

CASM-cosm Calibration Update

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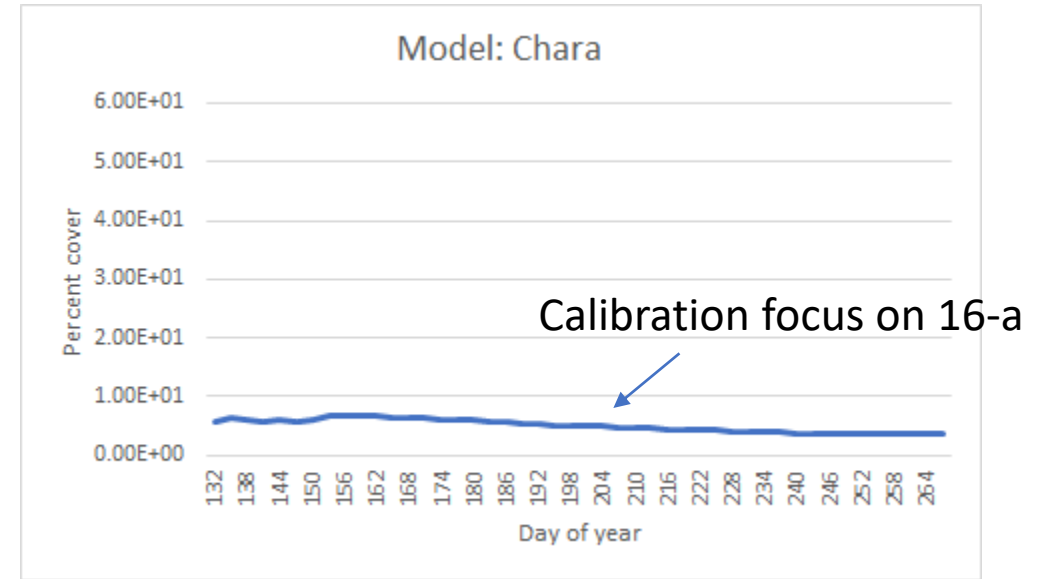
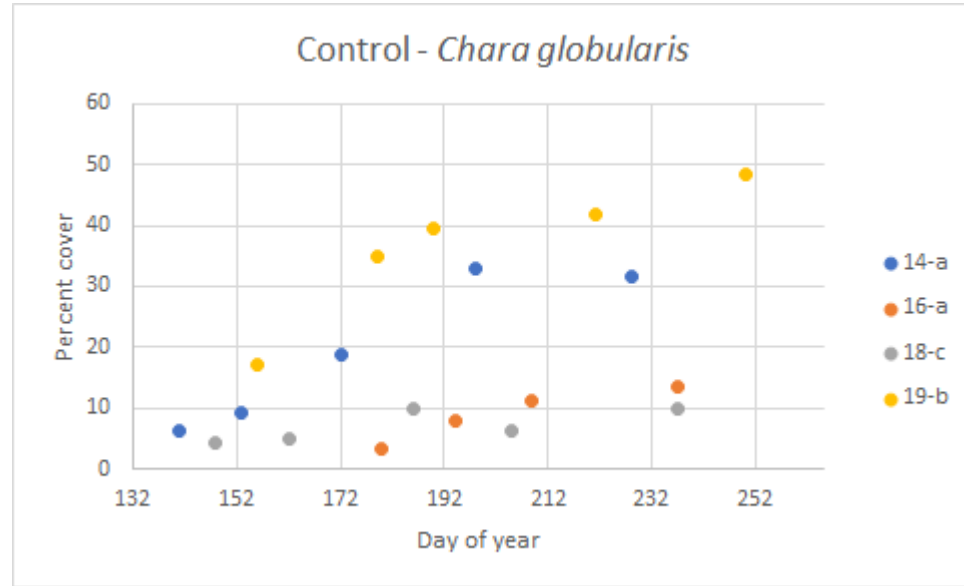
Update - objectives

- Achieve more realistic calibrations for periphyton and phytoplankton chlorophyll concentrations
- Revised calibrations for entire CASM-cosm food web

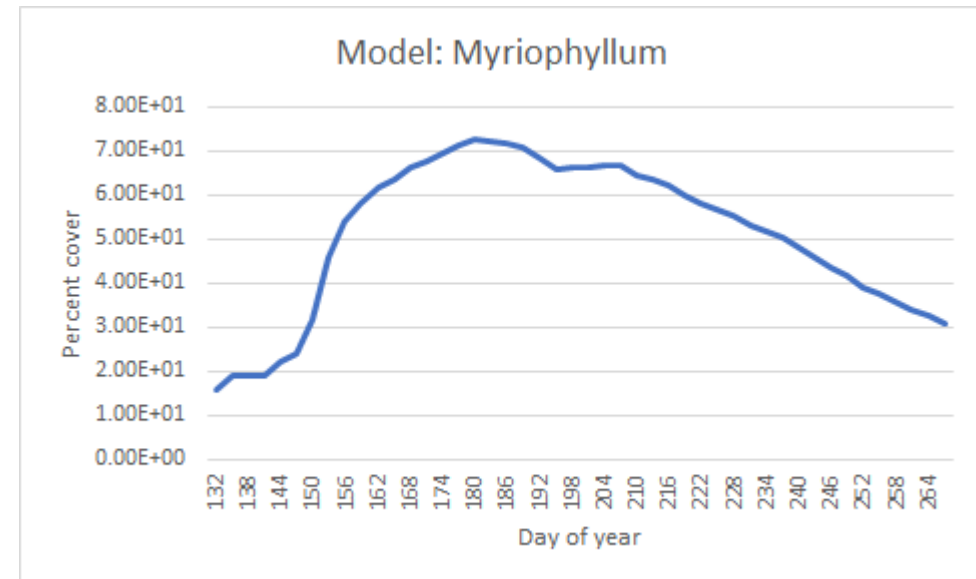
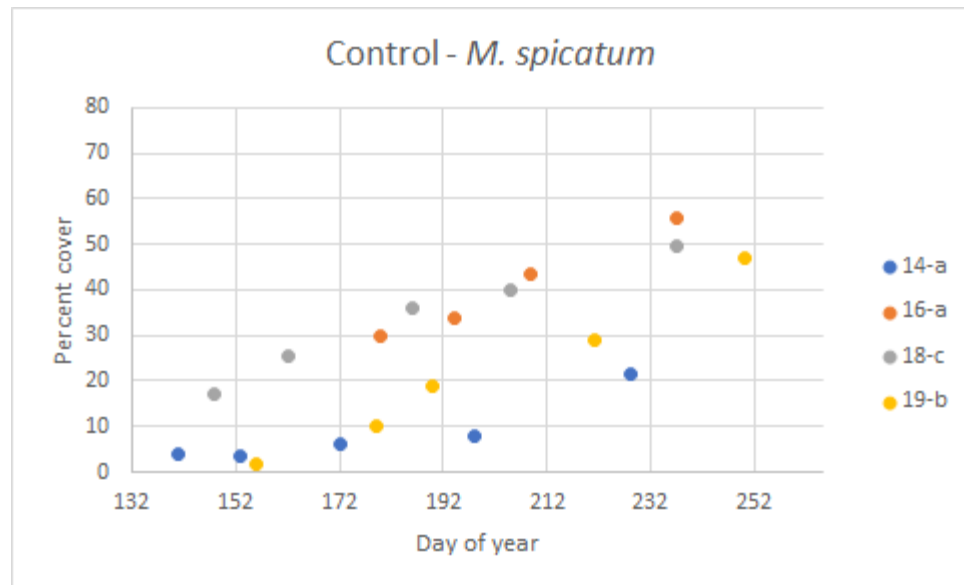
Update approach

- Calibrations were revised since previous ASM group meeting
- Focus was on revisions to bioenergetics parameters
 - Aquatic plants: photosynthesis rates, standard respiration rates, mortality rates
 - Consumers: consumption rates, standard respiration rates, mortality rates
- Individual mass (ug C) from reported mesocosm data were used
- Physical-chemical inputs for the 16-a mesocosm study were used
- Calibration criteria used were
 - Comparisons with control data (average, min, max) for 14-a, 16-a, 18-c, and 19-b for 365 modeled days and model days 132 – 265 (time span of mesocosm control data)
 - Plots of temporal values of model outputs compared with data

Macrophytes



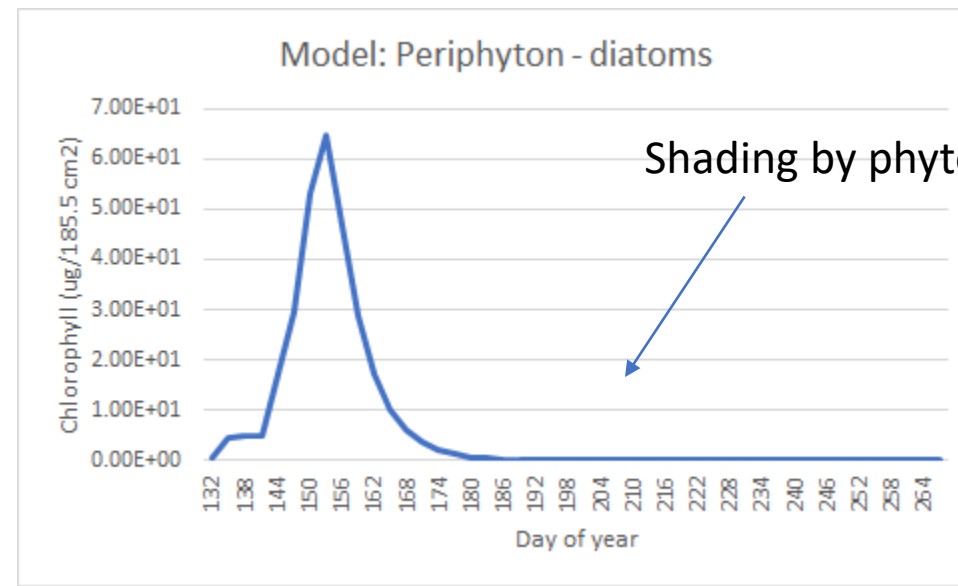
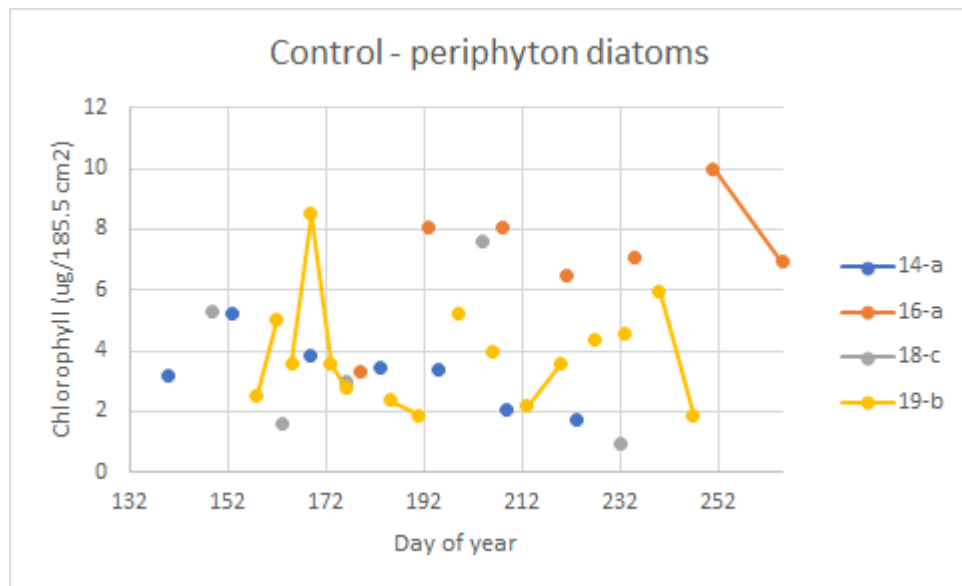
	Percent cover				Calibration	
Chara globularis	14-a	16-a	18-c	19-b	365	132-265
Mean	19.77	10.27	7.13	36.34	5.93	5.03
Min	6.40	3.22	4.20	17.00	3.55	3.55
Max	33.10	15.38	10.04	48.30	10.06	6.64



