

Electronic Supplementary Material

Spatial density, biomass, and composition of crustacean zooplankton on Lake Michigan beaches

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Electronic Supplementary Material

Figures S1-S2 pages 2-3

Tables S1-S4 pages 4-7

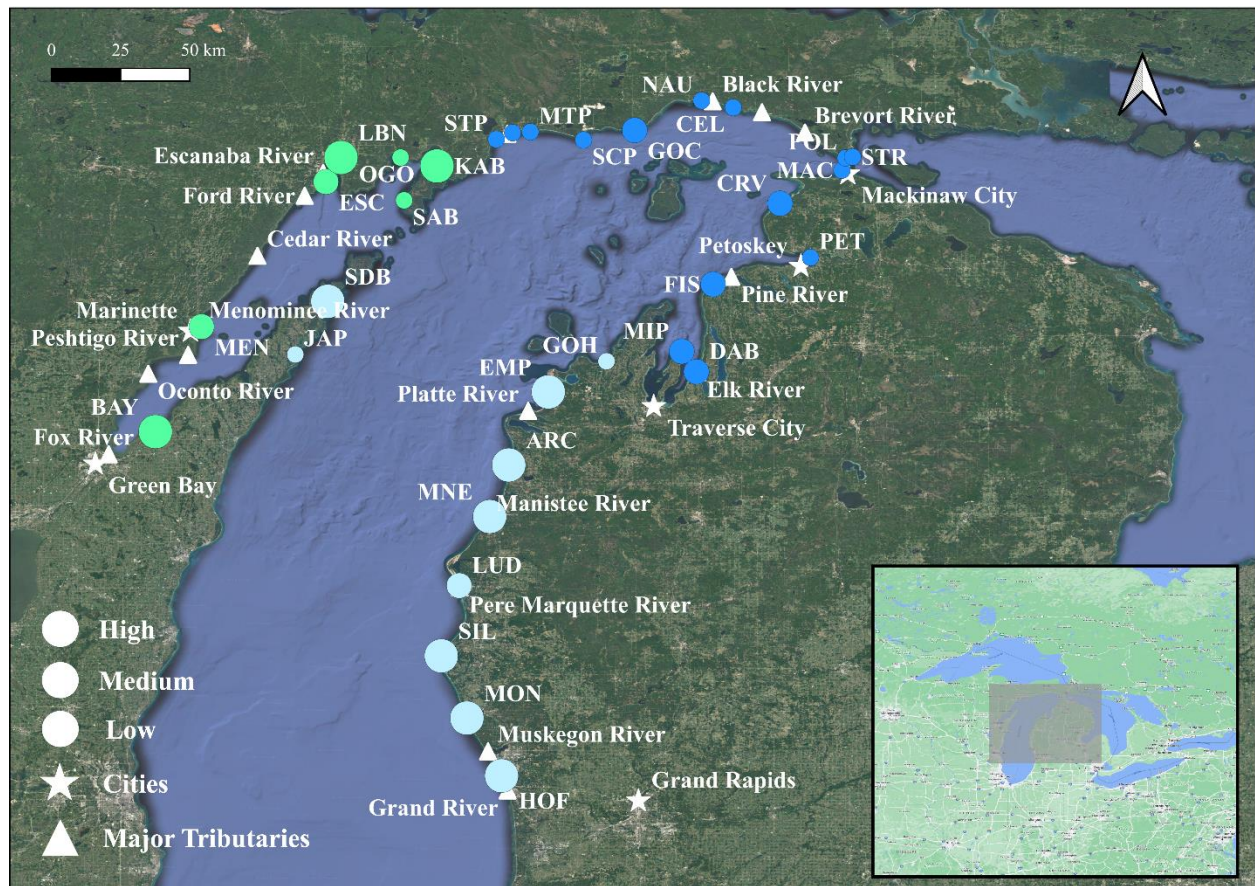


Figure S1. Mean crustacean zooplankton biomass on 32 beach sites sampled in Lake Michigan from June 26-29, 2020. ARC = Arcadia, BAY = Bayshore, CEL = Cedar Loft, CRV = Cross Village, DAB = Dam Beach, EMP = Empire, ESC = Escanaba, FIS = Fisherman's Island State Park, GOH = Good Harbor, GOC = Gould City, HOF = Hoffmaster State Park, JAP = Jackson Port, KAB = Kates Bay, LBN = Little Bay de Noc, LUD = Ludington, MAC = Mackinaw City, MNE = Manistee, MAN = Manistique, MTP = Manistique Township Park, MEN = Menominee, MIP = Mission Point, MON = Montague, NAU = Naubinway, OGO = Ogontz, PET = Petoskey, POL = Point La barbe, SAB = Sac Bay, SDB = Sand Bay, SCP = Seul Choix Point, SIL = Silver Lake, STP = Stony Point, STR = Straits.

