

CASM-cosm Calibration Update

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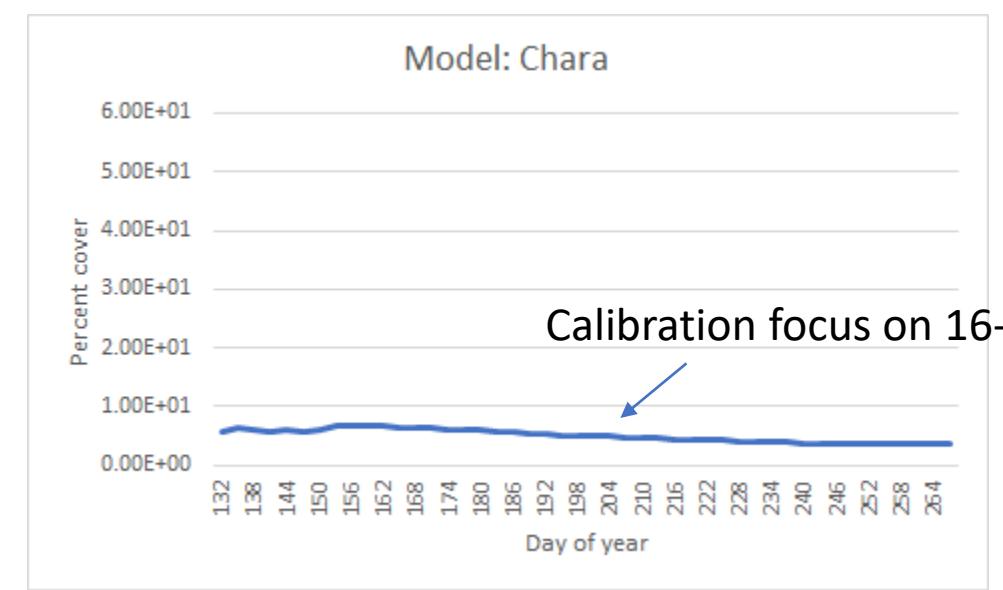
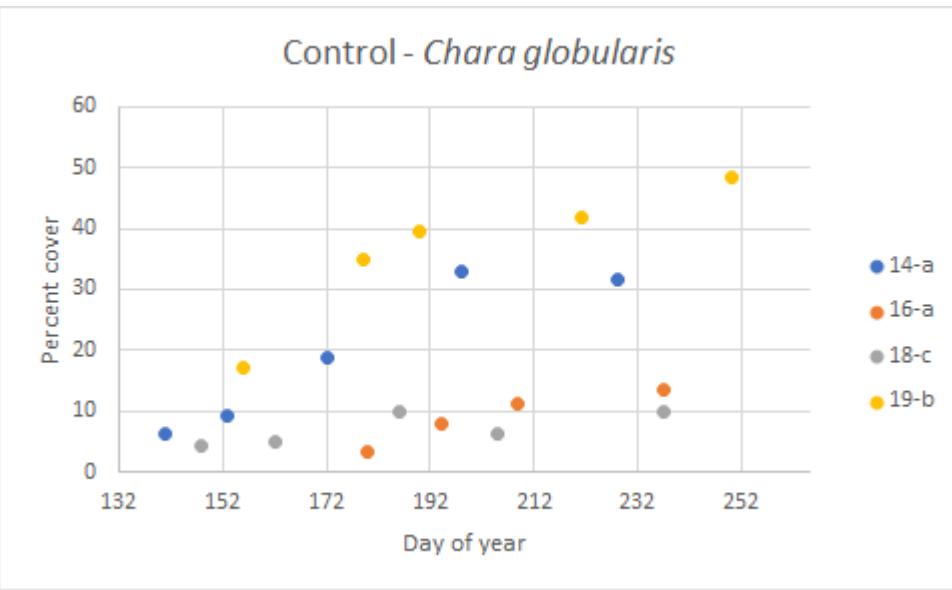
Update - objectives

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

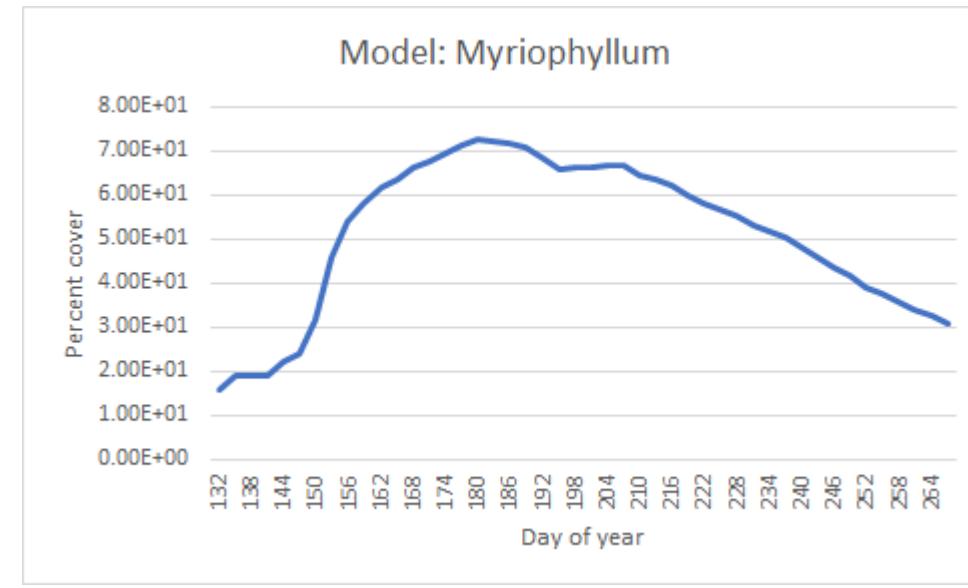
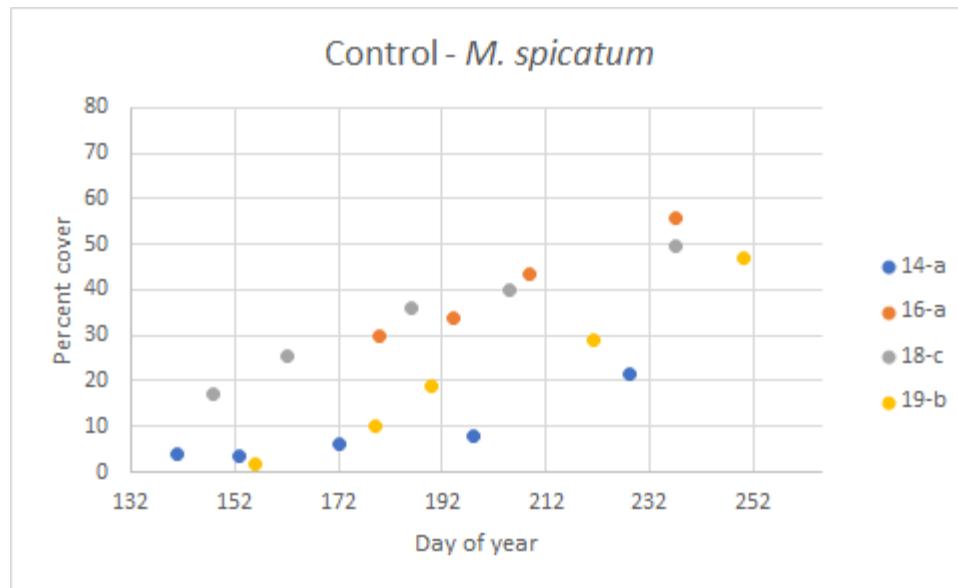
Update approach

- 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



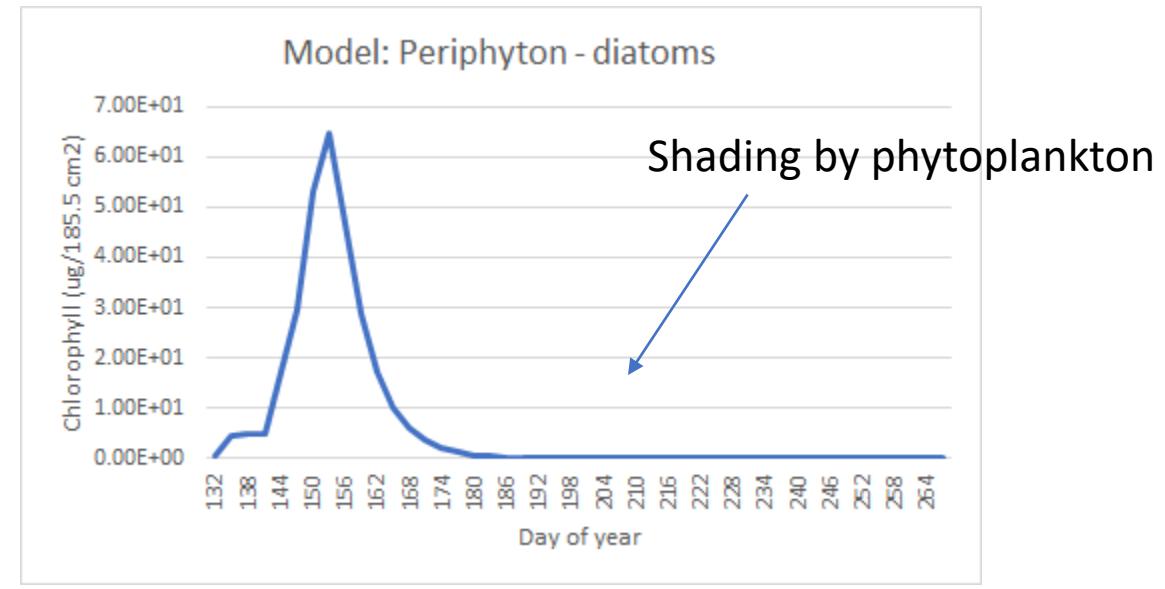
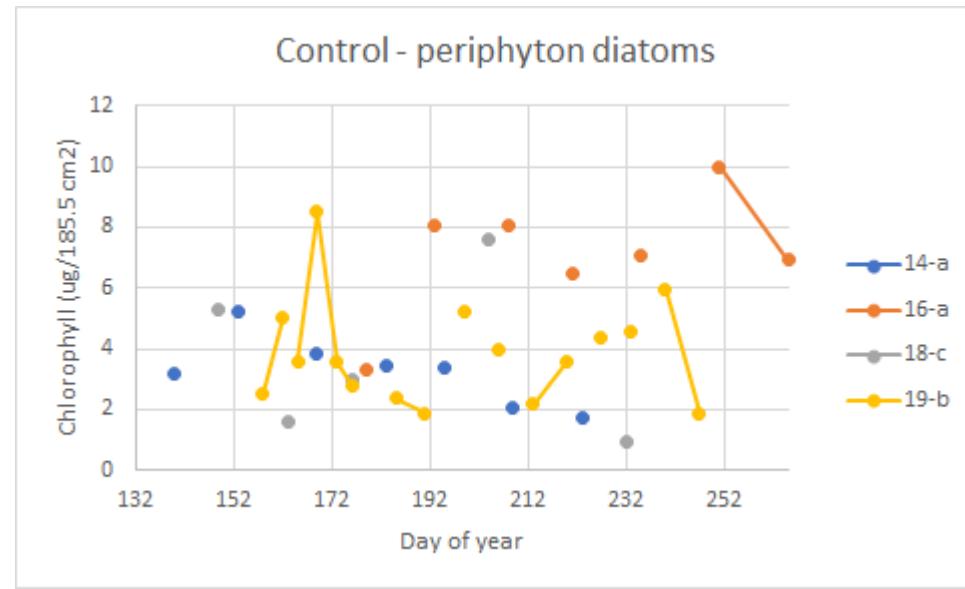
	Percent cover				Calibration	
	14-a	16-a	18-c	19-b	365	132-265
Chara globularis	14-a	16-a	18-c	19-b	365	132-265
Mean	19.77	10.27	7.13	36.34	5.93	5.03
Min	6.40	3.22	4.20	17.00	3.55	3.55
Max	33.10	15.38	10.04	48.30	10.06	6.64



