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From: Nancy Decker <ndecker@asaac.com>
Sent: Thursday, April 21, 2016 10:14 AM
To: Wentzel, Michael
Cc: Dara Gray
Subject: [External_Sender] Email 1 for 2014 YCR
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Michael,

There will only be 4 emails for the 2014 YCR.

Nancy

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Sent Date: 4/21/2016 10:13:56 AM
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Recipients:
"Dara Gray" <dgray@entergy.com>
Tracking Status: None
"Wentzel, Michael" <Michael.Wentzel@nrc.gov>
Tracking Status: None

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MESSAGE	252	4/21/2016 10:14:19 AM
2014-Appendix B.pdf	337639	
2014-Appendix E.pdf	460771	
2014-Appendix F.pdf	383416	
2014-Appendix G.pdf	166563	
2014-Chapter 1.pdf	81077	
2014-Chapter 2.pdf	593920	
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Appendix B

Physical/Chemical Parameters

APPENDIX B

LIST OF TABLES

APPENDIX B

LIST OF TABLES (CONTINUED)

Table B-1 Daily Freshwater Flow (m^3/sec/day) Estimated for Green Island, New York, 2014

DAY OF MONTH	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT[1]	NOV[1]	DEC[1]
1	480	376	276	1401	920	442	358	243	198	106	230	371
2	426	358	251	1211	1027	402	370	247	213	124	218	553
3	369	339	224	1211	917	380	410	231	207	121	215	577
4	390	321	220	1126	790	505	651	231	243	122	224	418
5	445	298	219	1107	742	442	508	312	185	127	209	421
6	517	240	200	1118	818	370	379	243	156	161	218	387
7	889	237	182	1002	725	337	279	242	152	149	239	590
8	841	269	184	993	651	315	350	181	162	158	199	548
9	702	260	180	1234	588	249	453	163	123	129	210	477
10	627	226	186	1186	606	168	472	170	129	131	219	635
11	562	219	201	1109	649	179	429	168	113	170	193	642
12	676	223	306	1231	593	267	331	159	128	165	211	545
13	1092	205	420	1206	549	441	304	215	89	141	224	476
14	951	221	412	1316	537	1423	288	200	113	134	183	420
15	1112	228	349	1477	543	925	276	251	153	131	204	421
16	991	235	331	2448	673	716	298	205	137	321	189	421
17	781	229	323	2162	1350	534	274	212	152	514	218	539
18	688	249	291	1545	1496	494	296	190	130	368	353	670
19	613	214	266	1163	1123	505	195	186	114	354	423	606
20	559	223	272	909	886	494	202	167	132	267	284	474
21	483	332	324	712	672	397	257	334	110	222	265	397
22	438	499	323	594	593	297	191	680	115	204	228	373
23	411	710	306	617	557	361	149	518	130	289	268	385
24	449	665	299	558	644	352	175	408	125	387	316	699
25	481	538	260	528	696	428	181	315	126	368	431	1386
26	509	432	245	599	661	832	178	235	111	324	489	1476
27	492	333	226	661	529	821	162	222	112	325	487	1144
28	474	298	311	622	530	581	298	193	120	316	438	955
29	423	NA	651	590	465	468	526	203	125	291	426	1000
30	438	NA	1627	662	434	369	440	244	114	272	384	800
31	420	NA	1692	NA	447	NA	306	197	NA	257	NA	625

[1] October through December data are provisional.

Table B-2 Long-Term (1947-2013) and 2014 Monthly Mean Freshwater Flow (m^3/sec/day) Estimated for Green Island, New York

MONTH	2014 AVERAGE	LONG-TERM AVERAGE	LONG-TERM MINIMUM	LONG-TERM MAXIMUM
JAN	604	410	118	961
FEB	321	399	128	885
MAR	373	635	258	1,077
APR	1,077	864	257	1,749
MAY	723	526	156	1,147
JUN	483	303	101	909
JUL	322	201	87	670
AUG	250	179	48	480
SEP	141	193	58	897
OCT	231[1]	279	71	853
NOV	280[1]	387	93	758
DEC	627[1]	441	173	989
ANNUAL AVERAGE[2]	453	401		

[1] October through December data for 2014 are provisional.
[2] Weighted by number of days in each month. 2014 average is provisional.

Table B-3 Monthly Mean Freshwater Flow (m^3/sec/day) Estimated for Green Island, New York, 1974 to 2014

	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
JAN	623	540	417	225	744	571	256	148	321	259	133	439	310	262	268	196	383	512
FEB	527	548	885	227	400	335	128	851	356	352	552	319	362	201	349	256	703	496
MAR	587	670	897	987	619	1,077	633	349	613	580	281	581	1,018	605	461	332	994	696
APR	854	724	1,040	1,092	950	1,009	748	384	897	1,062	761	456	689	981	476	548	894	655
MAY	650	566	900	421	530	508	274	328	354	1,036	651	232	363	156	357	620	990	346
JUN	249	367	431	207	282	216	192	169	431	358	275	157	428	175	123	389	250	144
JUL	333	211	432	162	131	131	144	140	182	127	127	133	250	162	131	92	157	112
AUG	180	254	414	154	169	149	130	133	124	155	48	104	350	118	139	61	248	123
SEP	294	482	271	408	175	221	118	233	122	133	58	171	218	341	164	120	159	136
OCT	256	662	658	853	244	313	158	456	124	71	178	206	336	504	211	254	477	216
NOV	486	637	507	663	227	465	242	393	196	224	277	423	544	453	565	407	653	301
DEC	548	532	398	749	303	430	273	319	233	624	447	338	524	437	330	180	687	364
ANNUAL AVERAGE	466	516	604	512	398	452	275	325	329	415	316	296	449	366	298	288	549	342

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
JAN	304	550	239	490	736	465	922	426	417	291	168	331	488	624	814	849	645	421
FEB	236	276	337	263	503	516	437	473	473	346	423	279	297	391	634	331	710	345
MAR	408	453	562	514	461	683	873	584	861	413	540	914	651	456	491	825	1,032	841
APR	648	1,749	1,375	257	939	873	652	593	1,069	1,375	693	833	676	1,059	566	1,240	1,203	644
MAY	501	375	534	158	1,081	643	349	214	898	341	652	621	526	385	553	496	385	429
JUN	342	203	233	130	353	180	550	115	573	451	483	413	298	301	909	195	204	423
JUL	254	136	248	94	384	153	243	142	314	195	152	188	259	214	670	151	333	343
AUG	203	140	265	97	191	126	153	84	393	105	112	332	399	126	257	114	331	400
SEP	217	158	190	102	185	127	133	257	228	116	138	257	452	161	187	110	173	219
OCT	286	192	177	361	288	133	169	266	264	115	248	533	222	683	569	211	313	446
NOV	531	347	251	693	613	293	190	280	309	163	525	736	350	758	752	427	483	502
DEC	438	403	396	328	989	268	187	298	469	220	406	846	759	639	584	472	750	483
ANNUAL AVERAGE	364	415	401	291	560	372	405	311	522	344	378	524	448	483	582	452	547	458

Table B-3 (Continued)

	2010	2011	2012	2013	2014	Minimum	Maximum	Average
JAN	418	326	520	387	604	133	922	440
FEB	341	270	381	382	321	128	885	410
MAR	1,006	925	476	465	373	281	1,077	653
APR	591	1,236	263	742	1,077	257	1,749	843
MAY	233	1,000	519	427	723	156	1,081	520
JUN	247	489	297	951	483	115	951	333
JUL	209	268	126	618	322	92	670	224
AUG	250	480	131	189	250	48	480	199
SEP	161	897	137	200	141	58	897	214
OCT[1]	762	641	363	210	231	71	853	338
NOV[1]	620	528	338	398	280	163	758	440
DEC[1]	601	673	461	501	627	180	989	476
ANNUAL AVERAGE	453	644	334	456	453	140	943	424

[1] October through December data for 2014 are provisional.

Table B-4 Average Annual Freshwater Flow (m^3/sec/day) Estimated for Green Island, New York, 1947 to 2014

YEAR	FLOW	YEAR	FLOW
1947	457	1981	325
1948	366	1982	329
1949	350	1983	415
1950	398	1984	316
1951	479	1985	296
1952	432	1986	449
1953	395	1987	366
1954	408	1988	298
1955	414	1989	288
1956	393	1990	549
1957	273	1991	342
1958	363	1992	364
1959	401	1993	415
1960	397	1994	401
1961	304	1995	291
1962	299	1996	560
1963	266	1997	372
1964	247	1998	405
1965	219	1999	311
1966	285	2000	522
1967	316	2001	344
1968	353	2002	378
1969	377	2003	524
1970	337	2004	448
1971	420	2005	483
1972	595	2006	582
1973	493	2007	452
1974	466	2008	547
1975	516	2009	458
1976	604	2010	453
1977	512	2011	644
1978	398	2012	334
1979	452	2013	456
1980	275	2014[1]	453

[1] Data for 2014 are provisional.

