Table S1. Method components to determine apparent quantum yield spectra in the four laboratories^{*}. Further methods are given in the article section *Apparent quantum yield*. Lab: laboratory.

Lab	Sample treatment prior irradiation	Incubation vessels and septa	Cut-off filters	Incubation times and temperature	Dark controls	Irradiance measurement	CDOM- absorbed photons	Parameter optimization
Georgia	Samples stored at 4°C after arrival until use (<1 month storage time). Samples re- filtered (0.2 μ m pre- rinsed Whatman® Polycap AS). Samples acidified to pH ~3 with HCl and bubbled with CO ₂ -free air for 30 – 60 min. All samples buffered and returned to original pH with sodium borate before filling quartz cells for experiment.	10 cm quartz, screw cap spectrophotometric cells. UVC sterilized for >1 h prior to filling headspace-free. Teflon- faced butyl rubber septa, Teflon side facing the sample. Cells aligned vertically under each cut- off filter and a dark position in a water- cooled, machined black aluminum block, covered with a 1" gray PVC lid to further exclude off-axis photons.	Seven duplicate cut- off filters (280, 295, 305, 320, 380, 425, 480 nm; Schott Advanced Optics, Duryea, PA, USA).	3.3–5.6 h at 15°C. Irradiation times selected based on photoproduced DIC determined previously in samples with similar CDOM absorbance spectra and in attempts to select the shortest time possible that would allow for quantifiable levels of photoproduced DIC.	Pre-irradiation baseline DIC concentration and those for dark controls were comparable within error. One in aluminum block and another submerged in dark water bath.	250–800 nm on 1 nm intervals (OL-756 UV-Vis spectroradiometer with quartz fiber optic cable and a 2" integrating sphere collector, Gooch & Housego, Orlando, FL, USA). Measured under each aperture in the gray PVC lid, screwed into position to assure measurement directly under each cut-off filter. Irradiance scans repeated 3 times and averaged (<1% variation across the spectrum). Spectroradiometer calibrated in our laboratory prior to experiments using a NIST irradiance standard and regulated power supply (Optronic, Muskoghee, Oklahoma, NE).	CDOM- absorbed photons calculated correcting for self-shading in the samples (Eq. 1 in Hu et al. 2002). CDOM- absorbed photons determined with broadband actinometry differed by a factor of $1.18 \pm$ 0.17.	Weighed parameter optimization (Rundel, 1983) using <i>Nlinfit</i> in Matlab.

