Supplementary Material

The Role of Sustained Photoprotective Non-photochemical Quenching in Low Temperature and High Light Acclimation in the Bloom-forming Arctic Diatom *Thalassiosira gravida*

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1 Supplementary Data

Fig. S1: NPQ_d^{app} (A,B) and NPQ_d^{eff} (C,D) as a function of incubation irradiance in cell previously acclimated to 50 µmol photons m^{-2} s^{-1} (A,C) and 400 µmol photons m^{-2} s^{-1} (B,D) and after 20, 180, 360 and 1440 min dark acclimation.

Fig. S2: Chlorophyll *a* per cell as a function of growth irradiance in *T. gravida* cells acclimated to 0°C (closed circles) and 5°C (open circles).

Fig. S3: (A) P^{Cell}_m, (B) α^C, (C) α^{Cell} as a function of growth irradiance in *T. gravida* cells acclimated to 0°C (closed circles) and 5°C (open circles).

Fig. S4: Carbon fixation rate (measured by ^{14}C incorporation) and growth rate as a function of incubation irradiance and growth irradiance respectively, in *T. gravida* cells acclimated to 10, 50, 80, and 400 µmol photons m^{-2} s^{-1} at 0°C (A) and 5°C (B).

Fig. S5: 1-qP as a function of incubation irradiance in *T. gravida* cells acclimated to 50 and 400 µmol photons m^{-2} s^{-1} at 0°C and 5°C with and without DTT.

Fig S6: Fv/Fm as a function of NPQs in *T. gravida* cells acclimated to 50 and 400 µmol photons m^{-2} s^{-1} at 0°C (A and B) during dark relaxation. In B we added data from literature (Verhoeven et al., 1996) : Fv/Fm as a function of NPQs in *Pseudotsuga menziesii*, *Pinus ponderosa* and *Euonymus kiautschovicus* obtained over the 4,5 days following transfer of the leaves from the field (on 10 March, 1994) to room temperature and low PPFD.

2 Supplementary Figures

It is important to note that when NPQs is high the calculation of NPQd without taking into account a relaxed Fm (F_m^{24h}) can lead to a large underestimation of NPQd. To look at this, we defined an apparent NPQd (NPQ_d^{app}) and an effective NPQd (NPQeff, which corresponds to the NPQd used in the manuscript); both were calculated as follow:

$NPQd^{app} = Fm/Fm'-1$

$NPQd^{eff}$ = NPQd as used in the manuscript = $Fm^{24h}/Fm'- 1- NPQs$

When not using the true FmMax, the apparent NPQd (NPQ_d^{app}) underestimates the effective NPQd (NPQ_d^{eff}) as follows:

$NPQ_d^{eff} = NPQd^{app} . (NPQs + 1)$

Therefore, when NPQs is high, the respective error on $NPQd^{app}$ is high. The Figure S1 below confirms that NPQ_d^{app} underestimates $NPQd^{eff}$ (panels C and D are the current figures proposed in the manuscript; panels A and B present $NPQd^{app}$ data calculated with Fm.