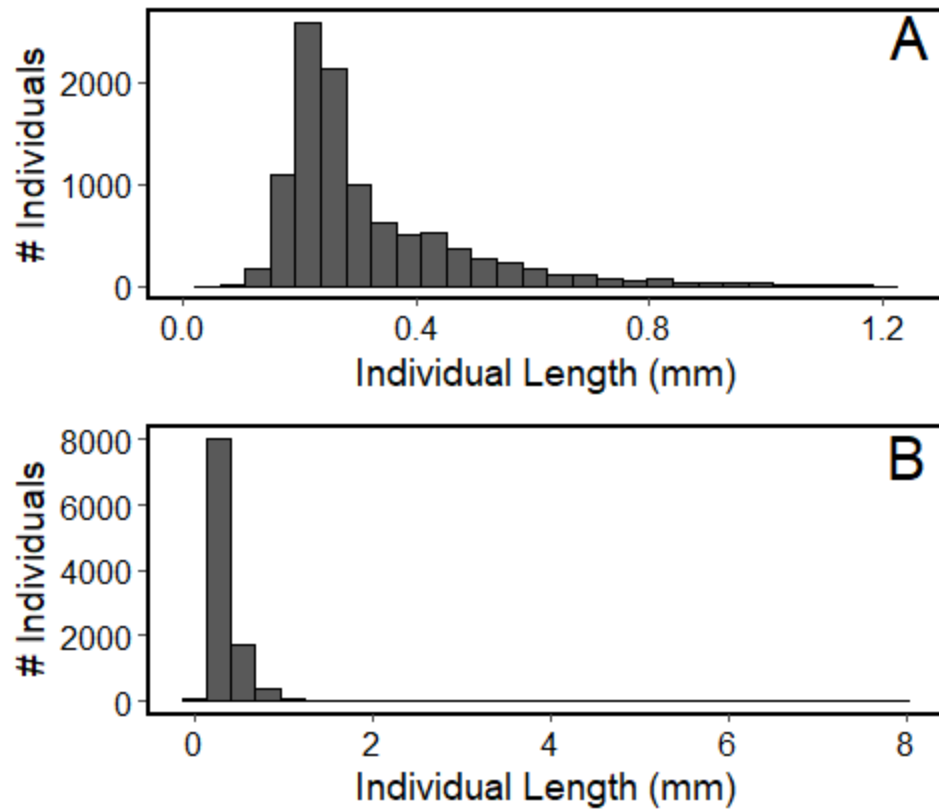


Figure S2. Lengths of individual crustacean zooplankton A) excluding *Leptodora* (which is a larger-bodied zooplankton) and B) including *Leptodora*. Notice the change in bin ranges with the addition of *Leptodora*.

Table S1. Environmental and total crustacean zooplankton data collected for each individual site. Cond is specific conductivity ($\mu\text{S cm}^{-1}$), Temp is subsurface water temperature ($^{\circ}\text{C}$), and DO is dissolved oxygen concentration (mg L^{-1}). Mean total crustacean zooplankton density (Density: individuals m^{-3}) and biomass (Biomass: mg DW m^{-3}) and the ± 1 S.E. across the replicates for each site are provided. Menominee was the only site with two versus three replicates collected for zooplankton.

