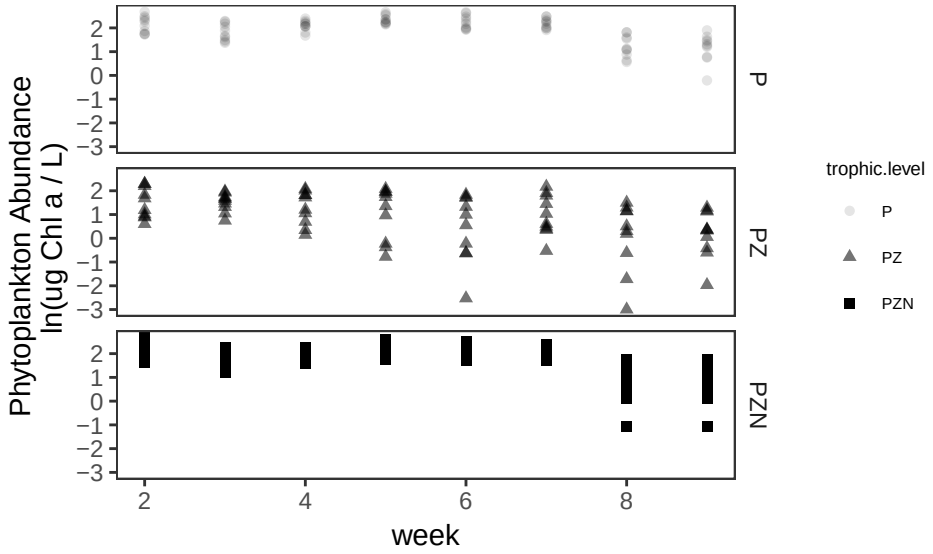
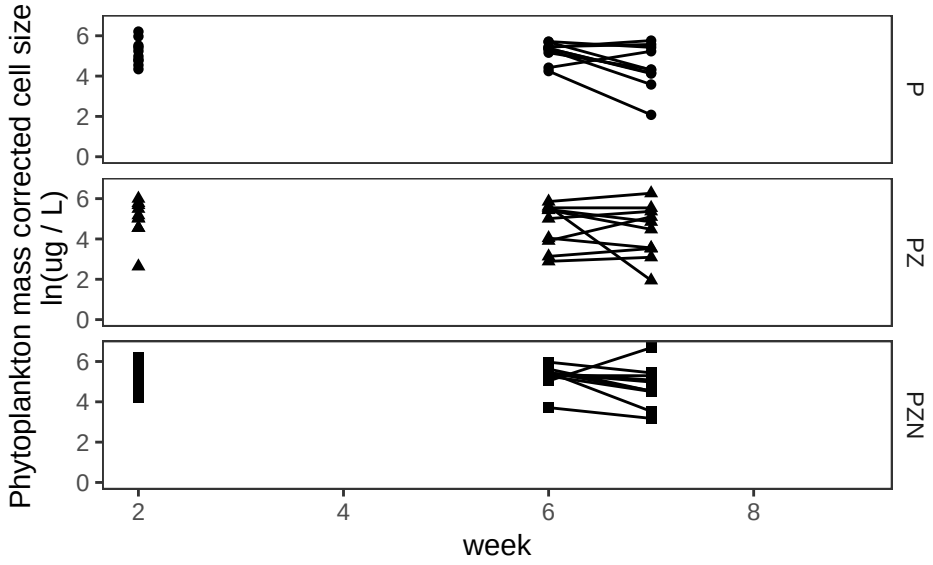
Temperature dependence of biomass and ecosystem function depend on species interactions. Supplementary File 2: Phytoplankton and oxygen flux results in main text.

0.5. Temporal Results: Chlorophyll over time (8 weeks)

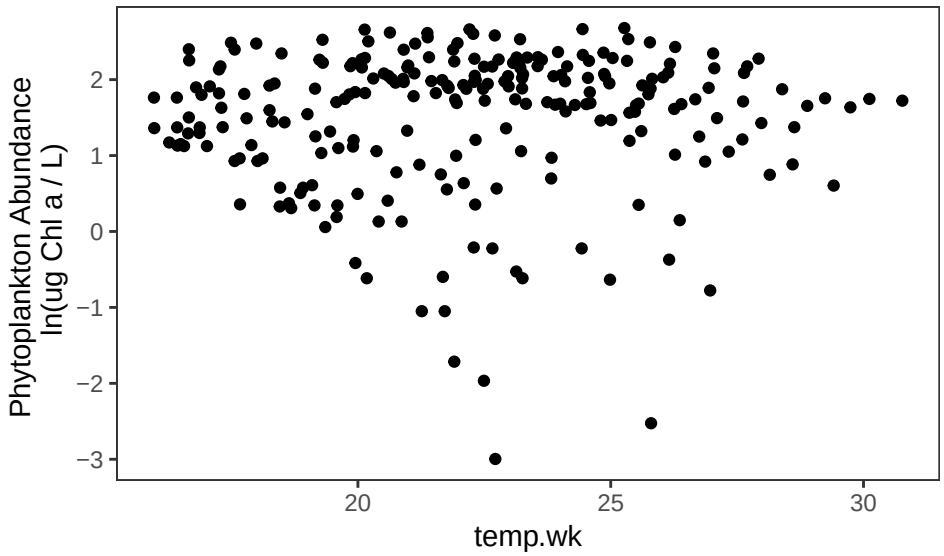



```
## Model selection table
##     (Int) trp.lvl     wek trp.lvl:wek df   logLik  AICc delta weight
## CT2 2.542       + -0.1161           +  8 -194.716 406.1  0.00  0.922
## CT3 2.819       + -0.1665              6 -199.331 411.0  4.97  0.077
## CT4 2.409         -0.1665              4 -206.272 420.7 14.66  0.001
## Models ranked by AICc(x)
## Random terms (all models):
## '1 | Tank'
```