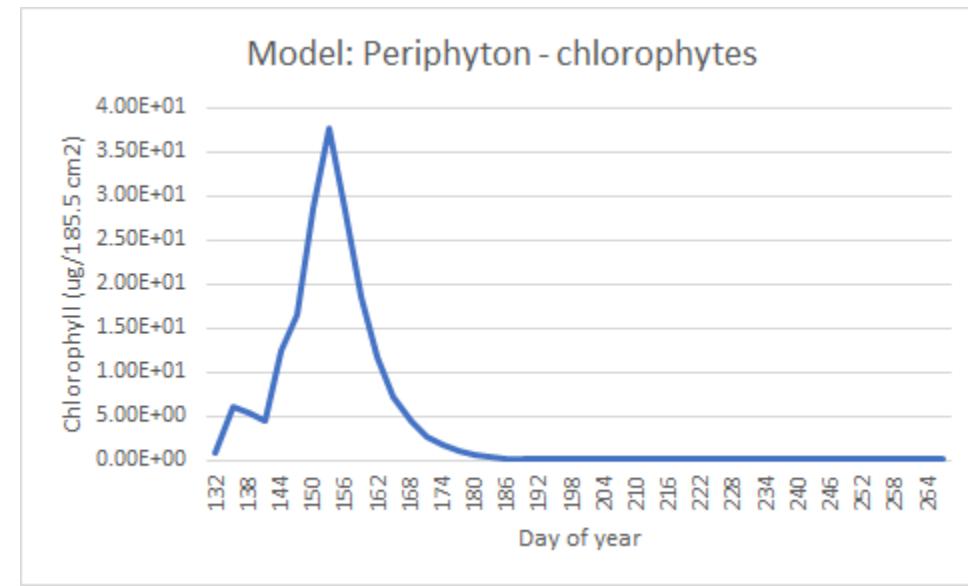
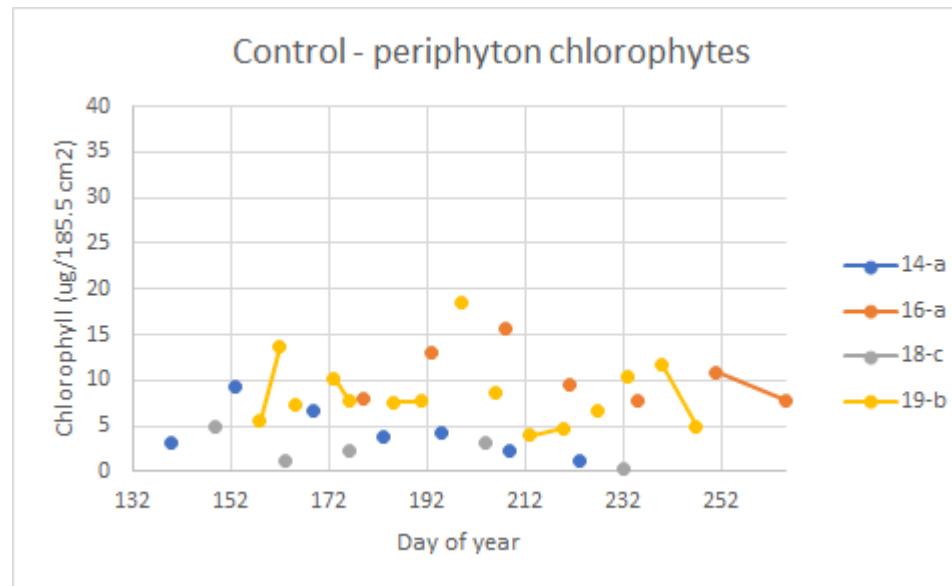
	Percent cover				Calibration	
	14-a	16-a	18-c	19-b	365	132-265
<i>M. spicatum</i>	14-a	16-a	18-c	19-b	365	132-265
Mean	8.65	42.50	33.62	21.33	29.12	45.33
Min	3.70	29.72	17.24	1.70	6.97	9.87
Max	21.73	55.65	49.80	47.15	72.78	72.78

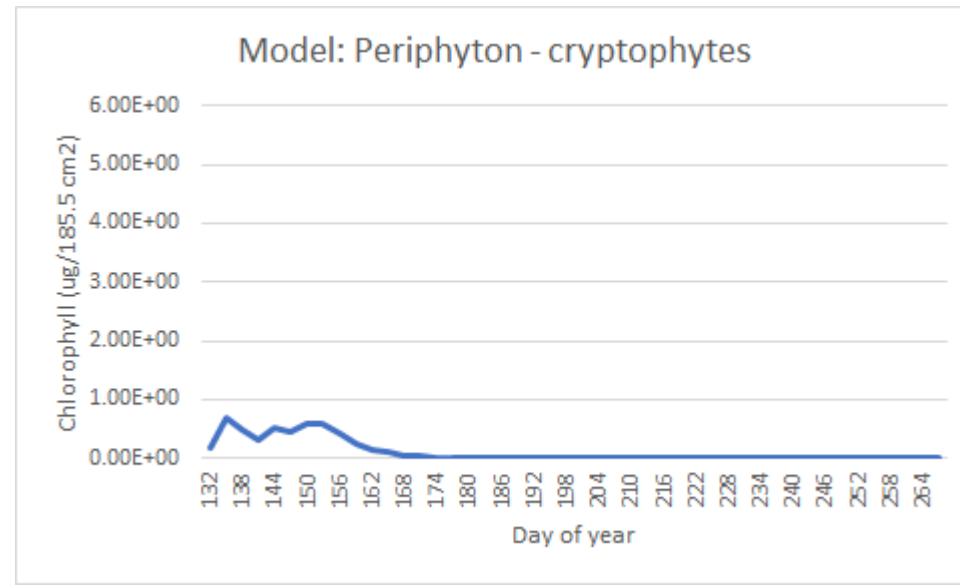
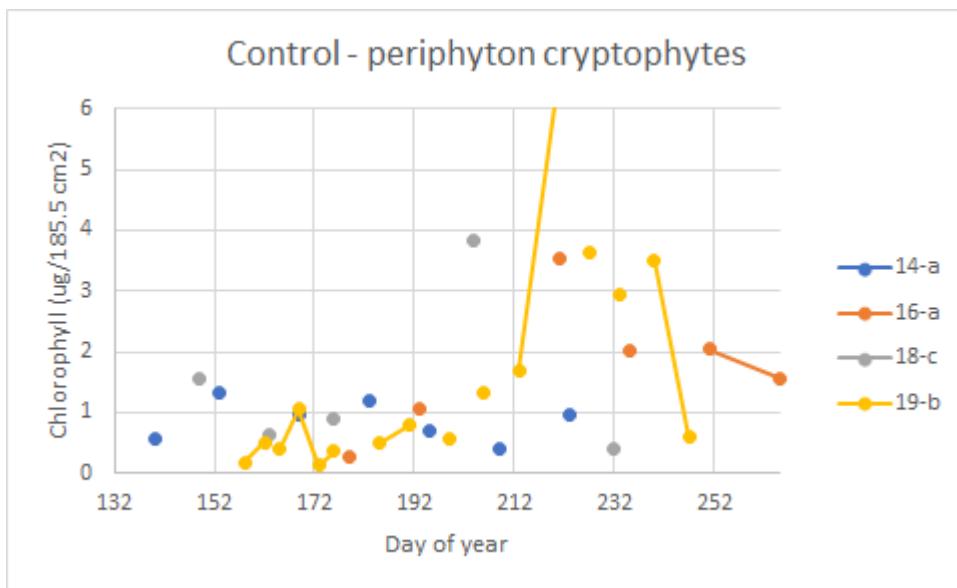
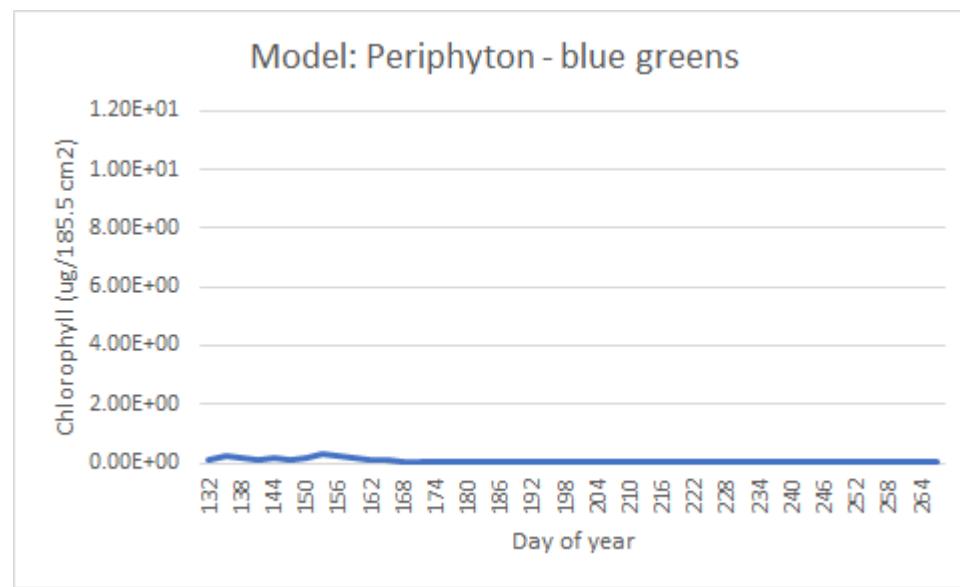
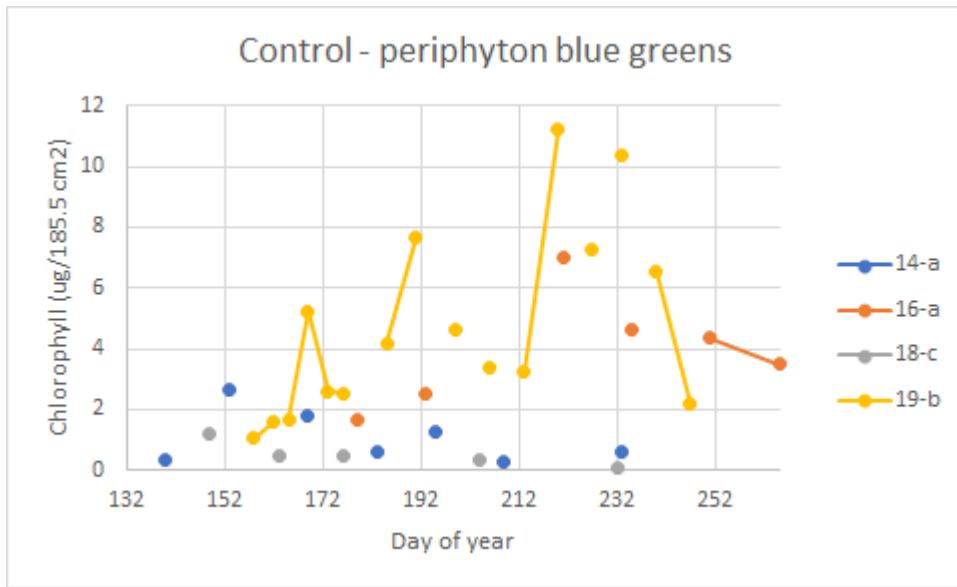
Periphyton

	Periphyton, ug Chlor/185.5 cm ²				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
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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
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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
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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