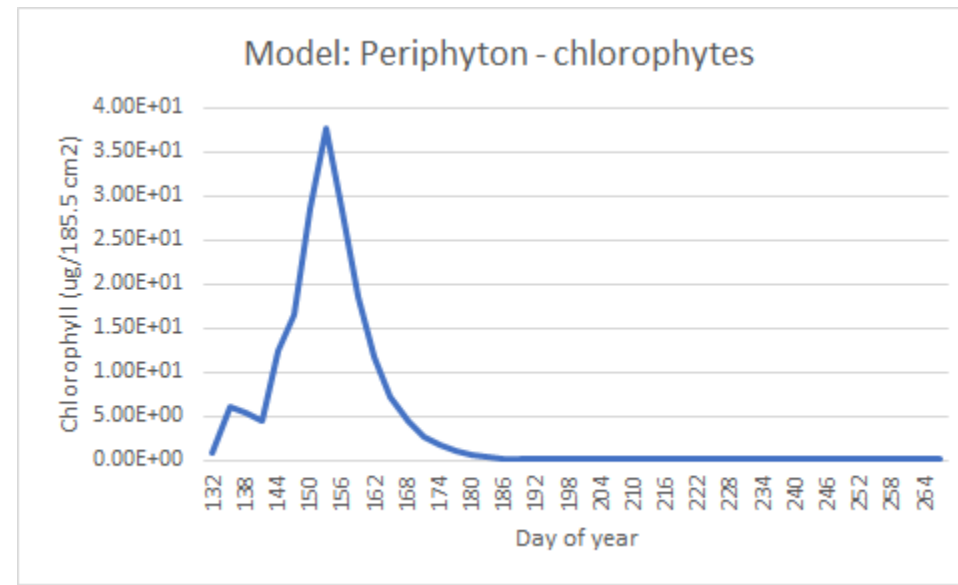
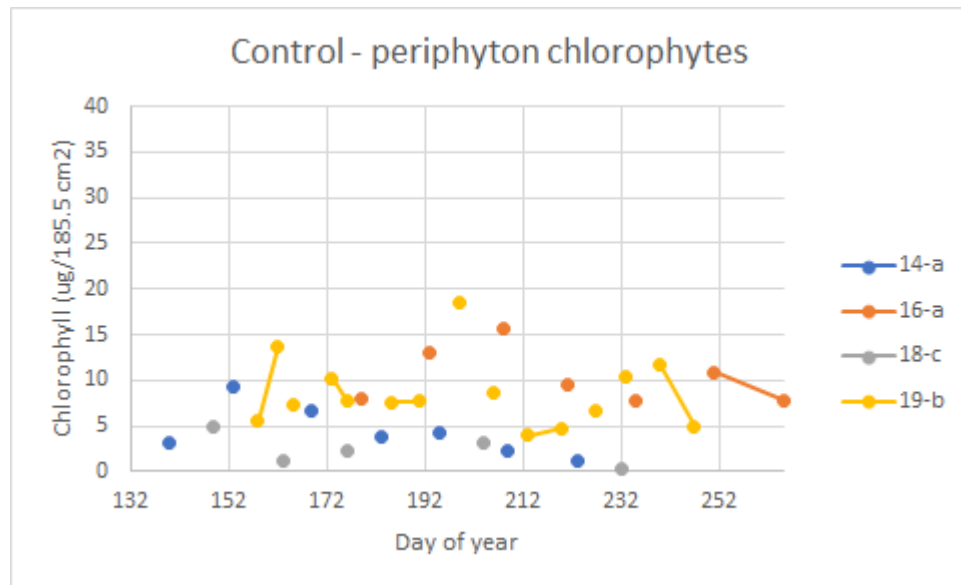
	Percent cover				Calibration	
<i>M. spicatum</i>	14-a	16-a	18-c	19-b	365	132-265
Mean	8.65	42.50	33.62	21.33	29.12	45.33
Min	3.70	29.72	17.24	1.70	6.97	9.87
Max	21.73	55.65	49.80	47.15	72.78	72.78

Periphyton

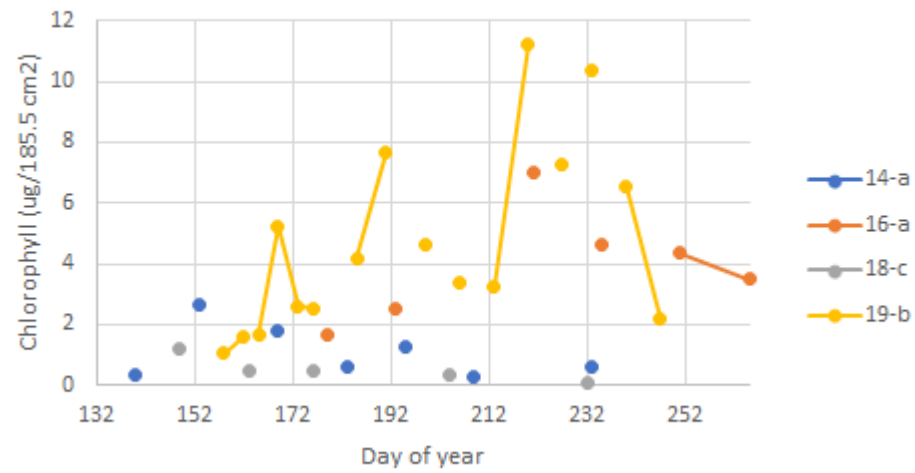
	Periphyton, ug Chlor/185.5 cm2				Calibration	
Diatoms	14-a	16-a	18-c	19-b	365	132-265
Mean	3.26	7.14	3.69	3.87	2.46	5.51
Min	1.76	3.34	0.97	1.87	0.02	0.02
Max	5.22	10.00	7.58	8.52	64.76	64.76
Greens	14-a	16-a	18-c	19-b	365	132-265
Mean	4.35	10.40	2.38	8.62	1.58	3.51
Min	1.13	7.80	0.39	3.91	0.02	0.02
Max	9.29	15.59	4.82	18.45	37.60	37.60
Bl greens	14-a	16-a	18-c	19-b	365	132-265
Mean	1.09	5.98	0.51	4.71	0.06	0.05
Min	0.30	1.68	0.07	1.05	0.02	0.02
Max	2.66	18.16	1.19	11.22	0.27	0.27
Cryptoph	14-a	16-a	18-c	19-b	365	132-265
Mean	0.88	2.67	1.47	1.52	0.07	0.10
Min	0.41	0.28	0.39	0.14	0.02	0.02
Max	1.32	8.13	3.84	6.05	0.70	0.70



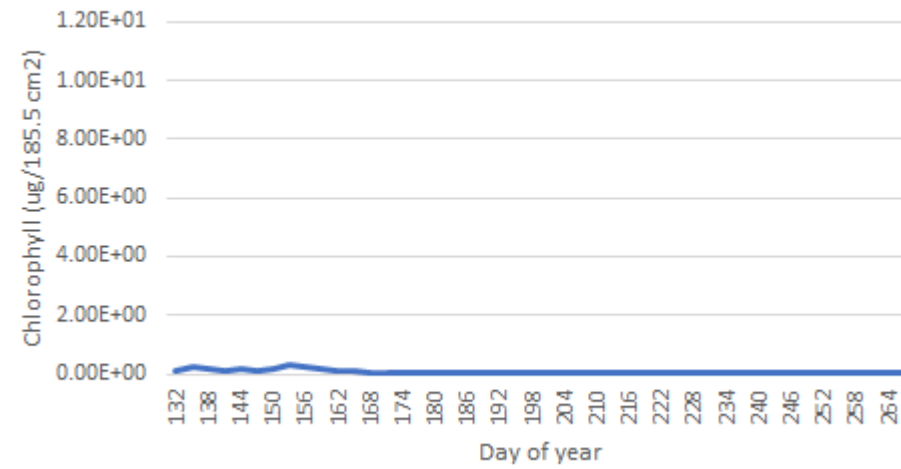
Note: Excel sometimes connects data points with lines...