Bay	Code	Lat	Long	Cond	pH	Temp	DO	Density	Density ± 1 S.E.	Biomass	Biomass ± 1 S.E.
Bayshore	BAY	44.63798	-87.7999	306	7.75	23.08	6.03	58908	20750	24.7	8.1
Menominee	MEN	45.10026	-87.5969	275	7.68	18.17	7.68	3380	393	7.2	4.1
Escanaba	ESC	45.73806	-87.0481	266	8.53	19.41	9.08	14737	3310	9.1	1.5
Little Bay De Noc	LBN	45.845	-86.9819	254	8.04	20.35	8.22	40781	11232	16.1	5.5
Ogontz	OGO	45.84473	-86.7194	267	8.26	23.36	8.89	6340	2589	1.7	0.7
Kates Bay	KAB	45.80755	-86.5587	260	8.21	22.24	8.35	24679	8697	26.7	16.1
Sac Bay	SAB	45.65641	-86.7038	279	8.26	21.71	10.18	6995	2716	1.9	0.7
Manistique	MAN	45.95404	-86.2254	258	8.32	16.24	9.93	419	302	0.5	0.3
Stony Point	STP	45.92523	-86.2972	274	8.32	15.48	9.72	2987	826	2.2	0.5
Manistique Township Park	MTP	45.9577	-86.1473	272	8.33	14.12	9.93	472	78.6	0.7	0.1
Seul Choix Point	SCP	45.92199	-85.9126	279	8.33	13.39	10.58	655	139	1.8	0.3
Gould City	GOC	45.96493	-85.6877	278	8.45	11.86	11.64	4454	1051	7.1	1.7
Naubinway	NAU	46.09534	-85.3924	268	8.34	15.24	9.42	550	136	0.6	0.2
Cedar Loft	CEL	46.065	-85.253	253	8.34	16.01	8.91	4768	1981	4.4	1.5
Point La barbe	POL	45.84289	-84.7577	262	8.51	17.12	9.24	865	354	1.2	0.9
Straits	STR	45.84722	-84.7266	249	8.48	18.75	9.04	1533	357	3.7	0.9
Cross Village	CRV	45.6426	-85.0465	306	8.88	17.45	9.26	5135	661	8.6	1.5
Mackinaw	MAC	45.78899	-84.774	295	8.89	16.17	9.43	341	146	0.2	0.2
Petoskey	PET	45.40449	-84.9123	202	8.88	19.83	9.17	1781	347	1.2	0.2
Fisherman's	FIS	45.28713	-85.3417	311	8.94	19.13	10.87	7126	2184	7.7	2.4
Dam Beach	DAB	44.90215	-85.4154	307	8.88	21.05	10	7912	578	9.4	1.2
Mission Point	MIP	44.99159	-85.4798	299	8.91	18.37	9.97	6419	526	6.3	0.2
Good Harbor	GOH	44.9479	-85.8117	315	8.77	18.91	9.44	8331	1500	4.2	0.3
Empire	EMP	44.81294	-86.068	316	8.8	20.34	9.12	54781	15114	26.9	7.3
Arcadia	ARC	44.49132	-86.2424	313	8.84	22.15	9.06	25478	9764	23.9	11.7
Manistee	MNE	44.26431	-86.3264	302	8.96	21.38	10.13	44799	20366	22.3	10.5
Ludington	LUD	43.96046	-86.4611	313	8.95	18.12	10.43	23146	3131	8.7	2.1
Silver Lake	SIL	43.65097	-86.5398	311	9.03	19.05	10.09	74010	14045	30.6	7.3
Montague	MON	43.37731	-86.4268	321	9.01	20.1	10.78	21456	461	15.8	2.7
Hoffmaster	HOF	43.12318	-86.2742	338	9.13	22.98	10.4	49672	6853	27.2	4.7
Jackson Port	JAP	44.97788	-87.1832	285	8.33	21.23	9.92	2070	114	1.8	0.2
Sand Bay	SDB	45.21191	-87.0403	288	8.46	23.08	9.36	14226	5734	17.5	8.4

Table S2. Density (individuals m⁻³) and the ± 1 S.E. across the replicates of each broader zooplankton group by site. NA signifies individuals of that group only being found in a single replicate from the site, or not found at all, and so a S.E. was not calculated.

Bay	Nauplii	Nauplii ± 1 S.E.	Calanoid	Calanoid ± 1 S.E.	Cyclopoid	Cyclopoid ± 1 S.E.	Cladoceran	Cladoceran ± 1 S.E.
Bayshore	3301	1656	0	NA	6170	2382	49437	20034
Menominee	550	314	825	589	825	275	1179	157
Escanaba	327	47.2	249	85.9	655	228	13505	3334
Little Bay De Noc	3694	795	0	NA	1493	393	35594	10318
Ogontz	314	78.6	0	NA	550	120	5580	2588
Kates Bay	0	NA	0	NA	812	148	23867	8580
Sac Bay	118	39.3	0	NA	118	39.3	6838	2716
Manistique	0	NA	314	NA	157	78.6	236	157
Stony Point	131	26.2	236	78.6	681	146	1939	825
Manistique Township Park	157	78.6	78.6	0	131	26.2	183	104.8
Seul Choix Point	157	NA	288	52.4	262	105	157	NA
Gould City	681	114	2332	988	812	159	943	628.8
Naubinway	131	26.2	118	39.3	131	26.2	210	94.5
Cedar Loft	393	NA	393	136	865	208	3380	1668
Point La barbe	262	26.2	131	52.4	367	210	314	NA
Straits	147	88.4	334	265	255	92.9	845	403
Cross Village	1520	114	3118	502	367	94.5	131	52
Mackinaw	118	39.3	78.6	0	78.6	NA	275	196
Petoskey	760	139	655	114	341	69.3	78.6	NA
Fisherman's	1965	798	3799	1432	1258	90.8	157	78.8
Dam Beach	2017	26.2	3799	498	1231	138.6	865	45.4
Mission Point	2829	643	2436	371	681	171.8	472	90.8
Good Harbor	2829	396	1912	749	288	69.3	1991	522
Empire	943	236	2908	1158	4480	1930	46450	12971
Arcadia	1389	644	5973	2217	2332	644	15785	6895
Manistee	1572	78.6	1886	836	4401	1468	36940	18073
Ludington	3026	682	413	177	1533	379	18313	2155
Silver Lake	7205	2800	236	NA	5292	1347	61435	12477
Montague	2646	664	1441	695	6104	869	11134	1052
Hoffmaster	1572	283	786	283	4716	1361	42599	5248
Jackson Port	78.6	0	118	39.3	734	114	1205	172
Sand Bay	629	157	413	295	1899	1481	11632	4380

