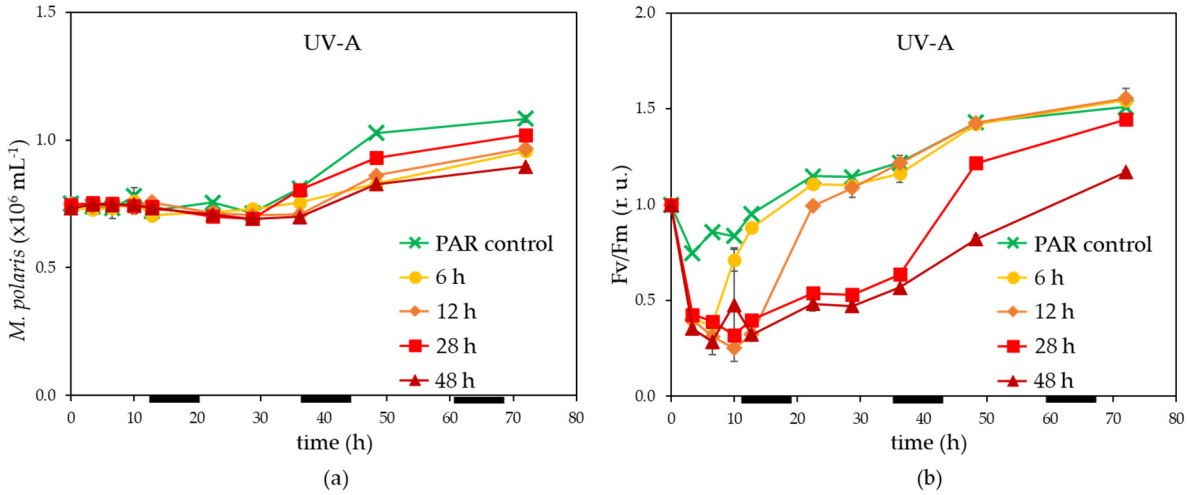


**Figure S1:** Exposure of non-infected *M. polaris* to UV-A radiation. (a) Phytoplankton abundance dynamics, (b) Photosynthetic efficiency (Fv/Fm, relative units r.u., normalized to starting value). Average values with standard deviation ($n$ = 2 except for PAR-only control and 28 h UV-AB where $n$ = 1). The horizontal black bars indicate the dark period.