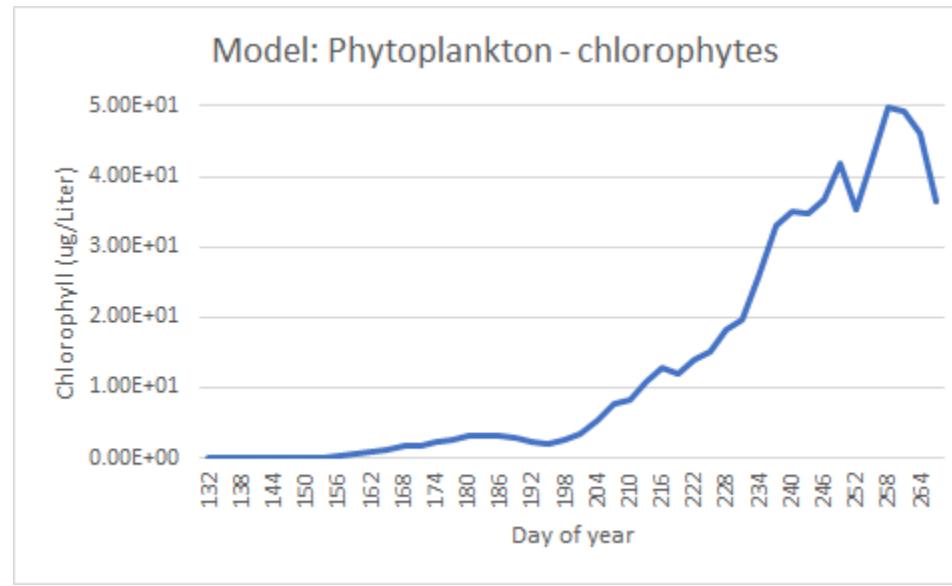
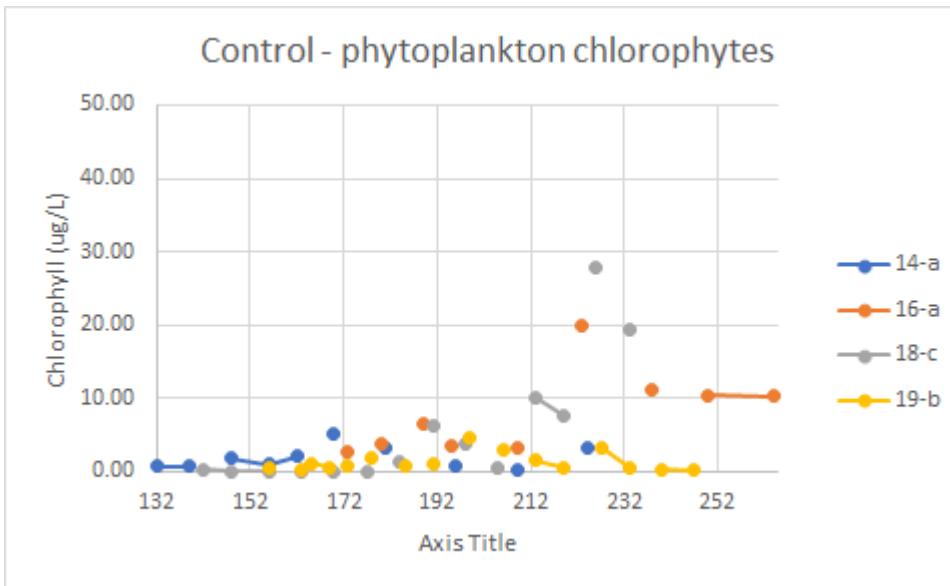
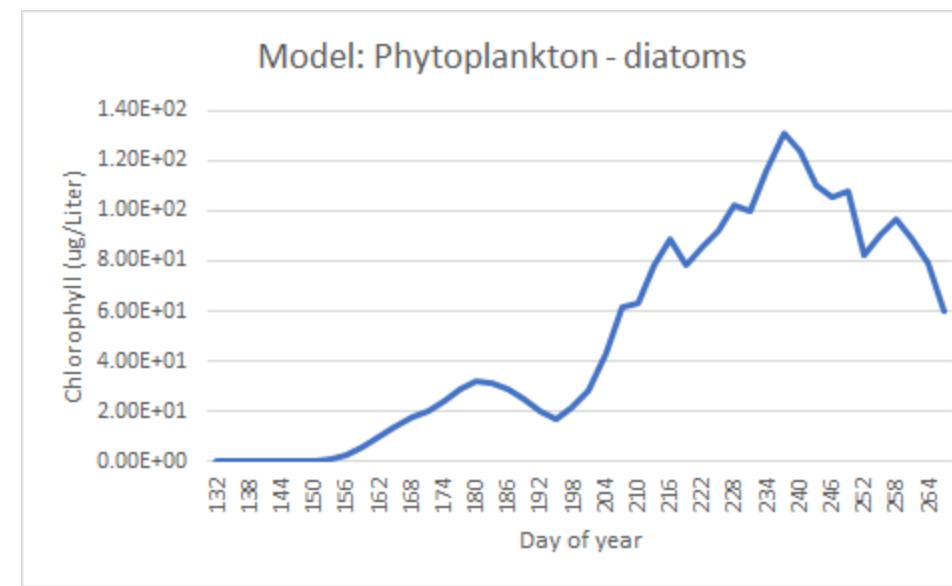
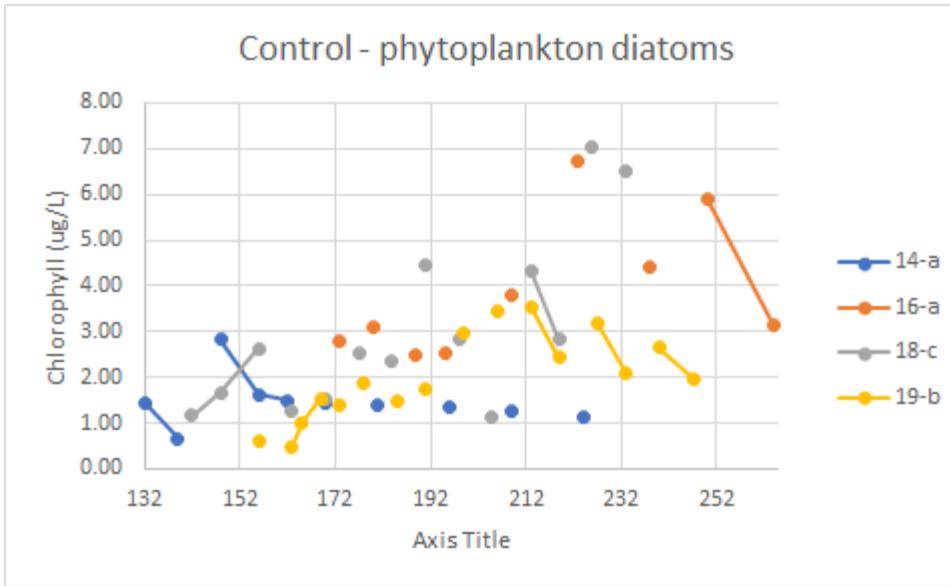
Note: Excel sometimes connects data points with lines...

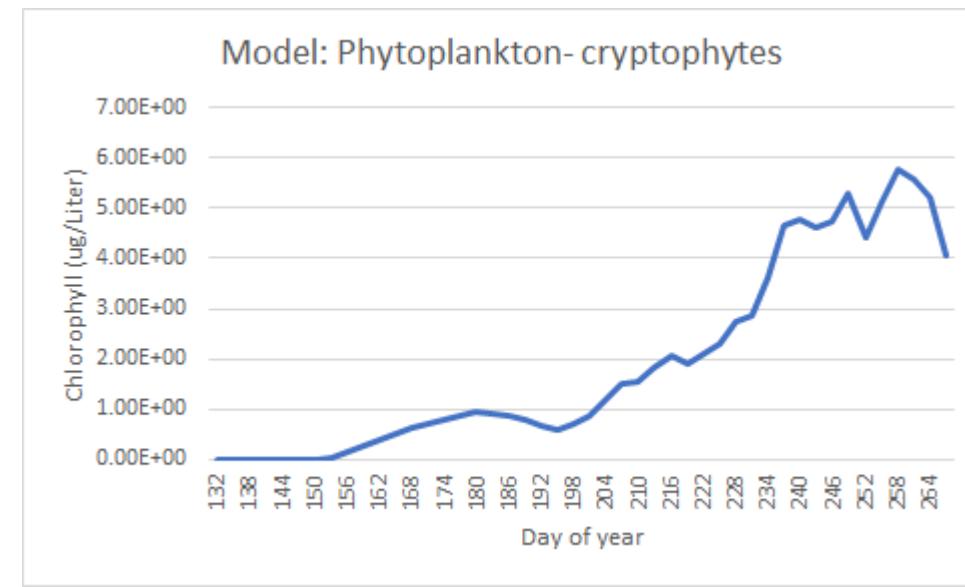
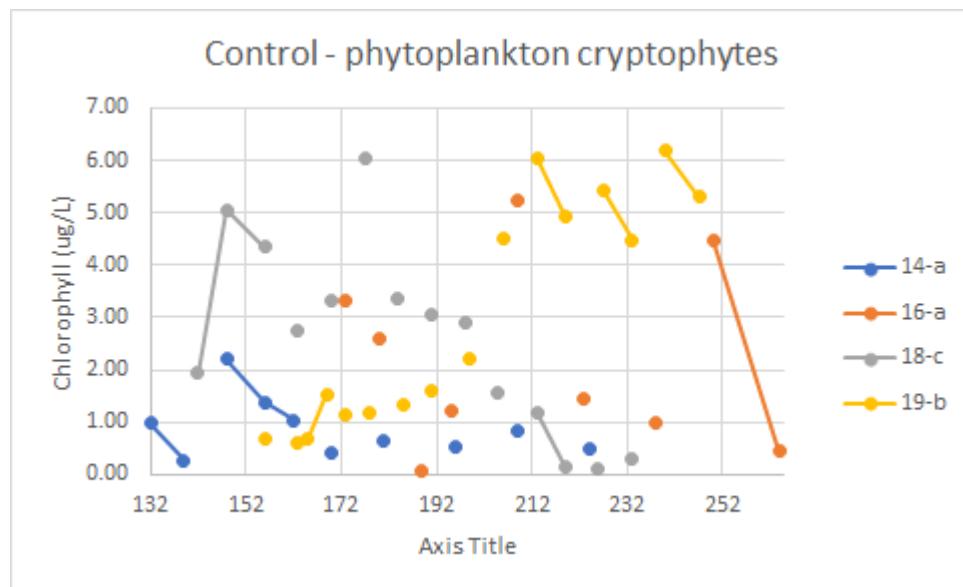
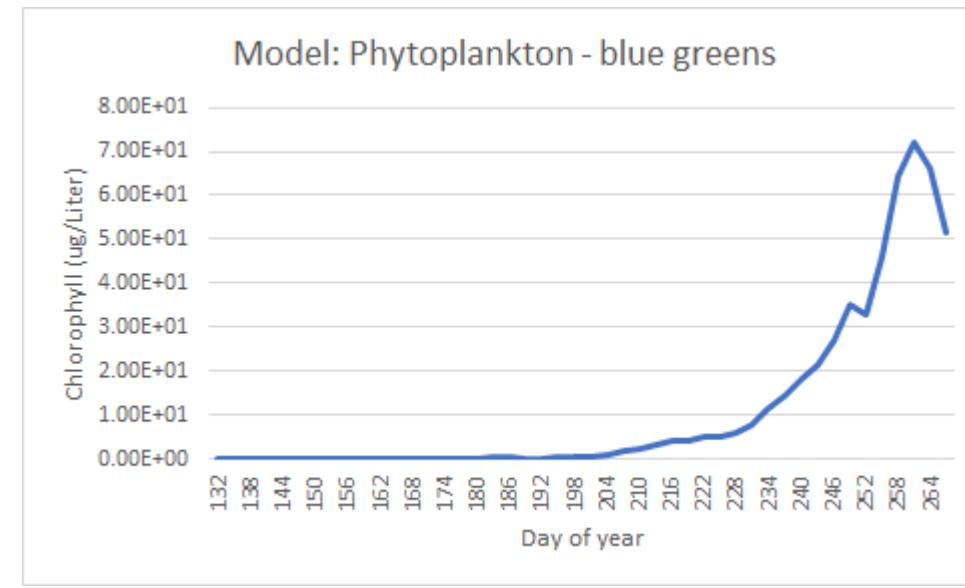
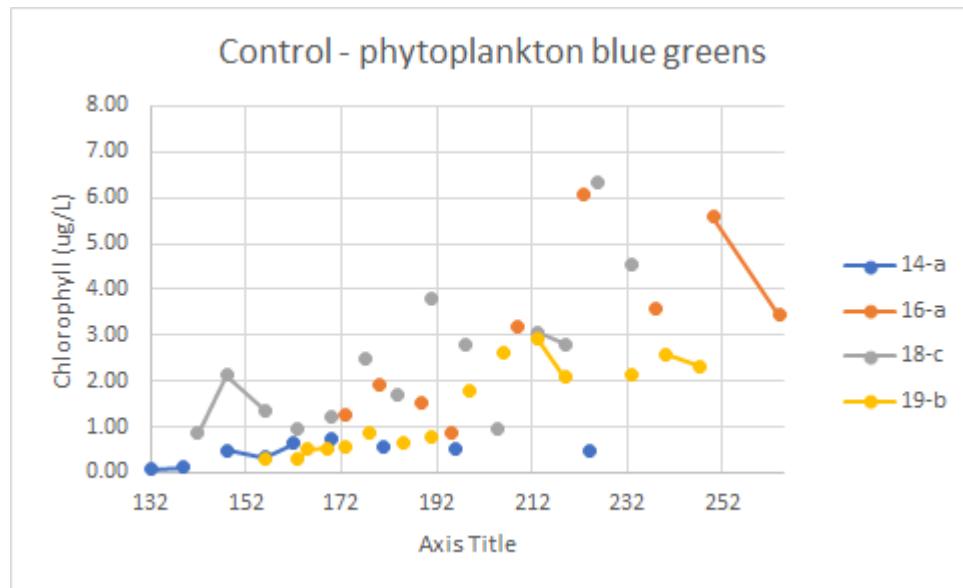