Table B-5 Mean, Minimum, And Maximum Temperature (°C) for Each Day of the Year, Hudson River near Poughkeepsie, 1951 to 2014[1]

		LONG-TERM TEMPERATURE (1951-2013)			2014 ACTUAL
MONTH	DAY	MEAN	MINIMUM	MAXIMUM	TEMPERATURES
1	1	1.4	0.0	4.4	0.2
1	2	1.4	0.0	4.4	0.0
1	3	1.4	0.0	4.4	-0.1
1	4	1.3	0.0	3.5	-0.1
1	5	1.3	0.0	3.5	-0.1
1	6	1.1	0.0	4.0	-0.1
1	7	1.1	0.0	3.5	-0.1
1	8	1.1	0.0	4.0	0.0
1	9	1.1	0.0	3.5	0.0
1	10	1.0	0.0	3.5	-0.1
1	11	1.0	0.0	3.5	0.0
1	12	1.0	0.0	4.0	0.0
1	13	1.0	0.0	4.0	0.0
1	14	1.0	0.0	4.0	0.0
1	15	1.0	0.0	4.0	0.0
1	16	1.0	0.0	3.5	0.0
1	17	0.9	-0.1	2.8	0.0
1	18	0.9	0.0	3.3	0.0
1	19	0.9	0.0	2.8	-0.1
1	20	0.8	0.0	2.2	-0.1
1	21	0.8	-0.1	2.4	-0.1
1	22	0.8	-0.1	2.2	-0.1
1	23	0.8	-0.1	3.0	-0.1
1	24	0.8	-0.1	3.0	-0.1
1	25	0.8	-0.1	3.5	-0.1
1	26	0.8	-0.1	3.5	-0.1
1	27	0.8	0.0	3.0	-0.1
1	28	0.8	0.0	3.0	-0.1
1	29	0.7	-0.1	2.5	-0.1
1	30	0.8	0.0	2.5	-0.1
1	31	0.8	0.0	2.5	-0.1
2	1	0.8	-0.1	2.5	0.0
2	2	0.8	-0.1	2.2	-0.1
2	3	0.8	0.0	2.2	-0.1
2	4	0.7	0.0	2.0	-0.1
2	5	0.7	0.0	2.0	-0.1
2	6	0.7	0.0	2.5	-0.1
2	7	0.7	0.0	2.5	0.0
2	8	0.8	0.0	3.0	-0.1
2	9	0.8	0.0	3.0	-0.1
2	10	0.8	0.0	3.3	0.0
2	11	0.8	0.0	3.0	0.0
2	12	0.8	0.0	2.5	0.0
2	13	0.8	0.0	2.5	-0.1
2	14	0.9	0.0	2.8	-0.1
2	15	0.8	0.0	2.8	-0.1
2	16	0.9	0.0	2.8	-0.1
2	17	0.9	0.0	2.8	-0.1
2	18	0.9	0.0	2.8	-0.1
2	19	0.9	0.0	2.8	-0.1
2	20	0.9	-0.1	2.8	-0.1
2	21	1.0	-0.1	2.8	-0.1
2	22	1.0	-0.1	3.9	0.0
2	23	1.0	-0.1	2.8	0.0
2	24	1.0	0.0	3.9	0.0
2	25	1.0	0.0	2.8	0.0
2	26	1.1	0.0	3.3	-0.1
2	27	1.2	0.0	4.4	-0.1
2	28	1.3	0.0	5.0	-0.1
2	29	1.5	0.0	4.4	
3	1	1.2	0.0	4.4	-0.1
3	2	1.3	0.0	4.4	-0.1
3	3	1.2	0.0	3.9	0.0
3	4	1.3	0.0	3.5	0.0
3	5	1.4	0.0	3.5	0.0
3	6	1.5	0.0	4.0	-0.1
3	7	1.5	0.0	4.7	0.0
3	8	1.6	0.0	4.9	0.0
3	9	1.7	0.0	4.5	0.0
3	10	1.7	0.0	4.8	0.1
3	11	1.9	0.0	4.4	0.1
3	12	2.0	0.0	4.4	0.0
3	13	2.1	0.0	4.7	0.1

[1] Data from 1951 through 1992 from Poughkeepsie's Water Treatment Facility. Data from 1993 through 2014 from USGS gaging site 01372058 Hudson River below Poughkeepsie, NY.

Table B-5 (Continued)

MONTH	DAY	LONG-TERM TEMPERATURE (1951-2013) MEAN	MINIMUM	MAXIMUM	2014 ACTUAL TEMPERATURES
3	14	2.3	0.0	5.0	0.1
3	15	2.3	0.0	5.3	0.2
3	16	2.4	0.0	5.6	0.2
3	17	2.5	0.0	5.8	0.1
3	18	2.6	0.0	6.3	0.2
3	19	2.7	0.0	7.7	0.3
3	20	2.9	0.0	7.5	0.5
3	21	3.0	0.0	7.8	0.4
3	22	3.1	0.0	8.4	0.5
3	23	3.4	0.0	8.9	0.4
3	24	3.5	0.5	9.2	0.3
3	25	3.7	0.5	9.3	0.4
3	26	3.8	0.5	9.6	0.5
3	27	4.1	0.5	9.6	0.5
3	28	4.3	1.0	9.7	0.8
3	29	4.6	1.1	10.0	1.1
3	30	4.8	1.1	10.1	1.6
3	31	5.1	1.1	10.1	2.2
4	1	5.3	1.7	10.1	2.8
4	2	5.4	2.0	10.2	3.3
4	3	5.6	2.5	10.2	3.5
4	4	5.8	2.5	10.5	3.4
4	5	5.9	2.8	10.4	3.4
4	6	6.1	3.0	10.4	3.9
4	7	6.3	2.8	10.4	4.3
4	8	6.4	2.8	10.6	4.7
4	9	6.5	2.8	10.6	5.3
4	10	6.7	2.8	10.9	5.8
4	11	6.9	2.8	11.5	6.3
4	12	7.1	2.8	11.8	6.9
4	13	7.3	2.8	12.1	7.1
4	14	7.5	2.8	12.3	7.6
4	15	7.8	2.8	12.6	8.0
4	16	7.9	3.3	12.7	8.4
4	17	8.1	3.9	12.7	9.0
4	18	8.3	4.5	12.7	9.2
4	19	8.5	5.0	12.7	9.3
4	20	8.8	5.0	13.5	9.4
4	21	9.1	5.5	13.5	9.4
4	22	9.3	6.5	13.5	9.5
4	23	9.5	6.7	13.5	9.3
4	24	9.8	6.7	14.0	9.1
4	25	9.9	6.7	13.5	9.2
4	26	10.2	6.7	13.5	9.4
4	27	10.4	7.2	13.5	9.2
4	28	10.7	7.8	13.5	9.4
4	29	10.9	8.3	13.9	9.4
4	30	11.2	8.9	13.9	9.3
5	1	11.4	8.9	14.4	9.9
5	2	11.6	8.9	14.4	10.4
5	3	11.8	8.9	14.4	10.8
5	4	12.0	8.9	15.0	11.3
5	5	12.2	8.9	15.0	11.6
5	6	12.4	8.9	15.0	11.9
5	7	12.6	8.9	15.0	12.2
5	8	12.8	8.9	15.2	12.4
5	9	12.9	8.9	15.6	12.6
5	10	13.1	8.9	16.1	12.9
5	11	13.2	9.4	16.1	13.5
5	12	13.4	9.4	16.1	13.6
5	13	13.6	10.0	16.2	13.8
5	14	13.8	10.6	16.7	14.1
5	15	14.1	11.1	17.5	14.3
5	16	14.3	11.1	18.0	14.6
5	17	14.5	11.7	18.0	15.2
5	18	14.7	11.5	17.5	15.8
5	19	14.9	12.0	17.5	16.2
5	20	15.2	12.2	18.0	16.7
5	21	15.4	12.5	18.0	17.1
5	22	15.6	12.8	18.5	17.2
5	23	15.8	12.8	19.0	17.2
5	24	16.0	12.8	19.0	17.3
5	25	16.1	12.8	20.0	17.6

Table B-5 (Continued)

MONTH	DAY	LONG-TERM TEMPERATURE (1951-2013) MEAN	MINIMUM	MAXIMUM	2014 ACTUAL TEMPERATURES
5	26	16.4	12.2	20.5	17.9
5	27	16.6	12.2	20.6	18.2
5	28	16.9	12.2	21.0	18.2
5	29	17.1	12.8	20.7	18.2
5	30	17.3	12.8	21.5	18.2
5	31	17.4	13.3	21.3	18.3
6	1	17.7	13.3	22.0	18.5
6	2	18.1	13.3	22.2	18.7
6	3	18.3	14.4	22.1	19.0
6	4	18.4	13.9	22.5	19.3
6	5	18.6	15.0	22.2	19.4
6	6	18.7	15.6	22.4	19.5
6	7	18.9	15.0	22.4	19.9
6	8	19.1	16.1	22.5	20.3
6	9	19.4	16.5	23.0	20.3
6	10	19.6	16.5	23.2	20.5
6	11	19.8	17.0	23.4	20.5
6	12	20.0	17.0	23.3	20.4
6	13	20.1	17.0	23.4	20.6
6	14	20.2	17.0	23.3	20.9
6	15	20.3	17.0	23.5	21.4
6	16	20.5	17.0	23.8	21.8
6	17	20.6	17.4	23.8	22.1
6	18	20.8	17.5	24.2	22.3
6	19	21.0	17.7	24.1	22.5
6	20	21.1	17.8	24.0	22.5
6	21	21.3	17.8	24.3	22.7
6	22	21.5	17.2	24.3	22.8
6	23	21.6	17.2	24.1	23.1
6	24	21.8	17.8	24.1	23.1
6	25	21.9	17.8	24.5	23.2
6	26	22.1	17.8	24.5	23.4
6	27	22.3	17.8	25.0	23.5
6	28	22.4	17.8	25.0	23.7
6	29	22.6	17.8	25.0	23.9
6	30	22.8	17.8	25.5	24.0
7	1	22.9	18.9	25.5	24.2
7	2	23.0	18.9	25.5	24.4
7	3	23.1	19.4	25.5	24.5
7	4	23.3	19.4	26.0	24.3
7	5	23.4	20.0	26.0	24.2
7	6	23.6	20.0	26.0	24.5
7	7	23.6	20.0	26.0	24.6
7	8	23.7	20.0	26.3	24.8
7	9	23.8	20.0	26.4	25.0
7	10	23.9	20.6	26.4	24.9
7	11	24.0	20.6	26.5	25.0
7	12	24.1	21.1	26.6	25.1
7	13	24.3	21.7	26.7	25.0
7	14	24.3	21.7	26.9	25.1
7	15	24.5	21.7	26.8	25.2
7	16	24.6	22.2	27.0	25.1
7	17	24.7	22.2	27.2	25.3
7	18	24.7	22.2	27.3	25.3
7	19	24.9	22.2	27.3	25.3
7	20	25.0	22.2	27.4	25.4
7	21	25.0	22.8	27.5	25.6
7	22	25.1	22.2	27.4	25.8
7	23	25.1	22.2	27.4	25.9
7	24	25.2	22.8	27.5	25.9
7	25	25.2	22.8	27.5	25.9
7	26	25.2	22.8	27.5	25.8
7	27	25.4	22.8	27.5	25.8
7	28	25.4	22.8	27.5	25.9
7	29	25.4	22.8	27.5	25.8
7	30	25.4	23.0	27.5	25.8
7	31	25.5	23.0	28.0	25.7
8	1	25.5	23.0	28.0	25.8
8	2	25.5	22.8	28.0	25.7
8	3	25.6	23.3	28.0	25.8
8	4	25.6	23.3	28.0	25.9
8	5	25.6	23.3	28.0	26.1
8	6	25.6	23.3	28.0	26.0