two months at 4°C) were filtered (0.7 μ m), acidified to pH ~2 with HCl in a 500-mL glass gas-exchange flask and purged with CO ₂ -free air (2 L min ⁻¹) for 30– 45 min. Under purging of CO ₂ -free air, pH adjusted with NaOH to the original value, typically within a precision of 0.09 (range 0.00–0.37) pH-unit.	water was tapped from a gas exchange bottle into two glass (for initial and dark controls) and one quartz (to be irradiated) pre-combusted (2 h +450°C) vials by overflowing the volume of vials (~13 mL) for at least three times. Quartz vials (inner radius 6.7 mm, outer diameter 16.98 \pm 0.11 mm, volume 12.81 \pm 0.35 mL) sealed with ground glass stoppers without headspace, and irradiated horizontally on a stainless steel grid in a cooled water bath. The dark glass control vials wrapped in aluminium foil were in the bottom of water bath. The glass vials for the initial DIC concentration were immerced in ar ion acids	Without cut- off filters.	5 h irradiation with full power of the solar simulator (Suntest CPS+) in a water bath regulated at 20°C within 0.1°C accuracy. The selected irradiation temperature was close to the temperature of the water samples during sealing of the vials, and prevented appearance of gas head space due to thermal compression/expans ion of water volume or heat-generated oversaturation of dissolved gases.	Non-significant apparent DIC production rate - $0.18 \pm 0.72 \ \mu g \ h^{-1}$ L ⁻¹ (mean \pm SD) when calculated as the difference between [DIC _{dark}] and [DIC _{initial}].	240–800 nm with a SR9910 double monochromator spectroradiometer (Macam photometrics, Scotland). Measurement of down- ($Q_{v,d}$) and upward ($Q_{v,u}$) vector photon flux density in the water bath at the site of vials. Additional measurements of down- ($Q_{o,d}$) and upward ($Q_{o,u}$) scalar photon fluxes with a spherical scalar irradiance sensor (QSL 2101, Biospherical Instruments, United States). The mean cosine of the downward photon flux density incident to the samples was calculated as: $\mu_d = Q_{v,d}/Q_{0,d}$, and the calculated vector photon flux density at $\mu_d=1$ was: $Q_{v,d,\mu=1} = Q_{v,d}/\mu_d$. Similar calculations were done for upward photons. The spectroradiometer was calibrated in air by the	photon flux density absorbed by CDOM, $Q_{a,d}$, (mol photons m ⁻² s ⁻¹ nm ⁻¹) was calculated from $Q_{v,d,\mu=1}$: $Q_{v,d,\mu=1}(1 - e^{L\bar{\alpha}}g)$ where $\bar{\alpha}_g$ is the mean CDOM absorption coefficient during irradiation (m ⁻¹) and <i>L</i> is the mean optical pathlength (<i>L</i> = $0.5\pi r$, where <i>r</i> = inner vial radius in m). Upward photon flux density absorbed by CDOM, $Q_{a,u}$,	simplex algorithm (Nelder and Mead 1965), function <i>fminsearch</i> in MATLAB (MATLAB R2013a, MathWorks, US) iterated for 1,000 times for the spectral range 268–700 nm by setting the initial value of c = 1 and selecting randomly different initial values of <i>d</i> (between 0.011 nm ⁻¹ and 0.84 nm ⁻¹) with a Monte
	vials for the initial DIC concentration were immersed in an ice acidic		oversaturation of		The spectroradiometer was calibrated in air by the manufacturer and immersion	absorbed by CDOM, $Q_{a,u}$, was calculated	and 0.84 nm ⁻¹) with a Monte Carlo
	(HCl) bath at 0 °C and kept in the dark prior to DIC analysis. After the				corrected for the measurement.	in the same way. The photons	procedure. The final AQY

Jyväskylä

The samples (stored

The pH-adjusted lake

Downward

Nelder-Mead

irradiation, the dark	absorbed by	spectrum was
controls and the	CDOM, Q_a ,	the median
irradiated vials were also	was:	value of 1,000
immersed in an ice bath	$Q_a = Q_{a,d} + Q_{a,u}.$	iterated AQY
prior to DIC	The mean $a_{\rm g}$	spectra. The
determination, to stop	during	AQY with a
any potential biological	irradiation, \bar{a}_{g} ,	rank 25 and
DIC production. The	was:	975 were
introduced HCl lowered	$\bar{a}_{\rm g} = a_{\rm g,dark} k^{-1}$	considered to
pH <4 and thus DIC	$(1-e^{-k})$, where	present the
concentration to a low	$a_{\rm g,dark}$ is $a_{\rm g}$ in the	lower and
level in an ice bath,	dark control	upper 95%
minimizing possible -	sample after	confidence
exchange of DIC	irradiation and k	interval,
between the vials and ice	is the first order	respectively,
bath.	photobleaching	for the fitting.
	coefficient ($k =$	
	$\ln(a_{\rm g,dark})$ -	
	$\ln(a_{g,irr})$, where	
	$a_{\rm g,irr}$ is the	
	measured $a_{\rm g}$ in	
	the irradiated	
	sample).	
	A comparison to	
	CDOM-	
	absorbed	
	photons	
	determined with	
	broadband	
	actinometry not	
	reported.	

Filtered samples were kept dark and cold (4°C) until the experiments were conducted 4-5 months after arrival of all samples. Prior to all experiments, the samples were GF/F filtered to remove notable flocculant material that formed during storage.

Michigan

GL-14 screw threads with 2 mm butyl rubber septum on 15 mm O/D x 12 mm ID quartz tubing with round bottom, caps not exposed to light. Overall length 110 mm, max volume 12 mL. Tubes placed horizontally in a customdesigned black Delrin sample housing that minimized noncollimated light from reaching the samples. The housing rested in circulating water bath.