0.5. Temporal Results: Pp size over time (8 weeks)

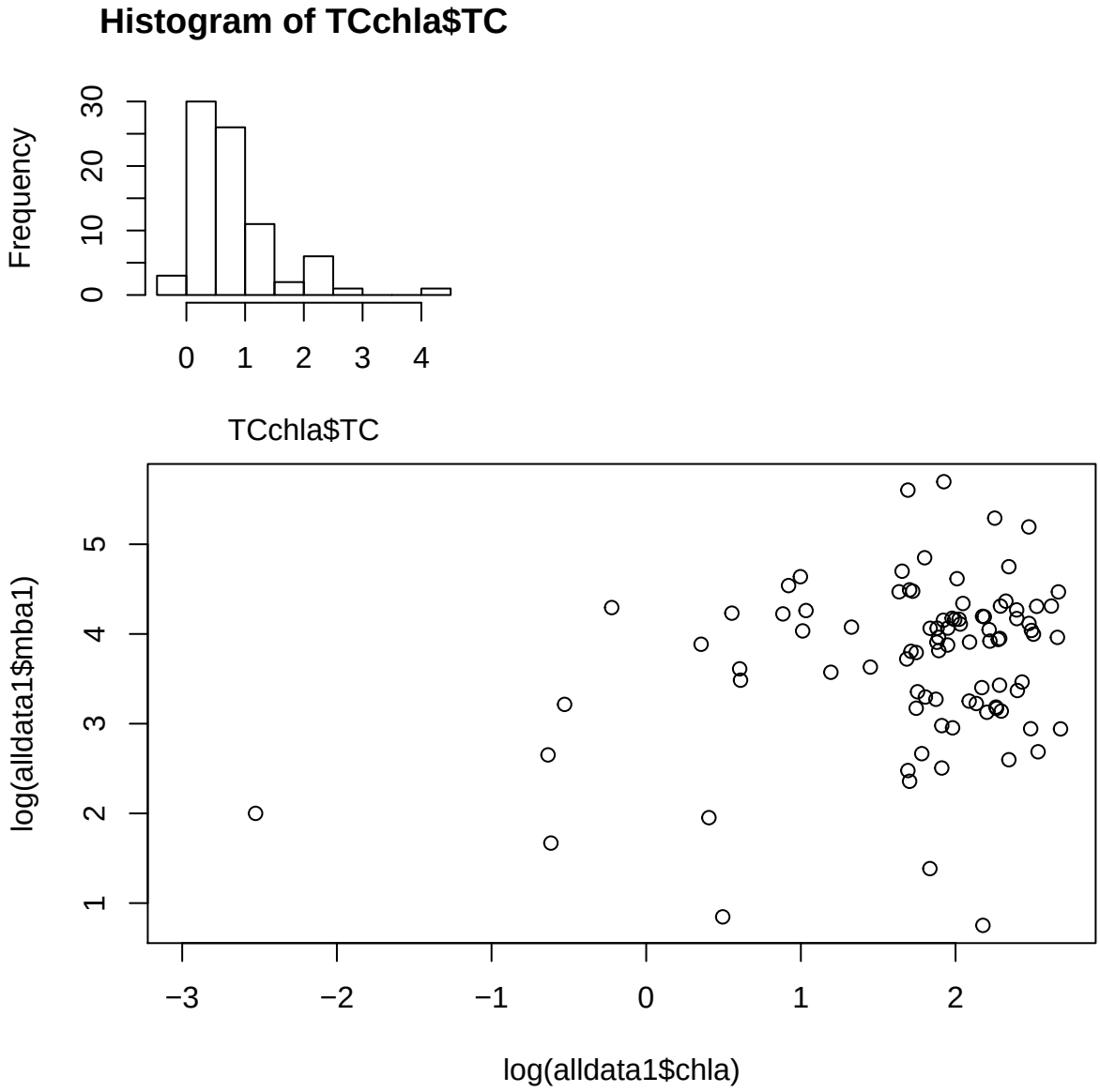


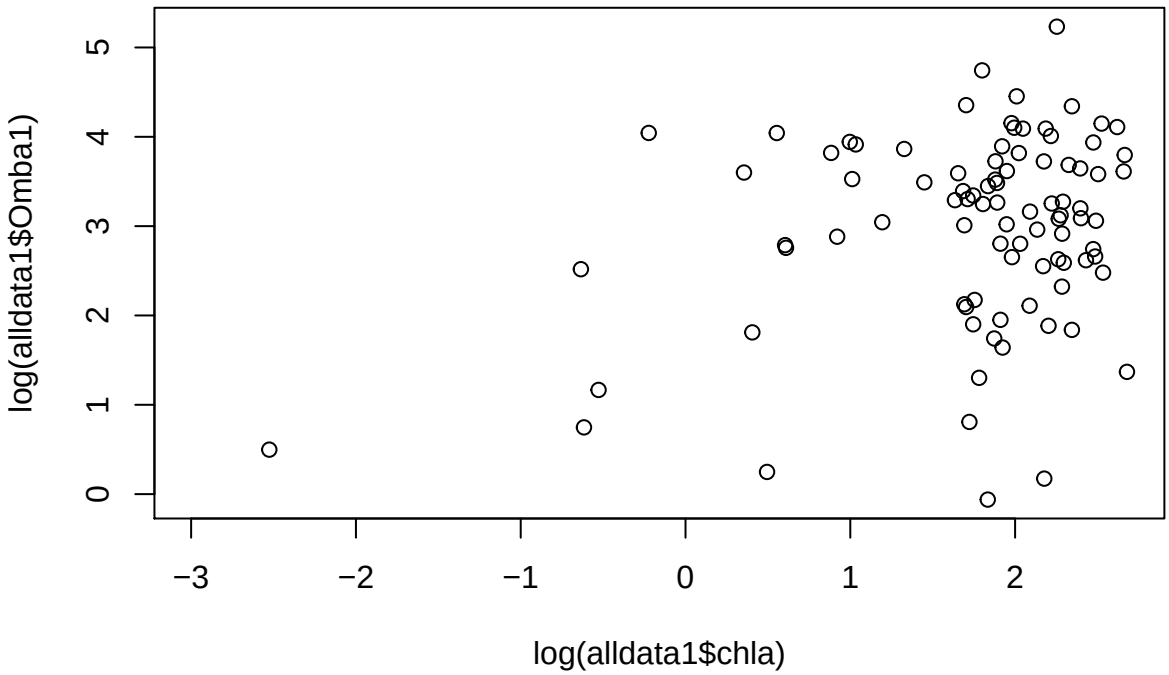
0.5. Temporal Results: Chlorophyll over temperatures

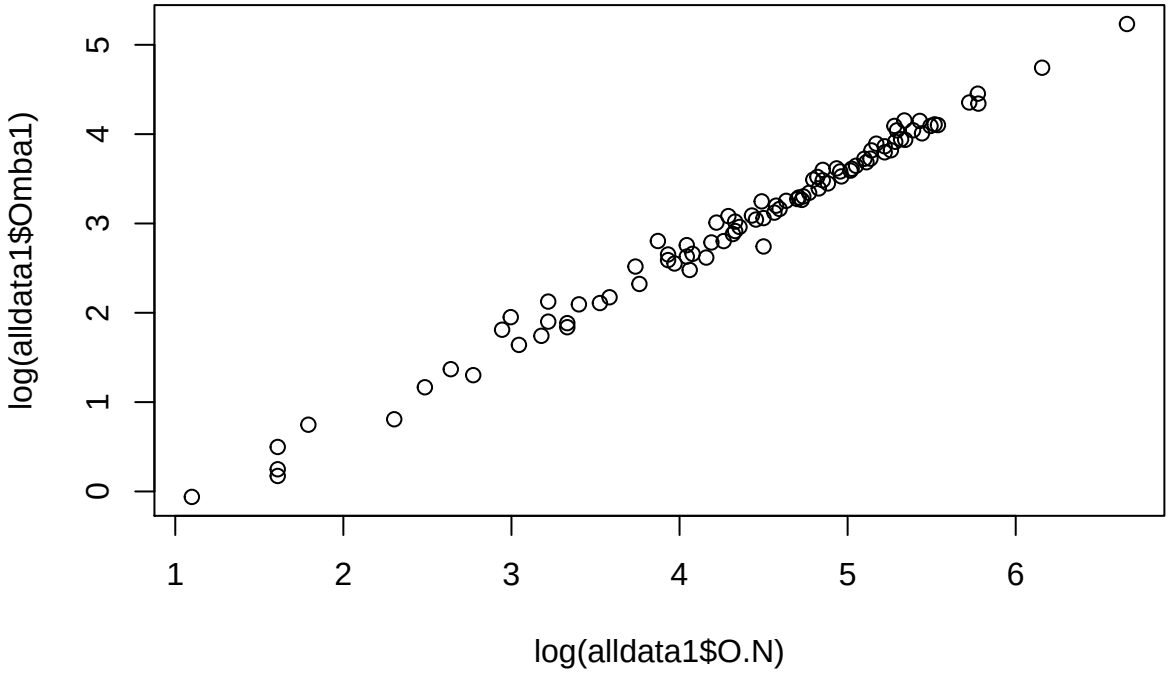


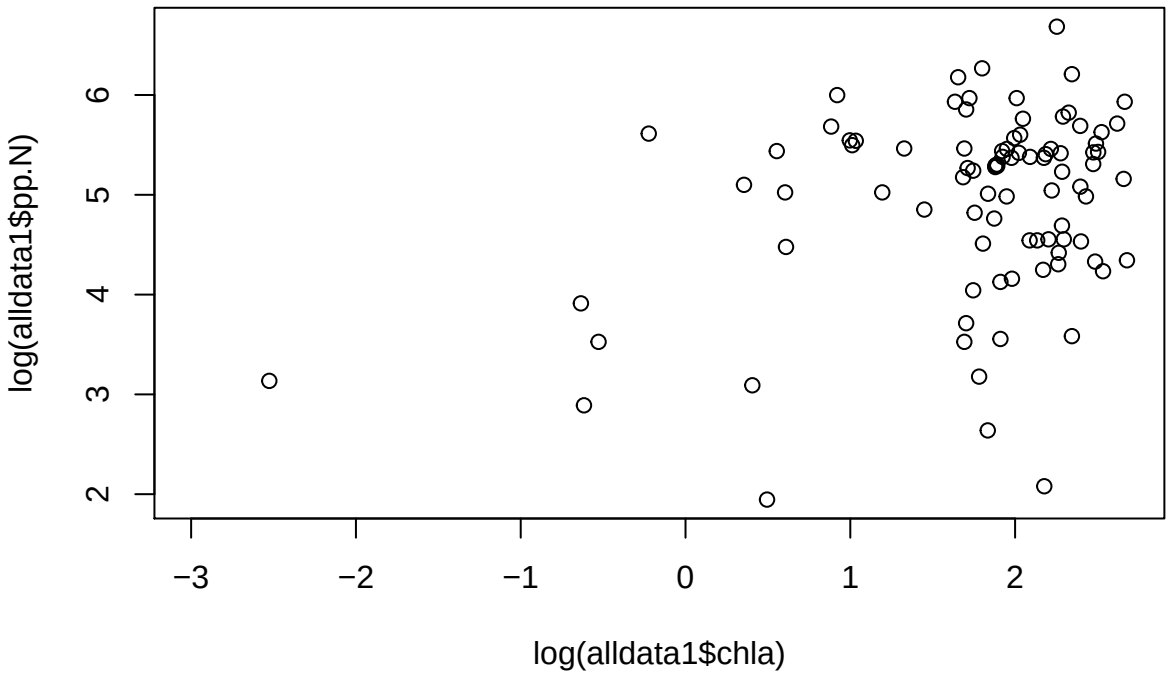
1. Trophic Cascade Results (Figure 2 Main text)