Table B-5 (Continued)

MONTH	DAY	LONG-TERM TEMPERATURE (1951-2013) MEAN	MINIMUM	MAXIMUM	2014 ACTUAL TEMPERATURES
8	7	25.5	23.3	28.0	25.9
8	8	25.5	23.3	28.0	25.8
8	9	25.6	23.3	28.0	25.8
8	10	25.6	23.3	28.0	25.8
8	11	25.5	22.8	28.0	25.9
8	12	25.5	22.8	28.1	25.8
8	13	25.4	22.2	28.5	25.6
8	14	25.4	22.2	28.5	25.5
8	15	25.3	22.2	28.4	25.3
8	16	25.3	22.2	28.4	25.2
8	17	25.2	22.2	28.1	25.1
8	18	25.2	22.8	28.0	25.1
8	19	25.1	22.2	27.7	25.1
8	20	25.2	22.8	27.6	25.2
8	21	25.1	22.2	27.5	25.2
8	22	25.0	22.2	27.5	25.0
8	23	24.9	22.8	27.0	24.8
8	24	24.8	22.2	27.0	24.6
8	25	24.7	21.7	27.0	24.5
8	26	24.7	21.7	27.0	24.6
8	27	24.7	22.2	26.8	24.7
8	28	24.6	22.2	26.8	24.6
8	29	24.5	22.2	26.7	24.5
8	30	24.5	22.2	26.5	24.5
8	31	24.4	20.5	26.5	24.5
9	1	24.3	20.2	26.5	24.6
9	2	24.2	20.2	26.7	24.8
9	3	24.1	20.3	26.2	24.8
9	4	24.1	20.6	26.2	24.9
9	5	24.0	20.7	26.2	25.0
9	6	24.0	20.8	26.1	25.0
9	7	23.8	20.7	26.2	24.9
9	8	23.7	19.8	26.1	24.7
9	9	23.6	19.0	26.0	24.5
9	10	23.5	18.8	25.8	24.5
9	11	23.3	18.7	25.6	24.3
9	12	23.3	19.1	25.6	24.1
9	13	23.1	19.4	25.6	23.7
9	14	23.0	18.9	25.5	23.4
9	15	22.8	17.8	25.5	23.3
9	16	22.6	17.2	25.5	23.3
9	17	22.4	17.2	25.5	23.2
9	18	22.2	16.7	25.5	23.0
9	19	22.2	16.7	25.5	22.7
9	20	22.0	17.2	25.5	22.5
9	21	21.7	16.7	25.0	22.5
9	22	21.6	16.1	25.0	22.4
9	23	21.3	16.1	25.0	22.1
9	24	21.1	15.6	24.5	22.0
9	25	20.9	15.6	24.5	21.7
9	26	20.8	15.6	24.0	21.6
9	27	20.7	16.1	24.0	21.6
9	28	20.4	15.6	23.5	21.6
9	29	20.2	15.6	23.5	21.6
9	30	20.1	15.6	23.0	21.6
10	1	19.8	16.1	22.7	21.4
10	2	19.6	15.6	22.5	21.3
10	3	19.5	15.6	22.6	21.3
10	4	19.2	15.6	22.7	21.1
10	5	19.0	15.0	22.7	20.8
10	6	18.8	15.0	22.7	20.4
10	7	18.7	15.0	22.6	20.3
10	8	18.4	14.4	22.6	20.2
10	9	18.1	14.4	22.4	20.0
10	10	18.0	14.4	22.2	19.7
10	11	17.8	13.9	22.0	19.4
10	12	17.6	13.3	21.5	19.2
10	13	17.3	13.3	21.1	19.0
10	14	17.1	12.8	21.1	19.1
10	15	16.9	12.2	20.5	19.2
10	16	16.7	12.2	20.3	19.3
10	17	16.5	12.8	20.2	19.1
10	18	16.3	12.2	20.2	18.9

Table B-5 (Continued)

		LONG-TERM TEMPERATURE (1951-2013)			2014 ACTUAL
MONTH	DAY	MEAN	MINIMUM	MAXIMUM	TEMPERATURES
10	19	16.0	11.7	20.2	18.3
10	20	15.8	10.6	20.0	17.8
10	21	15.4	10.6	19.7	17.6
10	22	15.1	10.0	19.6	17.2
10	23	14.9	10.0	19.6	16.5
10	24	14.7	10.0	19.3	16.4
10	25	14.6	10.0	19.0	16.3
10	26	14.3	10.0	18.6	15.9
10	27	14.0	9.4	18.2	15.7
10	28	13.8	8.9	17.8	15.6
10	29	13.5	8.3	17.8	15.4
10	30	13.2	7.8	16.7	15.1
10	31	13.1	7.2	16.7	14.8
11	1	12.9	7.2	16.7	14.4
11	2	12.6	7.2	16.1	13.5
11	3	12.4	7.2	16.1	13.3
11	4	12.2	7.2	15.6	13.3
11	5	11.9	7.2	15.6	13.2
11	6	11.7	6.7	15.6	12.9
11	7	11.5	6.1	15.0	12.7
11	8	11.2	6.1	15.0	12.4
11	9	11.0	5.6	15.0	12.3
11	10	10.7	5.0	14.4	12.1
11	11	10.4	5.0	13.9	12.1
11	12	10.2	5.0	13.3	12.1
11	13	10.0	5.0	13.3	11.7
11	14	9.8	5.0	13.3	11.5
11	15	9.7	5.0	12.8	11.1
11	16	9.4	5.0	12.8	10.8
11	17	9.2	5.0	12.8	10.6
11	18	9.0	5.0	12.8	10.2
11	19	8.8	5.0	12.2	9.4
11	20	8.6	5.0	11.1	9.2
11	21	8.4	3.9	11.1	8.7
11	22	8.1	3.9	11.1	8.3
11	23	7.9	3.9	11.1	8.2
11	24	7.7	3.9	10.6	8.4
11	25	7.4	3.9	10.6	8.3
11	26	7.2	3.3	10.5	7.7
11	27	7.0	3.3	10.5	7.2
11	28	6.9	3.3	10.5	6.7
11	29	6.7	3.3	10.5	6.3
11	30	6.5	2.8	10.5	6.1
12	1	6.2	2.2	10.5	5.9
12	2	6.0	3.0	10.0	5.5
12	3	5.7	2.2	9.5	5.3
12	4	5.5	1.3	9.5	4.8
12	5	5.4	2.8	9.5	4.5
12	6	5.2	2.6	9.5	4.5
12	7	5.1	2.0	9.5	4.1
12	8	4.8	2.0	9.0	3.6
12	9	4.6	1.7	9.0	3.4
12	10	4.3	1.1	9.0	3.0
12	11	4.1	1.1	8.5	2.6
12	12	3.9	0.6	8.5	2.4
12	13	3.7	0.6	8.5	2.2
12	14	3.5	0.5	8.5	2.2
12	15	3.3	0.5	8.5	2.2
12	16	3.2	0.5	8.0	2.2
12	17	3.0	0.0	8.0	2.2
12	18	2.8	0.0	7.5	2.1
12	19	2.6	0.0	7.5	2.0
12	20	2.5	0.0	7.5	1.9
12	21	2.4	0.0	7.0	1.8
12	22	2.2	0.0	6.5	1.8
12	23	2.1	0.0	6.5	1.9
12	24	2.0	0.0	6.5	2.0
12	25	1.9	0.0	6.0	1.9
12	26	1.7	0.0	6.1	1.9
12	27	1.7	0.0	6.1	2.1
12	28	1.7	0.0	6.1	2.3
12	29	1.6	0.0	6.1	2.5
12	30	1.6	0.0	6.1	2.6
12	31	1.5	0.0	5.0	2.5

Table B-6 Average Annual Water Temperature (°C), Hudson River near Poughkeepsie, 1951 to 2014[1]

YEAR	TEMPERATURE	YEAR	TEMPERATURE
1951	11.66	1983	13.01
1952	12.25	1984	13.04
1953	12.87	1985	13.05
1954	11.92	1986	12.69
1955	12.40	1987	12.66
1956	11.92	1988	12.57
1957	13.03	1989	12.09
1958	12.18	1990	12.77
1959	12.90	1991	13.67
1960	11.29	1992	12.10
1961	12.17	1993	12.09
1962	11.63	1994	12.24
1963	11.82	1995	12.47
1964	12.99	1996	11.83
1965	12.51	1997	12.07
1966	12.75	1998	13.66
1967	12.05	1999	13.08
1968	13.10	2000	12.00
1969	12.59	2001	13.24
1970	12.79	2002	12.85
1971	12.31	2003	11.80
1972	11.35	2004	12.37
1973	12.73	2005	12.68
1974	11.61	2006	12.77
1975	12.37	2007	12.97
1976	11.43	2008	12.54
1977	11.97	2009	12.30
1978	12.27	2010	13.11
1979	12.49	2011	12.41
1980	12.72	2012	14.05
1981	12.63	2013	12.70
1982	12.48	2014	12.51

[1] Data from 1951 through 1992 from Poughkeepsie's Water Treatment Facility. Data from 1993 through 2014 from USGS gaging site 01372058 Hudson River below Poughkeepsie, NY.