Phytoplankton

	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

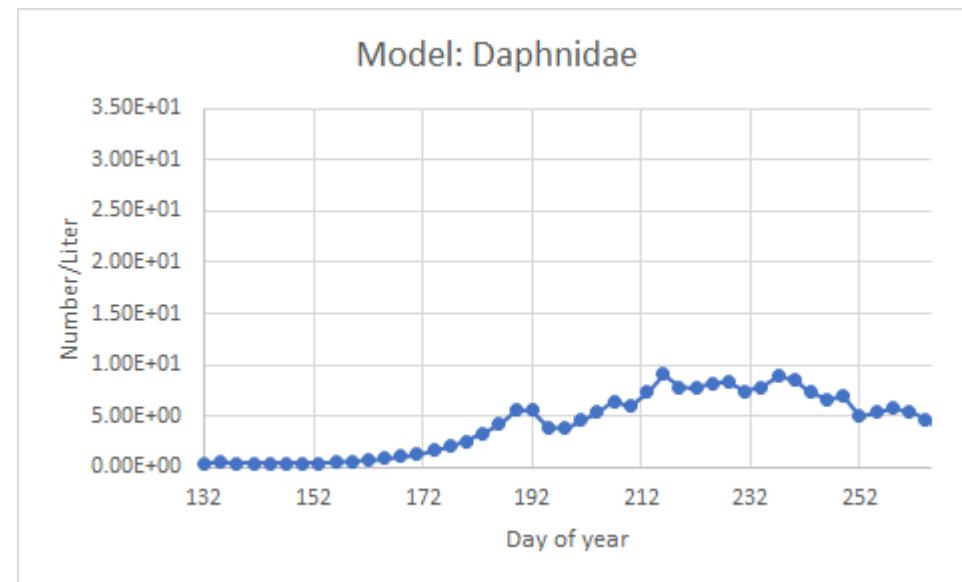
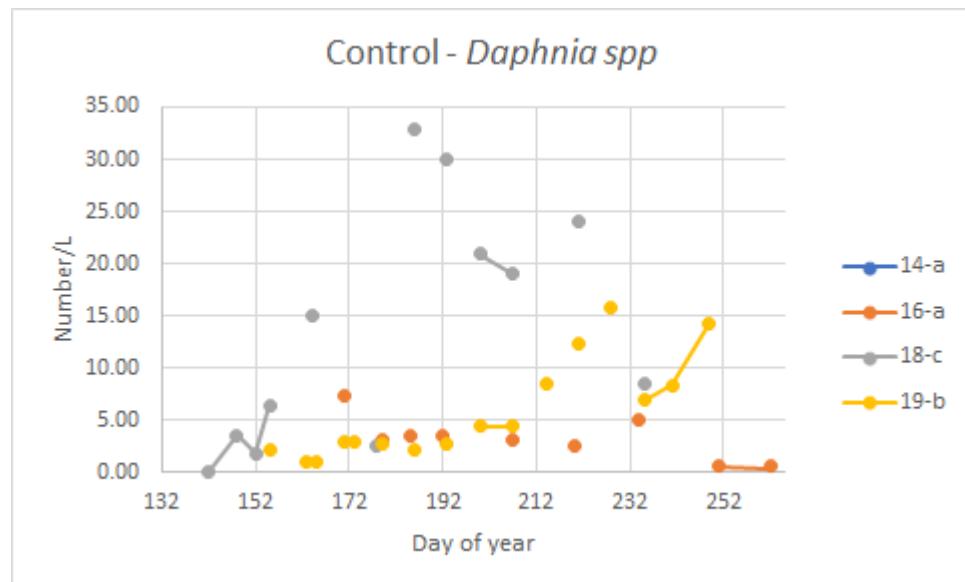
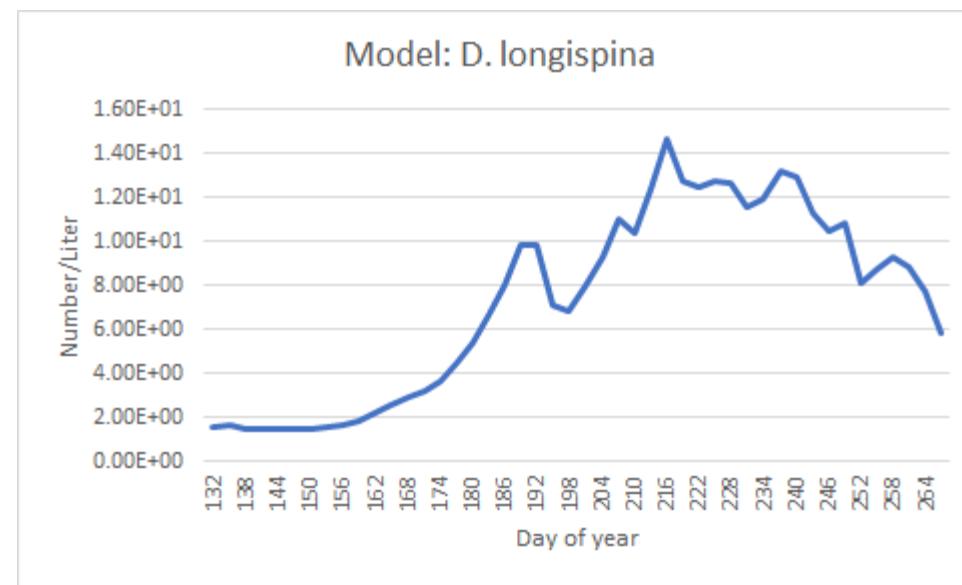
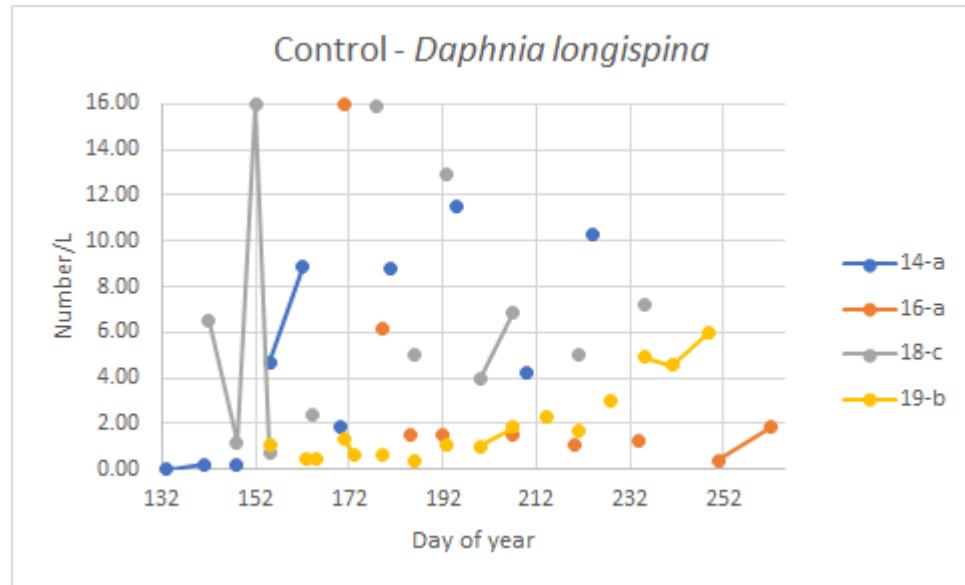




Zooplankton

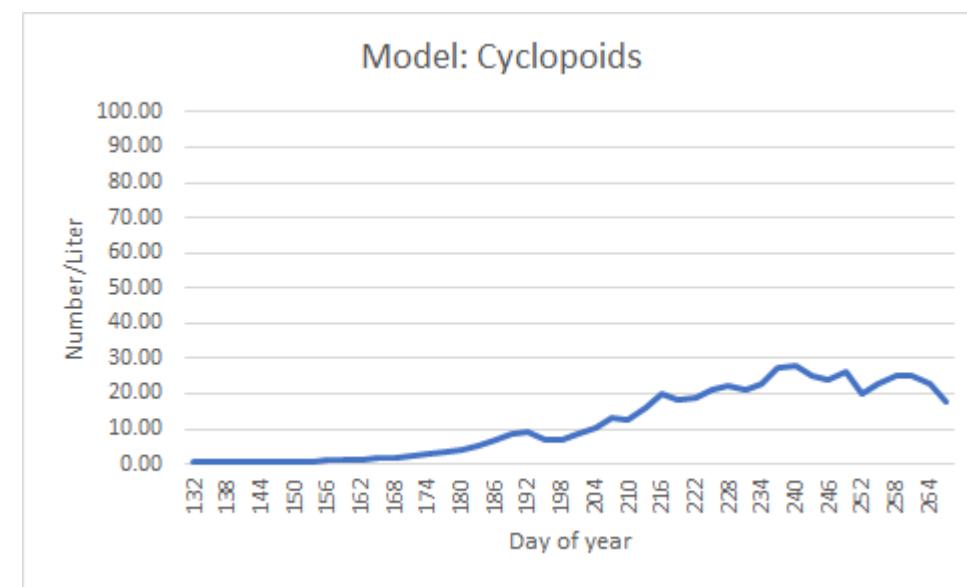
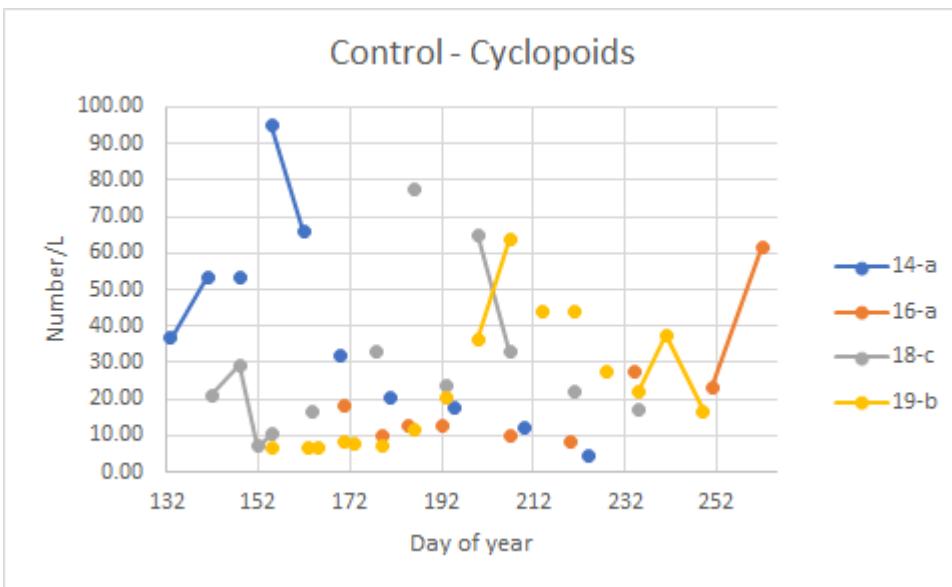
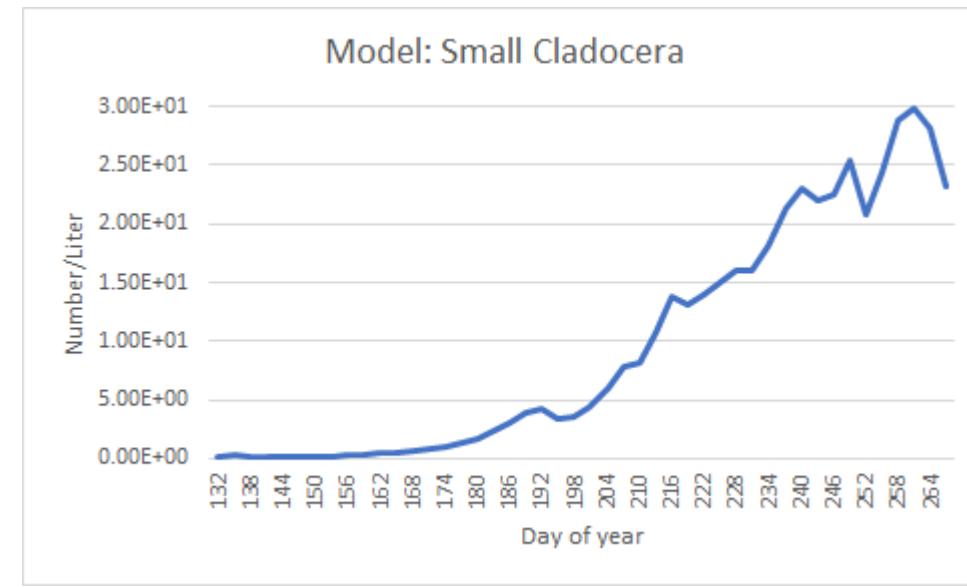
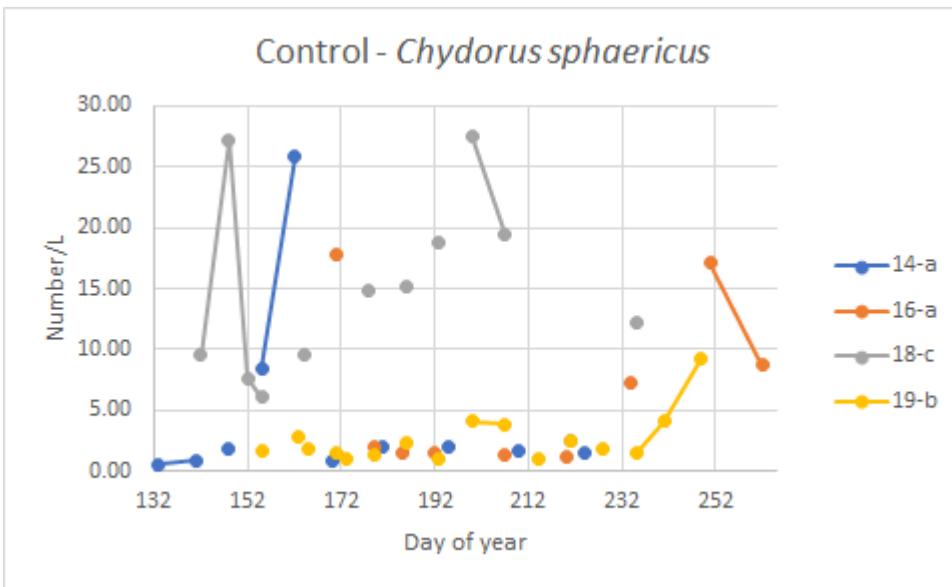
	Daphnia longispina				Calibration	
	14-a	16-a	18-c	19-b	365	132-265
Mean	5.06	3.46	6.97	1.94	4.49	6.44
Min	0.00	0.37	0.71	0.32	1.50	1.50
Max	11.56	15.99	15.98	5.99	14.68	14.68

