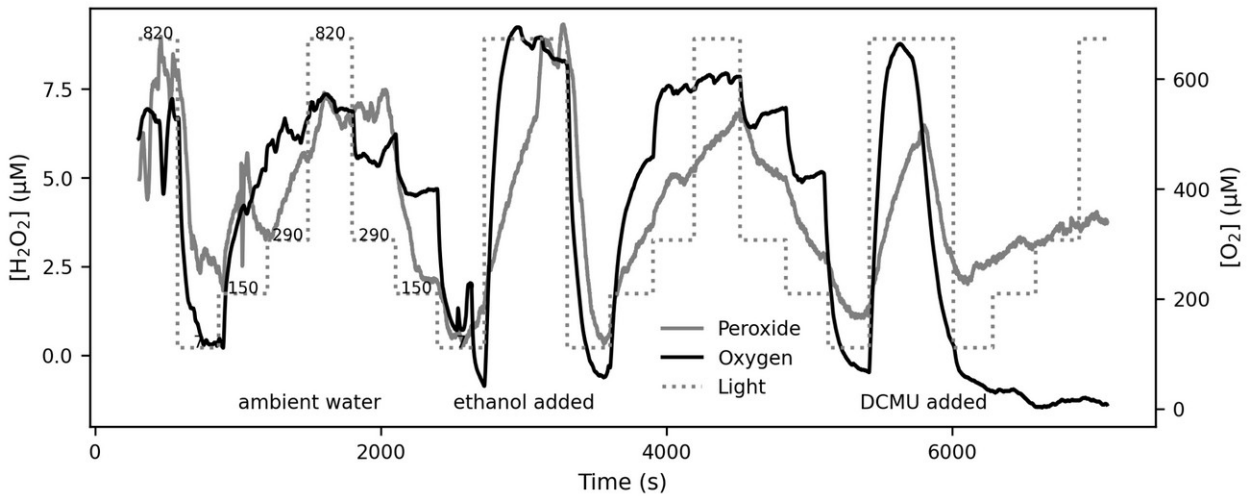

Figure S3: The response of $[O_2]$ and $[H_2O_2]$ at polyp surface during the inhibition of photosynthesis by addition of DCMU to *Stylophora pistillata* specimen. The incident light levels (in µmol m^{-2} s^{-1}) are shown on the *Light* line. Since DCMU is dissolved in ethanol, potential artefacts of ethanol exposure were studied by adding only ethanol first. The $[O_2]$ and $[H_2O_2]$ responses indicate no adverse effects of ethanol exposure. The addition of DCMU resulted in immediate depletion of $[O_2]$ indicating the inhibition of oxygenic photosynthesis in the polyp.