Table B-7 Weighted Mean Temperature (°C) by Region and Week from 2014 Long River/Fall Juvenile Survey

WEEK BEGINNING	REGIONS												
MONDAY	BT	YK	TZ	CH	IP	WP	CW	PK	HP	KG	SG	CS	AL
31MAR14	3.9	4.0	3.6	2.7	2.1	2.5	2.9	3.2	3.2	2.9	2.9	3.3	3.8
07APR14	4.9	4.8	4.7	5.1	4.9	4.6	4.5	4.9	5.5	5.8	5.5	5.3	5.2
14APR14	7.2	7.7	8.0	7.8	7.9	8.0	8.2	8.4	9.0	9.2	9.0	7.7	6.1
21APR14	8.5	9.5	10.5	10.9	10.9	10.2	10.2	9.3	8.5	8.5	8.5	9.1	9.3
28APR14	9.8	10.3	11.5	11.9	11.3	10.2	9.7	9.6	10.1	10.5	10.8	10.7	10.5
05MAY14	11.1	12.1	12.0	12.0	11.9	11.5	12.0	12.2	12.7	12.3	11.9	11.6	11.3
12MAY14	12.1	13.6	14.0	14.3	13.8	14.1	14.1	14.2	15.2	15.6	15.8	16.2	16.7
19MAY14	14.5	15.7	16.6	17.0	16.3	16.5	16.8	17.1	17.2	17.1	16.9	15.8	15.3
26MAY14	17.4	18.3	18.6	19.4	19.4	18.4	18.4	18.2	18.1	17.8	18.0	18.1	17.9
02JUN14	18.1	19.7	19.9	20.5	20.4	19.3	19.9	19.6	19.6	20.0	20.2	20.4	20.4
09JUN14	17.9	19.0	19.9	20.7	21.0	20.4	20.4	20.5	21.0	21.6	21.7	21.6	21.5
16JUN14	20.6	22.4	23.2	22.9	22.1	21.8	22.7	22.6	22.2	22.0	21.6	21.2	20.3
23JUN14	22.3	23.1	24.0	24.6	24.3	23.2	23.3	23.3	23.2	23.0	22.5	22.7	22.9
30JUN14	23.3	24.6	25.3	26.3	25.9	24.4	24.4	24.3	24.3	24.0	24.0	23.9	23.9
07JUL14	20.6	23.5	25.1	25.8	26.0	24.9	25.2	25.0	.	.	.	.	.
14JUL14	22.6	25.1	26.2	26.6	26.5	25.4	25.3	25.3	25.4	25.3	25.2	25.1	24.8
21JUL14	23.3	24.1	25.2	26.2	26.8	26.0	25.8	26.0	.	.	.	.	.
28JUL14	23.7	24.7	25.3	26.0	26.2	25.6	25.6	25.9	25.8	25.6	25.4	25.5	25.4
04AUG14	22.9	24.7	25.6	26.1	26.3	25.8	25.8	26.1	.	.	.	.	.
11AUG14	23.9	24.6	25.1	25.6	26.1	25.6	25.5	25.7	25.6	25.5	24.9	24.8	24.9
18AUG14	22.7	23.6	24.6	25.6	25.7	25.1	24.8	25.1	.	.	.	.	.
25AUG14	24.3	24.7	25.1	25.4	25.7	25.2	25.1	24.7	24.4	24.2	24.0	23.4	22.7
01SEP14	23.8	25.0	25.6	26.3	26.4	25.4	25.1	25.1	.	.	.	.	.
08SEP14	23.5	24.1	24.5	24.9	25.9	25.4	24.7	24.5	24.4	24.3	24.0	24.0	24.3
15SEP14	21.7	22.1	22.6	23.7	24.2	23.3	22.8	23.2	.	.	.	.	.
22SEP14	20.8	20.9	21.0	21.7	22.7	22.3	21.8	21.9	21.3	20.5	19.8	19.6	19.0
29SEP14	20.9	21.3	21.7	22.6	22.7	21.9	21.6	21.7	.	.	.	.	.
06OCT14	19.1	19.1	19.3	20.2	21.4	20.6	20.0	20.1	19.6	19.1	18.6	18.3	18.2
20OCT14	17.4	17.5	17.7	18.7	18.9	18.4	17.6	16.8	15.8	14.9	13.8	13.8	13.1
03NOV14	13.5	13.2	13.3	14.6	14.9	14.4	13.6	12.8	11.5	11.0	10.6	10.4	9.8
17NOV14	11.2	10.7	10.9	10.7	11.3	10.7	10.3	9.2	6.7	6.1	5.6	5.1	3.7

Note: Dots (.) indicate no sampling.

Table B-8 Average Annual Temperature (°C) from Long River/Fall Juvenile Surveys, 1974 to 2014

YEAR	TEMPERATURE
1974	21.54
1975	22.10
1976	20.04
1977	20.79
1978	20.16
1979	21.53
1980	21.23
1981	20.96
1982	19.16
1983	19.14
1984	19.22
1985	21.69
1986	21.28
1987	21.41
1988	21.80
1989	20.65
1990	20.97
1991	23.59
1992	21.06
1993	21.01
1994	21.93
1995	21.78
1996	20.18
1997	20.96
1998	22.26
1999	23.17
2000	20.43
2001	21.43
2002	22.07
2003	21.09
2004	21.94
2005	22.14
2006	21.08
2007	21.69
2008	22.22
2009	21.01
2010	22.93
2011	22.17
2012	22.61
2013	21.92
2014	22.16

Table B-9 Mean Temperature (°C) by Region and Week from 2014 Beach Seine Survey

WEEK BEGINNING MONDAY	REGIONS											
	YK	TZ	CH	IP	WP	CW	PK	HP	KG	SG	CS	AL
09JUN14	20.8	21.4	21.4	21.0	20.2	19.7	20.4	21.0	21.5	21.8	23.3	22.9
23JUN14	23.1	25.2	26.1	25.2	23.8	23.3	23.2	23.8	23.5	24.0	23.7	23.2
07JUL14	27.2	27.7	27.9	27.1	25.1	24.9	24.8	25.6	25.4	24.6	26.2	25.2
21JUL14	25.8	26.3	27.0	27.9	26.4	27.0	26.9	25.9	25.4	26.2	26.9	24.9
04AUG14	26.8	26.1	27.8	28.0	26.4	26.8	25.9	25.0	25.1	25.6	24.8	24.3
18AUG14	25.4	25.4	26.9	26.3	25.1	25.4	25.4	24.5	24.0	24.9	24.6	23.4
01SEP14	26.1	26.1	28.0	27.4	25.6	26.9	25.3	24.2	24.1	25.9	25.6	24.0
15SEP14	21.4	22.0	23.9	24.7	23.5	23.1	22.7	21.9	21.2	21.9	21.4	20.2
29SEP14	21.4	21.2	22.4	22.9	21.6	21.1	21.5	20.5	20.0	20.0	19.7	19.4
13OCT14	18.6	18.9	20.3	21.4	19.6	19.8	19.5	18.4	18.1	18.6	18.1	16.8

Table B-10 Average Annual Temperature (°C) from Beach Seine Surveys, 1974 to 2014

YEAR	TEMPERATURE
1974	21.34
1975	21.59
1976	22.21
1977	22.85
1978	23.71
1979	23.05
1980	24.29
1981	21.91
1982	22.73
1983	24.53
1984	23.17
1985	23.38
1986	22.02
1987	23.03
1988	23.16
1989	24.15
1990	24.34
1991	23.63
1992	22.07
1993	23.48
1994	22.39
1995	23.85
1996	24.42
1997	22.41
1998	24.20
1999	23.42
2000	22.32
2001	24.89
2002	24.52
2003	23.69
2004	22.60
2005	25.69
2006	23.27
2007	23.74
2008	23.85
2009	23.88
2010	23.06
2011	22.01
2012	25.33
2013	23.04
2014	23.61

Table B-11 Weighted Mean Salinity (ppt) by Region and Week from 2014 Long River/Fall Juvenile Survey