	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



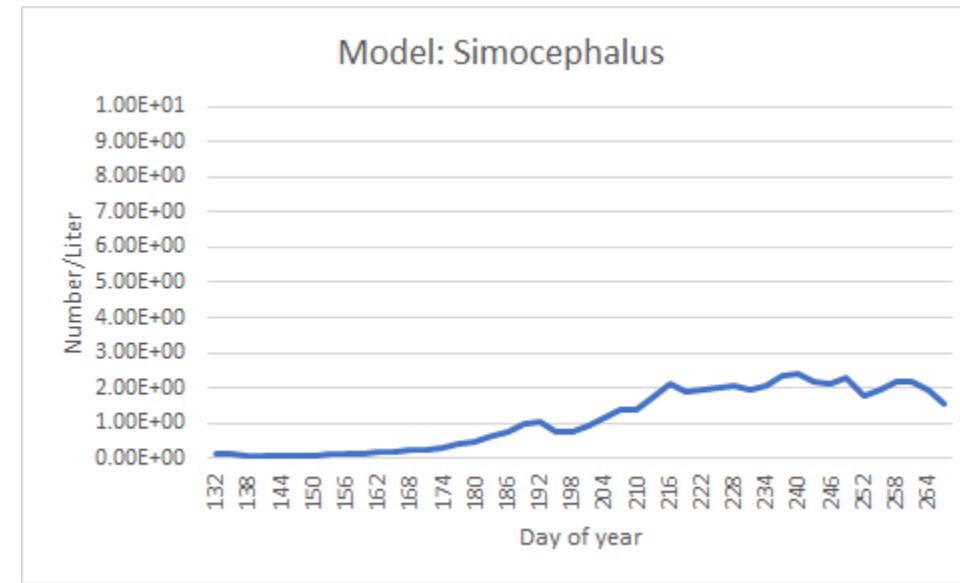
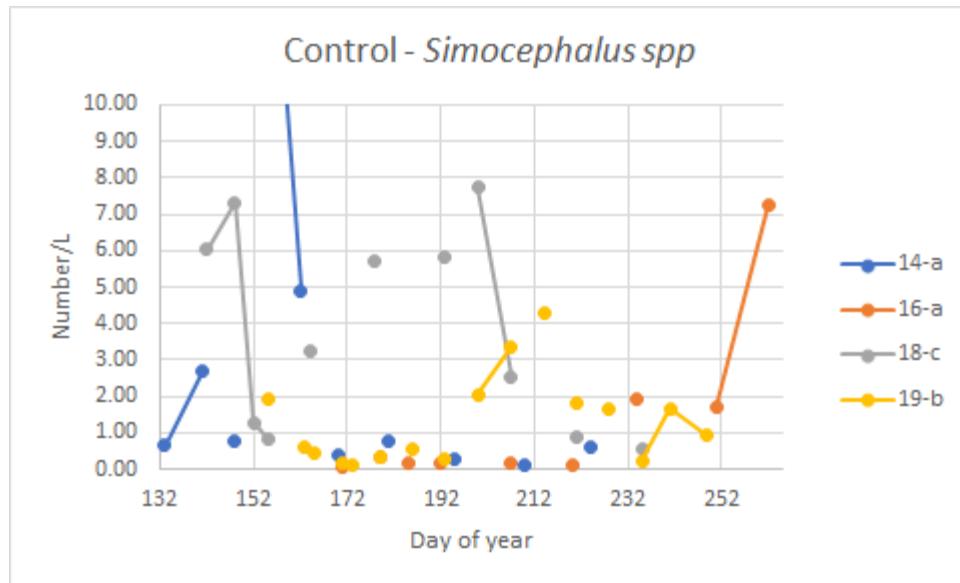
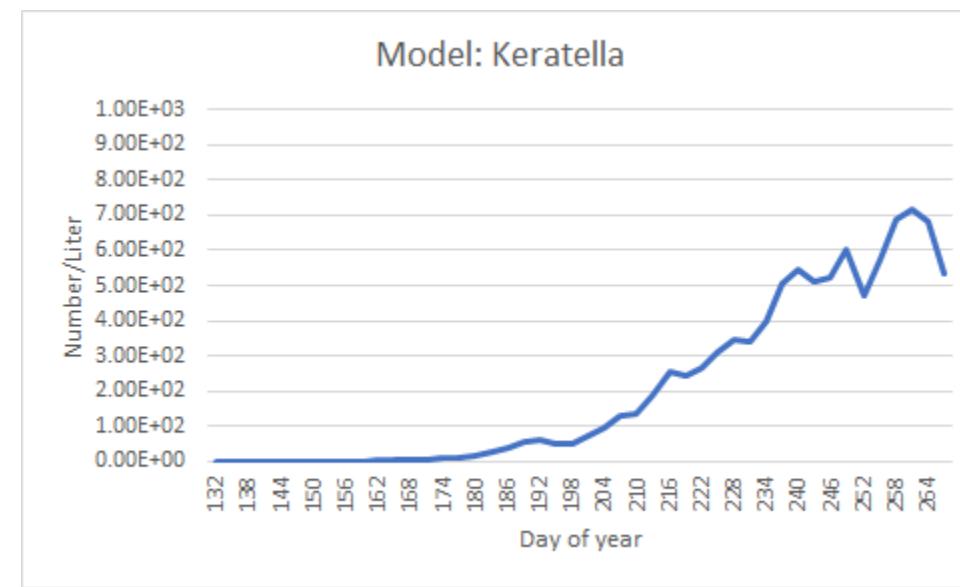
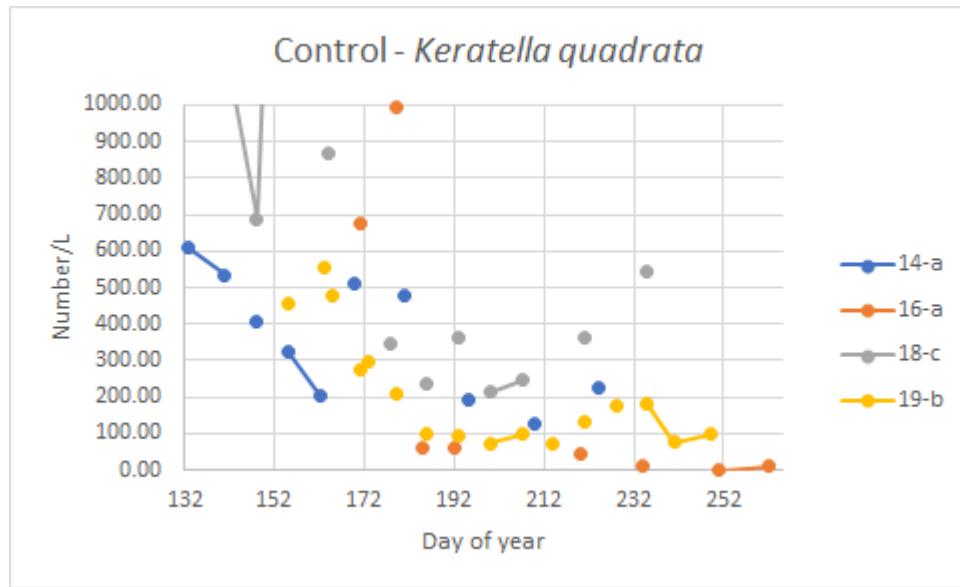
	<i>Chydorus sphaericus</i>				Calibration	
	14-a	16-a	18-c	19-b	365	132-265
Mean	4.58	6.49	14.22	2.60	5.91	8.21
Min	0.58	1.09	2.52	0.94	0.20	0.20
Max	25.93	17.73	27.58	9.29	29.89	29.89

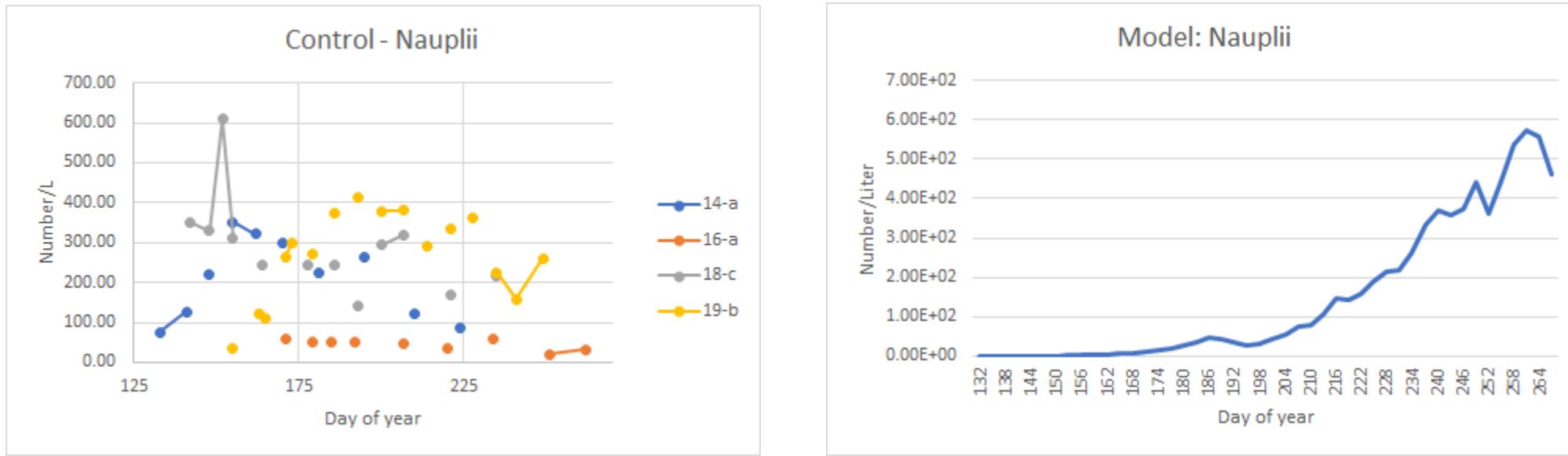
	<i>Cyclopoids</i>				Calibration	
	14-a	16-a	18-c	19-b	365	132-265
Mean	39.03	20.39	29.56	22.91	5.87	10.03
Min	4.54	8.14	7.14	6.41	0.40	0.40
Max	94.82	61.61	77.30	63.79	27.79	27.79