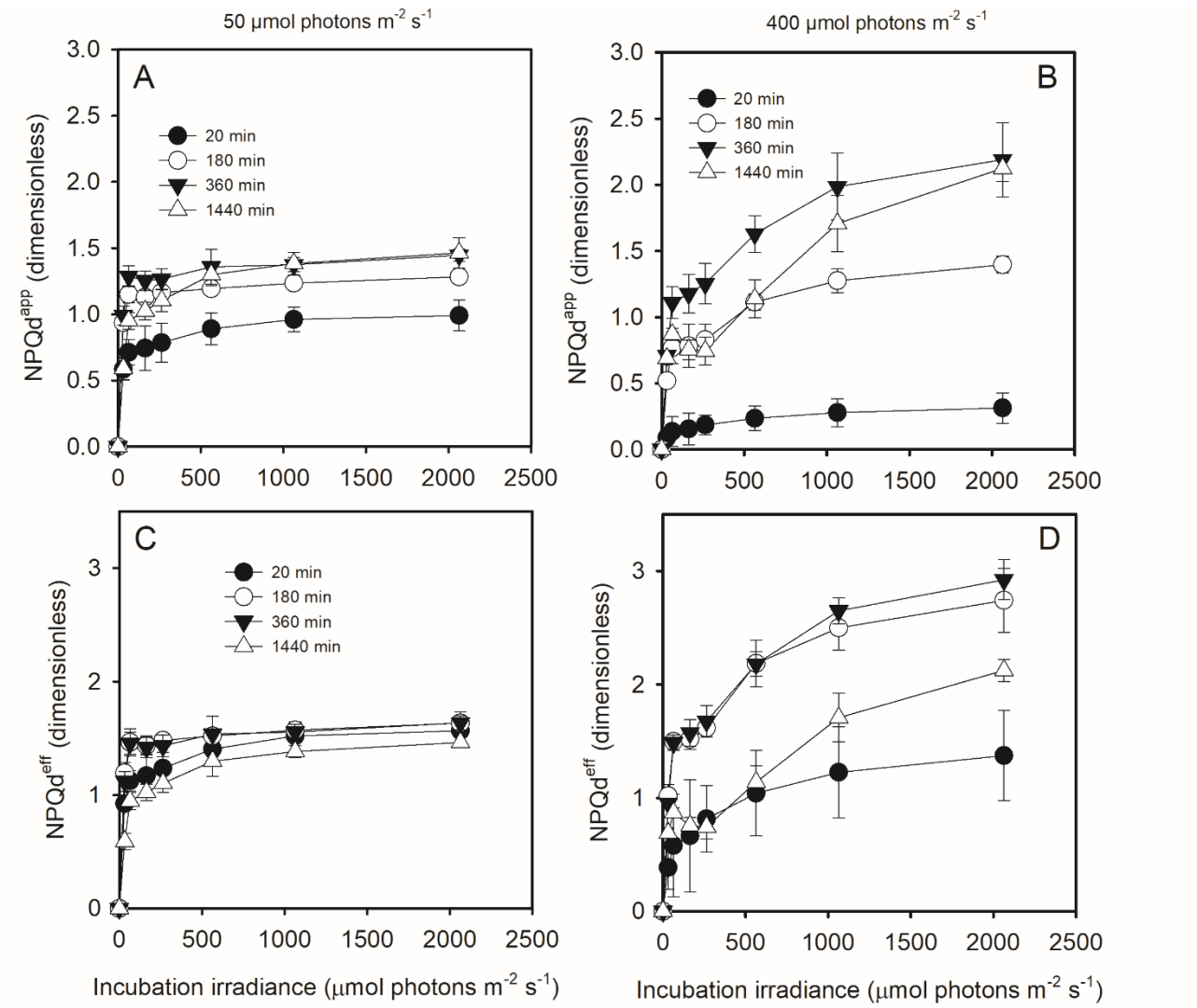

Figure S1: NPQ_d^{app} (A,B) and NPQ_d^{eff} (C,D) as a function of incubation irradiance in cell previously acclimated to 50 µmol photons m^{-2} s^{-1} (A,C) and 400 µmol photons m^{-2} s^{-1} (B,D) and after 20, 180, 360 and 1440 min dark acclimation. Each data point is the mean of 3 independent cultures, error bars represent standard deviations.

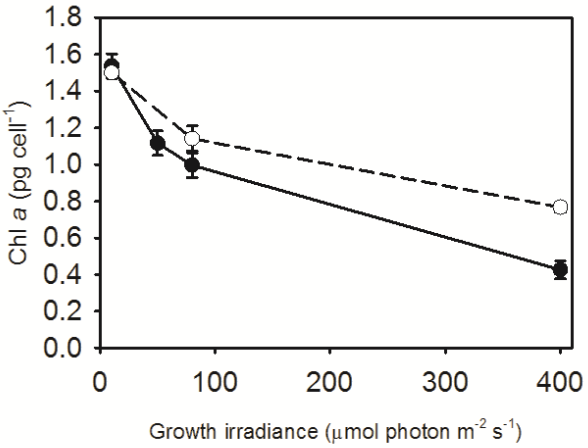

Figure S2: Chlorophyll *a* per cell as a function of growth irradiance in *T. gravida* cells acclimated to 0°C (closed circles) and 5°C (open circles).