WEEK BEGINNING MONDAY	REGIONS												
	BT	YK	TZ	CH	IP	WP	CW	PK	HP	KG	SG	CS	AL
31MAR14	6.1	2.5	0.3	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1
07APR14	9.9	3.8	1.1	0.5	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
14APR14	13.4	6.8	2.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
21APR14	12.3	3.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
28APR14	13.5	8.7	1.8	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
05MAY14	10.4	5.0	1.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
12MAY14	17.3	9.5	5.8	3.1	1.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
19MAY14	16.1	7.2	1.3	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
26MAY14	9.4	4.1	2.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
02JUN14	15.4	6.5	5.5	2.3	0.4	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
09JUN14	18.4	13.4	9.0	6.0	3.7	1.3	0.7	0.1	0.1	0.1	0.1	0.1	0.1
16JUN14	16.8	7.4	2.6	0.7	0.3	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
23JUN14	12.7	7.9	3.7	1.2	0.3	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
30JUN14	12.9	6.4	2.6	0.3	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
07JUL14	18.2	9.6	4.9	3.1	1.5	0.1	0.1	0.1	.	.	.	.	.
14JUL14	16.2	6.7	2.2	0.6	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
21JUL14	18.1	13.4	6.5	3.5	1.3	0.3	0.1	0.1	.	.	.	.	.
28JUL14	15.8	9.5	5.8	3.3	1.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
04AUG14	20.2	11.2	7.3	5.4	3.1	1.0	0.2	0.1	.	.	.	.	.
11AUG14	16.0	9.8	6.4	4.6	3.5	1.3	0.2	0.1	0.1	0.1	0.1	0.1	0.1
18AUG14	21.4	15.4	8.6	5.1	2.1	0.8	0.3	0.1	.	.	.	.	.
25AUG14	13.8	9.1	6.3	4.6	3.0	1.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1
01SEP14	20.6	11.5	6.5	3.9	2.5	1.0	0.3	0.1	.	.	.	.	.
08SEP14	15.9	9.7	6.3	4.8	3.0	1.2	0.3	0.1	0.1	0.1	0.1	0.1	0.1
15SEP14	18.5	12.3	8.3	4.7	2.9	0.7	0.2	0.1	.	.	.	.	.
22SEP14	16.9	10.2	7.6	6.0	5.2	2.7	0.9	0.1	0.1	0.1	0.1	0.1	0.1
29SEP14	19.7	12.8	8.7	6.6	5.2	2.7	1.6	0.4	.	.	.	.	.
06OCT14	16.5	11.2	8.4	7.2	6.0	3.1	1.2	0.2	0.1	0.1	0.2	0.2	0.1
20OCT14	20.5	13.4	7.9	5.1	4.4	2.3	0.9	0.2	0.2	0.2	0.2	0.2	0.1
03NOV14	22.0	12.7	7.0	4.7	4.2	1.7	0.4	0.2	0.2	0.2	0.1	0.1	0.1
17NOV14	16.4	9.8	7.0	6.6	4.3	2.9	1.7	0.2	0.1	0.1	0.1	0.2	0.2

Note: Dots (.) indicate no sampling.

Table B-12 Mean Salinity (ppt) by Region and Week from 2014 Beach Seine Survey

WEEK BEGINNING MONDAY	REGIONS											
	YK	TZ	CH	IP	WP	CW	PK	HP	KG	SG	CS	AL
09JUN14	5.5	3.3	3.0	4.1	1.0	0.3	0.1	0.1	0.1	0.1	0.1	0.1
23JUN14	3.9	2.5	0.8	0.2	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1
07JUL14	4.2	3.0	1.5	0.7	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1
21JUL14	3.8	2.8	1.3	1.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
04AUG14	5.1	4.7	2.9	2.2	0.2	0.1	0.2	0.1	0.1	0.1	0.1	0.1
18AUG14	6.2	5.1	3.3	2.8	0.5	0.2	0.1	0.1	0.1	0.1	0.1	0.2
01SEP14	6.4	5.2	3.3	2.5	0.4	0.2	0.2	0.2	0.2	0.2	0.1	0.1
15SEP14	8.2	5.9	3.8	3.1	0.9	0.2	0.1	0.1	0.1	0.1	0.1	0.1
29SEP14	9.3	8.1	6.0	4.8	1.9	0.9	0.3	0.1	0.1	0.1	0.2	0.1
13OCT14	9.5	7.5	5.8	4.2	1.6	1.0	0.2	0.1	0.1	0.1	0.2	0.2

Table B-13 Weighted Mean Dissolved Oxygen (mg/L) by Region and Week from 2014 Long River/Fall Juvenile Survey

WEEK BEGINNING	REGIONS												
MONDAY	BT	YK	TZ	CH	IP	WP	CW	PK	HP	KG	SG	CS	AL
31MAR14	12.3	12.4	13.7	13.3	13.4	12.1	12.2	12.2	12.3	12.7	13.8	14.1	13.9
07APR14	11.5	12.5	12.9	13.3	13.4	13.0	12.3	8.9	9.0	9.1	13.2	13.3	13.6
14APR14	10.2	11.0	10.3	11.1	11.9	12.0	12.0	11.4	11.2	11.2	11.2	12.3	13.3
21APR14	9.8	10.9	11.2	10.7	11.1	11.2	11.2	11.7	11.7	11.8	11.7	11.3	11.3
28APR14	8.9	9.2	10.2	10.1	10.1	10.4	10.7	10.9	10.7	10.7	10.7	10.7	11.0
05MAY14	8.7	9.2	10.0	10.4	10.1	10.1	10.0	10.0	10.2	10.4	10.4	10.6	11.0
12MAY14	7.9	8.1	8.6	8.6	8.7	9.7	9.8	9.9	9.8	9.8	9.5	9.1	9.2
19MAY14	6.6	6.3	7.2	7.5	8.6	9.1	9.1	8.7	7.6	9.5	9.8	10.4	11.0
26MAY14	7.0	7.0	7.7	7.8	7.7	7.4	7.6	7.4	7.2	7.6	7.8	8.3	8.6
02JUN14	6.8	6.9	7.7	7.6	6.7	6.5	8.8	8.2	7.2	8.3	8.8	8.4	8.6
09JUN14	7.5	6.5	7.2	7.1	6.6	7.1	7.3	6.9	7.1	8.0	7.4	7.0	7.0
16JUN14	5.3	5.8	7.0	6.9	6.6	7.0	7.7	7.6	6.8	7.6	7.8	8.0	8.6
23JUN14	5.5	5.8	6.4	6.5	6.6	6.4	7.4	7.4	6.9	8.0	7.9	7.6	8.0
30JUN14	4.9	4.9	5.4	6.3	6.5	6.1	6.3	5.9	6.4	6.8	7.3	7.5	7.8
07JUL14	6.0	6.0	6.2	6.6	6.6	6.6	6.7	6.4	.	.	.	.	.
14JUL14	4.8	5.5	6.2	6.1	6.1	6.3	6.3	6.1	6.2	6.6	7.2	7.2	7.3
21JUL14	5.4	5.4	5.6	5.7	5.7	6.1	6.5	6.5	.	.	.	.	.
28JUL14	5.0	5.4	5.7	5.8	6.3	7.0	7.0	6.4	6.6	6.9	7.1	7.0	6.9
04AUG14	5.6	6.0	5.7	5.7	5.6	6.2	6.9	6.8	.	.	.	.	.
11AUG14	4.6	5.2	6.0	6.1	6.1	6.5	6.9	6.7	6.6	6.7	6.8	8.2	7.4
18AUG14	5.3	5.8	7.1	6.6	6.0	6.2	6.7	6.9	.	.	.	.	.
25AUG14	5.2	5.8	6.7	7.0	5.9	6.2	6.3	6.3	6.6	6.8	7.7	8.4	8.4
01SEP14	4.8	5.8	6.5	6.4	6.4	6.5	6.9	6.9	.	.	.	.	.
08SEP14	5.1	6.6	7.0	6.4	6.1	6.1	6.9	7.3	6.4	7.5	7.6	7.7	7.3
15SEP14	5.2	5.6	5.7	5.9	5.9	6.5	6.9	6.7	.	.	.	.	.
22SEP14	5.4	5.6	6.0	6.5	6.5	6.3	7.6	7.3	7.3	7.8	7.9	8.9	8.9
29SEP14	4.5	4.8	5.3	5.4	5.7	6.5	6.9	6.9	.	.	.	.	.
06OCT14	5.7	6.2	7.1	7.0	6.6	7.1	7.7	7.4	7.5	7.8	8.0	8.9	8.5
20OCT14	5.7	6.4	7.3	7.2	7.1	7.4	7.9	8.3	8.5	8.7	9.1	9.1	9.4
03NOV14	7.4	8.1	9.2	8.5	8.5	8.9	9.5	9.2	9.7	10.1	10.3	10.4	10.7
17NOV14	7.1	7.8	8.3	7.8	8.5	9.1	9.4	10.2	10.4	10.8	11.1	11.1	12.1

Note: Dots (.) indicate no sampling.

Table B-14 Average Annual Dissolved Oxygen (mg/l) from Long River/Fall Juvenile Surveys, 1974 to 2014

YEAR	DISSOLVED OXYGEN
1974	7.26
1975	7.69
1976	8.37
1977	7.66
1978	7.86
1979	8.02
1980	7.77
1981	7.82
1982	7.99
1983	8.29
1984	8.64
1985	8.14
1986	8.19
1987	7.79
1988	7.58
1989	7.58
1990	7.77
1991	7.10
1992	7.67
1993	7.59
1994	7.95
1995	7.90
1996	7.95
1997	7.91
1998	7.61
1999	7.56
2000	7.97
2001	7.54
2002	7.51
2003	7.51
2004	7.12
2005	7.04
2006	7.13
2007	7.21
2008	6.81
2009	7.29
2010	6.99
2011	7.36
2012	6.86
2013	7.00
2014	6.89

Table B-15 Mean Dissolved Oxygen (mg/L) by Region and Week from 2014 Beach Seine Survey

WEEK BEGINNING MONDAY	REGIONS											
	YK	TZ	CH	IP	WP	CW	PK	HP	KG	SG	CS	AL
09JUN14	7.9	7.9	8.0	6.3	6.7	6.4	7.0	7.4	7.5	7.7	7.8	7.5
23JUN14	6.5	6.8	7.0	6.9	6.9	7.6	7.8	7.6	7.3	7.5	7.4	7.6
07JUL14	7.7	7.6	7.2	6.2	6.4	6.4	6.4	7.0	7.0	7.3	7.3	7.2
21JUL14	6.5	6.5	6.5	6.0	5.9	6.3	6.0	5.6	6.0	6.1	6.3	6.7
04AUG14	5.7	6.4	6.1	7.0	6.8	7.3	6.7	6.4	6.3	7.0	6.3	6.9
18AUG14	5.7	6.2	6.1	5.9	5.5	5.9	5.7	5.4	5.8	5.8	6.3	6.5
01SEP14	5.7	6.1	6.6	6.3	5.7	5.9	5.4	5.6	5.8	6.0	7.2	6.5
15SEP14	5.3	5.6	5.6	5.8	6.1	6.3	6.0	6.1	5.8	5.7	6.9	6.8
29SEP14	5.7	6.1	6.3	6.4	6.9	7.4	7.1	7.0	7.3	7.7	8.7	8.1
13OCT14	6.6	7.0	7.7	7.4	7.9	8.2	7.6	7.7	8.1	8.7	9.4	9.2