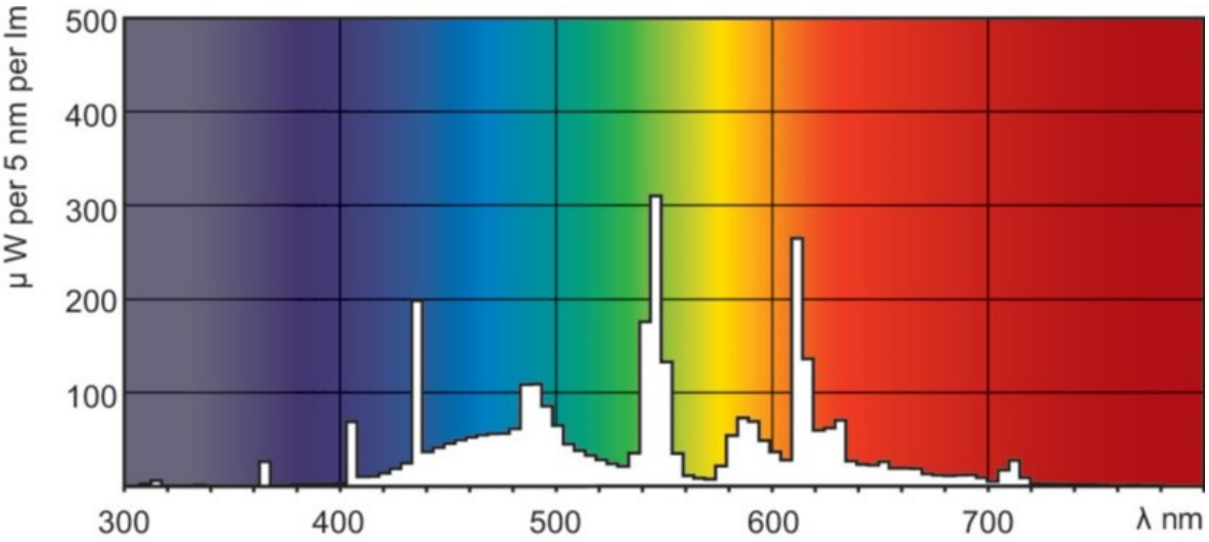


**Figure S2**: Light spectrum of lamps used to provide PAR.

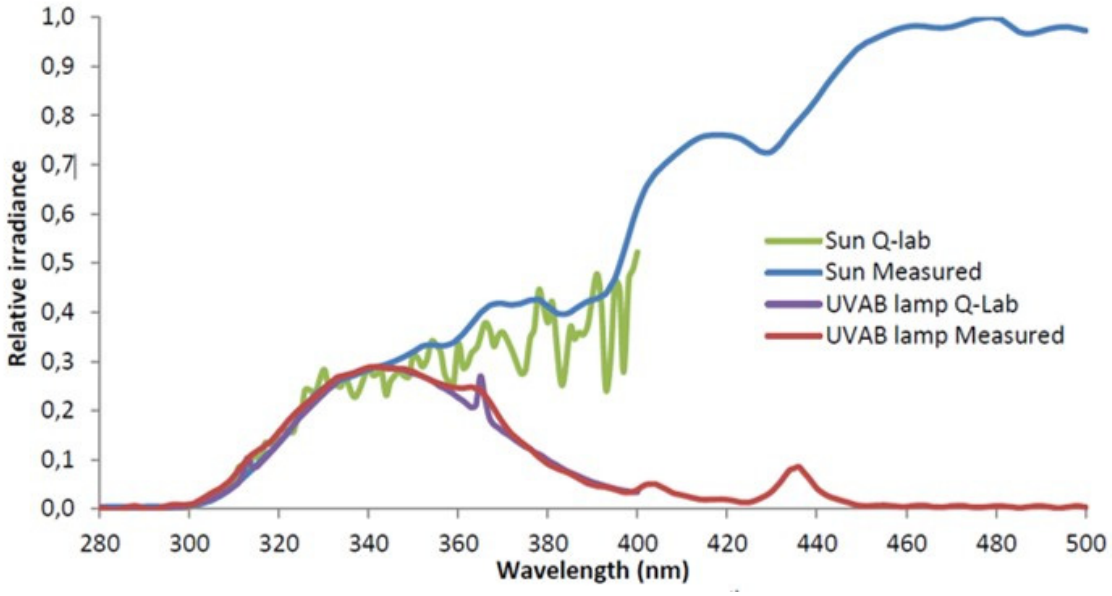


**Figure S3:** Light spectrum of UV-AB lamps.

**Table S1:** UV-AB intensities and attenuation coefficients (μac). The averages of these values were used to calculate the average UV-dose received in the Mixed Layer Depth (MLD) of polar regions. Average μac for the Arctic were 0.665 and 0.28 for UV-A and UV-B, respectively, with average UV-intensities (UV-I) of 6.6 and 0.4 each and MLD was up to 30 m. For the Southern Ocean, average μac were 0.38 and 0.28 for UV-A and UV-B, with average intensities of 27.9 and 1.1 for UV-A and UV-B, respectively, with a maximum MLD of 50 m. The UV-intensity at a given depth ($UV - I_D$) was calculated using the following formula following formula: $UV - I_D = UV - I * e^{n*(-\mu ac)}$, with n being the depth in meter in steps of 1. The resulting values were averaged over the MLD for each region to get to the average UV-Intensity within the mixed layer.

| | UV-Intensities | | | Attenuation Coefficients | | |
|---|---|---|---|---|---|---|
| | UV-A (W $m^{-2}$) | UV-B (W $m^{-2}$) | reference | UV-A ($m^{-1}$) | UV-B ($m^{-1}$) | reference |
| Arctic | 0.38 - 0.47 | 0.015 - 0.0189 | [1] | 0.39 - 0.94 | 0.225 | [2] |
| | 19 | 1.09 | [3] | | 0.34 | [4] |
| Southern Ocean | | 1.8 | [2] | | | |
| | 35 | 0.9 | [5] | 0.19 - 1.1 | | [2] |
| | 20.8 | 0.5 | [6] | 0.157 - 0.262 | 0.284 | [7] |