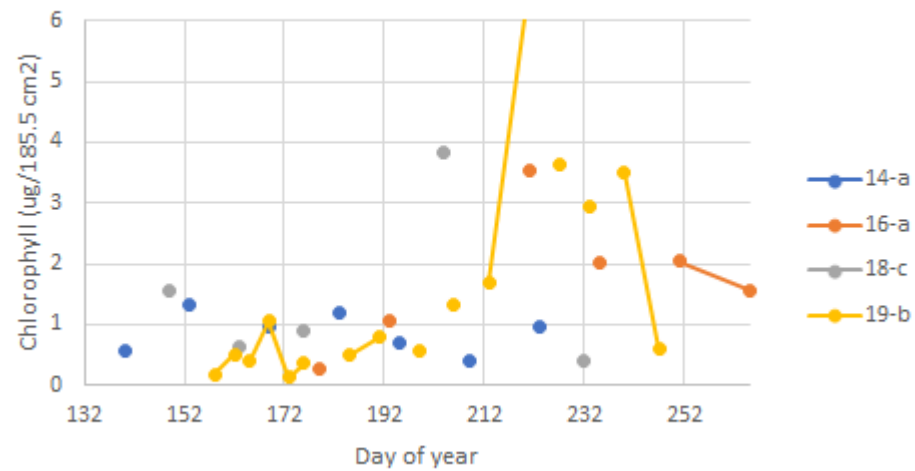
Control - periphyton blue greens



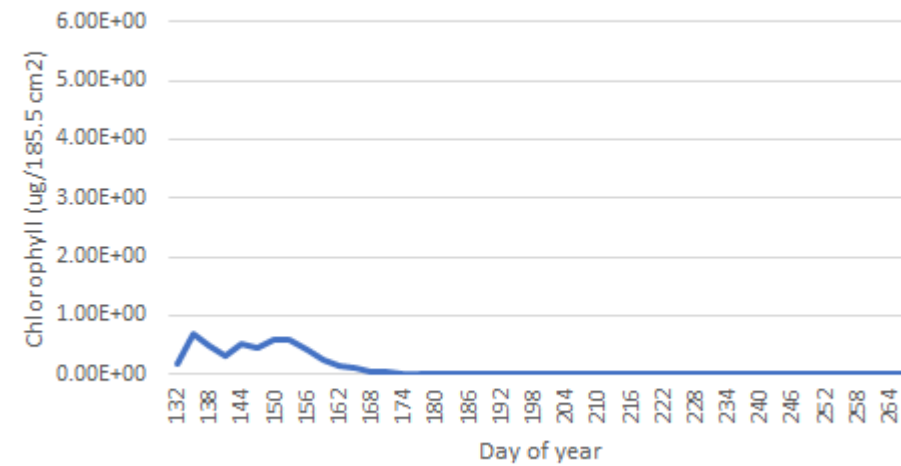
Model: Periphyton - blue greens



Control - periphyton cryptophytes



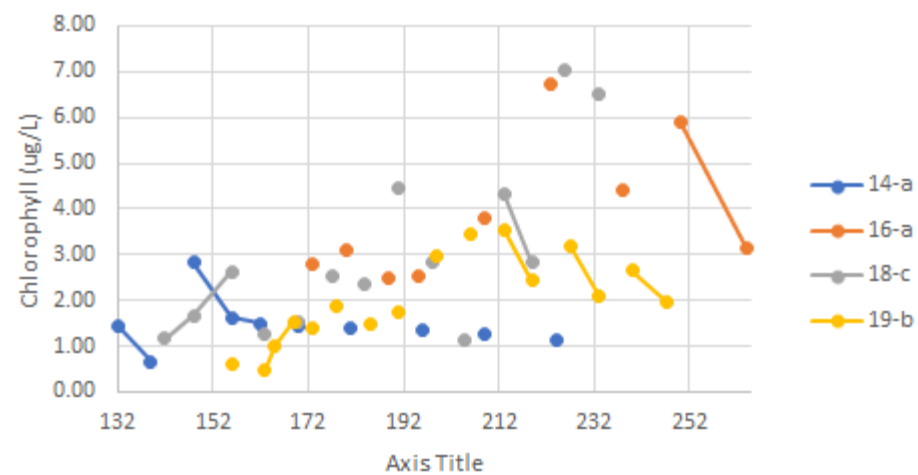
Model: Periphyton - cryptophytes



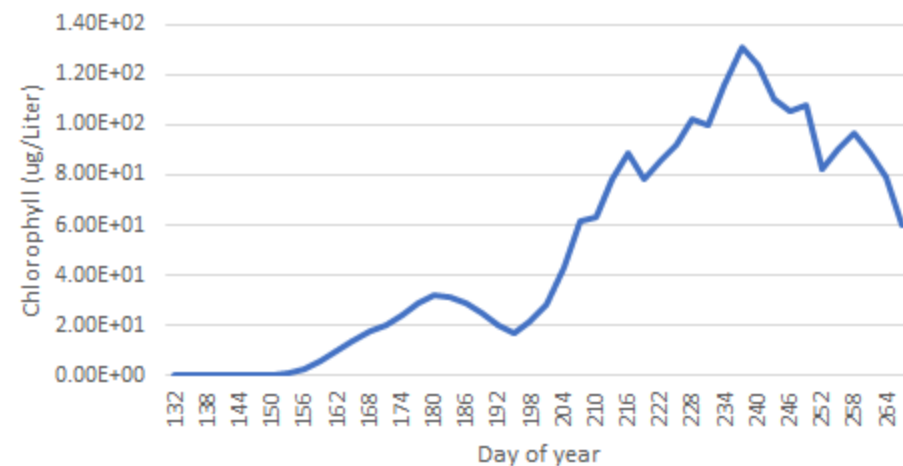
Phytoplankton

	Phytoplakton, ug Chlor/L				Calibration	
Diatoms	14-a	16-a	18-c	19-b	365	132-265
Mean	1.46	3.88	3.02	2.03	21.31	42.77
Min	0.67	2.50	1.15	0.49	0.00	0.00
Max	2.82	6.72	7.02	3.55	130.71	130.71
Greens	14-a	16-a	18-c	19-b	365	132-265
Mean	1.92	7.95	5.54	1.31	6.45	11.55
Min	0.30	2.57	0.00	0.19	0.00	0.00
Max	5.19	19.90	27.79	4.49	49.70	49.70
Bl greens	14-a	16-a	18-c	19-b	365	132-265
Mean	0.44	3.05	2.50	1.40	5.73	9.38
Min	0.08	0.88	0.86	0.28	0.00	0.00
Max	0.73	6.08	6.34	2.93	72.01	72.01
Cryptoph	14-a	16-a	18-c	19-b	365	132-265
Mean	0.88	2.21	2.58	3.00	0.86	1.64
Min	0.27	0.08	0.10	0.61	0.00	0.00
Max	2.20	5.24	6.04	6.19	5.78	5.78