	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





	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

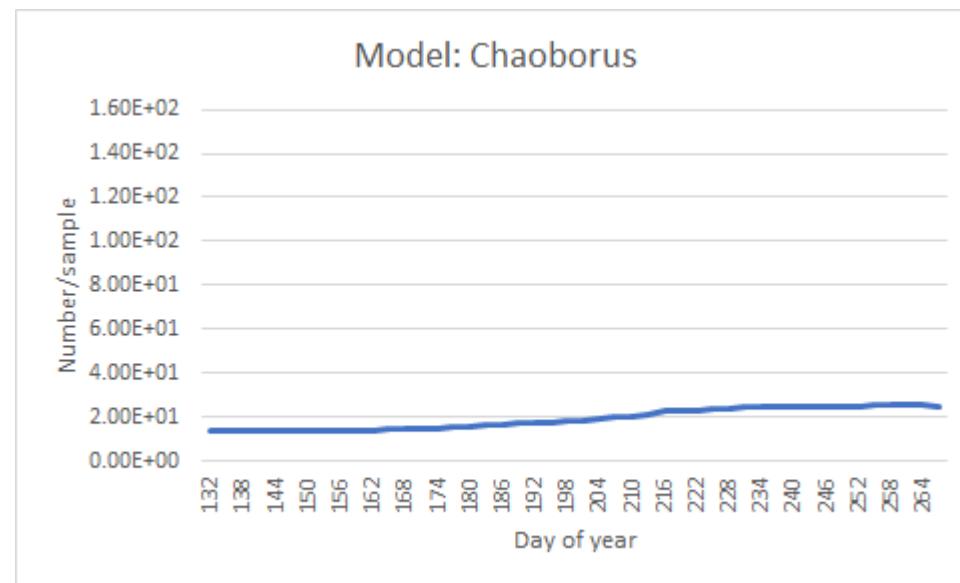
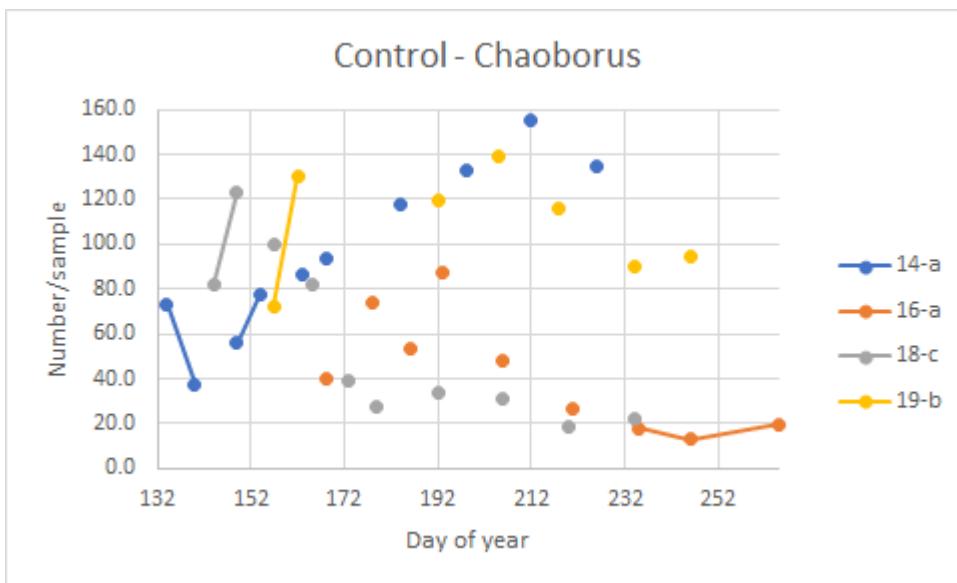
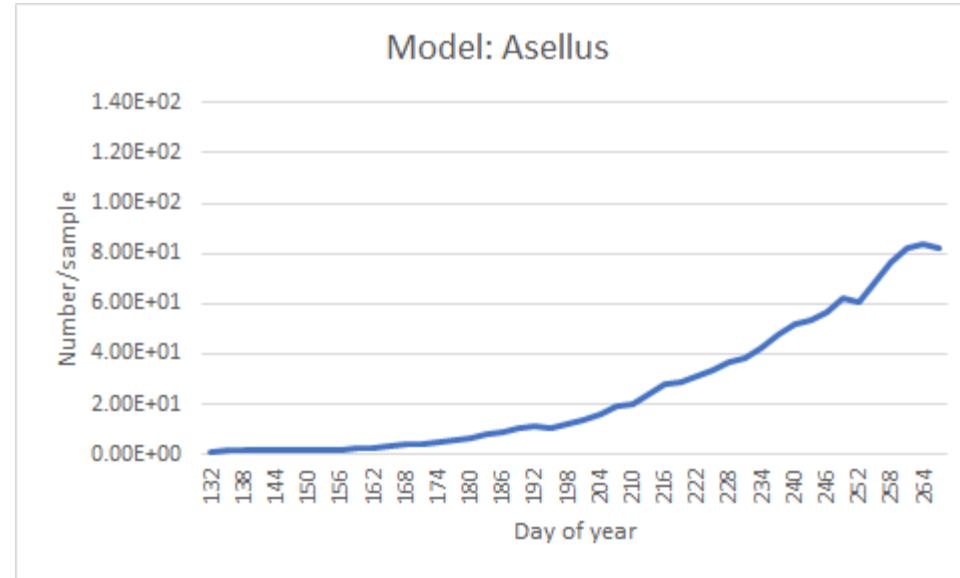
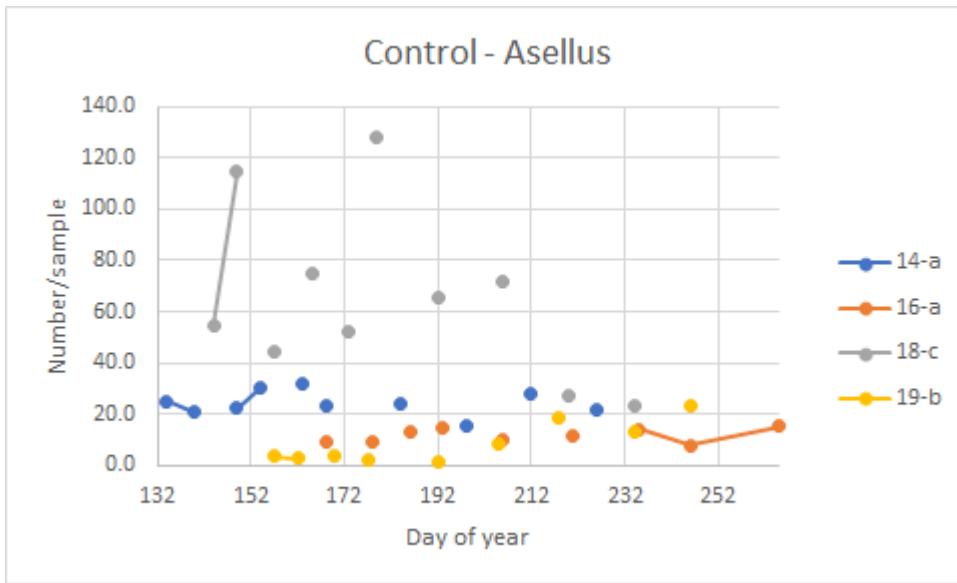
Assumption: data from sampling devices are directly comparable to number per square meter computed by the model... or, the sampling devices accurately estimate abundance of macroinvertebrates...

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)...

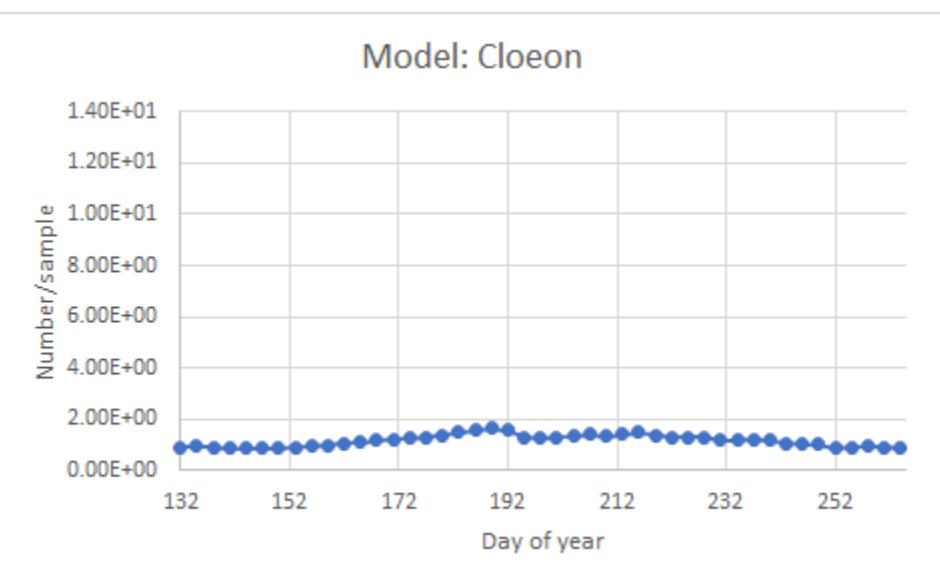
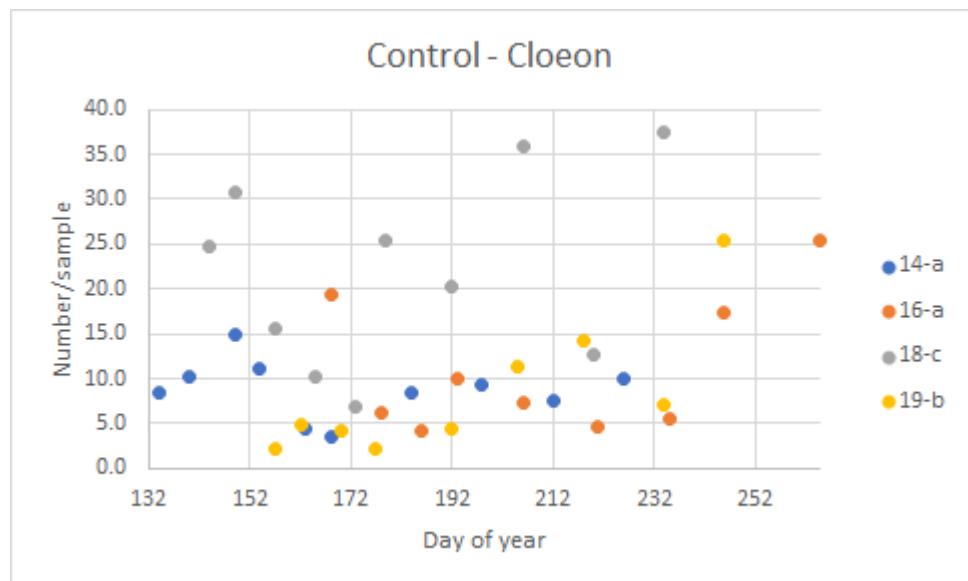
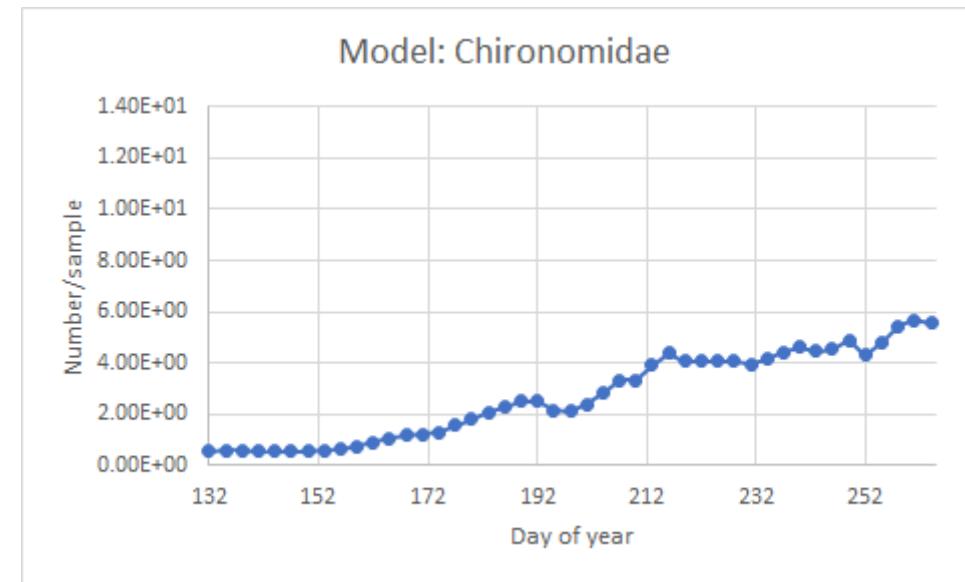
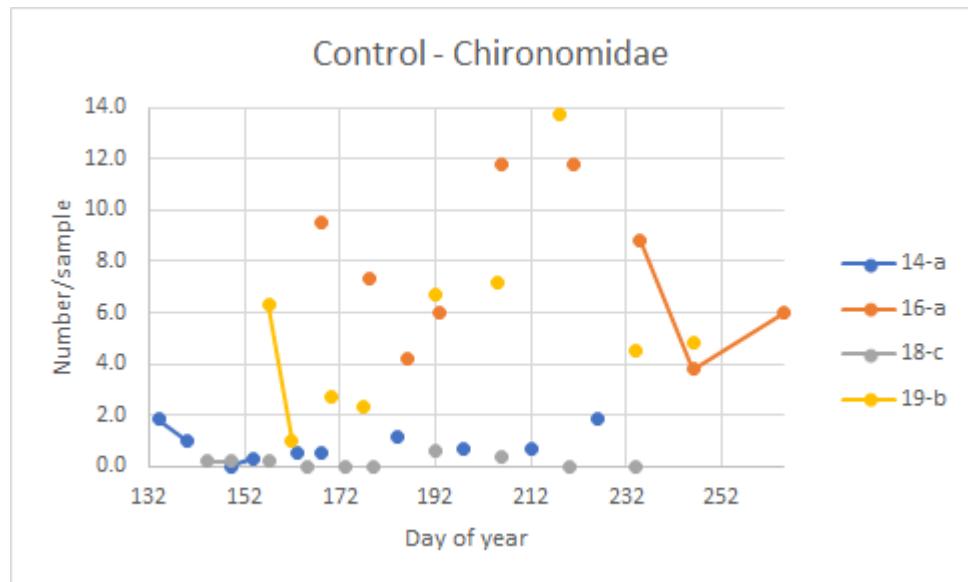
	Asellus				Calibration	
	14-a	16-a	18-c	19-b	365	132-265
Mean	24.32	11.74	65.72	8.58	27.45	21.68
Min	15.30	8.00	23.20	1.50	0.91	0.91
Max	31.70	15.20	127.80	23.20	84.40	84.05