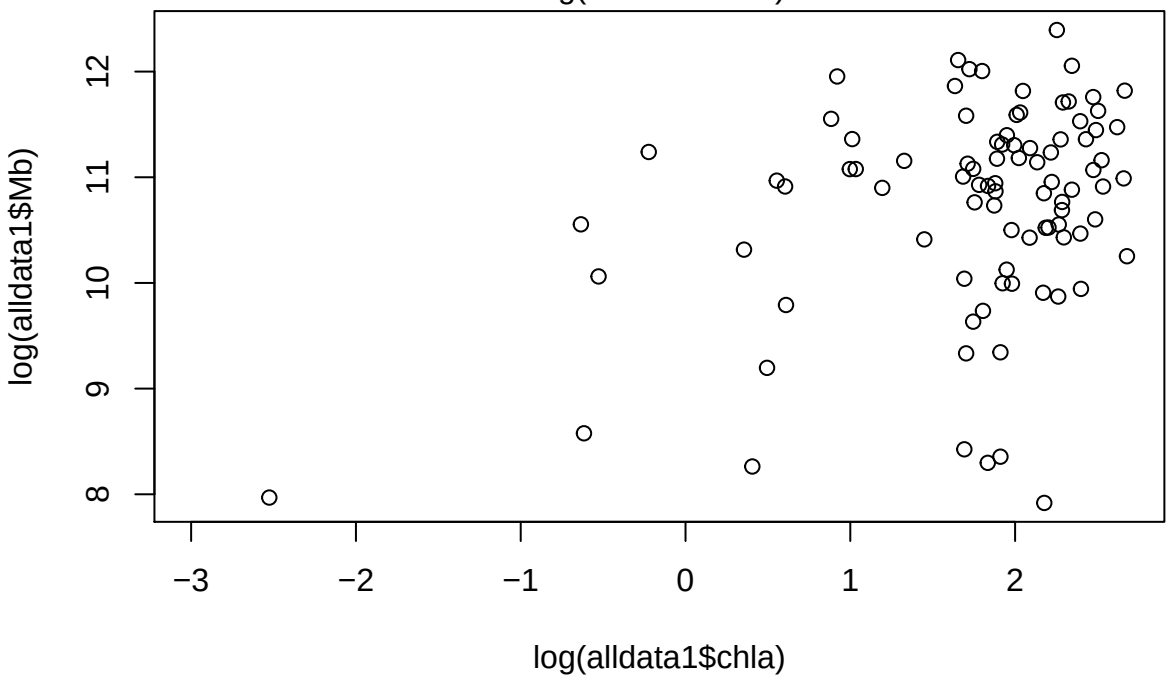
1.1 Trophic cascade (TC) is defined as log(PZN/PZ) for Chlorophyll a




log(alldata1$Omba1)
log(alldata1$chla)
0
1
2
3
4
5
−3
−2
−1
0
1
2


log(alldata1$Omba1)
log(alldata1$O.N)
0
1
2
3
4
5
1
2
3
4
5
6





1.2 duplicate TC analysis with TCmb

“‘{r, echo = FALSE}

TCmodb <- lme(TCMb ~ I(invTavg-mean(invTavg))*week, random = ~ 1|power + 1|week, data=TCvol, method = “REML”, na.action = na.omit) TCmodc <- lme(TCMb ~ I(invTavg-mean(invTavg))*week, random = ~ 1|power, data=TCvol, method = “REML”, na.action = na.omit)

anova(TCmodc, TCmodb)

```
#```{r}
## fixed effects model:
TCVmodb <- lme(TCMb ~ 1 + I(invTavg-mean(invTavg))*week, random = ~ 1|power, data=TCvol, method="ML", na
TCVmodc <- lme(TCMb ~ 1 + I(invTavg-mean(invTavg)) + week, random = ~ 1|power, data=TCvol, method="ML",
TCVmodd <- lme(TCMb ~ 1 + I(invTavg-mean(invTavg)), random = ~ 1|power, data=TCvol, method="ML", na.acti
TCVmode <- lme(TCMb ~ 1 + week, random = ~ 1|power, data=TCvol, method="ML", na.action=na.omit)
TCVmodf <- lme(TCMb ~ 1 + week, random = ~ 1|power, data=TCvol, method="ML", na.action=na.omit)

TCVres <- data.frame(model.sel(TCVmodb, TCVmodc, TCVmodd, TCVmode, TCVmodf))
```

1.1.2 Use nlme to compare fixed and ranefs

Table S2. 1: Model selection results for Trophic Cascade strength (Chl a) for linear mixed effects model

