

770 **Supplemental Figure 1.** HPLC-Mass spectrometric analysis of the PBP from isolated PBS of
771 *Synechococcus* 7002 wild type (A) and *cpcM* mutant (B).

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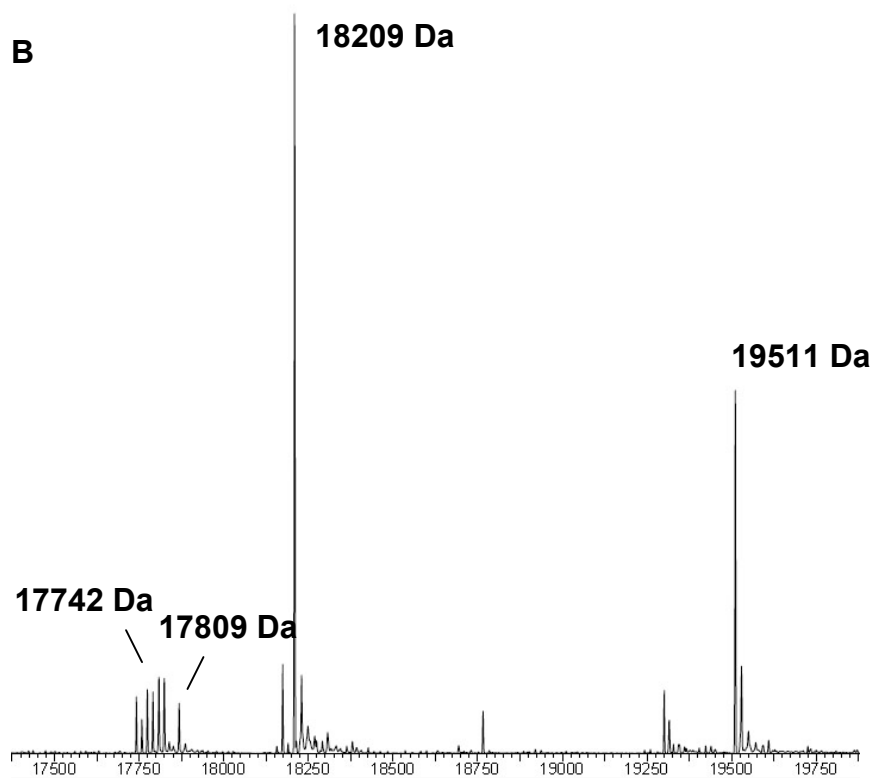
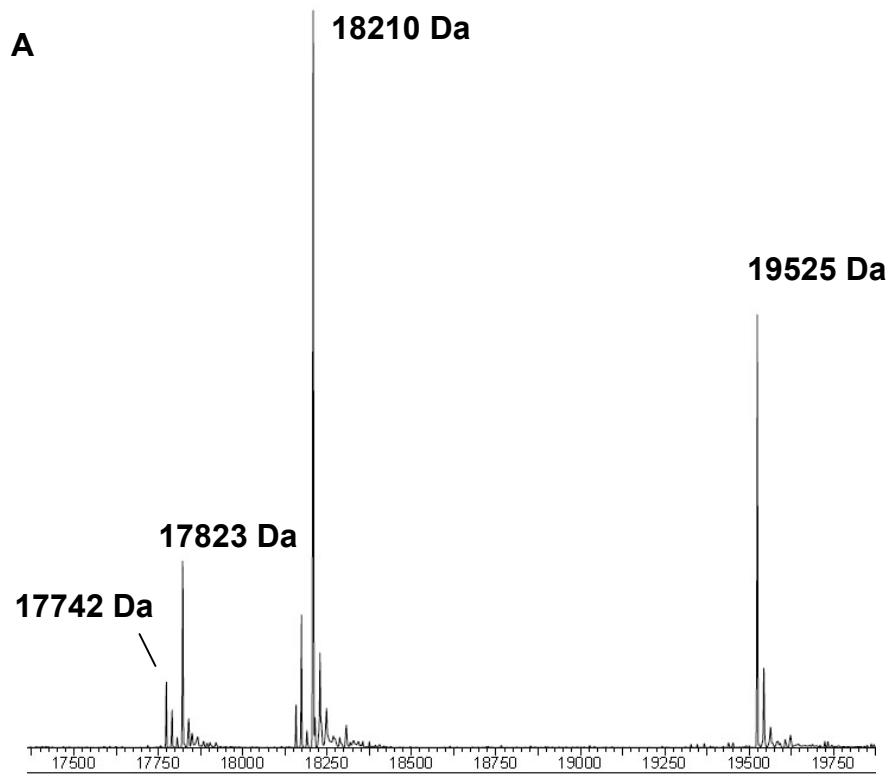
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778 **Supplemental Figure 2:** Sequence comparison of the CpcB, ApcB and ApcF proteins from
 779 *Synechococcus* 7002 and *Synechocystis* 6803. The highly conserved Asn71/72 residues in CpcB,
 780 ApcB and ApcF are highlighted in red, and the Cys residues that are the sites at which
 781 phycocyanobilin is covalently bound to these proteins are indicated in blue.