	Chaoborus Inv				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



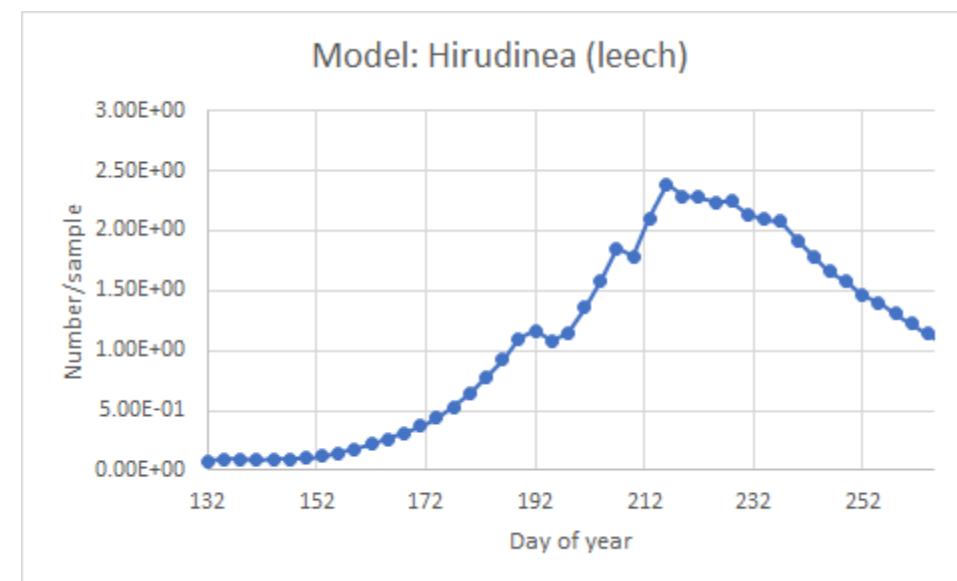
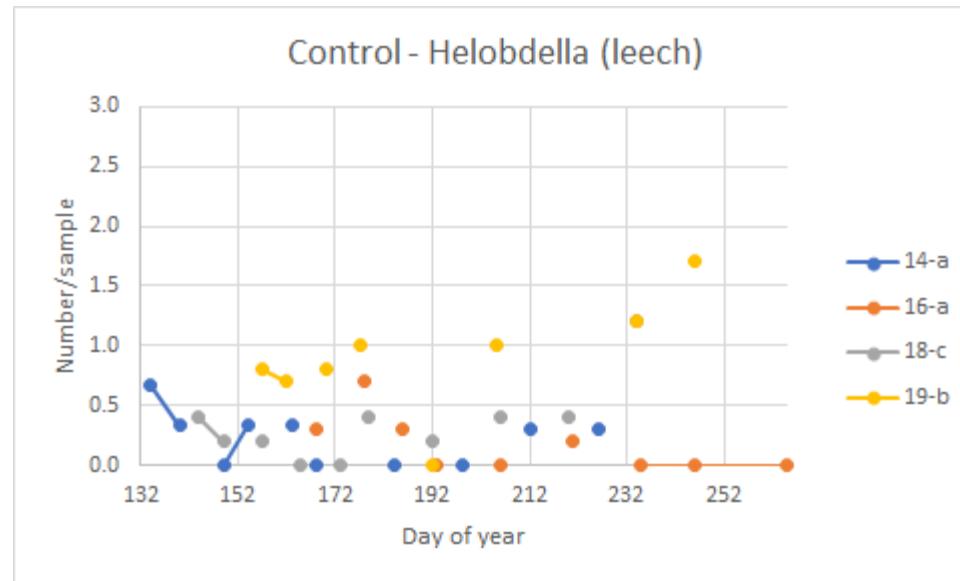
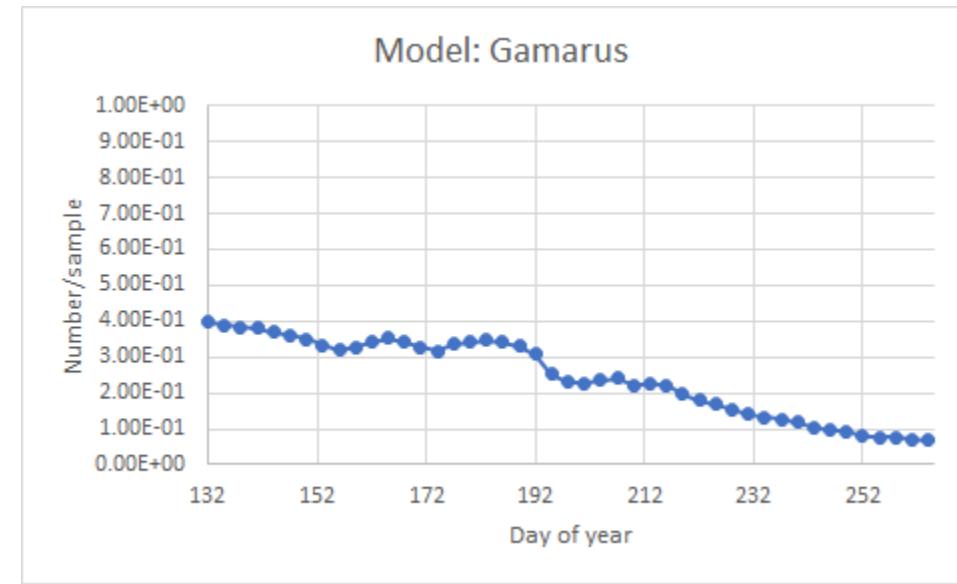
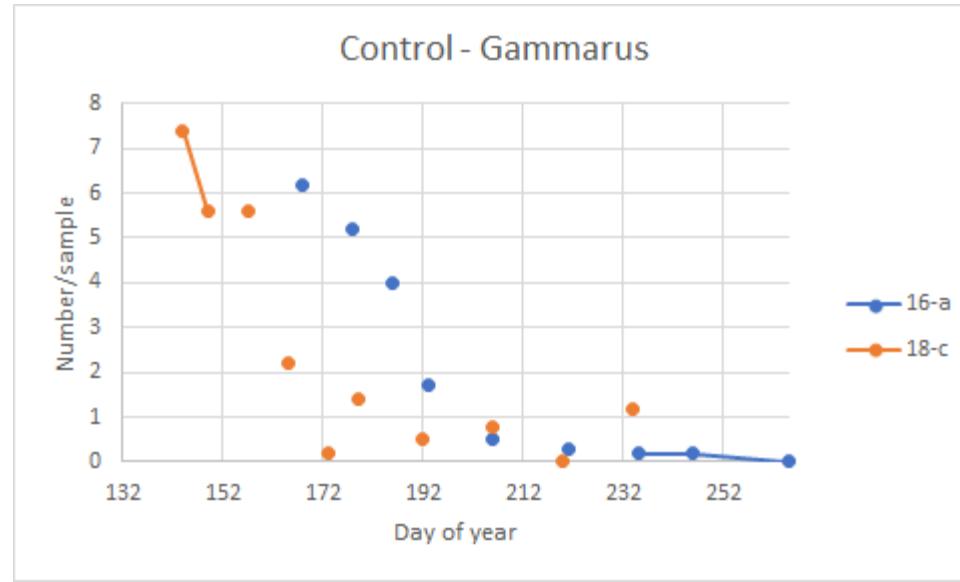
	Chironomidae - Inv				Calibration	
	14-a	16-a	18-c	19-b	365	132-265
Mean	0.85	7.69	0.16	5.47	2.26	2.44
Min	0.00	3.80	0.00	1.00	0.47	0.47
Max	1.83	11.80	0.60	13.70	5.67	5.67