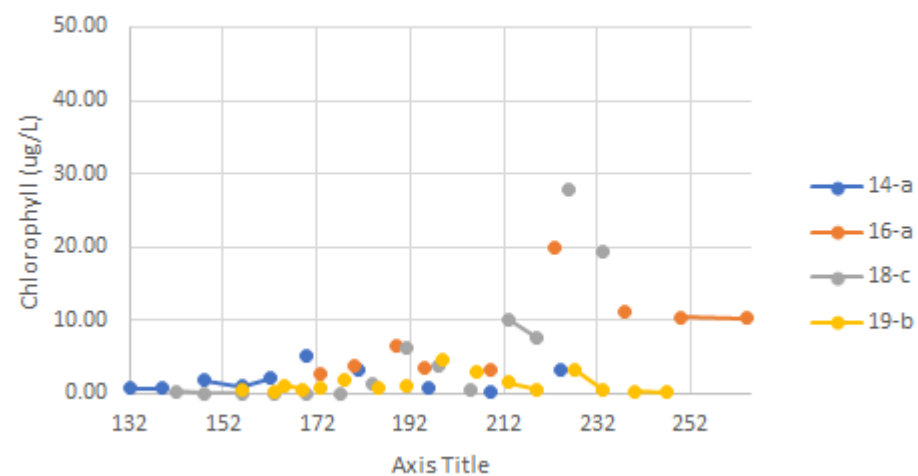
Control - phytoplankton diatoms



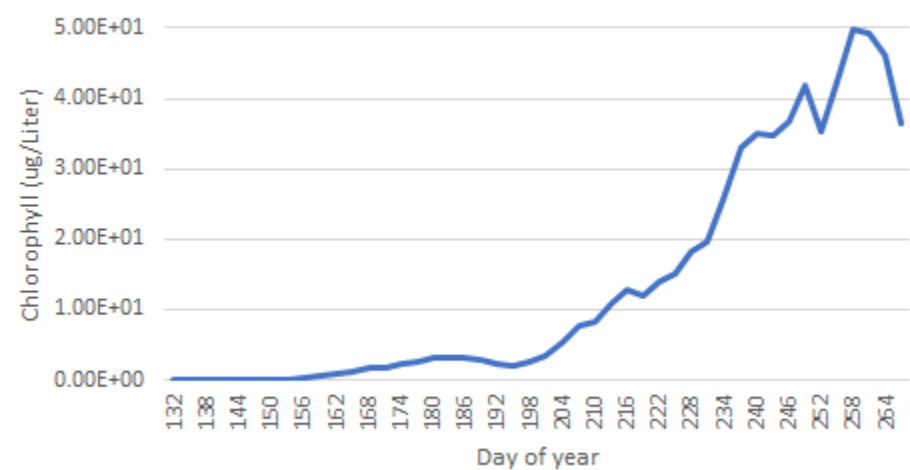
Model: Phytoplankton - diatoms



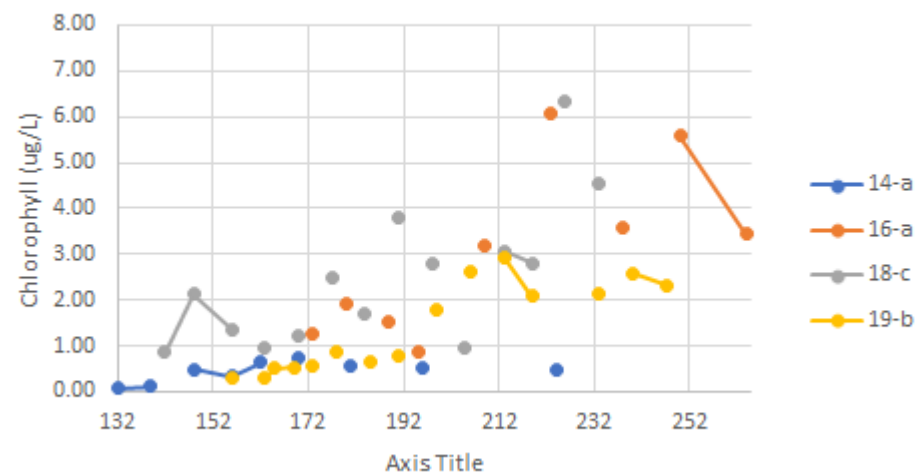
Control - phytoplankton chlorophytes



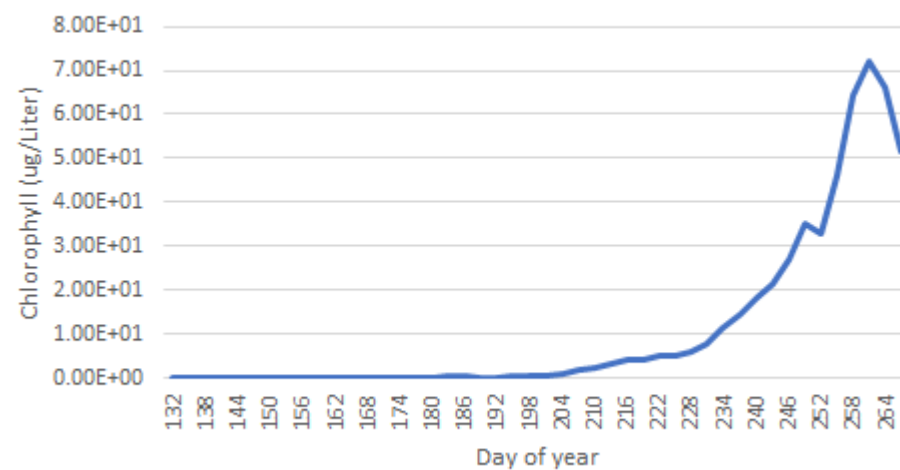
Model: Phytoplankton - chlorophytes



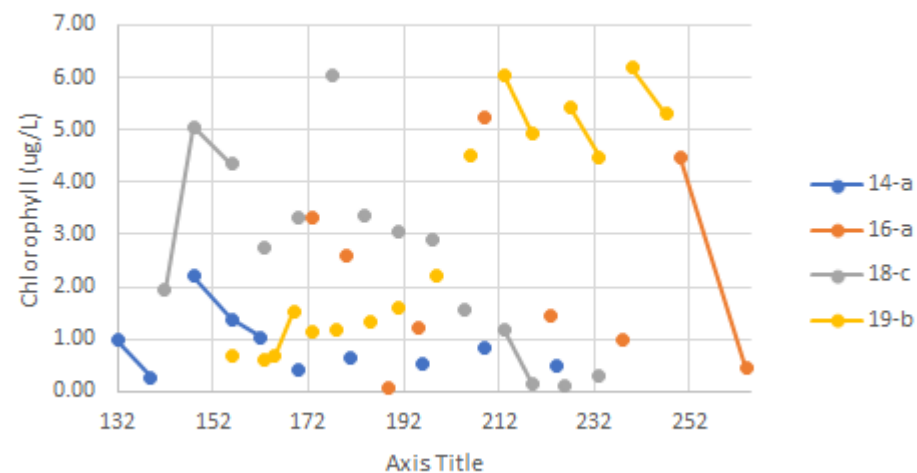
Control - phytoplankton blue greens



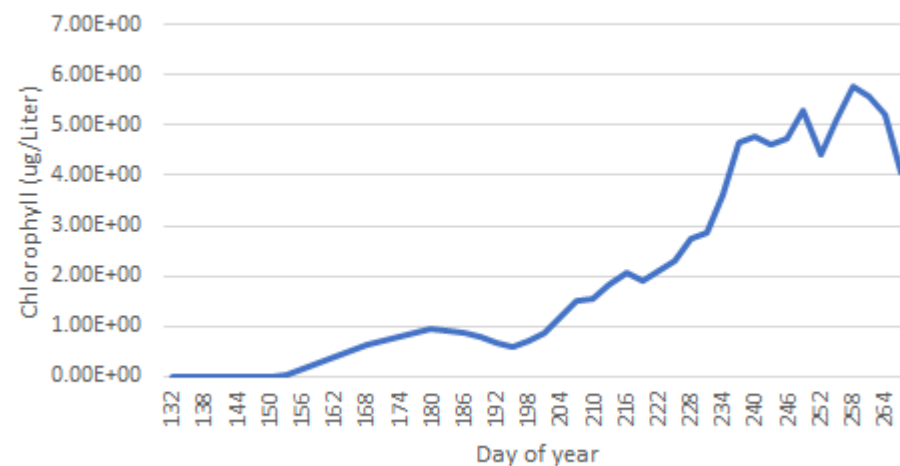
Model: Phytoplankton - blue greens



Control - phytoplankton cryptophytes



Model: Phytoplankton- cryptophytes

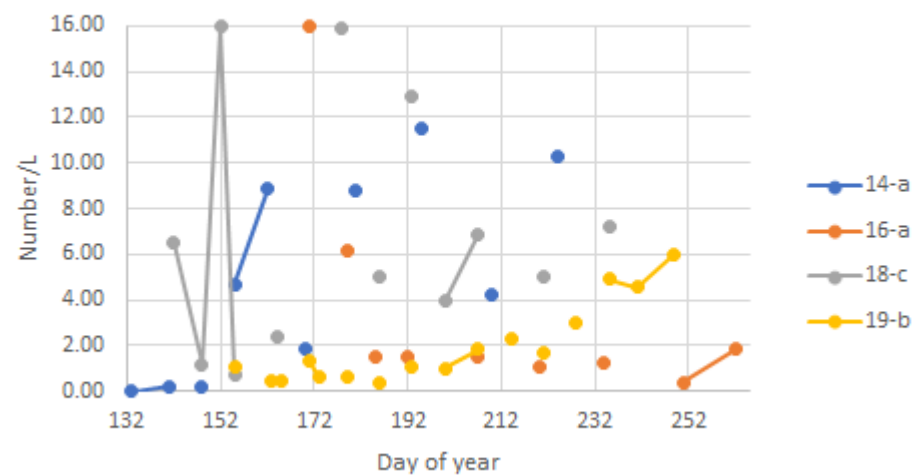


Zooplankton

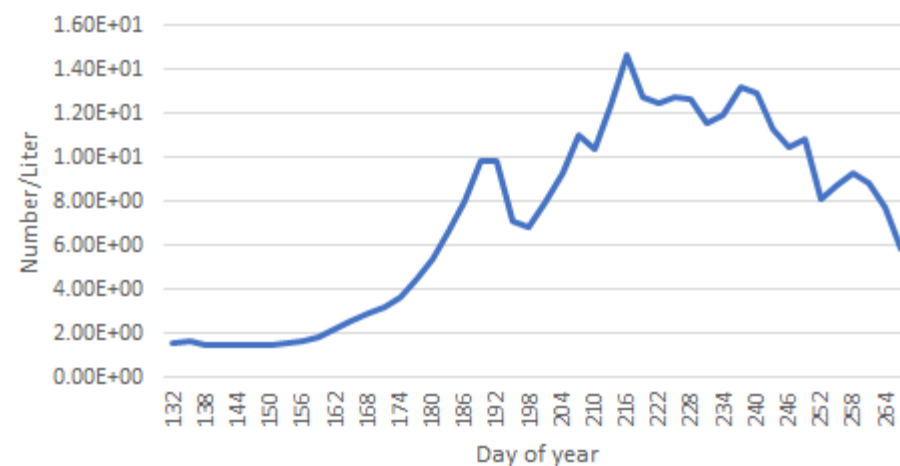
	Daphnia longispina				Calibration	
	14-a	16-a	18-c	19-b	365	132-265
Mean	5.06	3.46	6.97	1.94	4.49	6.44
Min	0.00	0.37	0.71	0.32	1.50	1.50
Max	11.56	15.99	15.98	5.99	14.68	14.68

	Daphnia spp				Calibration	
	14-a	16-a	18-c	19-b	365	132-265
Mean	1.46	3.23	13.71	5.77	2.07	3.69
Min	0.67	0.52	0.03	1.02	0.40	0.40
Max	2.82	7.36	32.95	15.77	9.08	9.08

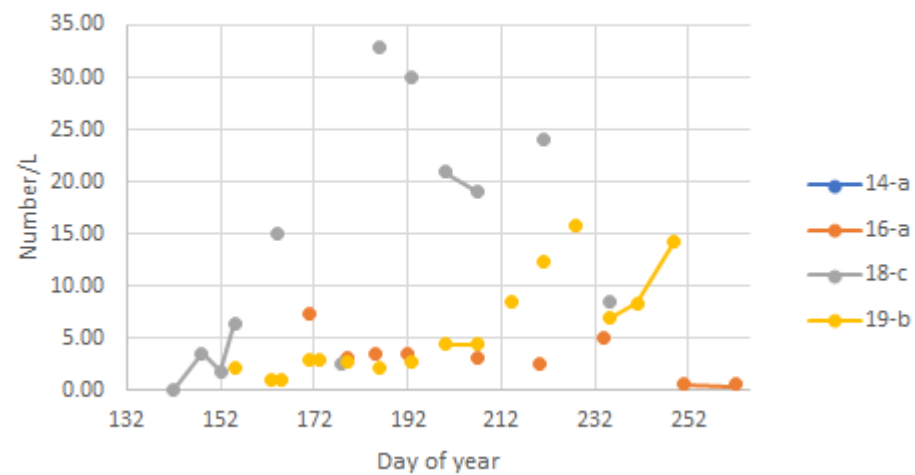
Control - *Daphnia longispina*



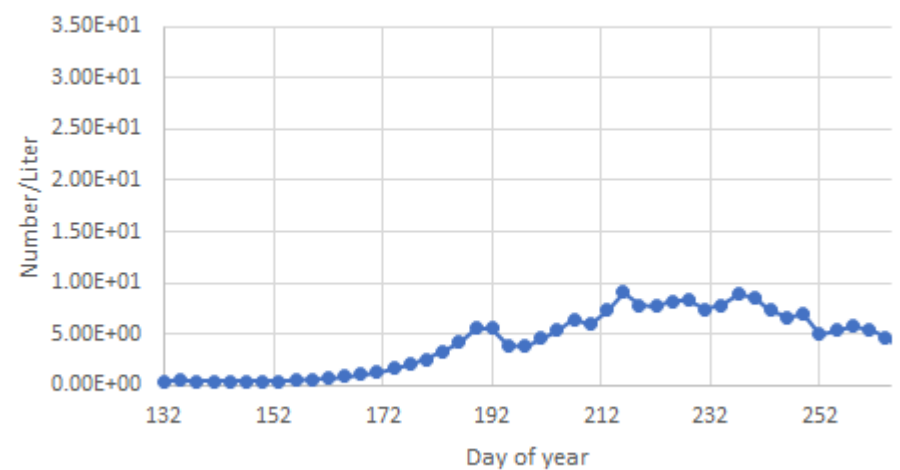
Model: *D. longispina*



Control - *Daphnia spp*



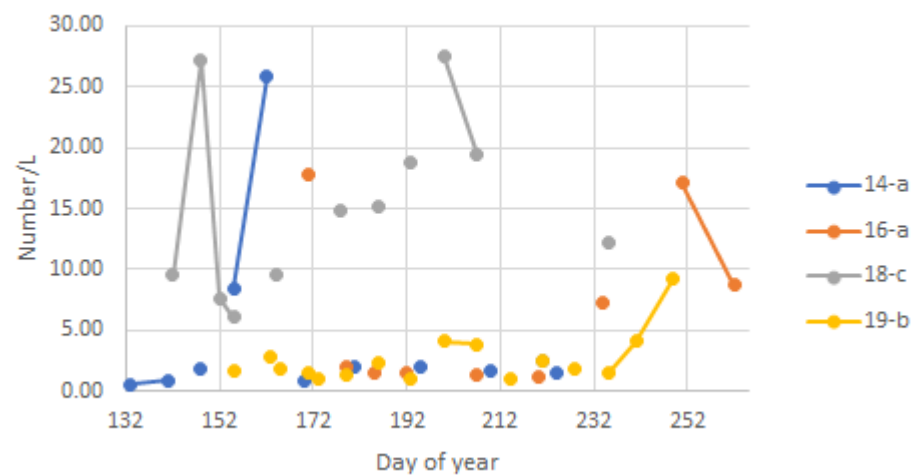
Model: Daphnidae



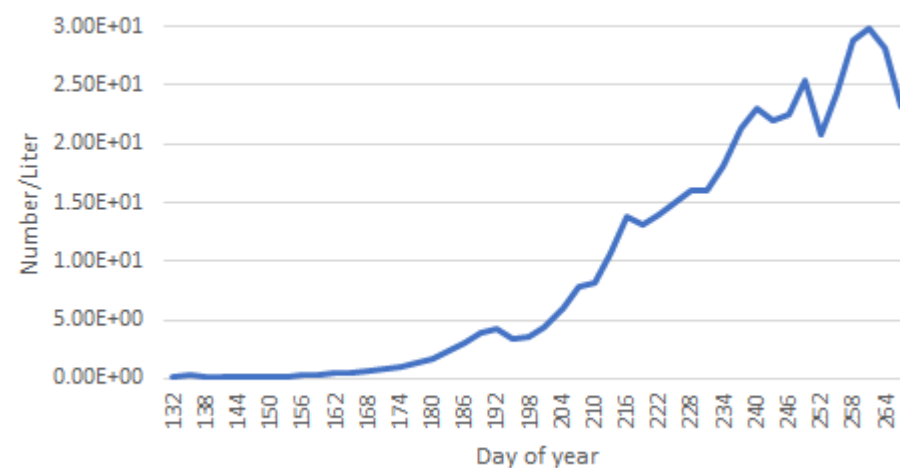
	Chydorus sphaericus				Calibration	
	14-a	16-a	18-c	19-b	365	132-265
Mean	4.58	6.49	14.22	2.60	5.91	8.21
Min	0.58	1.09	2.52	0.94	0.20	0.20
Max	25.93	17.73	27.58	9.29	29.89	29.89

	Cyclopoids				Calibration	
	14-a	16-a	18-c	19-b	365	132-265
Mean	39.03	20.39	29.56	22.91	5.87	10.03
Min	4.54	8.14	7.14	6.41	0.40	0.40
Max	94.82	61.61	77.30	63.79	27.79	27.79