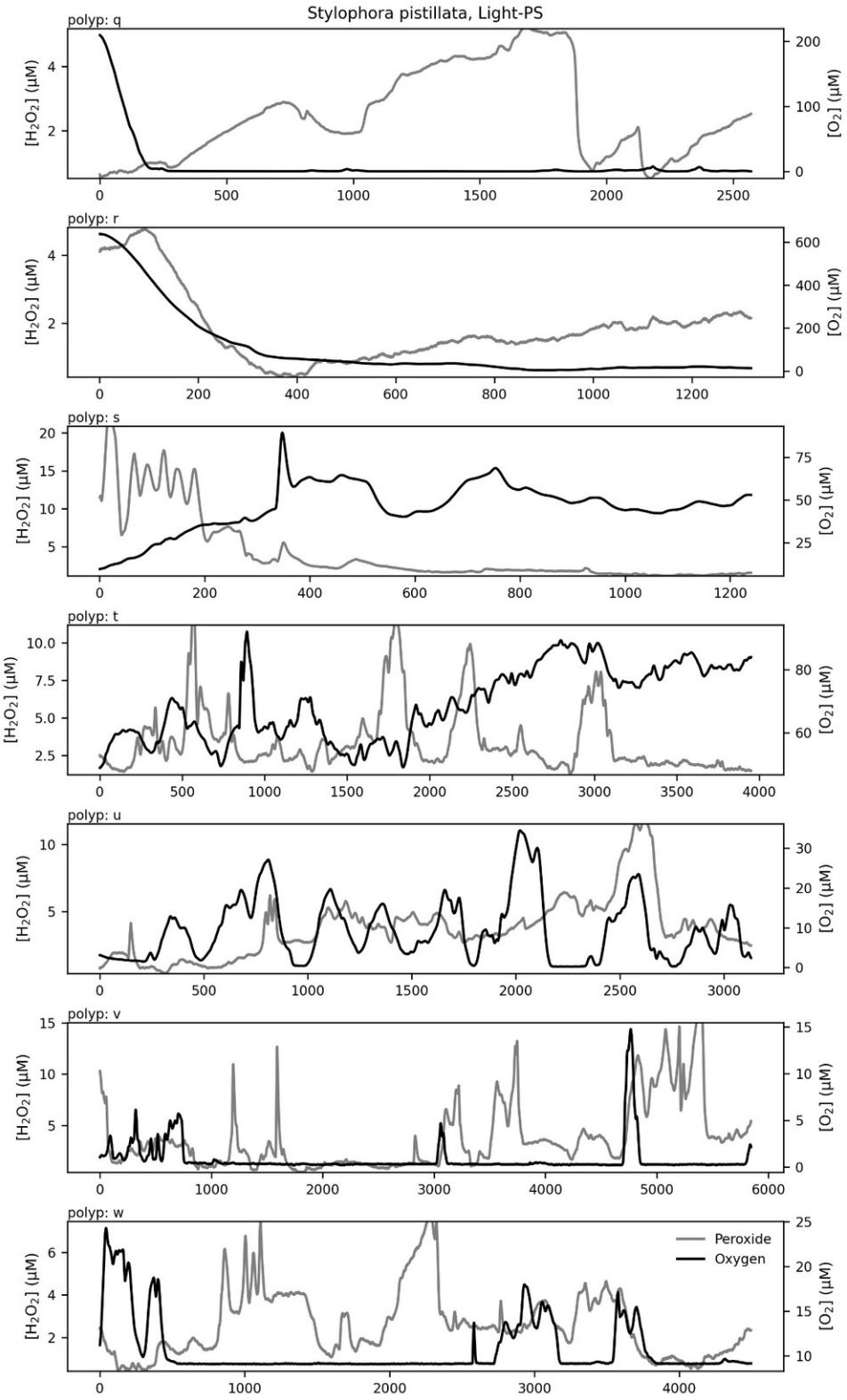

Figure S4: The response of $[O_2]$ and $[H_2O_2]$ at the surface of 7 polyps of *Stylophora pistillata* to variations of incident light levels (see Figure 6) while photosynthesis was inhibited by DCMU addition. The inhibition of oxygen production can be seen directly for polyp q and r. For some polyps (s-w), retraction from sensor tip resulted in $[O_2]$ levels from overlying ambient water. Note the different scales of time, $[O_2]$ and $[H_2O_2]$ axes. Peroxide bursts occurred on all polyps measured except for poly r, which had a steady increase in baseline levels.