	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



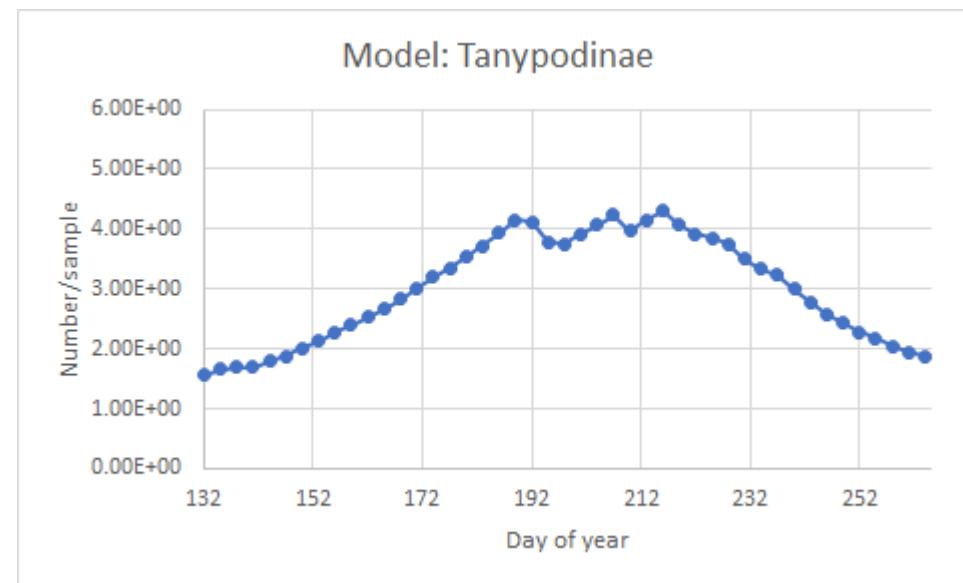
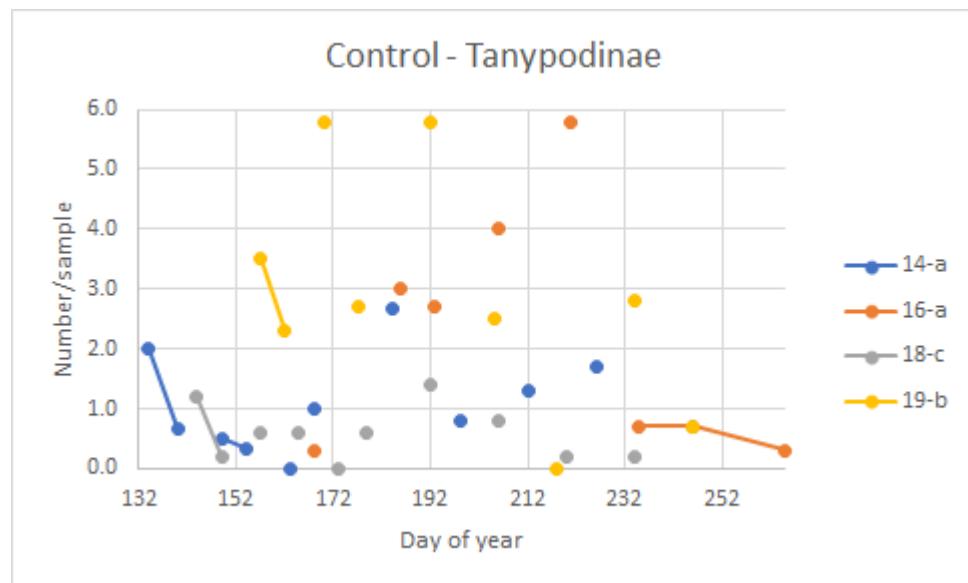
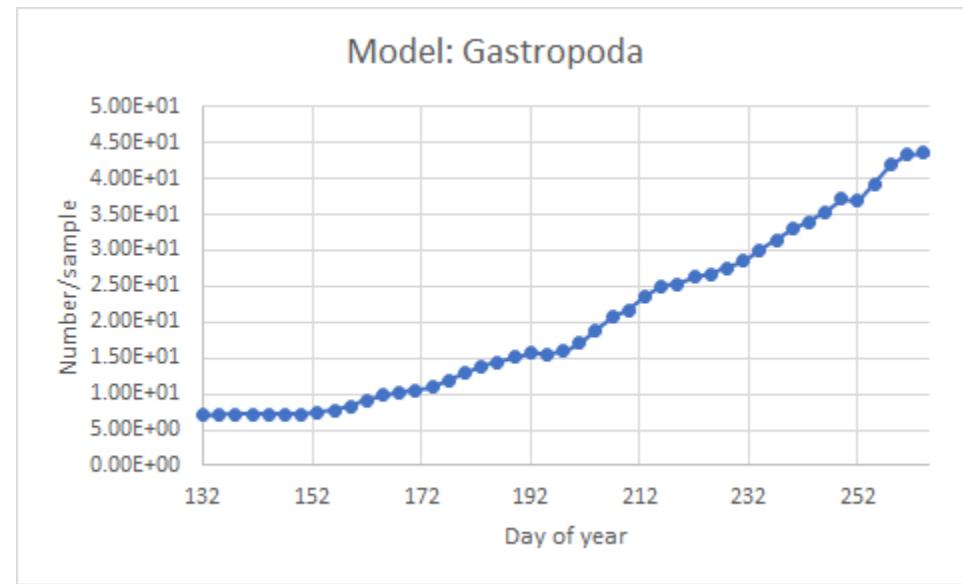
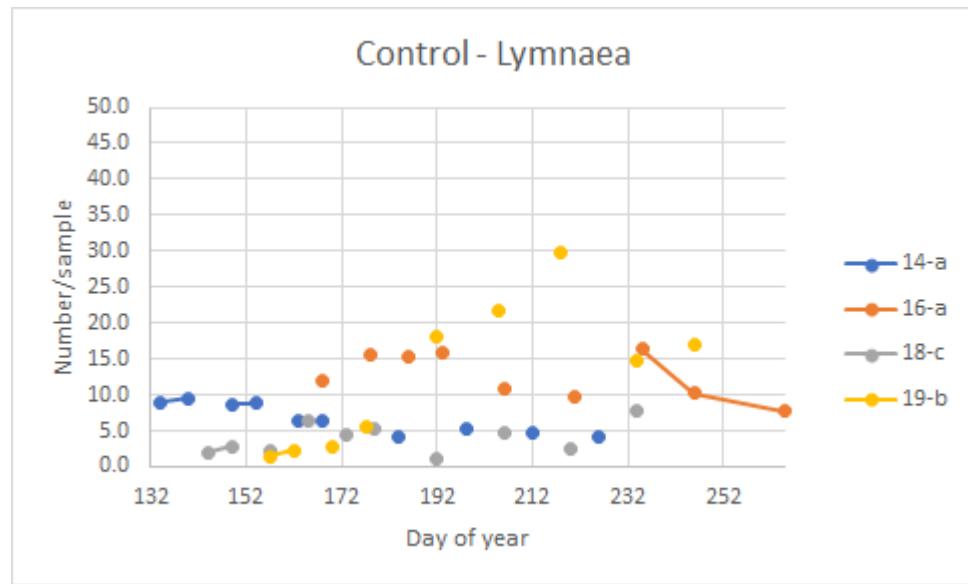
	Gammarus pulex				Calibration	
	14-a	16-a	18-c	19-b	365	132-265
Mean	no data	2.03	2.49	no data	0.27	0.27
Min		0.00	0.00		0.05	0.07
Max		6.20	7.40		0.50	0.44

	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



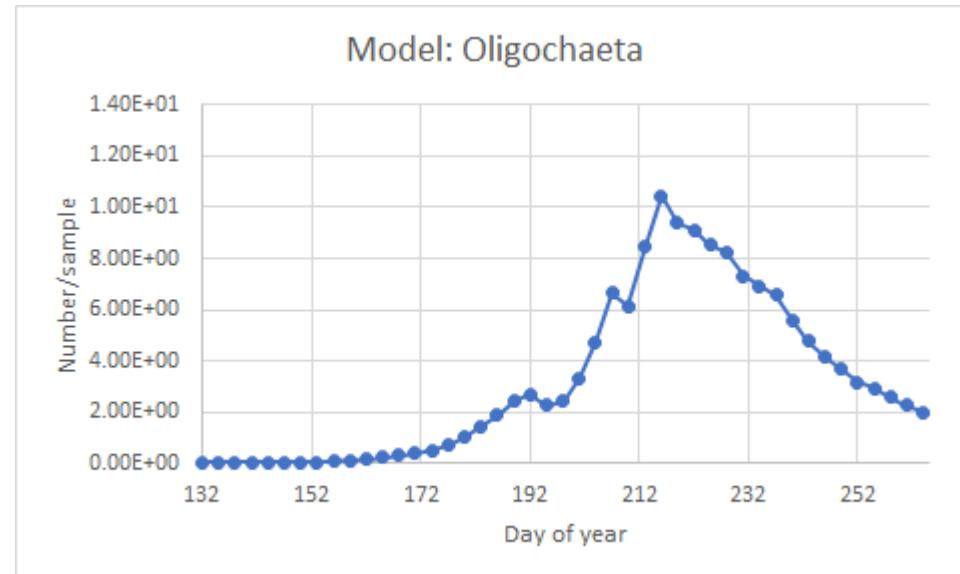
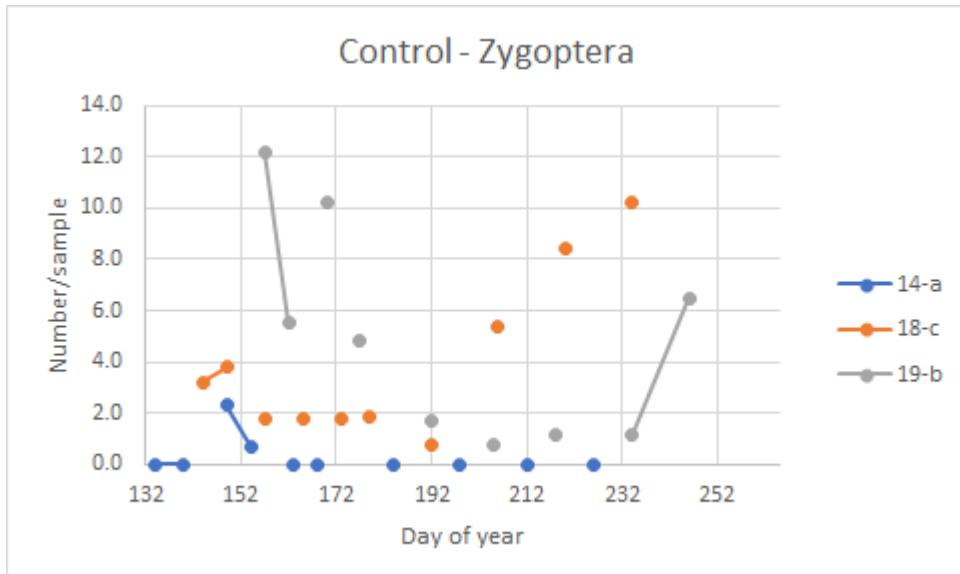
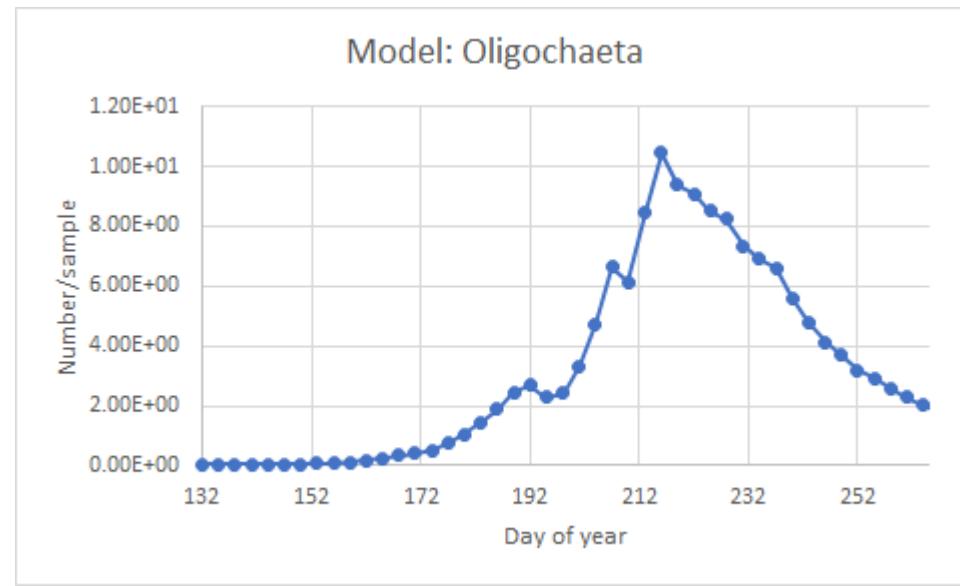
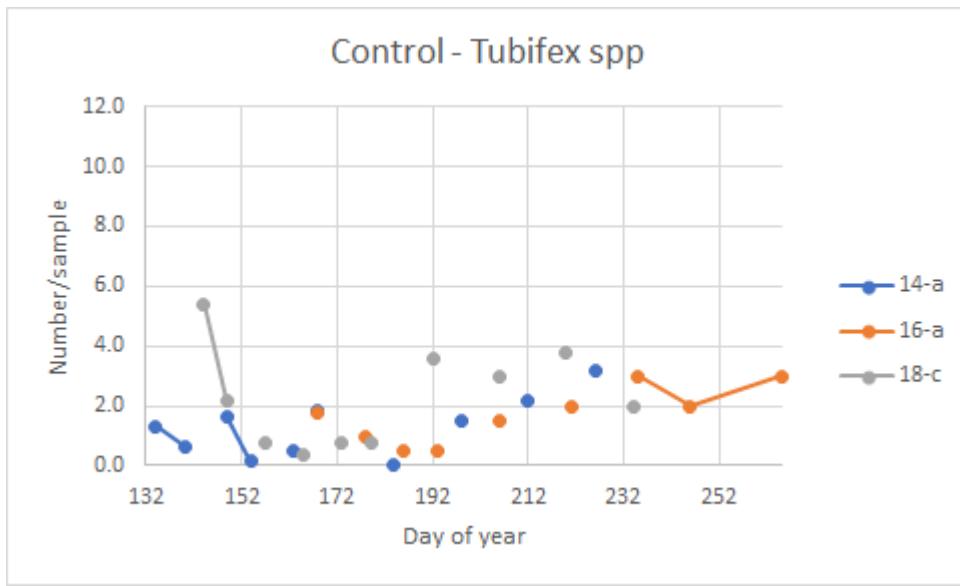
	Lymnaea				Calibration	
	14-a	16-a	18-c	19-b	365	132-265
Mean	6.68	12.60	3.88	12.60	20.76	18.60
Min	4.17	7.70	1.00	1.50	6.69	6.69
Max	9.50	16.30	7.80	29.70	43.59	43.59

	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



	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



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