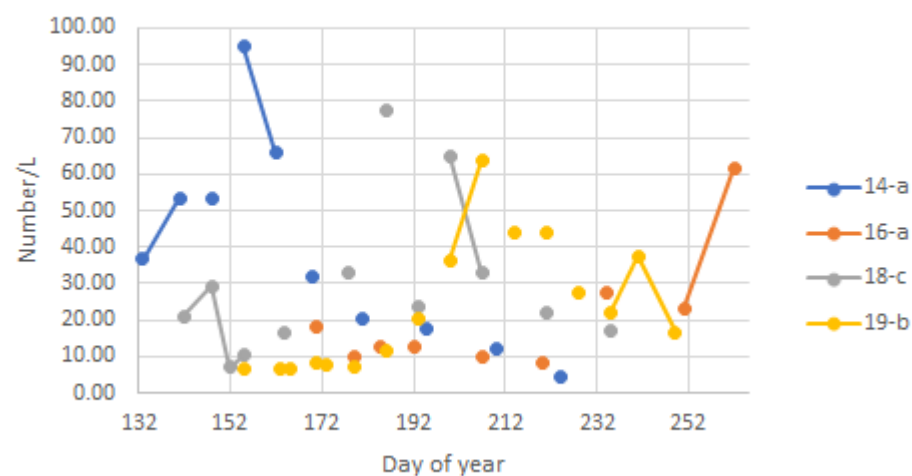
Control - *Chydorus sphaericus*



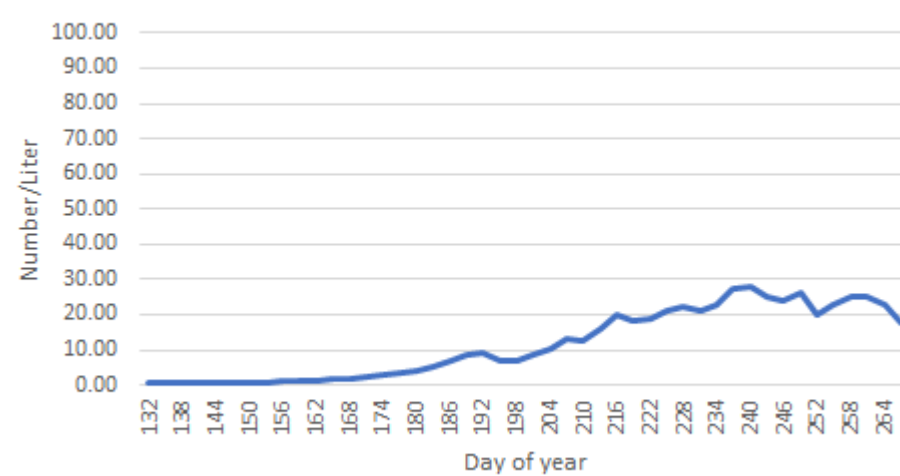
Model: Small Cladocera



Control - Cyclopoids



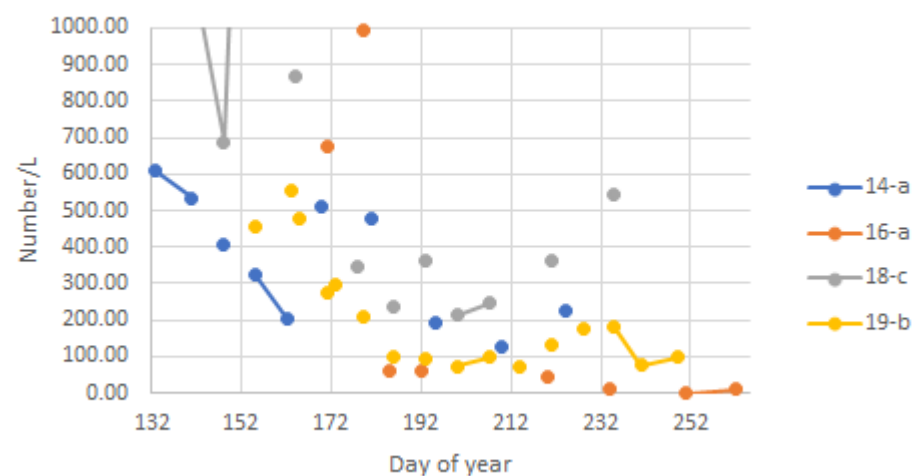
Model: Cyclopoids



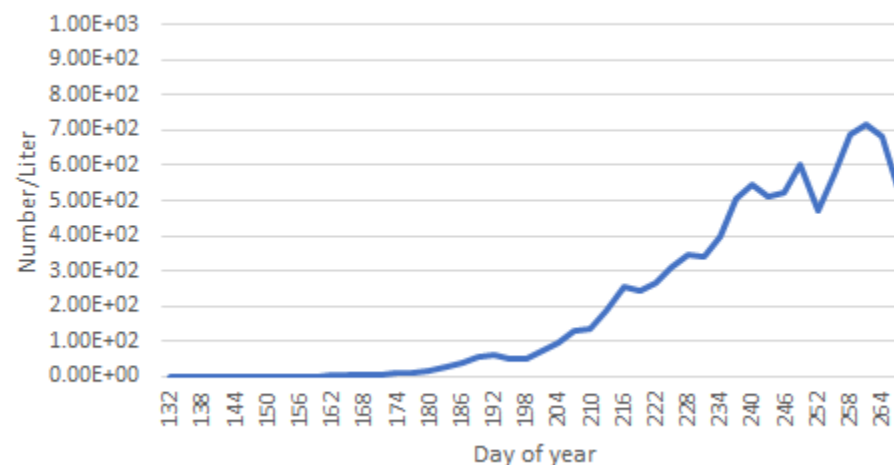
	Keratella				Calibration	
	14-a	16-a	18-c	19-b	365	132-265
Mean	361.47	232.00	672.33	210.96	115.90	175.91
Min	126.07	0.51	212.56	73.05	0.71	0.71
Max	607.35	993.42	1901.83	556.63	718.01	718.01

	Simocephalus spp				Calibration	
	14-a	16-a	18-c	19-b	365	132-265
Mean	2.82	1.32	4.67	1.27	0.62	0.97
Min	0.11	0.08	0.55	0.09	0.10	0.10
Max	16.99	7.25	14.10	4.29	2.40	2.40

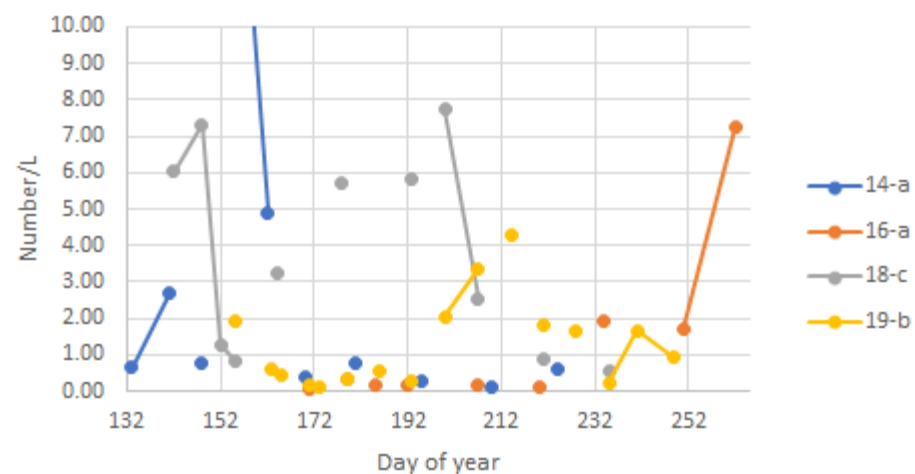
Control - *Keratella quadrata*



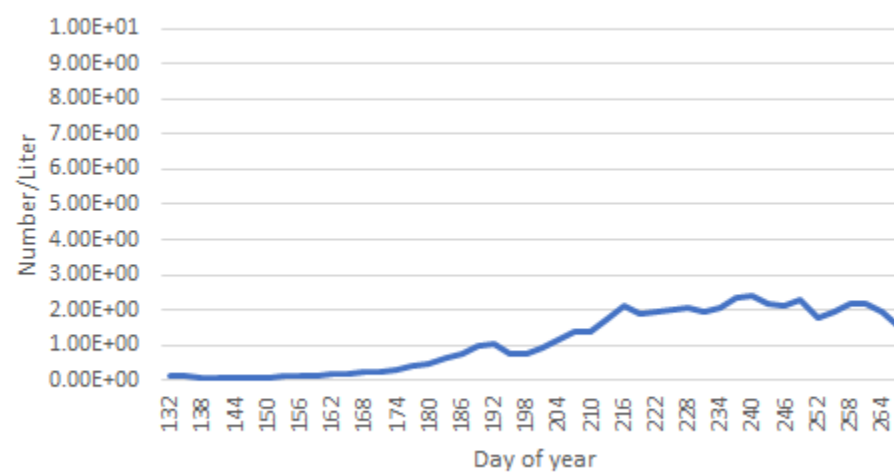
Model: *Keratella*

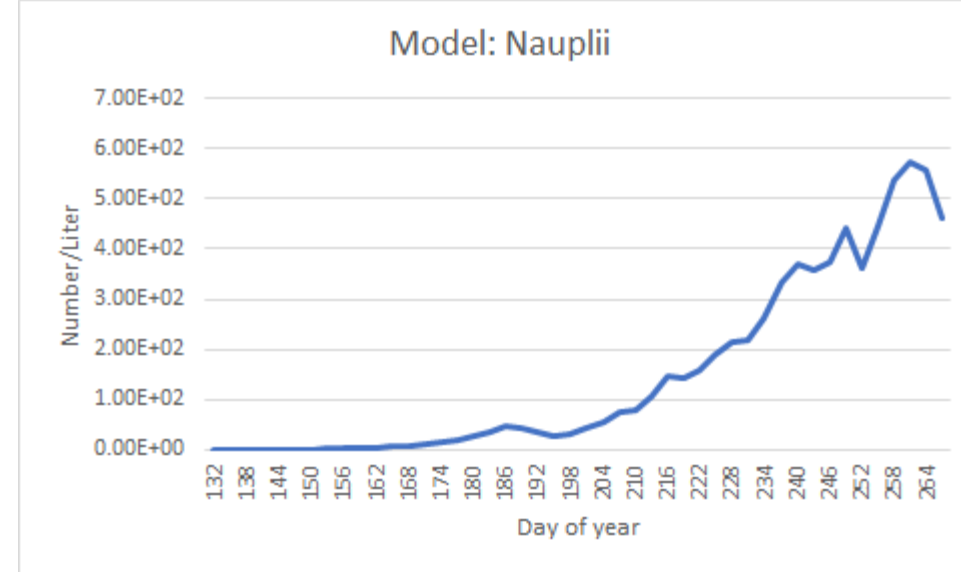
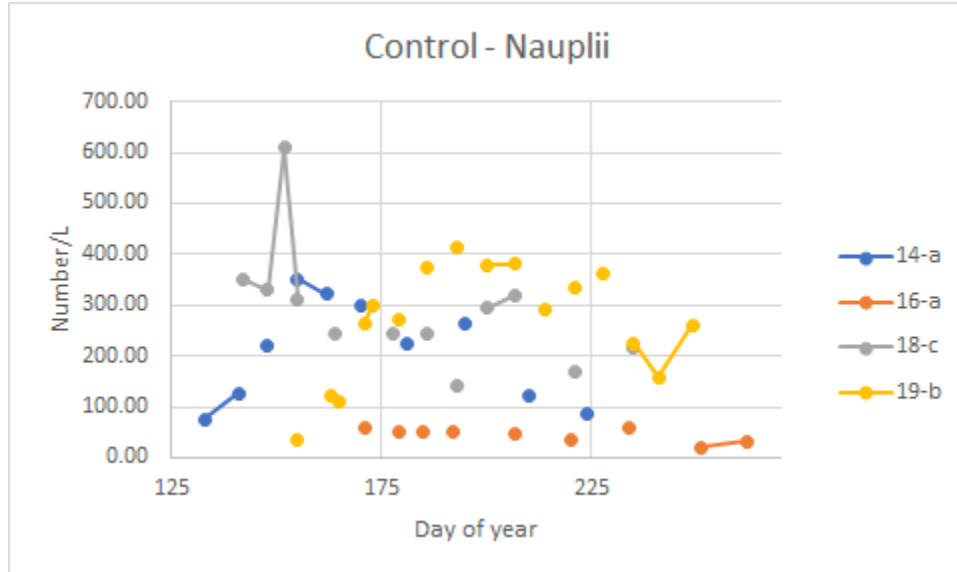