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CpcB 7002   1 MFDFTRVVSQADARGEFISSDKLEALKKVVVAEGTKRSDAVSRMTNNASSIVTNAARQLF   60
CpcB 6803   1 MFDVFTRVVSQADARGEYLSGSQLDALSATVAEGNKRIDSVNRITGNASAIVSNAARALF   60
ApcB 7002   1 MQDAITSVINSADVQGKYLDGSAMDKLKAYFTTGALRVRAASTISANAAAIVKEAVAKSL   60
ApcB 6803   1 MQDAITAVINSADVQGKYLDGAAMDKLKSYFASGELRVRAASVISANAATIVKEAVAKSL   60
ApcF 7002   1 MRDAVTSLIRNYDTTGRYFDRDAIESLKDYFASGNDRITVAAMINSQSAEIVKAAANSLF   60
ApcF 6803   1 MRDAVTTLIKNYDLTGRYLDNRNAMDELKAYFESGSARIAAAAAMINANSATIVKRAAAQLF  60

CpcB 7002   61 ADQPQLIAPGGNAYTNRMAACLRDMEIILRYVTYATFTGDASVLNDRCLNGLRETYVAL   120
CpcB 6803   61 AEQPQLIQPGGNAYTSRRMAACLRDMEIILRYVTYATFTGDASVLEDRCINGLRETYVAL   120
ApcB 7002   61 LYS-DVTRPGGNMYTTRRYAACIRDLDYLLRYATYAMLGDPSILDERVLNGLKETYNLSL   119
ApcB 6803   61 LYS-DVTRPGGNMYTTRRYAACIRDLDYLLRYATYAMLGDASILDERVLNGLKETYNLSL   119
ApcF 7002   61 EAVPELLLAGGNAYTTRRFSACLRDMYYLRYGTYALIAGDMVNLNERVLQGLRETYNSL   120
ApcF 6803   61 EEIPELIRPSGNAYTTRRFSACLRDMYYLRYASYALIAADNNVLDERVLQGLRETYNSL   120

CpcB 7002   121 GVPGASVAAGVRAMGKA AVAVIMDPAGVTSGD CSSLQOEIELYFETA AKAVE     172
CpcB 6803   121 GVPGASVAAGVQKMKEAALDI VNDPNGITRGDC SAI VAEIAGYFDRAAAVA     172
ApcB 7002   120 GVPVGSSTVQAIQAMKEVTAGLVG-----ADAGREMGVYFDYICSGLS     161
ApcB 6803   120 GVPISSSTVQAIQAIKEVTASLVG-----ADAGKEMGVYLDYICSGLS     161
ApcF 7002   121 GVPIAPTVRGIQFLKDAIKEMAAAAG-----IANTAFIDEPPDHMTRELSEVDL  169
ApcF 6803   121 GVPIGPTVRGIQIMKEMIEAMAEDSS-----LNSTDFIASPPDHMTRELSLSV   169
  