Table B-16 Average Annual Dissolved Oxygen (mg/l) from Beach Seine Surveys, 1974 to 2014

YEAR	DISSOLVED OXYGEN
1974	8.71
1975	7.82
1976	7.89
1977	7.35
1978	7.29
1979	8.61
1980	8.08
1981	8.34
1982	7.85
1983	7.14
1984	8.42
1985	7.98
1986	8.28
1987	8.63
1988	7.95
1989	7.60
1990	7.90
1991	8.82
1992	8.56
1993	7.39
1994	8.33
1995	7.67
1996	6.93
1997	8.44
1998	7.42
1999	7.62
2000	7.38
2001	7.37
2002	6.76
2003	7.09
2004	7.20
2005	6.44
2006	7.26
2007	6.46
2008	6.86
2009	6.34
2010	6.29
2011	6.84
2012	5.92
2013	6.65
2014	6.21

Table B-17 Weighted Mean Percent Oxygen Saturation by Region and Week from 2014 Long River/Fall Juvenile Survey

WEEK BEGINNING	REGIONS												
MONDAY	BT	YK	TZ	CH	IP	WP	CW	PK	HP	KG	SG	CS	AL
31MAR14	97.7	96.2	103.3	98.2	97.1	88.7	90.8	91.0	92.0	94.3	102.5	105.5	105.5
07APR14	96.1	100.0	101.4	105.0	104.7	101.0	94.9	69.9	71.5	72.9	104.5	105.3	107.4
14APR14	92.9	96.6	88.8	93.4	100.1	101.0	102.0	97.7	96.6	97.0	97.4	103.0	107.2
21APR14	91.6	97.4	100.4	97.3	100.8	99.6	100.2	101.9	100.2	101.1	100.6	98.0	98.6
28APR14	85.9	87.5	94.4	93.3	92.2	93.0	94.2	95.4	95.2	96.0	96.6	96.2	98.5
05MAY14	85.3	88.0	93.3	96.2	93.8	92.6	92.7	93.0	96.5	97.0	96.3	97.6	100.4
12MAY14	82.5	83.4	87.1	86.2	85.1	94.0	95.5	96.5	97.6	98.1	96.1	93.2	94.6
19MAY14	72.5	67.0	74.6	77.5	87.4	93.5	93.5	90.7	78.5	98.2	101.6	105.5	110.1
26MAY14	77.7	76.8	83.9	84.8	83.7	78.9	80.5	78.7	76.7	79.9	82.3	87.7	90.7
02JUN14	79.6	79.1	87.6	86.2	74.0	71.0	96.3	89.9	79.0	91.1	96.8	92.8	95.0
09JUN14	89.3	76.1	83.6	82.4	75.4	79.5	80.9	76.5	79.3	90.5	84.6	79.5	79.6
16JUN14	65.8	69.6	83.6	80.5	75.4	79.4	89.5	87.8	77.8	86.4	88.7	90.5	95.5
23JUN14	69.0	71.3	77.4	78.6	78.8	75.4	86.6	87.1	80.9	92.7	91.4	88.5	92.9
30JUN14	61.8	61.9	67.2	78.5	79.3	72.9	75.8	70.7	76.0	81.2	86.2	89.1	92.9
07JUL14	74.9	74.7	77.8	82.3	81.7	79.9	80.7	77.2	.	.	.	.	.
14JUL14	61.6	69.6	78.1	76.4	76.2	77.1	76.4	74.0	75.5	80.5	87.4	87.1	88.2
21JUL14	71.3	70.5	70.2	71.7	71.7	74.8	80.1	80.1	.	.	.	.	.
28JUL14	64.7	69.0	71.7	73.2	78.1	85.3	86.0	78.2	81.4	83.8	86.3	85.0	84.6
04AUG14	74.2	77.6	73.5	72.7	70.8	77.0	84.7	84.3	.	.	.	.	.
11AUG14	60.8	66.2	75.7	76.5	77.4	80.2	83.9	82.4	80.2	81.6	82.6	98.4	89.7
18AUG14	70.2	75.2	90.0	82.9	74.5	75.4	80.8	83.6	.	.	.	.	.
25AUG14	68.1	73.3	85.1	88.4	73.6	76.3	76.2	75.6	79.0	81.5	91.2	99.1	96.9
01SEP14	64.7	74.7	82.5	81.2	81.1	79.5	83.6	83.1	.	.	.	.	.
08SEP14	66.0	83.2	87.2	79.7	76.3	74.3	83.5	87.0	76.6	89.1	90.6	91.0	87.4
15SEP14	66.3	68.8	69.6	71.5	72.2	77.0	80.5	77.8	.	.	.	.	.
22SEP14	66.8	67.4	71.0	76.3	77.4	73.8	86.6	83.4	82.1	86.3	86.4	97.1	95.6
29SEP14	57.2	59.3	64.3	65.1	68.4	75.7	79.3	78.9	.	.	.	.	.
06OCT14	68.5	72.2	81.3	80.5	77.5	80.2	85.2	81.8	81.7	84.4	85.1	95.2	90.6
20OCT14	68.8	73.4	80.3	80.3	78.2	79.9	83.0	85.2	85.5	86.5	87.5	88.0	89.4
03NOV14	82.6	84.2	92.1	86.8	86.5	88.3	91.9	87.3	89.2	92.1	93.1	93.2	94.7
17NOV14	71.9	74.8	78.6	73.9	79.6	83.7	85.1	89.2	84.7	87.3	88.4	87.1	91.6

Note: Dots (.) indicate no sampling.

Table B-18 Mean Percent Oxygen Saturation by Region and Week from 2014 Beach Seine Survey

WEEK BEGINNING MONDAY	REGIONS											
	YK	TZ	CH	IP	WP	CW	PK	HP	KG	SG	CS	AL
09JUN14	91.0	90.8	91.8	72.3	74.3	70.5	78.0	83.5	84.4	87.4	91.5	87.1
23JUN14	78.1	83.6	87.2	83.6	82.0	88.7	90.9	89.5	86.3	89.3	87.2	88.6
07JUL14	99.2	97.6	92.1	78.2	77.4	77.4	76.8	85.2	85.0	88.2	89.9	87.6
21JUL14	82.1	81.8	82.4	76.3	73.2	79.2	74.4	68.5	73.5	75.1	78.9	81.3
04AUG14	73.2	81.7	78.3	90.4	84.3	91.3	82.5	77.2	76.7	85.2	75.5	82.8
18AUG14	72.3	77.9	77.7	74.6	66.9	72.1	69.5	65.0	68.8	69.6	75.6	76.4
01SEP14	73.5	78.1	86.9	80.4	69.3	74.3	65.4	66.6	69.2	74.3	88.3	77.4
15SEP14	63.8	66.9	67.6	71.5	72.4	73.6	69.8	69.4	65.1	65.2	78.3	74.7
29SEP14	68.6	73.0	75.1	77.2	79.7	83.7	80.2	77.6	80.1	84.6	95.3	87.8
13OCT14	74.8	79.4	88.2	85.4	86.7	90.5	82.8	81.7	85.7	93.6	99.7	95.0

Table B-19 Weighted Mean Conductivity (mS/cm @ 25°C) by Region and Week from 2014 Long River/Fall Juvenile Survey

WEEK BEGINNING MONDAY	REGIONS												
	BT	YK	TZ	CH	IP	WP	CW	PK	HP	KG	SG	CS	AL
31MAR14	10.4	4.3	0.5	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.2	0.2	0.2
07APR14	16.5	6.5	2.0	0.8	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
14APR14	22.3	11.7	3.9	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1
21APR14	20.3	5.6	0.4	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.2	0.2
28APR14	22.4	14.8	3.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
05MAY14	17.2	8.5	2.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
12MAY14	28.2	16.1	10.0	5.4	1.7	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
19MAY14	26.4	12.1	2.4	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
26MAY14	15.9	7.1	3.5	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
02JUN14	25.1	11.2	9.5	4.0	0.7	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
09JUN14	29.9	22.3	15.4	10.3	6.5	2.3	1.3	0.3	0.2	0.2	0.2	0.2	0.2
16JUN14	27.4	12.7	4.6	1.3	0.6	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
23JUN14	21.1	13.5	6.4	2.1	0.5	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
30JUN14	21.4	10.9	4.5	0.4	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
07JUL14	29.5	16.2	8.5	5.5	2.7	0.2	0.2	0.2	.	.	.	.	.
14JUL14	26.5	11.4	3.9	1.0	0.4	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
21JUL14	29.3	22.2	11.2	6.2	2.3	0.6	0.2	0.2	.	.	.	.	.
28JUL14	25.8	16.1	9.9	5.8	2.1	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.3
04AUG14	32.5	18.8	12.5	9.3	5.5	1.8	0.3	0.2	.	.	.	.	.
11AUG14	26.3	16.6	11.0	8.0	6.2	2.2	0.4	0.2	0.2	0.2	0.2	0.2	0.2
18AUG14	34.3	25.4	14.6	8.8	3.7	1.4	0.6	0.2	.	.	.	.	.
25AUG14	23.0	15.4	11.0	8.1	5.2	2.0	0.3	0.2	0.2	0.2	0.2	0.3	0.2
01SEP14	33.1	19.2	11.3	6.9	4.5	1.7	0.6	0.3	.	.	.	.	.
08SEP14	26.3	16.5	10.8	8.4	5.2	2.1	0.5	0.3	0.2	0.3	0.2	0.2	0.3
15SEP14	30.1	20.5	14.1	8.1	5.0	1.3	0.4	0.2	.	.	.	.	.
22SEP14	27.7	17.3	13.0	10.5	9.0	4.8	1.7	0.2	0.2	0.2	0.2	0.2	0.3
29SEP14	31.8	21.4	14.9	11.3	9.0	4.8	2.8	0.8	.	.	.	.	.
06OCT14	27.1	18.9	14.4	12.4	10.3	5.4	2.1	0.3	0.2	0.3	0.3	0.3	0.3
20OCT14	33.0	22.3	13.5	8.9	7.6	4.1	1.5	0.3	0.3	0.3	0.3	0.3	0.3
03NOV14	35.2	21.3	12.0	8.3	7.3	2.9	0.7	0.3	0.3	0.3	0.2	0.2	0.3
17NOV14	26.9	16.6	12.0	11.3	7.5	5.1	3.0	0.3	0.2	0.2	0.3	0.3	0.3

Note: Dots (.) indicate no sampling.