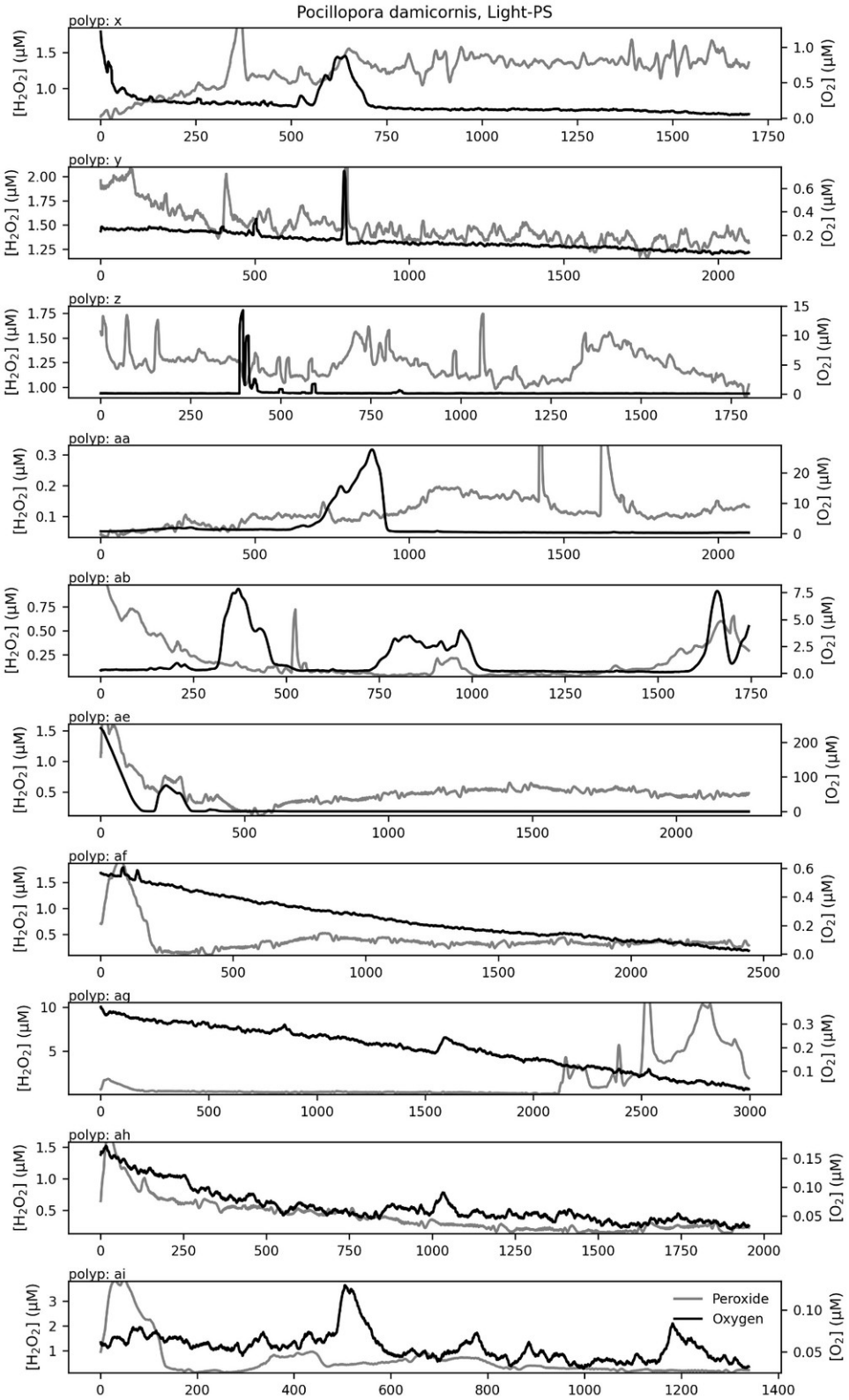

Figure S5: The response of $[O_2]$ and $[H_2O_2]$ at the surface of 10 polyps of *Pocillopora damicornis* to variations of incident light levels (see Figure 6) while photosynthesis was inhibited by DCMU addition. The inhibition of oxygen production can be seen for polyp ae. For some polyps, retraction from sensor tip resulted in $[O_2]$ levels from overlying ambient water. Note the different scales of time, $[O_2]$ and $[H_2O_2]$ axes. Peroxide bursts often occurred during first contact with the sensor (polyp ae, af, ah, ai). The timing and occurrence of bursts was unpredictable. For example, in polyp ag no significant peroxide dynamics occurred for 30 minutes, after which a series of strong peroxide bursts occurred in succession.