**Table S2:** Values needed to calculate UV-C exposure times: Three phytoplankton viruses were exposed to UV-C doses between 0 – 800 mJ $cm^{-2}$. UV-C doses were controlled by exposure time. Needed exposure time was calculated following [8] using the following values:

| | |
|---|---|
| Solution volume | 15 mL |
| Water path length | 0.63 cm |
| Distance UV-lamp to water surface | 48.6 cm |
| Divergence Factor | 0.9872 |
| Absorption Coefficient | 0.008 $cm^{-1}$ |
| Total Absorbance | 0.001 |
| Water Factor | 0.9988 |
| Petri Factor | 0.818 – 0.832 mW $cm^{-2}$ |
| Reflection Factor | 0.975 |
| Divergence Factor | 0.986 |
| Resulting average germicidal irradiance throughout the water column | 0.644 – 0.666 mW $cm^{-2}$ |

**Table S3:** Abundances of *Micromonas polaris* (x$10^5$ $mL^{-1}$) for cultures without viruses added (C) and with MpoV-45T added (V), exposed to PAR-only (controls) or UV-AB for total duration of 6, 12, 28 and 48 h for experiment 1 and experiment 2 ($n$ = 2, except for Exp. 1 PAR-only controls where $n$ = 1).

| Exp. 1 | PAR-only | | 6 h | | | | 12 h | | | | 48 h | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Time (h) | C 1 | V 1 | C 1 | C 2 | V 1 | I 2 | C 1 | C 2 | V 1 | V 2 | C 1 | C 2 | V 1 | V 2 |
| **0.0** | 5.6 | 5.2 | 5.3 | 5.4 | 5.2 | 5.3 | 5.6 | 5.6 | 5.8 | 5.6 | 5.4 | 5.5 | 5.5 | 5.6 |
| **3.3** | 5.9 | 5.2 | 5.2 | 5.3 | 5.3 | 5.1 | 5.6 | 5.4 | 5.5 | 5.4 | 5.3 | 5.5 | 5.3 | 5.4 |
| **6.6** | 6.4 | 5.7 | 5.7 | 5.6 | 5.8 | 5.6 | 6.0 | 5.9 | 6.1 | 6.2 | 5.9 | 5.9 | 5.8 | 5.8 |
| **9.7** | 5.9 | 5.6 | 5.6 | 5.3 | 5.5 | 5.4 | 5.9 | 5.9 | 5.8 | 5.4 | 6.1 | 5.8 | 5.7 | 5.9 |
| **12.7** | 6.3 | 5.4 | 5.3 | 5.5 | 5.2 | 5.4 | 6.2 | 5.7 | 5.8 | 5.7 | 5.5 | 5.6 | 5.8 | 5.6 |
| **20.9** | 6.6 | 5.6 | 5.4 | 6.0 | 5.2 | 5.5 | 5.8 | 5.6 | 5.2 | 5.5 | 5.6 | 6.1 | 5.3 | 5.5 |
| **28.5** | 6.6 | 5.2 | 5.6 | 5.5 | 5.2 | 4.9 | 6.0 | 5.7 | 5.5 | 5.4 | 5.8 | 5.9 | 4.8 | 5.1 |
| **47.7** | 8.1 | 4.6 | 6.3 | 7.1 | 4.2 | 4.9 | 6.8 | 8.4 | 5.5 | 4.7 | 5.5 | 5.8 | 4.6 | 4.5 |
| **71.9** | 9.3 | 2.9 | 8.2 | 9.1 | 2.6 | 3.0 | 8.4 | 10.1 | 3.1 | 2.5 | 5.0 | 5.3 | 1.9 | 1.6 |