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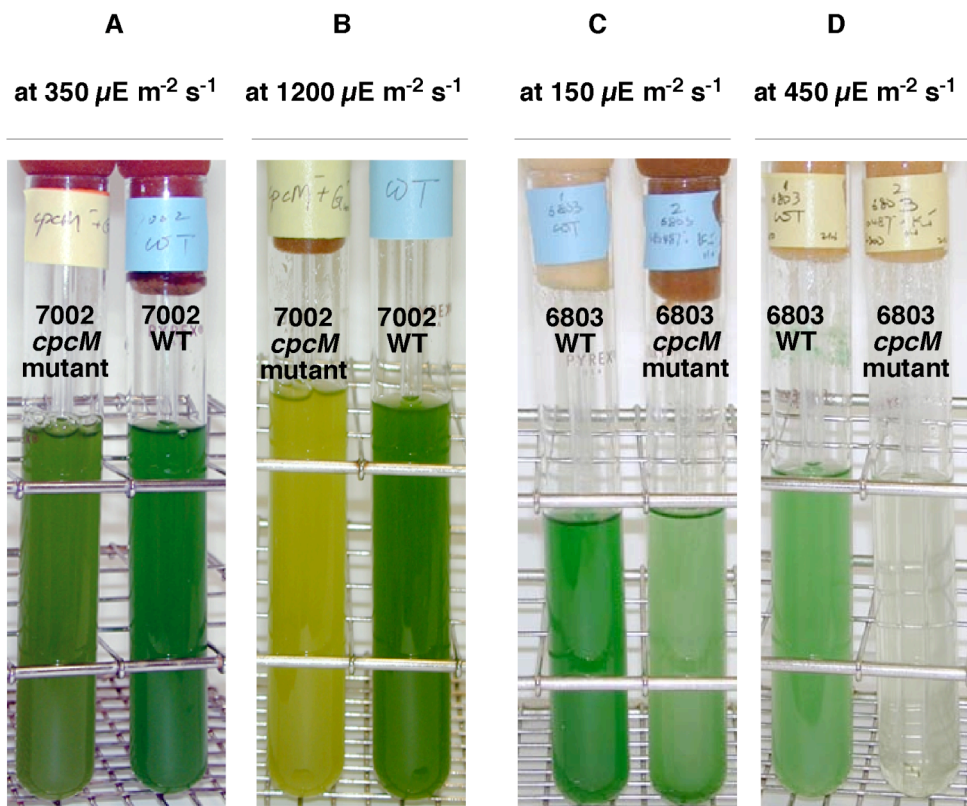
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786 **Supplemental Figure 3.** Liquid cultures of the wild type and *cpcM* mutants strains of
787 *Synechococcus* 7002 and *Synechocystis* 6803 grown at different light intensities. The
788 *Synechococcus* 7002 strains were grown photoautotrophically in A⁺ medium at the indicated
789 light intensities: (A) 350 $\mu\text{mol photons m}^{-2} \text{s}^{-1}$ and (B) 1200 $\mu\text{mol photons m}^{-2} \text{s}^{-1}$. The
790 *Synechocystis* 6803 strains were grown photoautotrophically in B-HEPES medium at 150 μmol
791 $\text{photons m}^{-2} \text{s}^{-1}$ (C) and 350 $\mu\text{mol photons m}^{-2} \text{s}^{-1}$ (D). The *cpcM* mutant of *Synechococcus* 7002
792 contains much less PBP than the wild type when grown at high light intensity. The *Synechocystis*
793 6803 *cpcM* mutant is much more sensitive to high light intensity than the corresponding wild-
794 type strain.