Table S3. Biomass (mg DW m⁻³) and the ± 1 S.E. across the replicates of each broader zooplankton group by site. NA signifies individuals of that group only being found in a single replicate from the site, or not found at all, and so a S.E. was not calculated.

Bay	Nauplii	Nauplii ± 1 S.E.	Calanoid	Calanoid ± 1 S.E.	Cyclopoid	Cyclopoid ± 1 S.E.	Cladoceran	Cladoceran ± 1 S.E.
Bayshore	0.5	0.3	0	NA	8.0	2.7	16.2	5.7
Menominee	0.1	0.1	4.5	3.2	1.6	1.1	0.9	0.2
Escanaba	0.08	0.01	1.3	0.5	1.5	0.9	6.3	1.2
Little Bay De Noc	0.7	0.2	0	NA	1.4	0.5	14.1	5.2
Ogontz	0.03	0.01	0	NA	0.6	0.2	1.1	0.6
Kates Bay	0	NA	0	NA	0.5	0.1	26.2	16.1
Sac Bay	0.01	0.01	0	NA	0.2	0.1	1.8	0.8
Manistique	0	NA	0.7	NA	0.2	0.1	0.1	0.03
Stony Point	0.03	0.01	0.4	0.2	1.0	0.3	0.7	0.3
Manistique Township Park	0.03	0.02	0.2	0.1	0.4	0.2	0.2	0.1
Seul Choix Point	0.07	NA	1.2	0.1	0.6	0.4	0.1	NA
Gould City	0.2	0.1	4.4	1.6	1.1	0.3	2.3	1.1
Naubinway	0.03	0.01	0.4	0.04	0.2	0.1	0.1	0.1
Cedar Loft	0.1	0	1.0	0.4	1.6	0.6	1.7	0.7
Point La barbe	0.04	0.01	0.3	0.2	0.5	0.3	1.2	NA
Straits	0.03	0.01	1.0	0.9	0.4	0.2	2.2	1.4
Cross Village	0.3	0.03	7.6	1.4	0.4	0.1	0.3	0.1
Mackinaw	0.01	0	0.2	0.1	0.1	NA	0.1	0.1
Petoskey	0.2	0.04	0.8	0.2	0.2	0.03	0.1	NA
Fisherman's	0.4	0.1	6.3	2.4	1.0	0.1	0.1	0.03
Dam Beach	0.4	0.04	6.5	1.0	1.5	0.3	1.0	0.5
Mission Point	0.6	0.1	3.4	0.2	0.6	0.2	1.7	0.3
Good Harbor	0.8	0.2	2.4	0.1	0.3	0.1	0.7	0.2
Empire	0.2	0.1	6.3	2.2	6.5	2.1	13.9	3.7
Arcadia	0.3	0.2	15.7	8.4	3.5	1.7	4.5	1.9
Manistee	0.3	0.1	5.7	2.8	6.7	2.8	9.6	5.0
Ludington	0.5	0.2	0.9	0.3	2.4	0.5	5.2	1.2
Silver Lake	1.0	0.4	0.4	NA	9.2	5.0	20.3	3.4
Montague	0.5	0.1	5.4	1.8	6.5	1.2	3.6	0.5
Hoffmaster	0.4	0.1	3.6	1.8	6.8	1.5	16.5	1.6
Jackson Port	0.01	0.01	0.3	0.1	1.1	0.1	0.4	0.1
Sand Bay	0.08	0.02	1.9	1.3	2.3	1.7	13.9	7.1

Table S4. List of crustacean zooplankton taxa observed across sites.

Taxa
Cladocera
<i>Bosmina</i>
<i>Bythotrephes</i>
<i>Chydorus</i>
<i>Daphnia</i>
<i>Diaphanosoma</i>
<i>Leptodora</i>
<i>Polyphemus</i>
Copepoda
<i>Diacyclops</i>
<i>Epischura</i>
<i>Eurytemora</i>
Harpacticoida
<i>Leptodiaptomus</i>
<i>Mesocyclops</i>
Nauplii
<i>Skistodiaptomus</i>