| Exp. 2 | PAR-only | | | | 28 h UV | | | | 48 h UV | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Time (h) | C 1 | C 2 | V 1 | V 2 | C 1 | C 2 | V 1 | V 2 | C 1 | C 2 | V 1 | V 2 |
| **0** | 7.8 | 7.2 | 7.2 | 7.4 | 7.5 | 7.7 | 7.5 | 7.4 | 7.3 | 7.3 | 7.4 | 7.4 |
| **2** | 7.3 | 7.2 | 7.3 | 7.2 | 7.5 | 7.5 | 7.5 | 7.3 | 7.2 | 7.6 | 7.2 | 7.0 |
| **6** | 7.1 | 6.9 | 7.2 | 7.2 | 7.5 | 7.7 | 7.6 | 7.5 | 7.6 | 7.3 | 7.3 | 7.3 |
| **10** | 7.1 | 7.0 | 7.0 | 6.6 | 7.4 | 7.6 | 7.4 | 7.4 | 7.4 | 7.2 | 7.6 | 7.1 |
| **14** | 7.4 | 7.2 | 7.2 | 6.8 | 7.6 | 7.6 | 7.1 | 6.8 | 7.5 | 7.6 | 7.3 | 7.3 |
| **25** | 8.0 | 8.2 | 7.4 | 6.8 | 7.8 | 8.1 | 7.2 | 7.1 | 7.8 | 7.7 | 7.1 | 6.9 |
| **35** | 8.0 | 8.4 | 6.1 | | 7.7 | 7.7 | 6.9 | 6.4 | 7.6 | 7.7 | 6.4 | 6.4 |
| **49** | 10.0 | 9.5 | | 5.7 | 8.1 | 8.1 | 5.3 | 5.6 | 7.4 | 7.8 | 5.4 | 4.9 |
| **59** | 10.5 | 10.1 | 5.3 | 5.0 | 9.1 | 9.2 | 5.2 | 4.9 | 7.2 | 8.0 | 4.1 | 3.5 |
| **71** | 13.7 | 13.9 | 4.5 | 4.4 | 10.6 | 10.8 | 4.4 | 4.1 | 7.6 | 8.3 | 2.4 | 1.6 |

**Table S4:** Abundances of MpoV-45T (x$10^6$ $mL^{-1}$) from infected *Micromonas polaris* cultures exposed to PAR-only (controls) or UV-AB for total duration of 6, 12, 28 and 48 h for Experiment 1 and Experiment 2 ($n$ = 2, except for Exp. 1 PAR-only controls, there $n$ = 1). Due to technical failure no values were obtained for Exp. 2, 48 h treatment, T0.

| Exp. 1 | PAR-only | 6 h | | 12 h | | 48 h | |
|---|---|---|---|---|---|---|---|
| Time (h) | V 1 | V 1 | V 2 | V 1 | V 2 | V 1 | V 2 |
| **0** | 6.6 | 7.7 | 7.1 | 5.1 | 5.1 | 7.3 | 8.5 |
| **3** | 10.2 | 8.5 | 8.3 | 9.4 | 5.3 | 8.4 | 9.2 |
| **7** | 7.2 | 7.5 | 10.3 | 11.2 | 8.5 | 8.6 | 10.4 |
| **10** | 7.8 | 0.0 | 9.9 | 9.8 | 8.1 | 10.7 | 6.8 |
| **13** | 13.6 | 8.3 | 7.1 | 0.0 | 6.5 | 8.1 | 7.9 |
| **21** | 9.2 | 6.2 | 9.5 | 5.6 | 6.6 | 6.8 | 8.4 |
| **28** | 14.2 | 12.6 | 10.9 | 14.0 | 13.0 | 10.7 | 11.7 |
| **48** | 25.1 | 31.8 | 28.0 | 30.9 | 23.5 | 20.8 | 32.0 |
| **72** | 45.9 | 48.7 | 39.4 | 38.5 | 47.5 | 25.5 | 22.7 |

| Exp. 2 | PAR-only | | 28 h UV | | 48 h UV | |
|---|---|---|---|---|---|---|
| Time (h) | V 1 | V 2 | V 1 | V 2 | V 1 | V 2 |
| **0** | 12.4 | 10.0 | 10.8 | 10.4 | | |
| **2** | 8.7 | 13.0 | 10.3 | 11.9 | 9.7 | 8.4 |
| **6** | 11.2 | 9.3 | 14.5 | 9.4 | 12.2 | 7.7 |
| **10** | 7.4 | 8.1 | 7.1 | 10.7 | 9.5 | 4.5 |
| **14** | 4.8 | 3.7 | 4.4 | 4.5 | 5.0 | 5.4 |
| **25** | 17.0 | 13.4 | 8.9 | 7.9 | 7.9 | 10.9 |
| **35** | 15.4 | 17.2 | 13.1 | 12.1 | 11.0 | 9.4 |
| **49** | 25.8 | 32.0 | 26.1 | 25.9 | 18.3 | 15.1 |
| **59** | 40.9 | 35.4 | 26.1 | 24.0 | 23.0 | 15.8 |
| **71** | 42.2 | 37.1 | 23.1 | 28.3 | 19.0 | 14.9 |

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