	Int	T	Wk	T*Wk	df	logLik	AICc	d	w
TCmodb	0.18	0.03	0.13	-0.13	6	-73.17	159.50	0.00	0.749796131
TCmodc	-0.02	-0.82	0.15	NA	5	-75.55	161.91	2.41	0.224356212
TCmode	0.57	NA	0.05	NA	4	-79.67	167.88	8.39	0.011316356
TCmodf	0.57	NA	0.05	NA	4	-79.67	167.88	8.39	0.011316356
TCmodd	0.83	0.00	NA	NA	4	-80.93	170.40	10.90	0.003214947

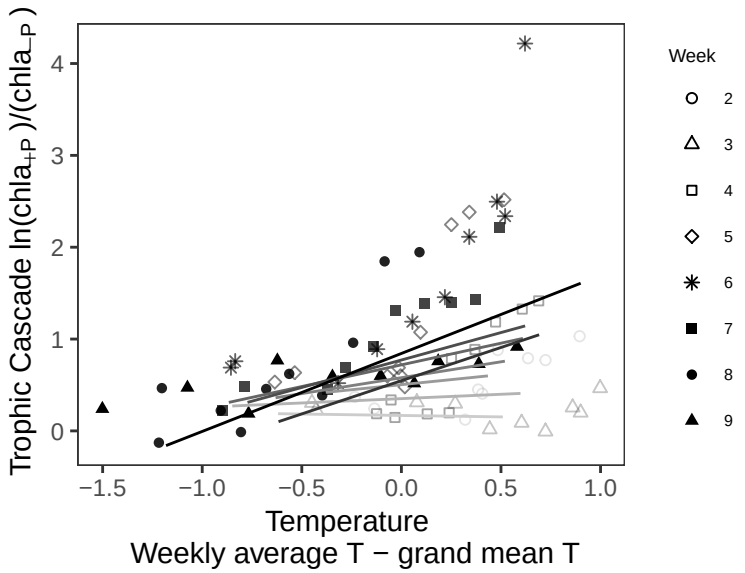
Summary of best model: trophic cascade strength

```
## Linear mixed-effects model fit by maximum likelihood
##  Data: TCchla
##       AIC      BIC    logLik
##   158.345 172.6371 -73.17248
##
## Random effects:
##  Formula: ~1 | power
##         (Intercept)  Residual
## StdDev:   0.1498711 0.5883612
##
## Fixed effects: TC ~ 1 + I(invTavg - mean(invTavg)) * week
##                                       Value Std.Error DF   t-value p-value
## (Intercept)                       0.1800156 0.2347745 67  0.766760  0.4459
## I(invTavg - mean(invTavg))        0.0312063 0.4087578 67  0.076344  0.9394
## week                              0.1334953 0.0379404 67  3.518551  0.0008
## I(invTavg - mean(invTavg)):week -0.1257280 0.0572430 67 -2.196390  0.0315
##  Correlation:
##                                  (Intr) I(nT-m(T)) week
## I(invTavg - mean(invTavg))        0.530
## week                             -0.920 -0.424
## I(invTavg - mean(invTavg)):week -0.335 -0.906      0.187
##
## Standardized Within-Group Residuals:
##         Min          Q1         Med          Q3         Max
## -2.21341355 -0.48187644 -0.06052218  0.43164327  4.40130752
##
## Number of Observations: 80
```

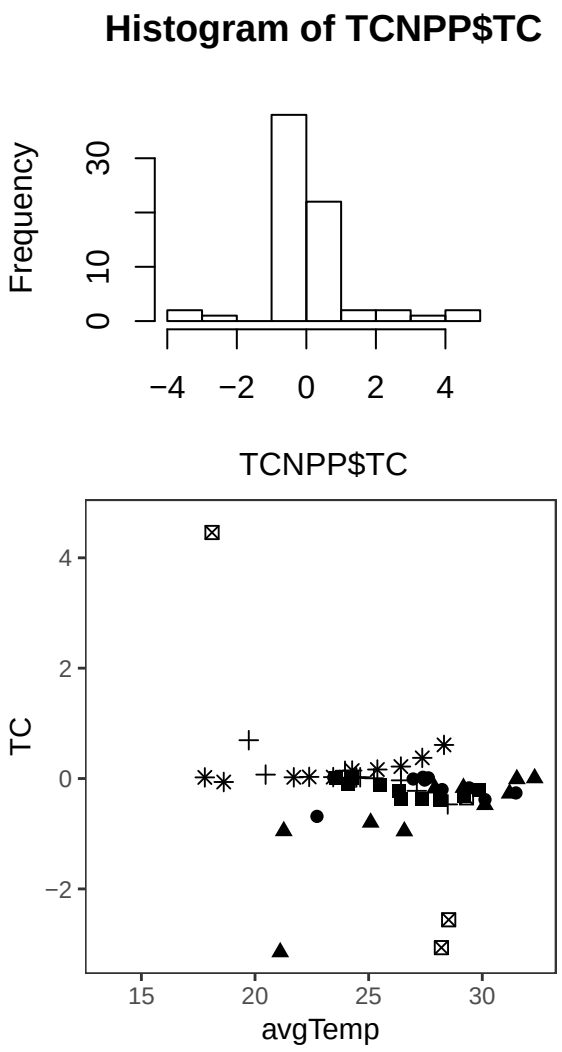
```
## Number of Groups: 10
```

```
## Approximate 95% confidence intervals
##
##  Fixed effects:
##                                         lower       est.       upper
## (Intercept)                       -0.27673063  0.1800157  0.63676193
## I(invTavg - mean(invTavg))        -0.76401909  0.0312063  0.82643170
## week                               0.05968344  0.1334953  0.20730721
## I(invTavg - mean(invTavg)):week -0.23709240 -0.1257280 -0.01436351
## attr(,"label")
## [1] "Fixed effects:"
##
##  Random Effects:
##   Level: power
##                         lower      est.     upper
## sd((Intercept)) 0.02252525 0.1498711 0.9971638
##
##  Within-group standard error:
##     lower      est.     upper
## 0.4932259 0.5883612 0.7018465
```