Table B-20 Mean Conductivity (mS/cm @ 25°C) by Region and Week from 2014 Beach Seine Survey

WEEK BEGINNING MONDAY	REGIONS											
	YK	TZ	CH	IP	WP	CW	PK	HP	KG	SG	CS	AL
09JUN14	9.5	5.8	5.3	7.1	1.6	0.6	0.2	0.2	0.2	0.2	0.2	0.2
23JUN14	6.9	4.4	1.3	0.4	0.2	0.3	0.2	0.2	0.2	0.2	0.2	0.2
07JUL14	7.4	5.2	2.6	1.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
21JUL14	6.6	4.9	2.4	1.9	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
04AUG14	8.9	8.2	5.1	3.9	0.4	0.3	0.4	0.3	0.3	0.2	0.2	0.2
18AUG14	10.8	8.9	5.8	4.9	0.9	0.4	0.3	0.3	0.3	0.3	0.3	0.3
01SEP14	11.1	8.9	5.8	4.4	0.6	0.3	0.3	0.3	0.3	0.3	0.2	0.2
15SEP14	14.0	10.2	6.7	5.4	1.5	0.3	0.3	0.2	0.2	0.2	0.2	0.2
29SEP14	15.8	13.9	10.4	8.4	3.4	1.7	0.5	0.3	0.3	0.3	0.3	0.3
13OCT14	16.1	13.0	10.1	7.3	2.9	1.7	0.4	0.3	0.3	0.3	0.3	0.3

Appendix E

Temporal and Geographical Distribution Indices

APPENDIX E

LIST OF TABLES

APPENDIX E

LIST OF TABLES (CONTINUED)

Table E-1 Striped Bass Temporal Distribution Indices Based on Long River Survey, 1974-2014

Week	Eggs		Yolk-sac Larvae		Post Yolk-sac Larvae		Young-of-Year	
	1974-2013	2014	1974-2013	2014	1974-2013	2014	1974-2013	2014
18	0.03039	0.00271	0.00214	0	0.00021	0	0	0
19	0.09957	0.55683	0.03204	0.00359	0.00155	0	0	0
20	0.33264	0.36254	0.25403	0.50886	0.02296	0.03047	0.06097	0
21	0.35079	0.05403	0.28776	0.36240	0.28394	0.43135	0.00077	0
22	0.13779	0.02183	0.16177	0.09871	0.24525	0.27570	0	0
23	0.04052	0.00155	0.20935	0.02451	0.18641	0.16900	0.00499	0
24	0.00643	0.00047	0.04673	0.00166	0.17124	0.07201	0.11889	0
25	0.00113	0.00003	0.00544	0.00026	0.06183	0.02147	0.23496	1
26	0.00075	NS	0.00074	NS	0.02661	NS	0.57942	NS

NS = No sampling in week 26 during 2014 LRS.

Table E-2 Striped Bass Geographical Distribution Indices Based on Long River Survey, 1974-2014

Region	Eggs		Yolk-sac Larvae		Post Yolk-sac Larvae		Young-of-Year	
	1974-2013	2014	1974-2013	2014	1974-2013	2014	1974-2013	2014
Yonkers	0.04530	0.00010	0.00201	0.00048	0.05503	0.01185	0.01032	0
Tappan Zee	0.00152	0.00186	0.02305	0.02218	0.09716	0.13534	0.08392	0.39056
Croton-Haverstraw	0.00395	0.00269	0.02132	0.02403	0.07920	0.06282	0.09462	0.03925
Indian Point	0.01745	0.00800	0.08130	0.17186	0.17504	0.12048	0.09545	0.00811
West Point	0.12227	0.43831	0.18686	0.28696	0.22816	0.20975	0.08198	0.02871
Cornwall	0.19721	0.09245	0.15595	0.05776	0.13488	0.12486	0.15786	0.05797
Poughkeepsie	0.14208	0.09863	0.34009	0.17711	0.16575	0.17039	0.13124	0
Hyde Park	0.13747	0.15925	0.13162	0.10364	0.03412	0.07272	0.01908	0
Kingston	0.22842	0.11782	0.03967	0.11260	0.01660	0.05869	0.07798	0.05537
Saugerties	0.09507	0.07313	0.01606	0.03786	0.00901	0.00877	0.08504	0.27165
Catskill	0.00688	0.00538	0.00194	0.00547	0.00484	0.02358	0.12682	0.11094
Albany	0.00236	0.00238	0.00013	0.00006	0.00021	0.00075	0.03568	0.03743

Table E-3 Striped Bass Geographical Distribution Indices Based on Beach Seine Survey, 1974-2014

Region	Young-of-Year		Yearling		Older-than-Yearling	
	1974-2013	2014	1974-2013	2014	1974-2013	2014
Yonkers	0.04104	0.04112	0.03224	0.04691	0.03341	0
Tappan Zee	0.38117	0.31351	0.35197	0.39591	0.34280	0.26698
Croton-Haverstraw	0.33923	0.22460	0.26871	0.22221	0.25788	0.18058
Indian Point	0.05645	0.04540	0.03384	0	0.03432	0
West Point	0.01303	0.01205	0.00738	0.00235	0.01009	0
Cornwall	0.04109	0.07007	0.04553	0.03159	0.04640	0
Poughkeepsie	0.01720	0.02211	0.04748	0.01263	0.04480	0
Hyde Park	0.00112	0.00173	0.00375	0.00110	0.00351	0
Kingston	0.01240	0.05927	0.02122	0	0.02247	0
Saugerties	0.03632	0.13054	0.05923	0.03472	0.07077	0
Catskill	0.04250	0.05080	0.06913	0.15758	0.07517	0.36996
Albany	0.01846	0.02880	0.05953	0.09500	0.05838	0.18248

Table E-4 White Perch Temporal Distribution Indices Based on Long River Survey, 1974-2014

Week	Eggs		Yolk-sac Larvae		Post Yolk-sac Larvae		Young-of-Year	
	1974-2013	2014	1974-2013	2014	1974-2013	2014	1974-2013	2014
18	0.10607	0.12761	0.08839	0.00299	0.00225	0	0.00429	--[1]
19	0.15828	0.33937	0.18940	0.26042	0.03077	0.00086	0.01185	--
20	0.17836	0.14374	0.25984	0.15779	0.08712	0.06897	0	--
21	0.18532	0.23254	0.17597	0.24748	0.15819	0.15882	0.00017	--
22	0.14481	0.15107	0.11703	0.28918	0.18053	0.35447	0.00027	--
23	0.12364	0.00419	0.10946	0.03618	0.18926	0.26687	0.00618	--
24	0.09482	0.00147	0.04593	0.00312	0.16397	0.13107	0.18192	--
25	0.00763	0	0.01205	0.00284	0.12169	0.01893	0.31277	--
26	0.00107	NS	0.00194	NS	0.06623	NS	0.48256	--

[1] No young-of-year white perch were collected within the temporal limits of this index in 2014.

NS = No sampling in week 26 during 2014 LRS.

Table E-5 White Perch Geographical Distribution Indices Based on Long River Survey, 1974-2014

Region	Eggs		Yolk-sac Larvae		Post Yolk-sac Larvae		Young-of-Year	
	1974-2013	2014	1974-2013	2014	1974-2013	2014	1974-2013	2014
Yonkers	0.00016	0	0.00118	0	0.00739	0.00039	0.00307	--[1]
Tappan Zee	0.00789	0	0.01403	0.00148	0.02059	0.00657	0.00651	--
Croton-Haverstraw	0.00538	0.00012	0.01165	0.00457	0.02004	0.00743	0.01229	--
Indian Point	0.00225	0	0.01708	0.00757	0.05142	0.03124	0.10830	--
West Point	0.01512	0.00201	0.03252	0.01867	0.07384	0.03068	0.11053	--
Cornwall	0.01746	0.00085	0.04104	0.00887	0.08183	0.06573	0.10037	--
Poughkeepsie	0.06938	0.09710	0.14255	0.02036	0.20419	0.15764	0.23489	--
Hyde Park	0.03898	0.00594	0.13660	0.03611	0.13809	0.09305	0.19601	--
Kingston	0.09402	0.13539	0.15316	0.12365	0.14732	0.1906	0.14629	--
Saugerties	0.22940	0.43072	0.19024	0.28742	0.13937	0.15265	0.02786	--
Catskill	0.38868	0.23370	0.19106	0.40466	0.10737	0.24473	0.04621	--
Albany	0.13128	0.09417	0.06889	0.08664	0.00856	0.01930	0.00766	--

[1] No young-of-year white perch were collected within the temporal limits of this index in 2014.