All sa irradia coolea The sa Six duplicate Imnay cut-off filters Gäddt (295, 320, Grästj 345, 370, 395, Svartj 420 nm, irradia Schott, Kopp hours, Glass Inc., tempe Pittsburgh, betwe PA, US, Hoya The sa Corporation, Toolil Milpitas, US). Jyväsj Breds Skärsj

All samples were irradiated in a cooled water bath. The samples from Imnavait Creek, Gäddtjärn, Grästjärn and Svartjärn were irradiated for 5-6 hours, final temperature varied between 16-20°C. The samples from Toolik Lake, Jyväsjärvi, Norra Bredsjön and Övre Skärsjön were irradiated for 24 hours, final temperature varied between 19-23°C.

The DIC concentration in the dark controls (duplicate per experiment) ranged from 40.23 ± 0.04 µmol (mean \pm SE) for Svartjärn to 389.04 ± 0.06 µmol for Jyväskylä.

Measured at 305, 313, 320, 340, 380, 395, 412 nm with a PUV radiometer (Biospherical Instruments Inc.) and linearly interpolated to 1-nm increments. Cut-off filter transmission spectra measured with a Cary 300 with diffuse reflectance accessory (LabSphere - 15 cm, North Suton, US).

 Q_a = E(0) * trans* (1 $-e^{-a_{CDOM^{*L}}}$ where E(0) is irradiance (mol photons m⁻² s⁻¹ Difference nm⁻¹), *trans* is method transmittance of (Rundel the cut-off filter 1983), with (proportion), subsequent and L is optical unconstrained pathlength of nonlinear the photo-vial parameter (0.012 m). H₂O optimization absorption using the coefficients fminsearch were assumed to function in be zero. Matlab CDOM-(7.11.0).absorbed photons determined with broadband actinometry differed by a factor of $1.30 \pm$ 0.08.

Filtered samples were kept dark and cold (4°C) until incubation in a solar simulator within one week to 3 months after arrival of the samples. Prior to each incubation, initial pH was measured, the sample was acidified to pH~3 with HCl and bubbled with N₂ air for 30-45 min, and then re-adjusted to the initial pH with 1M NaOH. Upon re-filtering (0.2 µm membrane filter Ø47mm, Supor[®]), the sample got aerated with

ambient air.

Uppsala

Glass vessels with planar quartz top and bottom and black sides. 49 mm high, 37 mm outer diameter. Silicon/PTFE septa with the PTFE side facing the water sample (VWR Singapore Ltd, Singapore). Vertically standing in a cooled water-bath underneath each cut-off filter.

Six triplicate cut-off filters (250, 310,355, 385, 420, 455 nm. CVI Laser Corporation, obtained from former Gamma Optronik AB, Sweden and Oriel Instruments. Newport Corporation, Irvine. California).

All samples were irradiated in a cooled water bath. starting the irradiations at 20°C temperature. The sample from Toolik Lake was irradiated for 40 hours, the final water temperature in the water bath was 31°C. The samples from Norra Bredsjön, Övre Skärsjön and Imnavait Creek were irradiated for 16 hours, the final temperature was 25-27°C. The remaining four samples were irradiated for 5-6 hours.

 $0.24 \pm 0.05 \ \mu g \ h^{-1}$, corresponding to $4.7 \pm 1.0\%$ and 11.3 $\pm 2.8\%$ of the DIC production under the 250 nm and 380 nm cutoff filter. respectively.

increments using a concave grating spectrometer for UV-Vis applications (Black Comet BLK-C, StellarNet, Tampa, Florida) equipped with a fiber optic cable (STE-F600-UVVis-SR, StellarNet) and a cosine receptor for UV-Vis near-infrared irradiance (STE-CR2, StellarNet). Cut-off filter transmittance spectra measured with a Lambda 35 spectrophotometer (PerkinElmer Life and Analytical Sciences, Shelton, Connecticut, US). The solar simulator lamp was replaced once during the study. Irradiance spectra were measured on five occasions during use of lamp 1, and on two occasions during use of lamp 2.

280-600 nm on 1-nm

 Q_a

= E(0) * trans a_{CDOM} $a_{CDOM} + a_{H_2O}$ * S * (1 $-e^{-(a_{CDOM}+a_{H_2}o)}$ Weighed (Hu et al. 2002), parameter where a_{H2O} is optimization (Rundel 1983) H₂O absorption coefficients (musing the Nelder Mead ¹) and S is the cross section of simplex minimization the illuminated area (m^2) . algorithm CDOM-(Nelder and absorbed Mead 1965), photons function *mle2*. determined with R3.1.1 (R broadband Development Core Team actinometry differed by a 2014). factor of 1.43 \pm 0.04.