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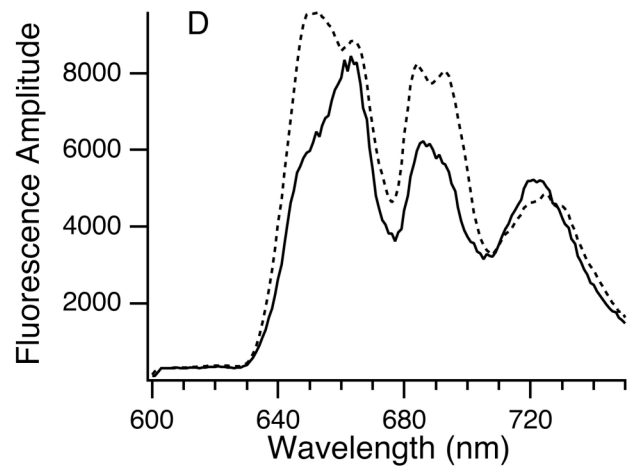
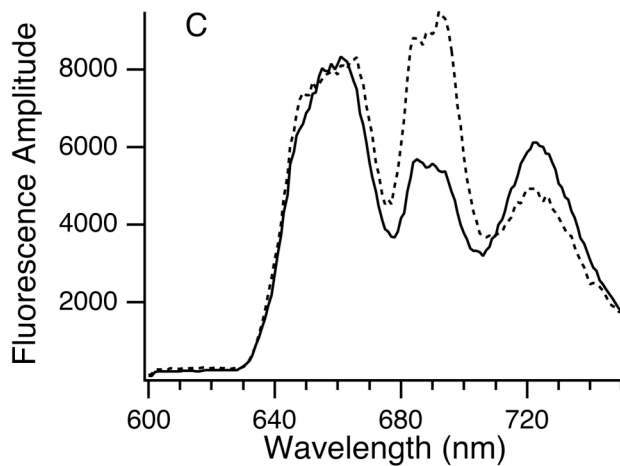
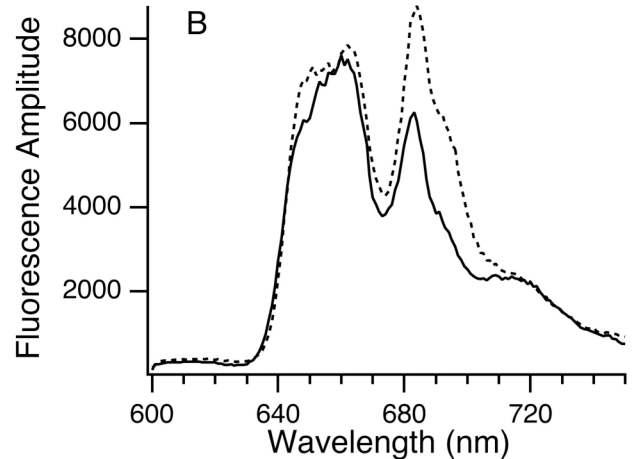
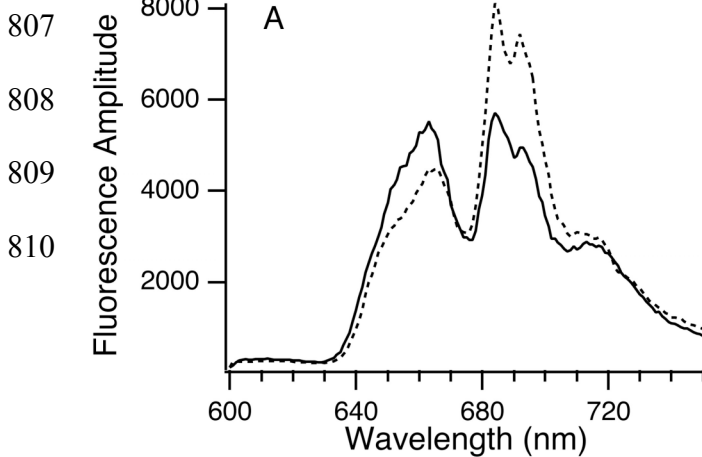


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798 **Supplemental Figure 4. Low-temperature fluorescence emission spectra of wild type and**
799 ***cpcM* mutant cells.** The 77K fluorescence emission spectra were measured for cells of (A),
800 *Synechococcus* 7002 wild type; (B), *Synechococcus* 7002 *cpcM* mutant; (C), *Synechocystis* 6803
801 wild type; and (D), *Synechocystis* 6803 *cpcM* mutant. Cells were incubated for 5 min in blue
802 light to produce state 1 (dashed line) or were dark-adapted for a similar period to produce state 2
803 (solid line). Each spectrum is the average of three independent measurements. The excitation
804 wavelength was 590 nm, which principally excites the PBP.

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810 **Supplemental Figure 5.** Crystal structure of the alpha (aqua blue) and beta (green) subunits of
811 PC (A) and AP (B). The N-methylasparagine residue is highlighted in pink and shown in space-
812 filling manner in the β -PC subunit and in orange-brown with only the methyl group shown in
813 space-filling manner in β -AP. The phycocyanobilin chromophores are shown in dark blue in
814 space-filling manner. Note that the N-methylasparagine lies immediately adjacent to the
815 chromophore attached to the Cys82 of β -PC and Cys81 of β -AP. The PC structure is that for the
816 red alga *Cyanidium caldarium* (56) and the AP structure is that from *Arthrospira (Spirulina)*
817 *platensis* (4).

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A: Phycocyanin

B: Allophycocyanin