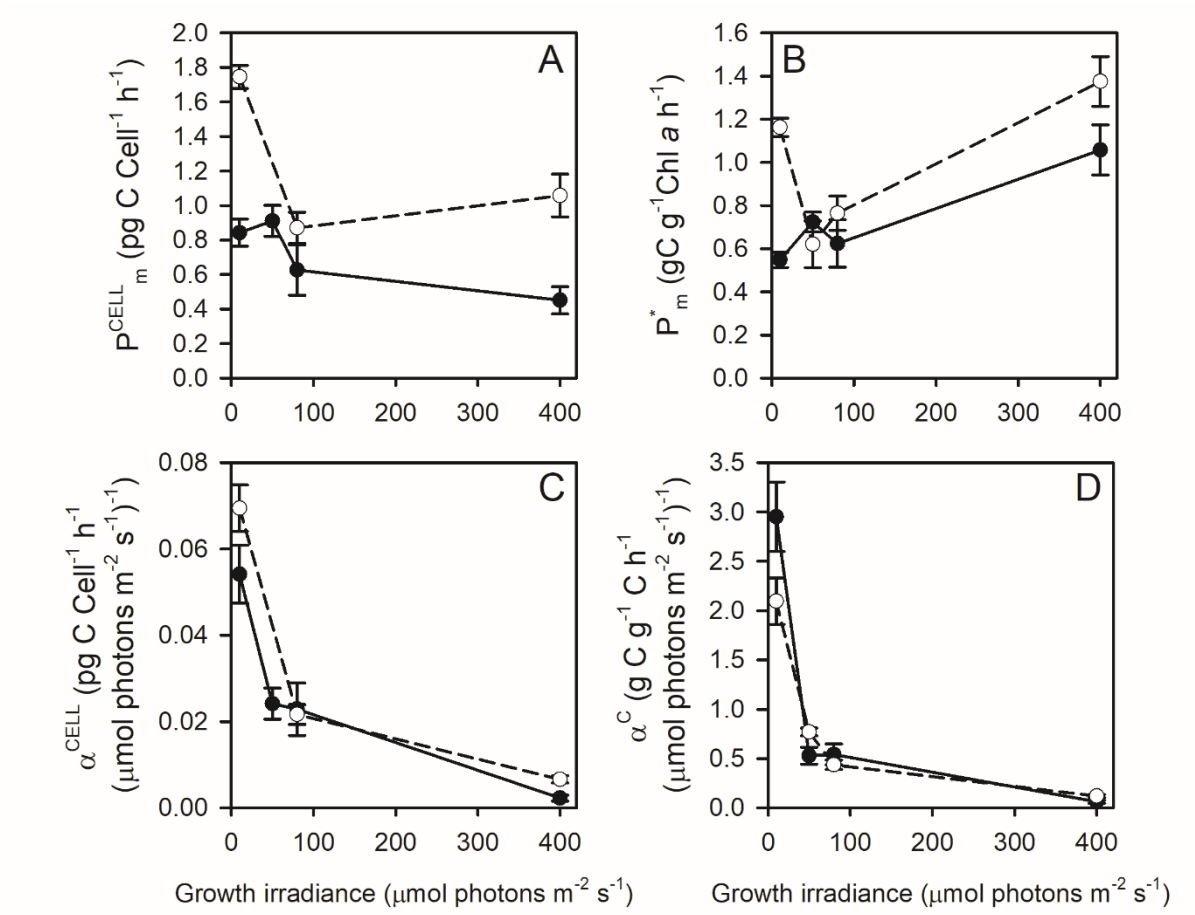

Figure S3: (A) P^{Cell}_m, (B) P^*_m, (C) α^{Cell}, (D) α^C as a function of growth irradiance in *T. gravida* cells acclimated to 0°C (closed circles) and 5°C (open circles). See Table 1 for parameters definition. Each data point is the mean of 3 independent cultures, error bars represent standard deviations.