*Please see Fig. 1 for a method flow chart

5

Table S2. Performance to predict the photochemical DIC production observed in the irradiation measurements when using the fitted AQY spectra (see Table S3 for fitting equations), per lake and laboratory. Given are the slope and R^2 of linear regressions between observed vs. predicted DIC production, and the normalized root mean squared error (*nRMSE*; %). The intercept of the linear relationship was not significantly different from zero in any case.^{*}

Laboratory		Georgia			Michigan			Uppsala					
Lake	Slope	R^2	nRMSE	Slope	R^2	nRMSE	Slope	R^2	nRMSE				
Toolik Lake	0.90	0.86	15.7	0.99	0.97	6.9	0.88	0.85	12.3				
Norra Bredsjön	1.01	0.90	13.4	0.91	0.99	9.2	0.94	0.91	10.6				
Östra Skärsjön	0.91	0.77	19.3	1.03	0.96	8.0	1.00	0.99	4.5				
Jyväsjärvi	0.86	0.88	13.3	1.02	0.97	6.5	0.98	0.95	7.6				
Imnavait Creek	1.00	0.95	9.5	1.15	0.96	10.4	1.00	0.97	5.8				
Gäddtjärn	0.96	0.91	12.1	1.07	0.96	8.0	0.90	0.88	11.5				
Grästjärn	0.97	0.92	11.0	0.91	0.97	13.6	1.01	0.98	4.9				
Svartjärn	1.02	0.96	7.8	0.81	0.97	16.3	0.99	0.97	5.6				
$Mean \pm SE$	0.95 ± 0.02	0.89 ± 0.02	12.8 ± 1.3	0.99 ± 0.04	0.97 ± 0.004	9.9 ± 1.2	0.96 ± 0.02	0.94 ± 0.02	7.9 ± 1.1				

*This analysis cannot be conducted with the method used in Jyväskyla laboratory, which is therefore not included in this comparison (see Gu et al., 2017 for detailed discussion).

Lake	Georgia		Jyväsky	lä	Michigan	l	Uppsala	Uppsala			
Гаке	m ₁	<i>m</i> ₂	с	d	С	d	m ₁	m_2			
Toolik Lake	6.5370	0.0252	1.2323	0.0237	0.6994*	0.024*	8.1102	0.0116			
Norra Bredsjön	6.6891	0.0288	1.2006	0.0243	0.2901	0.022	6.8677	0.0253			
Övre Skärsjön	5.8793	0.0470	1.1904	0.0244	2.3548	0.028	7.3592	0.0222			
Jyväsjärvi	7.3760	0.0134	1.2449	0.0238	0.9426	0.032	7.4000	0.0177			
Imnavait Creek	5.3256	0.0305	1.2696	0.0200	0.0833	0.014	7.1910	0.0147			
Gäddtjärn	7.1185	0.0145	1.2420	0.0221	0.2249	0.020	7.0387	0.0209			
Grästjärn	6.7267	0.0064	1.2809	0.0216	0.0582	0.015	6.2889	0.0183			
Svartjärn	5.9718	0.0139	1.3080	0.0210	0.2411	0.019	6.0700	0.0186			

Table S3. Mean fit parameter estimates for the AQY spectra (eqs. 2 and 3) per lake and laboratory. The values of m_2 and d are referred to as "spectral slope coefficients" in the manuscript.

* For Toolik lake, the AQY is based on photochemical oxygen consumption in Michigan laboratory since photochemical DIC production underneath the 370 nm cut-off filter did not differ from the dark controls.