Control - *Simocephalus spp*



Model: *Simocephalus*





	Nauplii				Calibration	
	14-a	16-a	18-c	19-b	365	132-265
Mean	209.01	45.29	289.68	267.94	103.50	126.84
Min	75.47	19.59	143.22	36.72	0.70	0.70
Max	351.04	58.39	608.93	412.43	572.18	572.18

Macroinvertebrates

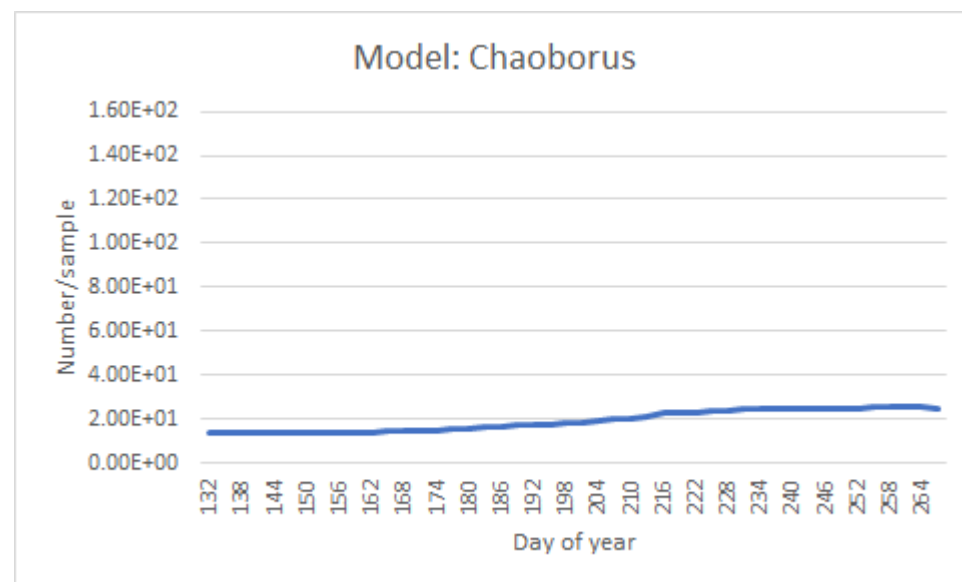
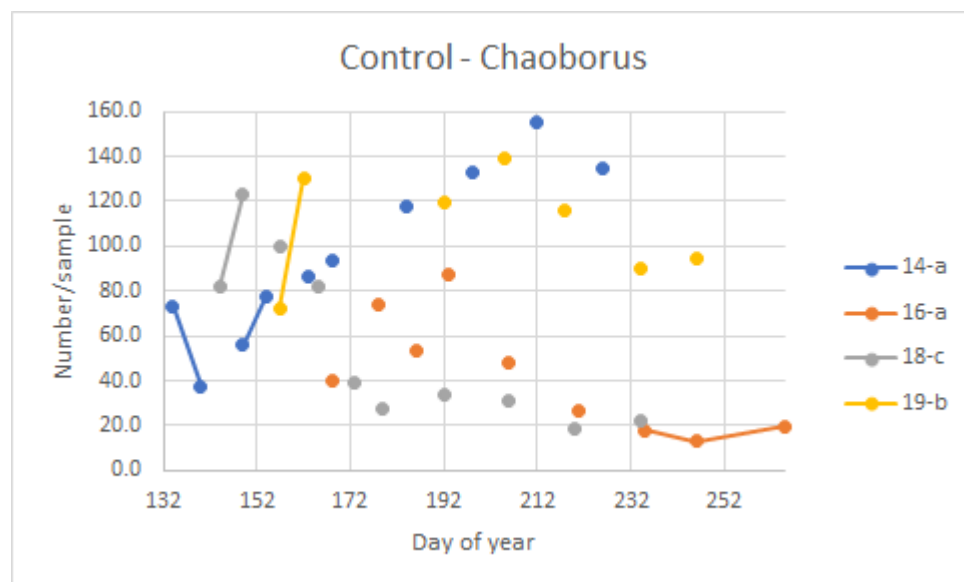
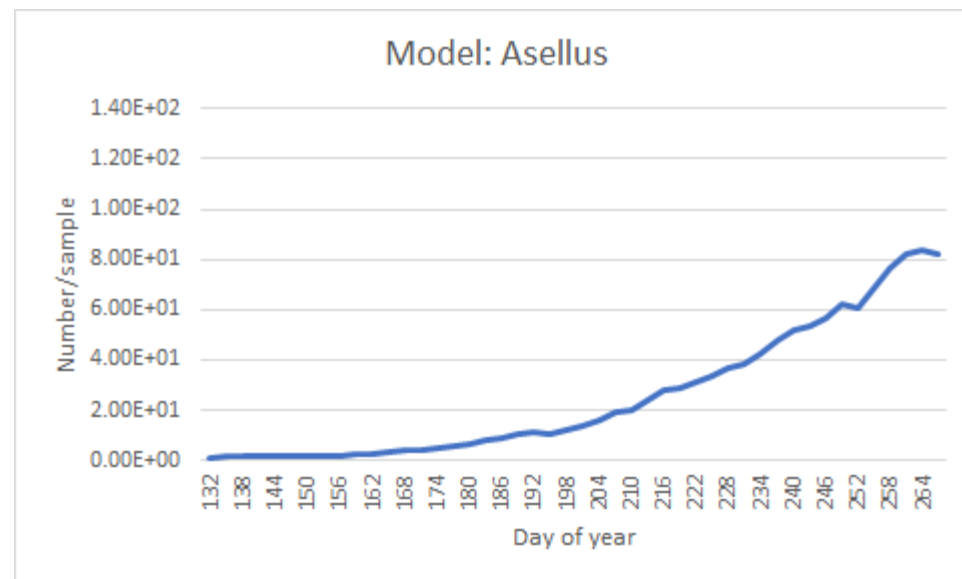
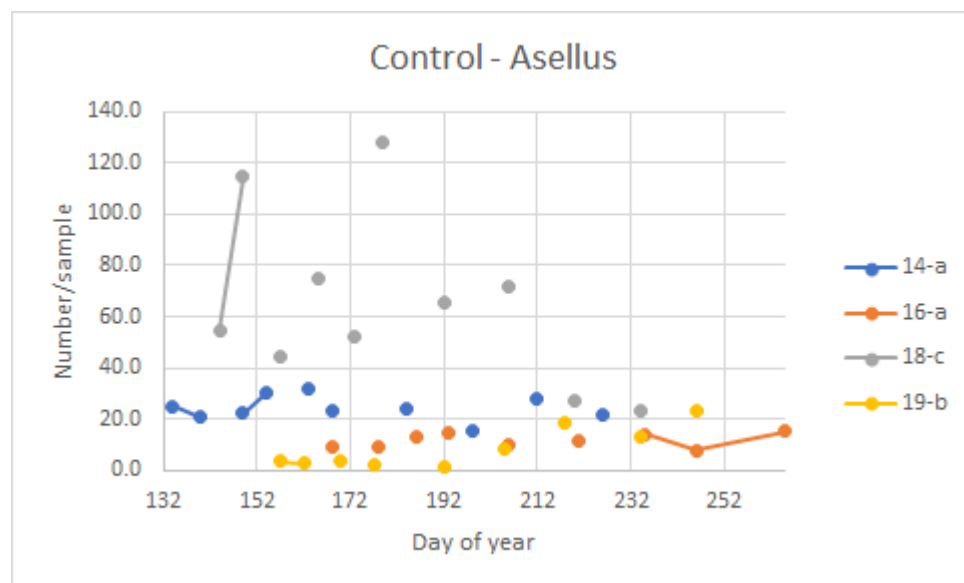
Assumption: data from sampling devices are directly comparable to number per square meter computed by the model... or, the sampling devices accurately estimate abundance of macroinvertebrates...

Alternatively, sample methods introduce consistent bias in estimates of abundance that can be corrected by adjustment factors...once determined

Worse case: sampling bias is inconsistent, which would question the usefulness of these data for calibration (or any other use by the models)...

	Asellus				Calibration	
	14-a	16-a	18-c	19-b	365	132-265
Mean	24.32	11.74	65.72	8.58	27.45	21.68
Min	15.30	8.00	23.20	1.50	0.91	0.91
Max	31.70	15.20	127.80	23.20	84.40	84.05

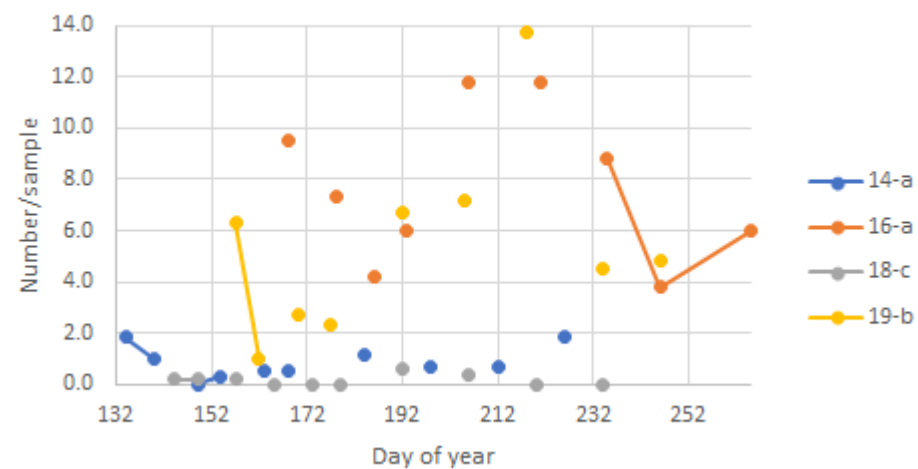
	Chaoborus lrv				Calibration	
	14-a	16-a	18-c	19-b	365	132-265
Mean	96.25	42.34	55.96	118.14	18.88	18.54
Min	37.50	13.00	18.60	72.30	13.47	13.47
Max	154.83	87.50	123.20	182.20	25.48	25.35



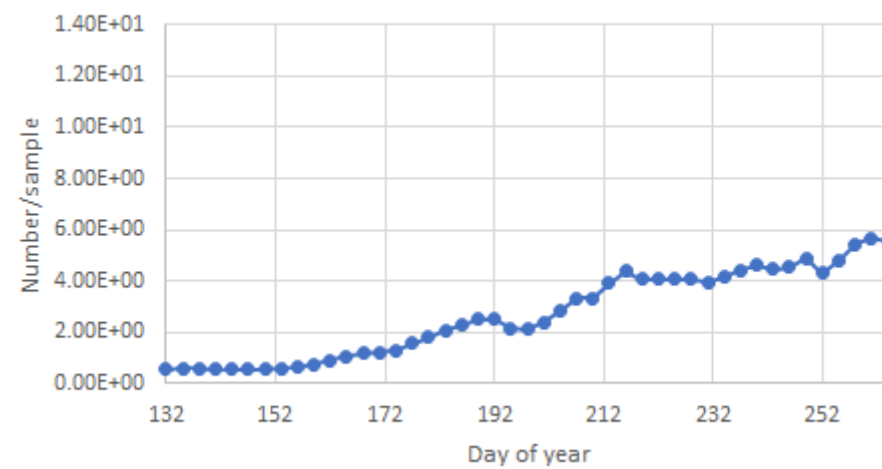
	Chironomidae - lrv				Calibration	
	14-a	16-a	18-c	19-b	365	132-265
Mean	0.85	7.69	0.16	5.47	2.26	2.44
Min	0.00	3.80	0.00	1.00	0.47	0.47
Max	1.83	11.80	0.60	13.70	5.67	5.67