Figure S2. 2: Trophic Cascade strength by temperature and week

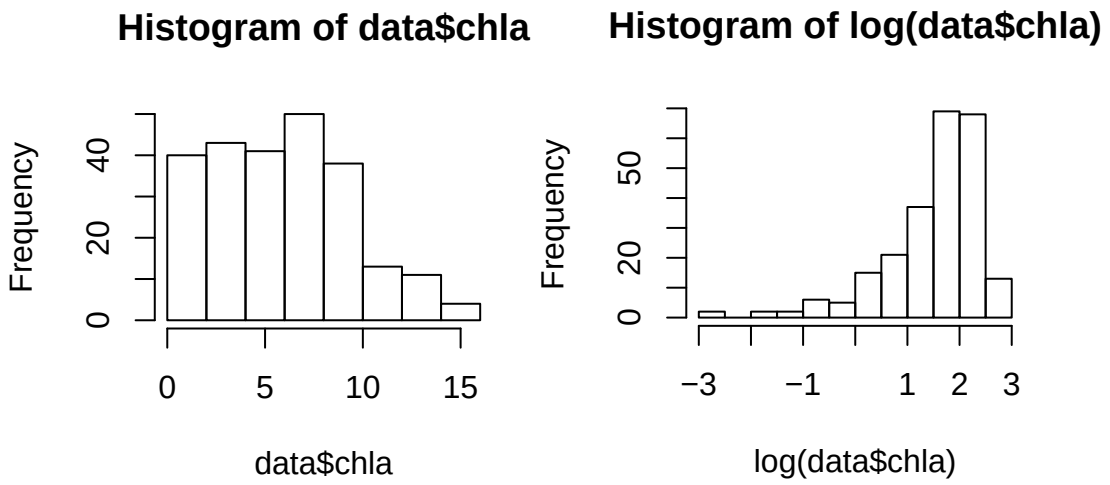


1.2. Strength of trophic cascade on NPP2



2.1 Phytoplankton abundance (for Figure 3, Table 2 main text)

Figure S2. 3: Chlorophyll a concentration



2.1.1 Phytoplankton abundance candidate models

Table S2. 2: Model selection results for Phytoplankton (Chl a) for linear mixed effects model

	Int	TL	Tw	Tt	Tw*Tt	Tw*TL	Tt*TL	df	logLik	AICc	d	w
modPB8	2.05	+	-0.66	1.30	NA	+	+	11	-162.86	348.87	0.00	9.528594e-01
modPB7	2.05	+	-0.96	1.30	NA	NA	+	9	-168.05	354.89	6.02	4.701760e-02
modPBF	2.14	+	-0.52	2.16	1.34	+	NA	10	-172.91	366.78	17.91	1.229740e-04
modPB4	1.50	NA	-0.96	1.70	0.96	NA	NA	6	-207.94	428.24	79.37	5.540632e-18
modPB6	1.91	+	-0.66	NA	NA	+	NA	8	-206.58	429.79	80.92	2.557698e-18
modPB3	1.50	NA	-0.96	1.71	NA	NA	NA	5	-211.73	433.72	84.85	3.574194e-19
modPB5	1.91	+	-0.96	NA	NA	NA	NA	6	-211.45	435.26	86.39	1.655581e-19
modPB2	1.50	NA	-0.96	NA	NA	NA	NA	4	-218.40	444.97	96.10	1.288997e-21
modPB1	1.90	+	NA	NA	NA	NA	NA	5	-257.21	524.68	175.81	6.335854e-39
modPB0	1.49	NA	NA	NA	NA	NA	NA	3	-264.15	534.41	185.54	4.894727e-41

Table S2. 3: Parameter estimates from model PB8 (Table S2.1) for Phytoplankton (Chl a) for linear mixed effects model