Lake	pH			<u> </u>	CDOM		0		$a_g(420)$				S _R					
Lune	Georgia	Jyväskylä	Michigan	Uppsala				Georgia	Jyväskylä	Michigan	Uppsala	Georgia Jyväskylä Michigan Uppsala						
Toolik	8.05	6.72	7.89	7.40	15.8	16.0	12.7	13.1	2.26	2.72	1.80	1.82	0.80	1.14	0.98	0.95		
Lake,																		
Alaska																		
Norra	7.30	5.78	7.48	6.60	33.4	31.6	26.7	29.4	5.10	5.11	3.88	4.51	0.89	0.95	0.89	0.90		
Bredsjön,																		
Sweden												· · · · ·						
Övre	6.18	6.21	6.12	6.00	43.0	41.4	37.4	40.9	6.97	6.73	5.84	6.66	0.84	0.80	0.80	0.76		
Skärsjön,																		
Sweden				C 10	22 0	21 7	07.0	20.4	4.02	1.0.0	2.05	1.00	0.00	0.00	0.00	0.01		
Jyväsjärvi, Finland	7.75	6.50	7.55	6.40	33.8	31.7	27.2	29.4	4.93	4.86	3.85	4.26	0.90	0.96	0.92	0.91		
Imnavait	6.37	5.39	6.88	5.50	45.6	47.5	41.2	44.0	7.05	7.53	6.11	6.54	0.88	0.78	0.74	0.73		
Creek,	0.57	5.59	0.00	5.50	45.0	47.3	41.2	44.0	7.05	1.55	0.11	0.34	0.00	0.78	0.74	0.75		
Alaska																		
Gäddtjärn,	7.65	5.93	7.53	6.8	65.7	62.1	56.7	60.4	11.4	11.0	9.72	10.5	0.87	0.87	0.86	0.84		
Sweden	1.00	0.00	,	0.0	0011	02.1	2017	0011		11.0		10.0	0.07	0.07	0.00	0.01		
Grästjärn,	6.09	5.45	6.19	5.60	73.4	78.0	71.3	77.4	11.0	13.4	12.0	13.2	0.70	0.78	0.70	0.78		
Sweden																		
Svartjärn,	6.35	5.17	6.02	5.50	141.1	135.0	132.2	135.1	24.5	23.7	22.9	23.7	0.85	0.75	0.77	0.75		
Sweden																		

Table S4. Sample pH, CDOM (*10⁻⁷, dimensionless)*, absorption coefficient at 420 nm ($a_g(420)$; m⁻¹), and slope ratio (S_R) measured in each laboratory before irradiation experiments. The mean svalues are given in Table 1.

*Chromophoric dissolved organic matter, as indicated by absorption coefficients integrated for 280–600 nm

Table S5. Means (\pm standard error, SE) and coefficient of variation (in brackets), per lake and laboratory, of observed photochemically produced dissolved inorganic carbon (DIC) under full irradiance in the solar simulators (DIC_{obs}; µmol L⁻¹ h⁻¹), CDOM-absorbed photons between 300 and 450 nm (Qa; mol photons m⁻² h⁻¹), and the broadband apparent quantum yield (AQY) for 300 to 450 nm (i.e. DIC_{obs}/ Qa, $\overline{AQY}_{300-450}$; mmol DIC mol photons⁻¹); the wavelength-integrated AQY across 300 to 450 nm ($\int_{300}^{450} AQY$; mmol DIC mol photons⁻¹), and simulated photochemical DIC production (DIC_{sim}; mg C m⁻² day⁻¹) when using the AQY spectra to parameterize a photochemical rate model (Swedish lakes only).