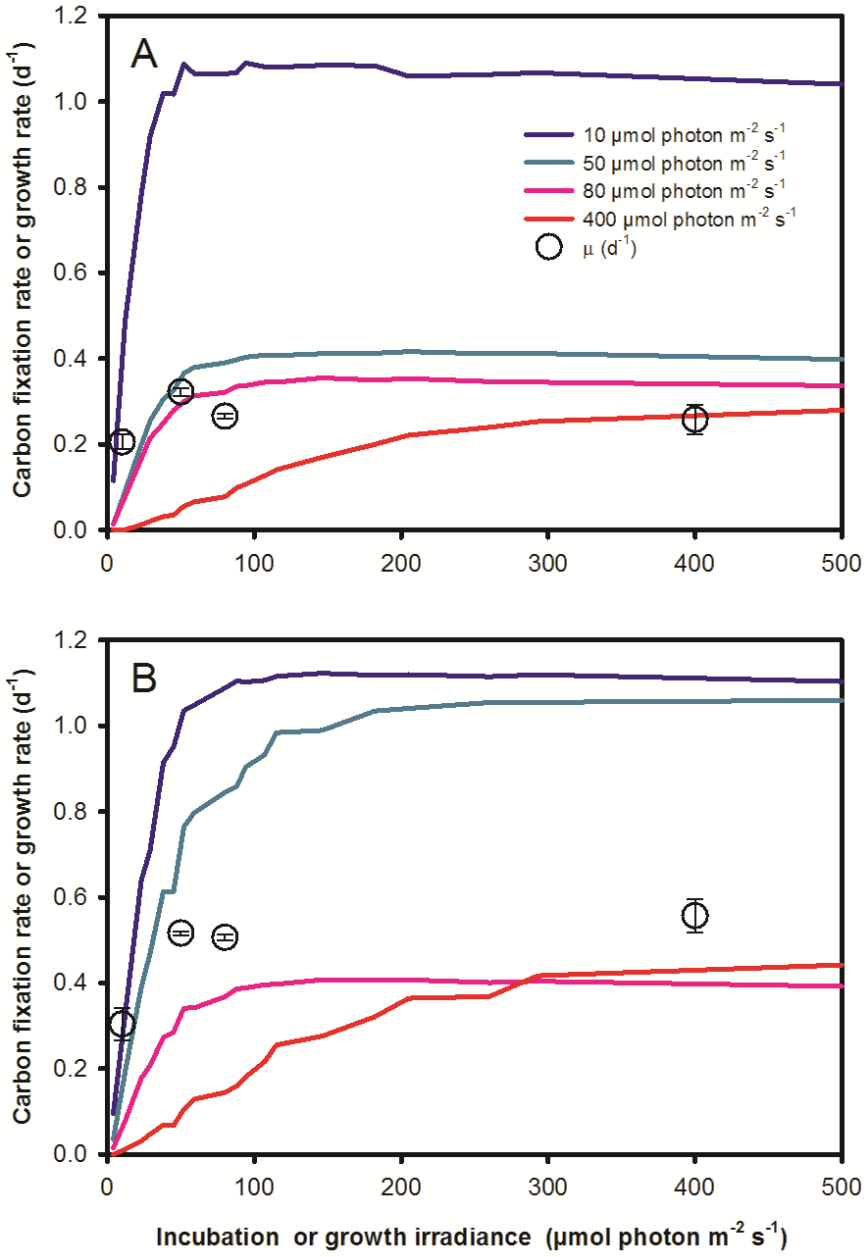

Figure S4: Carbon fixation rate (measured by ^{14}C incorporation) and growth rate as a function of incubation irradiance and growth rate respectively in *T. gravida* cells acclimated to 10, 50, 80, and 400 µmol photons m^{-2} s^{-1} at 0°C (A) and 5°C (B).