	Ea	lower	upper
P	1.30	0.84	1.76
PZ	3.15	2.76	3.54
PZN	1.65	1.19	2.10

2.1.1b Phytoplankton metabolic biomass candidate models

2.2 Net ecosystem oxygen production

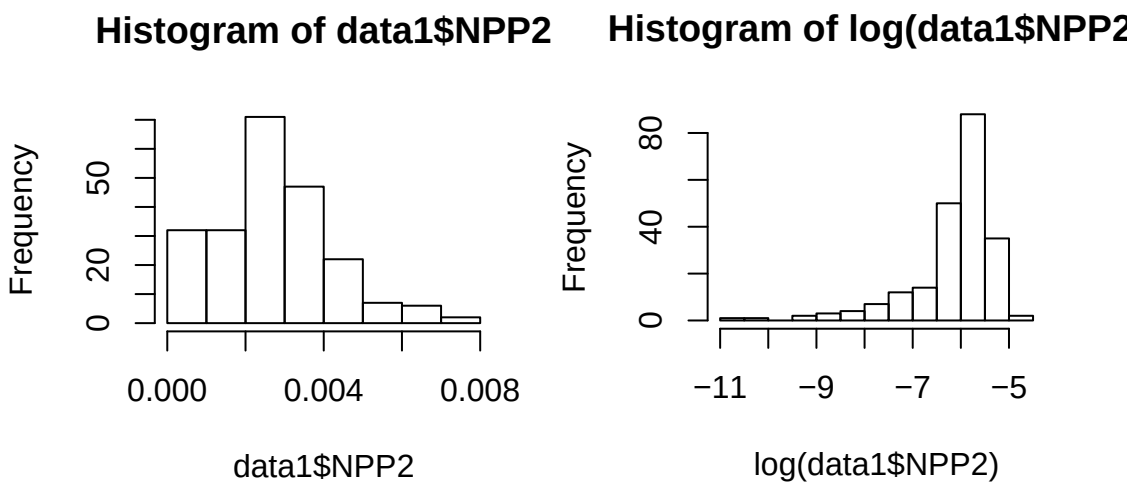


Table S2. 4: Model selection results for Net Ecosystem Oxygen Production, with 1|Tank as a random effect. Model terms are: intercept (Int), trophic treatment (TL), Temperature - weekly average (Tw), temperature - expt average (Tt), interaction terms and statistical estimates

	Int	TL	Tw	Tt	Tw*Tt	Tw*TL	Tt*TL	df	logLik	AICc	d	w
modNPP8	-6.42	+	0.29	-1.40	NA	+	+	11	-266.47	556.21	0.00	3.878747e-01
modNPPF	-6.42	+	0.37	-1.42	0.84	+	+	12	-265.54	556.60	0.39	3.192963e-01
modNPP7	-6.41	+	0.03	-1.39	NA	NA	+	9	-269.68	558.22	2.01	1.421535e-01
modNPP3	-6.15	NA	0.02	-0.96	NA	NA	NA	5	-274.36	559.01	2.80	9.557409e-02
modNPP4	-6.15	NA	0.02	-0.96	0.61	NA	NA	6	-273.86	560.12	3.91	5.487563e-02
modNPP0	-6.15	NA	NA	NA	NA	NA	NA	3	-283.15	572.41	16.20	1.179389e-04
modNPP2	-6.15	NA	0.03	NA	NA	NA	NA	4	-283.13	574.44	18.23	4.265400e-05
modNPP1	-6.26	+	NA	NA	NA	NA	NA	5	-282.25	574.78	18.57	3.596974e-05
modNPP6	-6.26	+	0.27	NA	NA	+	NA	8	-279.83	576.34	20.13	1.647426e-05
modNPP5	-6.26	+	0.03	NA	NA	NA	NA	6	-282.23	576.85	20.64	1.278556e-05

NPP Coefficients

Table S2. 5: Parameter estimates from model NPP8 (Table S2.3) for Net Ecosystem Oxygen Productivity (NEP) for linear mixed effects model(For MS Figure 3)

	Ea	lower	upper
P	-1.41	-2.24	-0.58
PZ	-1.21	-2.36	-0.07
PZN	-0.99	-2.10	0.12

2.2 Net ecosystem oxygen consumption (ER)

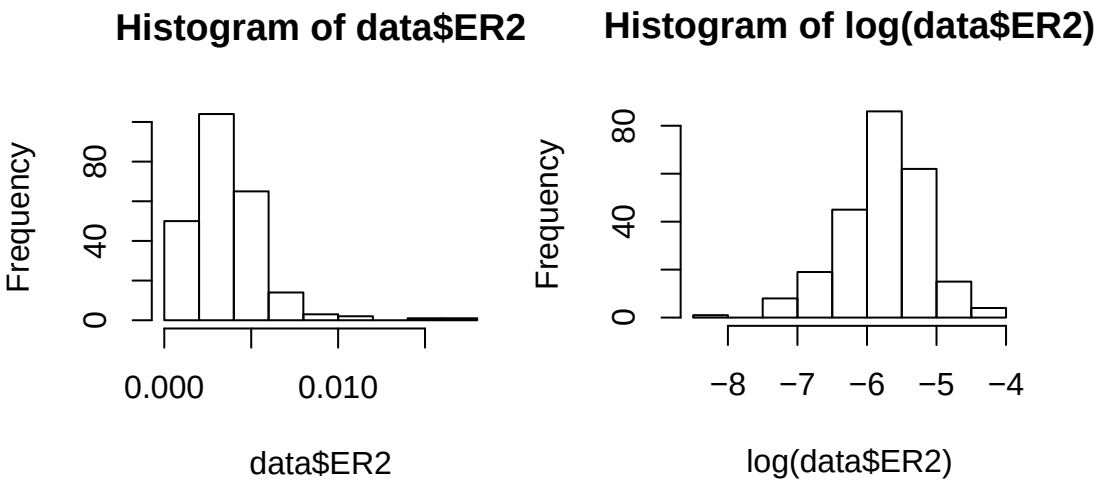


Table S2. 6: Model selection results for Net Ecosystem Respiration, with 1|Tank as a random effect. Model terms are: intercept (Int), trophic treatment (TL), Temperature - weekly average (Tw), temperature - expt average (Tt), interaction terms and statistical estimates