	Georgia	ı				Jyväsky	lä				Michigan	n				Uppsala	a			
Lake	DICobs	Qa	AQY	$\int^{450} AQY$	DICsim	DIC _{obs} *	Qa	AQY	$\int^{450} AQY$	DIC	DICobs	Qa	AQY	$\int^{450} AQY$	DICsim	DICobs	Qa	AQY	$\int^{450} AQY$	DIC _{sim}
			300-450	J ₃₀₀				300-450	J ₃₀₀ °			0.04	300-450	J ₃₀₀ °			o 44	300-450	J ₃₀₀	
	0.71 ±	0.39	$0.25 \pm$			1.51 ±	0.08	0.22			0.58 ±	$0.06 \pm$	0.117			1.22 ±	0.41	0.14		
Toolik	0.17	±	0.01	43.68	NA	0.08	±	±	41.96	NA	0.02	0.001	±	21.43	NA	0.07	±	±	19.02	NA
Lake	(34%)	0.02	(6%)			(8%)	0.001	0.04			(5%)	(2%)	0.005			(14%)	0.03	0.01		
	0.05	(7%)				0.50	(2%)	(26%)			1.0.4	0.1.4	(6%)			2.20	(12%)	(2%)		
N .T	0.95 ±	0.63	$0.21 \pm$			2.53 ±	0.18				$1.04 \pm$	0.14 ±	0.088			3.20 ±	0.85	0.18		
Norra	0.01	±	0.02	32.02	3.86	0.19	$\pm \mathrm{NA}$	0.15	32.83	4.73	0.05	0.0002	±	17.48	2.76	0.10	±	±	31.23	4.61
Bredsjön	(2%)	0.02	(14%)								(7%)	(0.2%)	0.004			(10%)	0.06	0.01		
	1.0()	(5%)				2 00 1	0.22				1 40 1	0.21	(6%)			2.59	(12%)	(15%)		
Övre	$1.06 \pm$	0.73	$0.21 \pm$			$3.09 \pm$	0.22				$1.48 \pm$	$0.21 \pm$	0.085			$2.58 \pm$	1.07	0.11		
	0.12	\pm 0.02	0.06	37.12	2.41	0.09	$\pm \mathrm{NA}$	0.15	31.48	4.41	0.02	0.002	\pm 0.002	18.90	2.23	0.21 (14%)	$^\pm$ 0.07	\pm 0.002	22.15	3.44
Skärsjön	(16%)	0.02 (4%)	(40%)								(2%)	(1%)				(14%)	(11%)	(3%)		
	$1.05 \pm$	0.62				$2.99 \pm$	0.16				$1.04 \pm$	$0.14 \pm$	(3%) 0.090			$4.45 \pm$	1.34	0.16		
	0.18	0.02 ±	$0.24 \ \pm$			2.99 ± 0.02	$\pm NA$				0.003	0.14 ± 0.001	0.090 ±			0.23	1.34 ±	0.10 ±		
Jyväsjärvi	(24%)	0.02	0.06	35.31	NA	0.02	$\pm 10A$	0.20	40.30	NA	(0.4%)	(1%)	0.001	20.11	NA	(9%)	0.09	0.01	26.90	NA
	(2470)	(5%)	(35%)								(0.470)	(170)	(2%)			()/0)	(12%)	(8%)		
	$4.05 \pm$	0.73				16.21	0.21	0.80			$8.39 \pm$	$0.23 \pm$	0.447			$7.60 \pm$	1.53	0.23		
Imnavait	0.26	±	$0.77 \pm$			± 0.08	±	±			0.002	0.0002	±			0.48	±	0.25 ±		
	(9%)	0.02	0.07	116.51	NA	(0.7%)	0.003	0.017	152.10	NA	(0.03%)	(0.1%)	0.001	79.02	NA	(11%)	0.15	0.01	39.37	NA
Creek ((,,,,)	(4%)	(13%)			(0.770)	(2%)	(3%)			(0.0570)	(0.170)	(0.3%)			(11/0)	(16%)	(9%)		

Gäddtjärn	1.65 ± 0.09 (8%)	0.87 ± 0.02 (3%)	0.29 ± 0.05 (24%)	42.87	11.85	$\begin{array}{c} 9.97 \pm \\ 0.09 \end{array}$	0.31 ± NA	0.34	71.50	12.98	2.79 ± 0.10 (5%)	0.32 ± 0.0002 (0.7%)	0.103 ± 0.004 (6%)	20.73	5.34	6.84 ± 0.73 (19%)	1.87 ± 0.18 (16%)	0.18 ± 0.04 (37%)	44.35	14.42
	$\begin{array}{c} 4.97 \pm \\ 0.63 \end{array}$	0.83 ±	$0.80 \pm$	100.74	(0.02	$\begin{array}{c} 14.77 \\ \pm \ 0.21 \end{array}$	0.38 ±	0.41 ±	07.20	15.00	$\begin{array}{c} 8.32 \pm \\ 0.08 \end{array}$	$\begin{array}{c} 0.39 \pm \\ 0.002 \end{array}$	0.255 ±	29.00	10.40	$\begin{array}{c} 14.88 \\ \pm \ 0.84 \end{array}$	1.67 ±	0.42 ±	70.07	17.40
Grästjärn	(18%) 0.05 (9%)	(34%)	108.74 60.92	60.92	(2%) 0.003 (1%)	0.003 (1%)	0.002 (1%)	87.39 15.9		(1%)	(0.7%)	0.004 (2%)	38.90	10.49	(10%)	0.12 (12%)	0.01 (2%)	79.07	17.40	
	$6.04~\pm$	1.04	$0.83 \pm$			27.14	0.56	0.51			$14.50 \ \pm$	$0.67 \pm$	0.260			20.64	1.92	0.50		
Svartjärn	0.24	±	0.05 ±	139.73	46.18	± 0.05	±	±	111.36	23.74	0.19	0.001	±	40.44	9.51	± 1.21	±	±	96.83	21.25
, c	(6%)	0.03 (4%)	(24%)			(0.3%)	0.005 (1%)	0.01 (3%)			(2%)	(0.2%)	0.004 (2%)			(10%)	0.18 (16%)	0.02 (8%)		
Mean CV	15 ± 4	5 ± 1				3 ± 2	$1.5 \pm$				3 ± 1	$0.7 \pm$				12 ± 1	$13 \pm$	11 ±		
(± SE) (%)			24 ± 4				0.3	8 ± 6				0.2	3 ± 1				1	4		