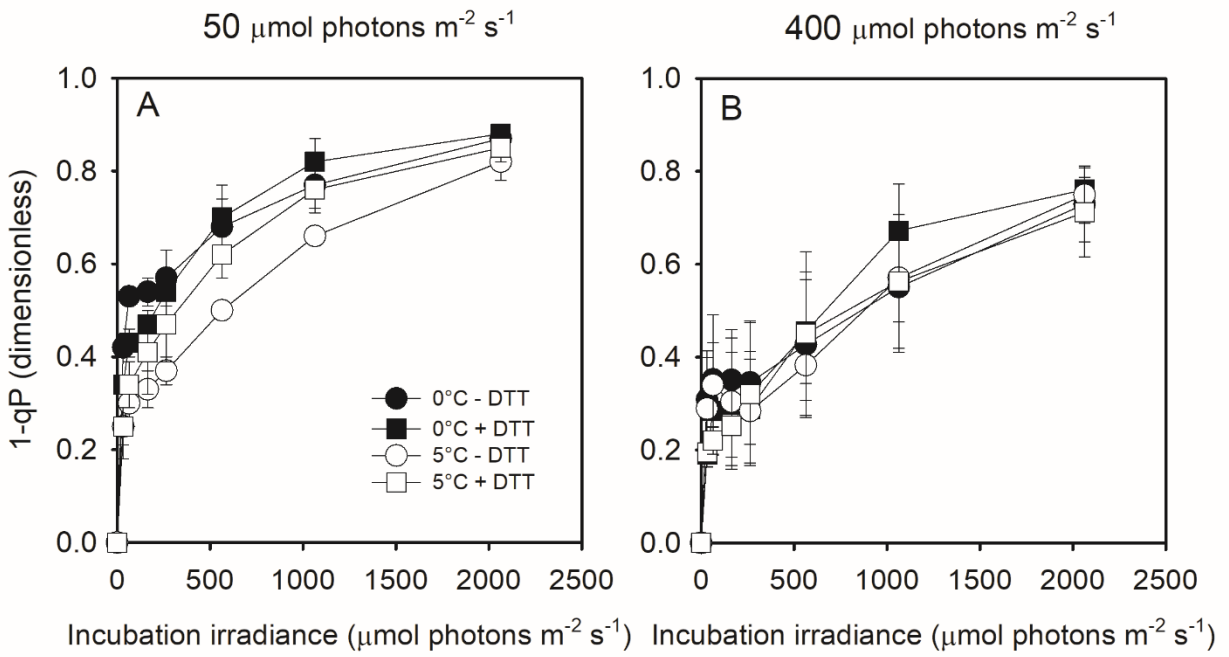

Figure S5: 1-qP as a function of incubation irradiance in *T. gravida* cells acclimated to 50 and 400 μmol photons m^{-2} s^{-1} at 0°C and 5°C with and without DTT.

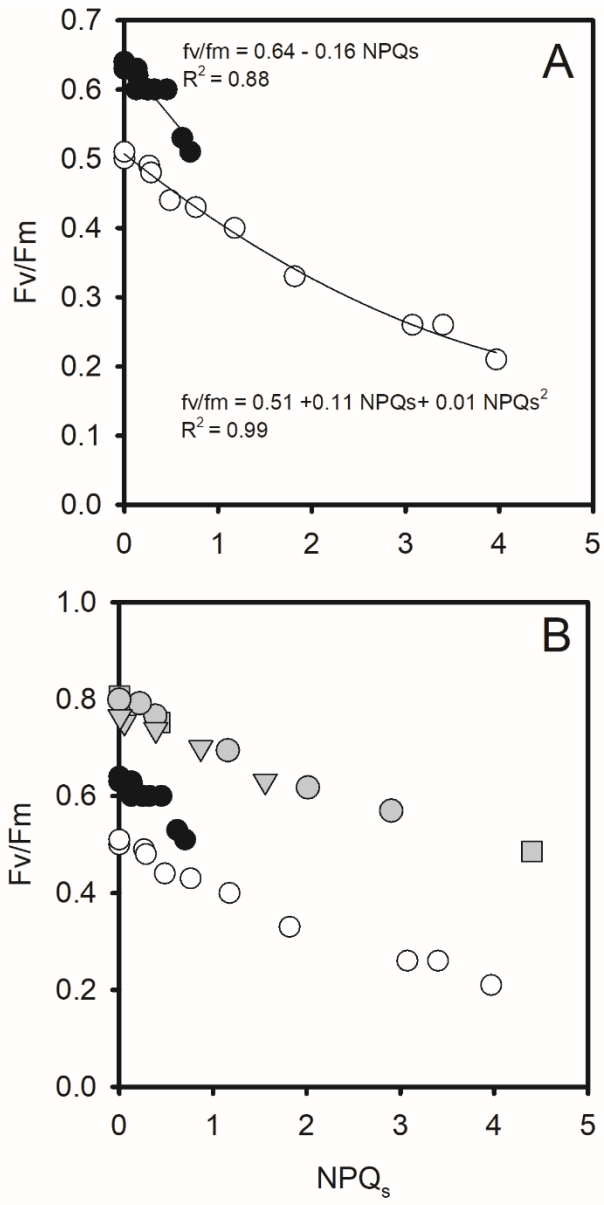

Figure S6: Fv/Fm as a function of NPQs in *T. gravida* cells acclimated to 50 (black dots) and 400 µmol photons m^{-2} s^{-1} (white dots) at 0°C (A and B) during dark relaxation. In B we added data from literature (Verhoeven et al., 1996). Fv/Fm as a function of NPQs in *Pseudotsuga menziesii*, *Pinus ponderosa* and *Euonymus kiautschovicus* obtained over the 4,5 days following transfer of the leaves from the field (on 10 March, 1994) to room temperature and low PPFD.

Verhoeven, A.S., Adams, W.W., and Demmig-Adams, B. (1996). Close relationship between the state of the xanthophyll cycle pigments and photosystem II efficiency during recovery from winter stress. Physiologia Plantarum 96, 567-576.