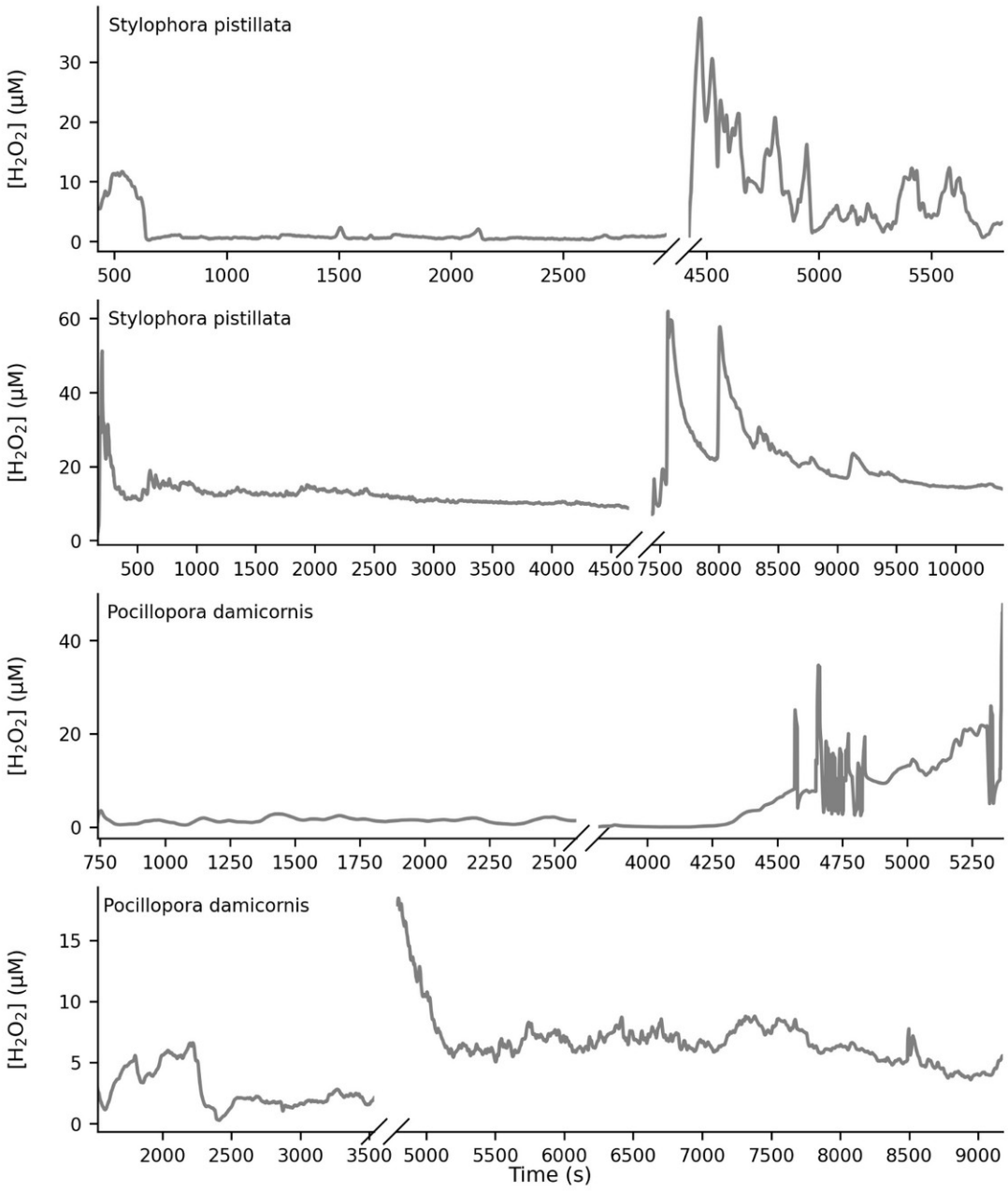

Figure S6. The effects of coral feeding behavior on external H_2O_2 dynamics on the surface of four separate polyps (see Figure 7). [H_2O_2] was measured before addition of prey, then the sensor was withdrawn when prey was added. Note the breaks in the time axis. On observation of prey capture, the sensor tip was brought back to the polyp surface and monitoring of [H_2O_2] continued. Note in the 3rd panel of *P. damicornis* polyp, interference from "mechanical stress" (See Figure 3) occurred during measurements, however bursts outside of this period were possible to detect.