	Cloeon spp				Calibration	
	14-a	16-a	18-c	19-b	365	132-265
Mean	8.83	11.10	22.00	8.47	1.13	1.13
Min	3.50	4.20	7.00	2.20	0.38	0.84
Max	14.83	25.30	37.40	25.50	2.41	1.65

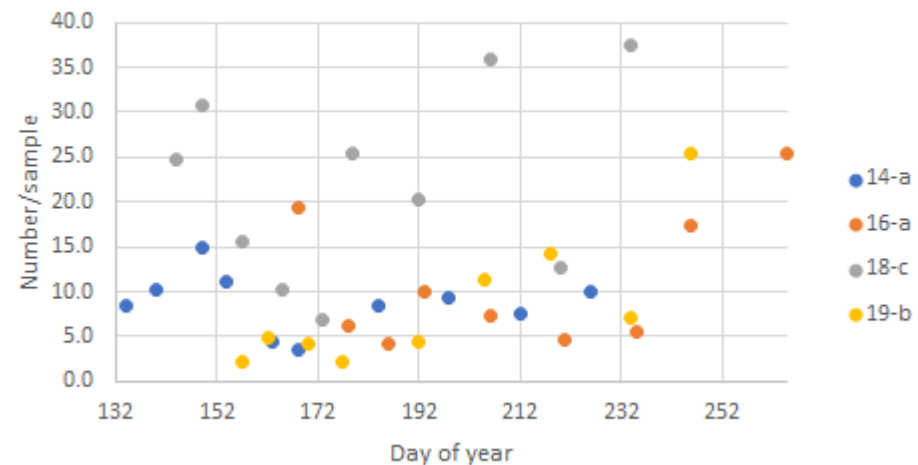
Control - Chironomidae



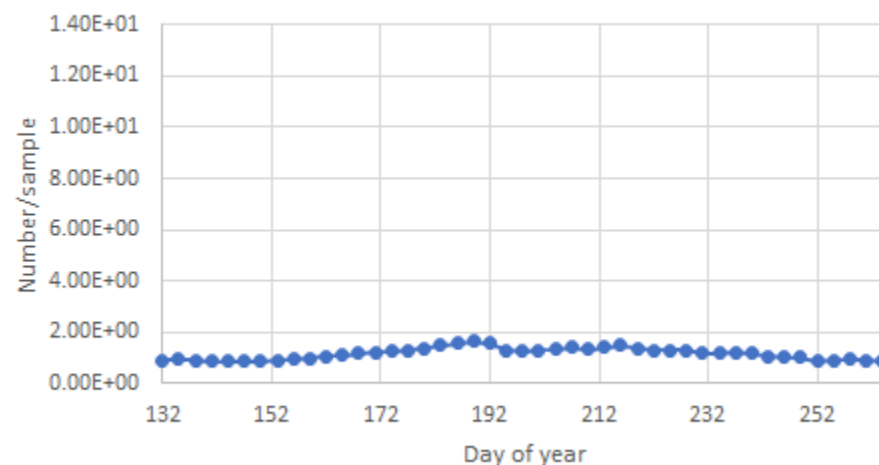
Model: Chironomidae



Control - Cloeon



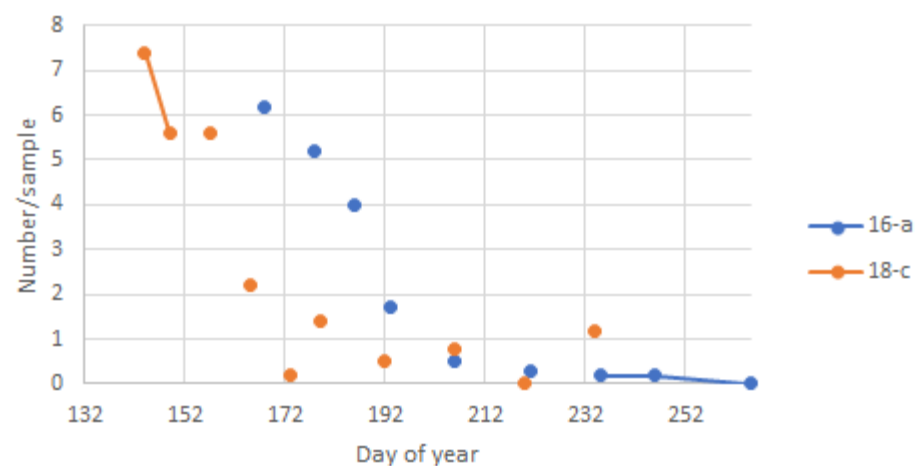
Model: Cloeon



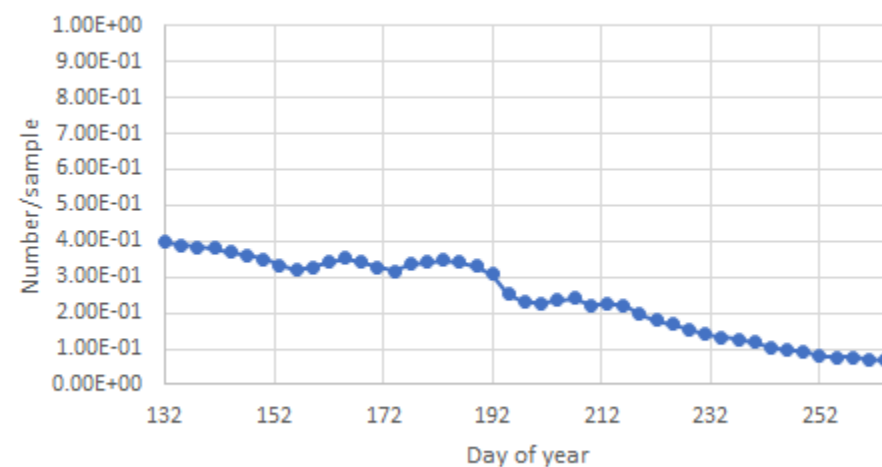
	Gammarus pulex				Calibration	
	14-a	16-a	18-c	19-b	365	132-265
Mean	no data	2.03	2.49	no data	0.27	0.27
Min		0.00	0.00		0.05	0.07
Max		6.20	7.40		0.50	0.44

	Helobdella - leech				Calibration	
	14-a	16-a	18-c	19-b	365	132-265
Mean	0.23	0.17	0.34	1.22	0.59	0.95
Min	0.00	0.00	0.00	0.00	0.06	0.06
Max	0.67	0.70	1.20	3.80	2.39	2.39

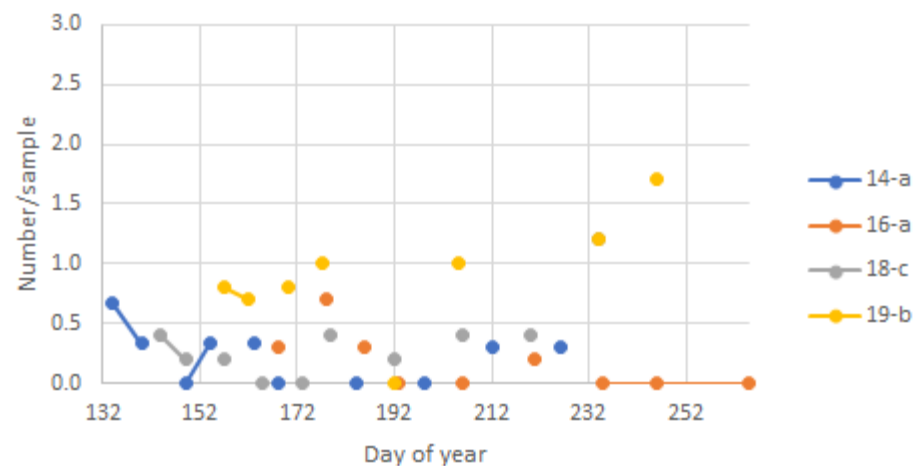
Control - Gammarus



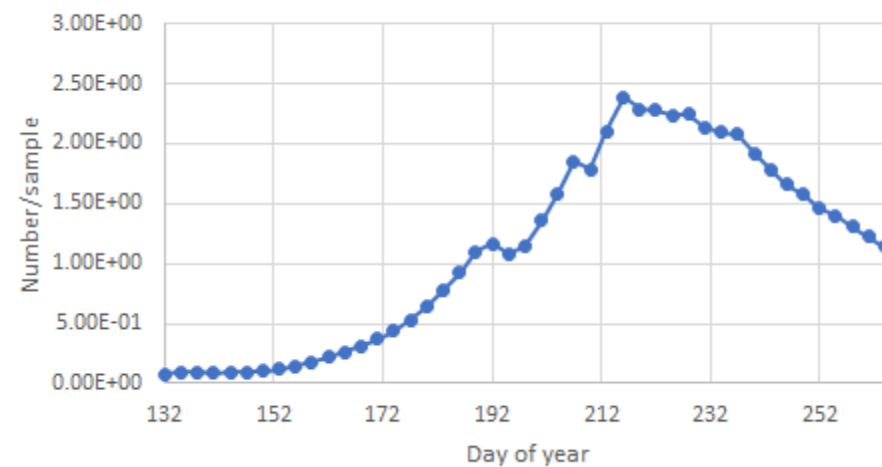
Model: Gamarus



Control - Helobdella (leech)



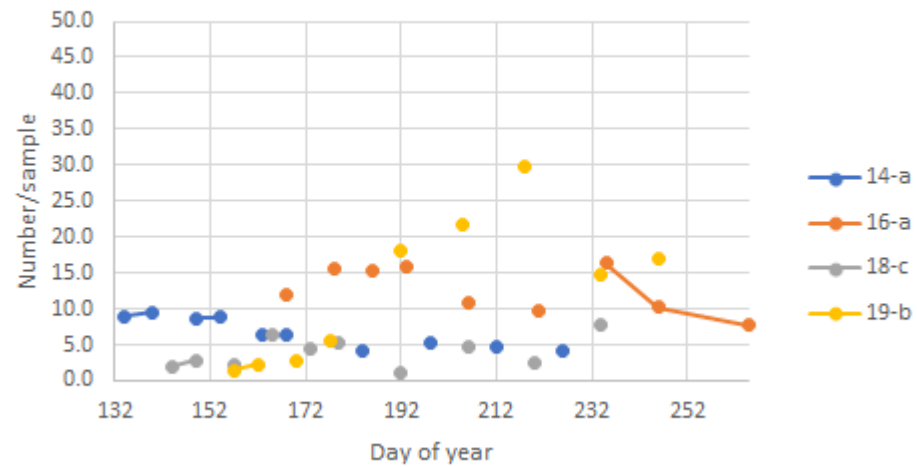
Model: Hirudinea (leech)



