**Supplementary material**

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**Figure S1:** Time dependent change in mean cell biovolume (A), cell density (B), carbon specific growth rate (C), nitrogen specific growth rate (D), Chl *a* specific growth rate (E) and xanthophyll specific growth rate (F) during a light ⁄ dark cycle in N-sufficient (circles) and N-starved growth (triangles). The continuous grey line represents growth irradiance. The dashed red line represents the daily averaged cell division rate (0.77 d-1). In each graph, a line passes through the mean of the two replicates.

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**Figure S2:** Time dependent change in Fv/Fm15min (A) during a light ⁄ dark cycle in N-sufficient (circles) and N-starved growth (triangles) and relationship between NPQdm and Dt/Chl *a* in N-sufficient (B). In A, the continuous grey line represents growth irradiance and a line passes through the mean of the two replicates.

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**Figure S3:** Darkness time dependent change in echinenone/Chl*a* in *T. lutea* cells under B12, N, P starvation (B)