	Int	TL	Tw	Tt	Tw*Tt	Tw*TL	Tt*TL	df	logLik	AICc	d	w
modER7	-6.09	+	0.11	-1.32	NA	NA	+	9	-185.88	390.54	0.00	6.849070e-01
modER8	-6.09	+	0.02	-1.32	NA	+	+	11	-184.58	392.31	1.77	2.824415e-01
modERF	-6.04	+	0.06	-0.85	0.43	+	NA	10	-187.83	396.63	6.09	3.262787e-02
modER3	-5.79	NA	0.11	-0.67	NA	NA	NA	5	-201.37	413.00	22.46	9.087033e-06
modER4	-5.79	NA	0.11	-0.68	0.50	NA	NA	6	-200.45	413.27	22.73	7.947617e-06
modER1	-5.94	+	NA	NA	NA	NA	NA	5	-202.46	415.18	24.64	3.058608e-06
modER5	-5.94	+	0.11	NA	NA	NA	NA	6	-201.75	415.85	25.31	2.182667e-06
modER6	-5.94	+	0.02	NA	NA	+	NA	8	-200.49	417.60	27.06	9.127731e-07
modER0	-5.79	NA	NA	NA	NA	NA	NA	3	-207.04	420.17	29.63	2.518649e-07
modER2	-5.79	NA	0.11	NA	NA	NA	NA	4	-206.32	420.82	30.28	1.825257e-07

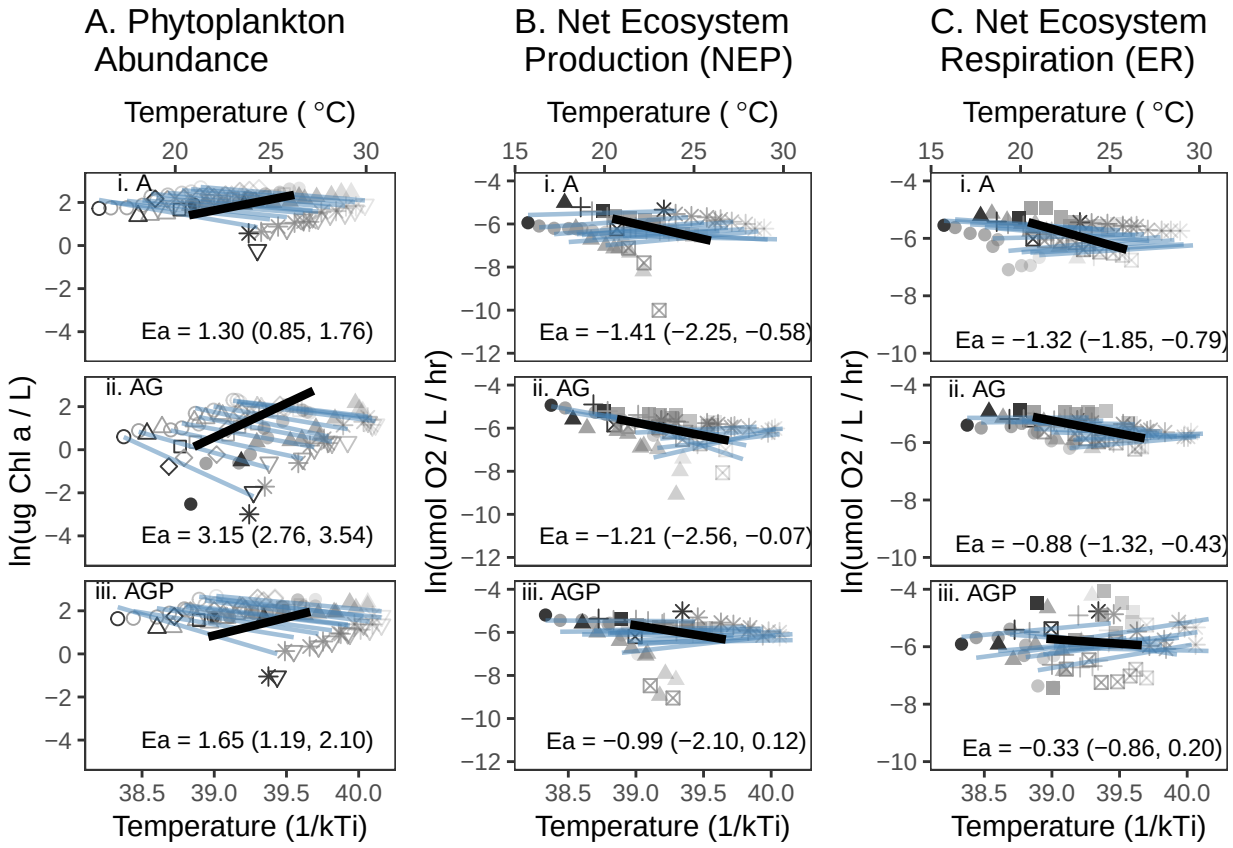
ER coefficients

Table S2. 7: Confidence intervals for model ER7 (Table S2.5) (For MS Figure 3

	Ea	lower	upper
P	-1.3150573	-1.8189019	-0.8112127
PZ	-0.9065681	-1.3325385	-0.4805977
PZN	-0.3177815	-0.8197504	0.1841874

Figure 3 (Full)

Figure S2. 5: Manuscript figure 3: Effects of temperature on oxygen flux and phytoplankton standing stock


A. Phytoplankton Abundance
B. Net Ecosystem Production (NEP)
C. Net Ecosystem Respiration (ER)
Temperature (°C)
i. A
ii. AG
iii. AGP
Ea = 1.30 (0.85, 1.76)
Ea = 3.15 (2.76, 3.54)
Ea = 1.65 (1.19, 2.10)
Ea = −1.41 (−2.25, −0.58)
Ea = −1.21 (−2.56, −0.07)
Ea = −0.99 (−2.10, 0.12)
Ea = −1.32 (−1.85, −0.79)
Ea = −0.88 (−1.32, −0.43)
Ea = −0.33 (−0.86, 0.20)
ln(ug Chl a / L)
ln(umol O2 / L / hr)
Temperature (1/kTi)

```
## pdf
##   2
```