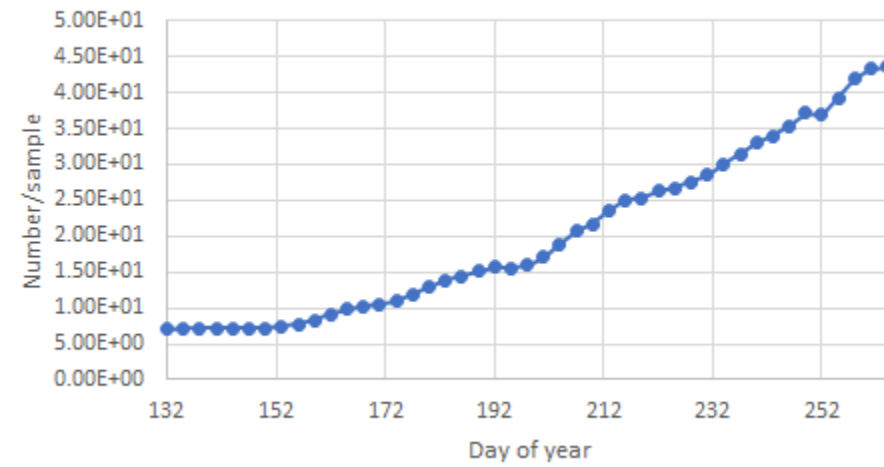
	Lymnaea				Calibration	
	14-a	16-a	18-c	19-b	365	132-265
Mean	6.68	12.60	3.88	12.60	20.76	18.60
Min	4.17	7.70	1.00	1.50	6.69	6.69
Max	9.50	16.30	7.80	29.70	43.59	43.59

	Tanypodinae				Calibration	
	14-a	16-a	18-c	19-b	365	132-265
Mean	1.10	3.56	0.58	2.90	2.10	2.74
Min	0.00	0.30	0.00	0.00	1.39	1.39
Max	2.67	14.50	1.40	5.80	4.31	4.31

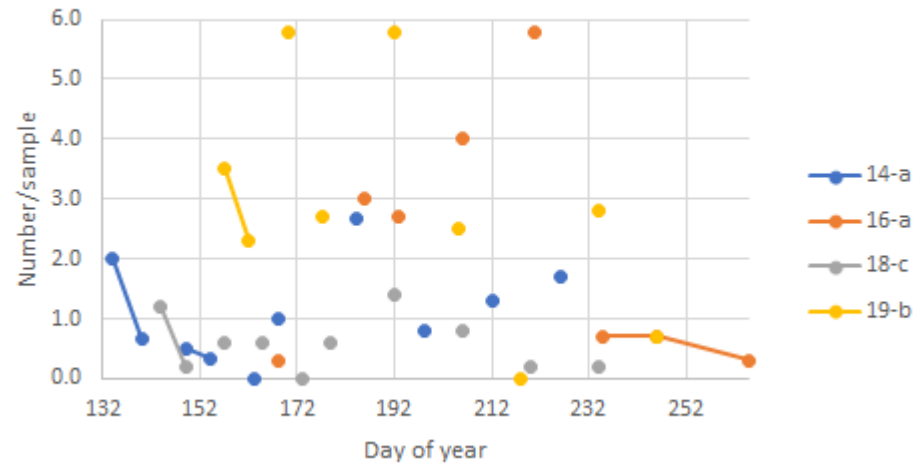
Control - Lymnaea



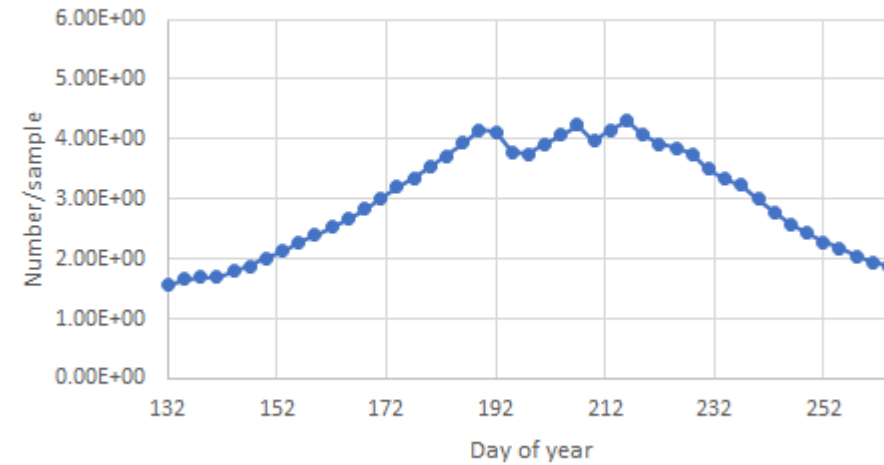
Model: Gastropoda



Control - Tanypodinae



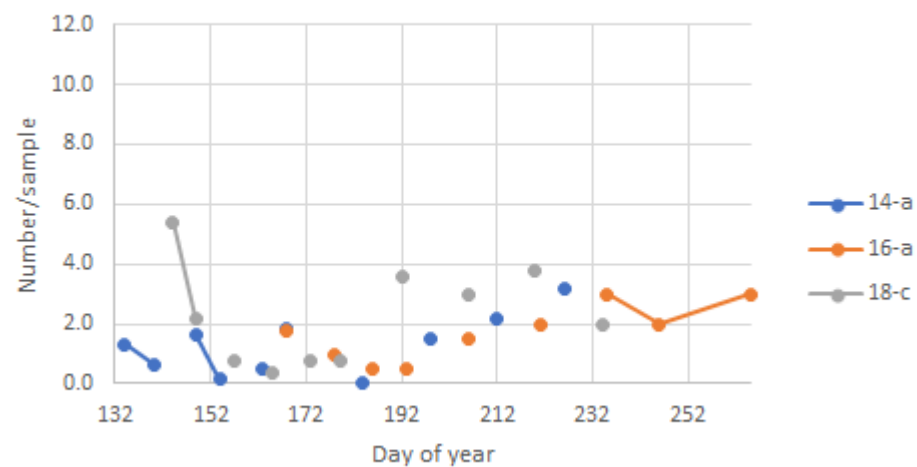
Model: Tanypodinae



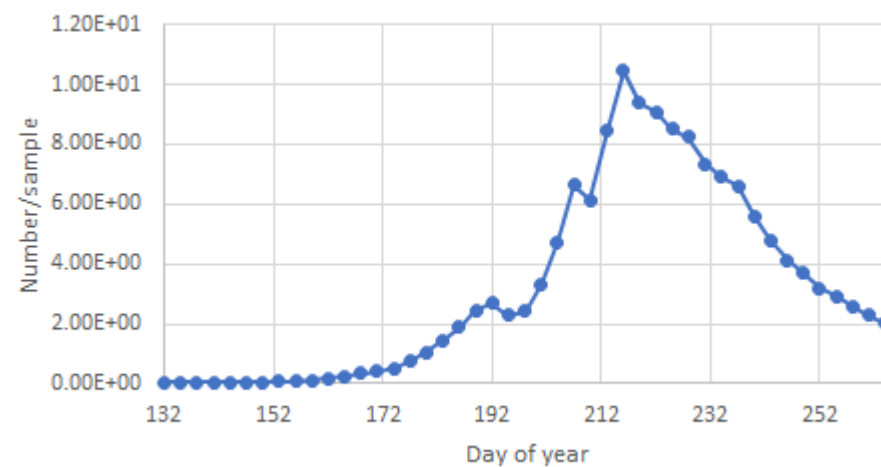
	Tubifex spp - oligochaetes				Calibration	
	14-a	16-a	18-c	19-b	365	132-265
Mean	1.30	1.70	2.28	no data	1.34	2.71
Min	0.00	0.50	0.40		0.03	0.03
Max	3.17	3.00	5.40		10.45	10.45

	Zygoptera - damselflies				Calibration	
	14-a	16-a	18-c	19-b	365	132-265
Mean	0.30	no data	3.91	4.90	1.49	1.73
Min	0.00		0.80	0.80	0.78	1.14
Max	2.30		10.20	12.20	2.55	2.55

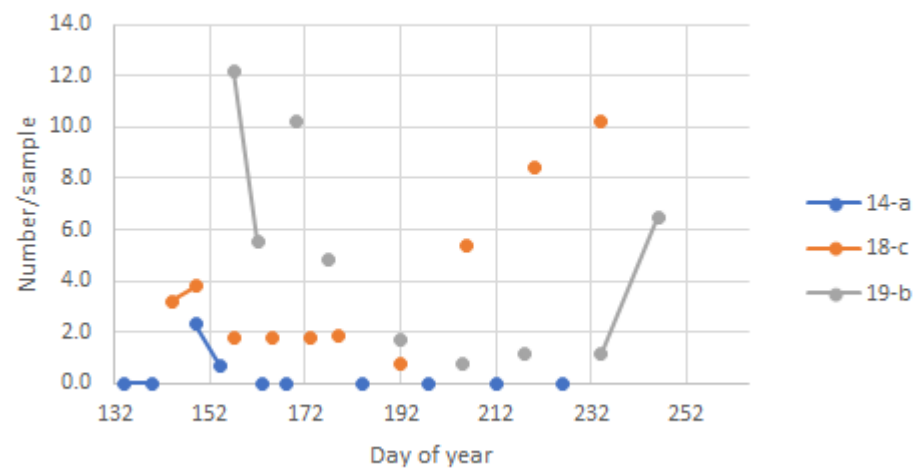
Control - Tubifex spp



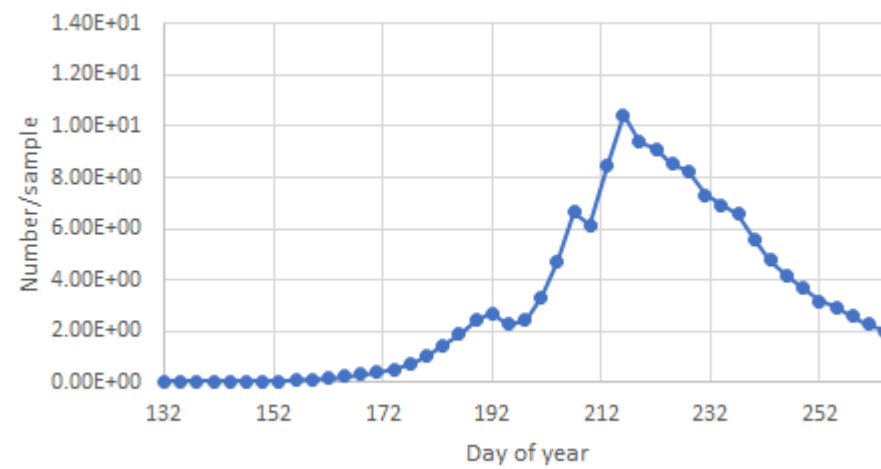
Model: Oligochaeta



Control - Zygoptera



Model: Oligochaeta



Summary and (preliminary) conclusions

- Able to reduce the model values for phytoplankton productivity, but diatoms and green algae are still unrealistically high (maximum values in particular)
 - Possible to revisit shading algorithms and parameters for additional calibration, if undertaken
 - Alternative, accept the bias in the periphyton and phytoplankton productivity, given the general (order of magnitude) agreement with zooplankton and macroinvertebrates calibrations
- Calibrations suggest model results are generally within ranges of data when compared across control data; mean model and mean control data are often quite similar (i.e., acceptable calibrations)
- Computed mean, min, and max values often suggest good agreement, while comparisons of plots with data are less encouraging (e.g., *Keratella*)
 - Data often fail to show consistent temporal patterns across controls