*The SE's are based on duplicates for four of eight samples measured in Jyväskylä (Toolik Lake, Imnavait Creek, Grästjärn and Svartjärn). For the four samples without duplicates, SE of photochemical DIC production was calculated as cumulative variation among three DIC measurement injections using samples from the same vessel.

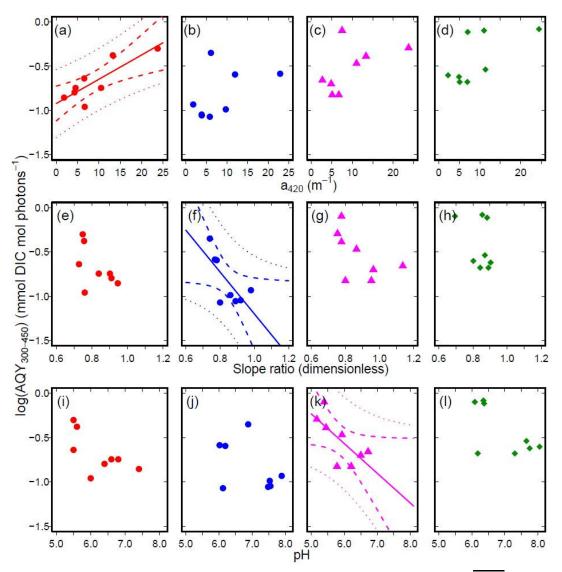


Figure S1. Scatterplots between the broadband apparent quantum yield $\overline{AQY}_{300-450}$ and the CDOM absorption coefficient at 420 nm (ag(420); a-d), the slope ratio (e-h) and pH (i-l), for the eight lakes measured in four laboratories, specifically Uppsala (first column, red squares), Michigan (second column, blue circles), Jyväskylä (third column, magenta triangles) and Georgia (fourth column, green diamonds). When significant, linear regression lines including 95% confidence intervals (dashed lines) and 95% prediction intervals (dotted lines) are shown as well.

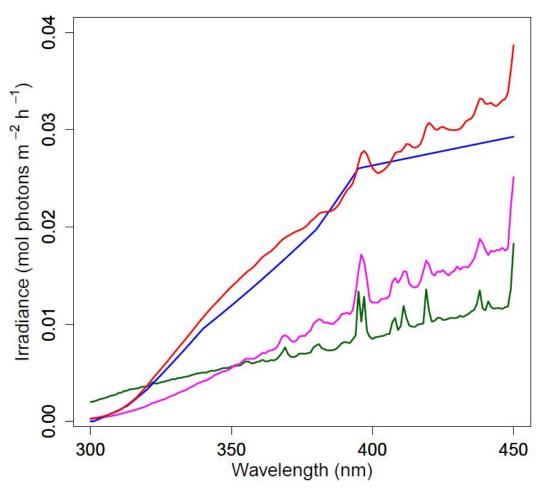


Figure S2. Irradiance spectra of the solar simulator lamps used during AQY experiments per laboratory, for Georgia (green), Jyväskylä (magenta), Michigan (blue) and Uppsala (red). In Goergia, Jyväskylä and Uppsala, irradiance was measured at 1-nm intervals. In Michigan laboratory, irradiance was measured at seven discrete wavelengths (i.e. 305, 313, 320, 340, 380, 395, 412 nm, see Table S1), and linearly interpolated to 1-nm increments.

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