Table E-6 White Perch Geographical Distribution Indices Based on Beach Seine Survey, 1974-2014

Region	Young-of-Year		Yearling		Older-than-Yearling	
	1974-2013	2014	1974-2013	2014	1974-2013	2014
Yonkers	0.00289	0	0.00112	0	0.02992	0.01127
Tappan Zee	0.17585	0.03653	0.23925	0.08285	0.32794	0.45040
Croton-Haverstraw	0.27188	0.36345	0.40499	0.06305	0.35107	0.21843
Indian Point	0.07106	0.06817	0.05504	0.06050	0.04936	0.08274
West Point	0.02557	0.02034	0.01026	0.01730	0.00720	0.00158
Cornwall	0.05590	0.09135	0.03256	0.05827	0.04426	0.02656
Poughkeepsie	0.03278	0.06542	0.01372	0	0.01435	0.00212
Hyde Park	0.00815	0.00253	0.00254	0.00271	0.00258	0.00037
Kingston	0.03961	0.08122	0.01995	0.07535	0.01875	0.02834
Saugerties	0.13895	0.21121	0.08764	0.10671	0.06081	0.01459
Catskill	0.14746	0.03480	0.10398	0.17222	0.06724	0.07066
Albany	0.02990	0.02497	0.02895	0.36102	0.02651	0.09294

Table E-7 Atlantic Tomcod Temporal Distribution Indices Based on Long River Survey, 1974-2014

Week	Eggs		Yolk-sac Larvae		Post Yolk-sac Larvae		Young-of-Year	
	1974-2013	2014	1974-2013	2014	1974-2013	2014	1974-2013	2014
18	0	--[1]	0.52375	--[1]	0.77679	0.77006	0.17982	0.00840
19	0	--	0.02082	--	0.17463	0.22994	0.22173	0.20762
20	0	--	0.27516	--	0.02575	0	0.18080	0.14181
21	0	--	0	--	0.01908	0	0.11320	0.13974
22	0	--	0	--	0.00156	0	0.09817	0.29471
23	0	--	0	--	0.00091	0	0.06036	0.10886
24	0	--	0.18026	--	0.00016	0	0.05322	0.05767
25	0	--	0	--	0.00077	0	0.05282	0.04119
26	1	NS	0	NS	0.00034	NS	0.03987	NS

[1] No Atlantic tomcod eggs or yolk-sac larvae were collected within the temporal limits of this index in 2014.

NS = No sampling in week 26 during 2014 LRS.

Table E-8 Atlantic Tomcod Geographical Distribution Indices Based on Long River Survey, 1974-2014

Region	Eggs		Yolk-sac Larvae		Post Yolk-sac Larvae		Young-of-Year	
	1974-2013	2014	1974-2013	2014	1974-2013	2014	1974-2013	2014
Yonkers	1	--[1]	0.34334	--[1]	0.51272	0.83929	0.41139	0.17807
Tappan Zee	0	--	0.18026	--	0.26349	0.08589	0.24079	0.28507
Croton-Haverstraw	0	--	0	--	0.04006	0.01916	0.05265	0.13620
Indian Point	0	--	0	--	0.09424	0.05281	0.12750	0.15978
West Point	0	--	0.47640	--	0.07295	0.00285	0.11580	0.12126
Cornwall	0	--	0	--	0.00919	0	0.02307	0.03850
Poughkeepsie	0	--	0	--	0.00630	0	0.02030	0.05062
Hyde Park	0	--	0	--	0.00044	0	0.00453	0.00825
Kingston	0	--	0	--	0.00015	0	0.00247	0.00838
Saugerties	0	--	0	--	0.00023	0	0.00061	0.00574
Catskill	0	--	0	--	0.00020	0	0.00067	0.00798
Albany	0	--	0	--	0.00002	0	0.00020	0.00014

[1] No Atlantic tomcod eggs or yolk-sac larvae were collected within the temporal limits of this index in 2014.

Table E-9 Atlantic Tomcod Geographical Distribution Indices Based on Fall Juvenile Survey, 1979-2014

Region	Young-of-Year		Yearling and Older	
	1979-2013	2014	1979-2013	2014
Yonkers	0.25407	0.05011	0.44886	0.09764
Tappan Zee	0.14067	0.03369	0.14027	0.12512
Croton-Haverstraw	0.05492	0.00353	0.03293	0
Indian Point	0.10306	0.06211	0.09792	0
West Point	0.22372	0.36517	0.18118	0.77724
Cornwall	0.10902	0.22868	0.06224	0
Poughkeepsie	0.07510	0.08834	0.03177	0
Hyde Park	0.01794	0.04227	0.00110	0
Kingston	0.01277	0.05817	0	0
Saugerties	0.00671	0.06022	0.00300	0
Catskill	0.00181	0.00772	0.00072	0
Albany	0.00020	0	0	0

Table E-10 Bay Anchovy Temporal Distribution Indices Based on Long River Survey, 1988-2014

Week	Eggs		Yolk-sac Larvae		Post Yolk-sac Larvae		Young-of-Year	
	1988-2013	2014	1988-2013	2014	1988-2013	2014	1988-2013	2014
18	0	0	0	0	0	0	0	0
19	0.00014	0	0	0	0	0	0	0
20	0.00192	0.00037	0.00149	0	0.00001	0	0.00001	0.00085
21	0.02245	0.00255	0.01087	0	0.00003	0	0.00001	0
22	0.05995	0.10778	0.11703	0	0.00464	0	0	0
23	0.12338	0.12680	0.11096	0.08030	0.03804	0.00496	0.00002	0
24	0.14398	0.08123	0.28426	0.00373	0.05208	0.00937	0.00001	0
25	0.15103	0.10432	0.18212	0.03595	0.11550	0.03127	0.00004	0
26	0.13762	NS	0.15896	NS	0.14114	NS	0.00290	NS
27	0.10507	0.28852	0.01444	0.48901	0.09500	0.08778	0.00650	0
28	0.14919	NS	0.01653	NS	0.19504	NS	0.01071	NS
29	0.01735	0.21047	0.01578	0.39101	0.04290	0.34173	0.02956	0.02765
30	0.05335	NS	0.03326	NS	0.11737	NS	0.07817	NS
31	0.01158	0.05183	0.00044	0	0.02731	0.26617	0.04910	0.18347
32	0.01707	NS	0.03679	NS	0.06843	NS	0.14686	NS
33	0.00331	0.00556	0.00016	0	0.01633	0.13642	0.08819	0.16002
34	0.00236	NS	0.01635	NS	0.04064	NS	0.16323	NS
35	0.00016	0.02055	0.00056	0	0.00913	0.07697	0.06567	0.35507
36	0.00007	NS	0	NS	0.01765	NS	0.12020	NS
37	0.00001	0.00001	0	0	0.00357	0.03444	0.03519	0.14618
38	0.00001	NS	0	NS	0.00913	NS	0.09242	NS
39	0	0	0	0	0.00203	0.01089	0.03324	0.12676
40	0	NS	0	NS	0.00402	NS	0.07795	NS

NS = No sampling during these weeks in 2014.

Table E-11 Bay Anchovy Geographical Distribution Indices Based on Long River Survey, 1988-2014

Region	Eggs		Yolk-sac Larvae		Post Yolk-sac Larvae		Young-of-Year	
	1988-2013	2014	1988-2013	2014	1988-2013	2014	1988-2013	2014
Battery	0.32612	0.32994	0.44588	0.39752	0.16350	0.27099	0.07686	0.06175
Yonkers	0.44041	0.54446	0.23185	0.21726	0.17875	0.20293	0.15995	0.14456
Tappan Zee	0.19942	0.11208	0.18067	0.36975	0.27727	0.26039	0.36872	0.48656
Croton-Haverstraw	0.02009	0.01102	0.09953	0.01547	0.16917	0.11956	0.14512	0.19912
Indian Point	0.01372	0.00249	0.03732	0	0.15276	0.10712	0.05694	0.05583
West Point	0.00018	0	0.00026	0	0.02294	0.01839	0.04330	0.02419
Cornwall	0.00001	0.00001	0.00337	0	0.01740	0.00931	0.07194	0.02243
Poughkeepsie	0.00002	0	0.00015	0	0.01776	0.01129	0.07711	0.00554
Hyde Park	0	0	0.00004	0	0.00015	0.00001	0.00001	0
Kingston	0	0	0.00065	0	0.00011	0	0.00005	0
Saugerties	0.00001	0	0	0	0.00005	0	0	0
Catskill	0.00002	0.00001	0	0	0.00005	0	0	0
Albany	0.00001	0	0.00028	0	0.00007	0	0	0

Table E-12 Bay Anchovy Geographical Distribution Indices Based on Beach Seine Survey, 1974-2014

Region	Young-of-Year		Yearling and Older	
	1974-2013	2014	1974-2013	2014
Yonkers	0.20625	0	0.79818	0
Tappan Zee	0.53007	0.3441	0.14488	0.35667
Croton-Haverstraw	0.08537	0.33642	0.00373	0.64333
Indian Point	0.06798	0.31277	0.03632	0
West Point	0.02229	0	0.00438	0
Cornwall	0.04732	0	0.00831	0
Poughkeepsie	0.01700	0	0.00179	0
Hyde Park	0.00068	0	0.00010	0
Kingston	0.00528	0.00067	0.00019	0
Saugerties	0.00270	0	0.00092	0
Catskill	0.01363	0	0.00079	0
Albany	0.00145	0.00604	0.00039	0

Table E-13 American Shad Temporal Distribution Indices Based on Long River Survey, 1974-2014

Week	Eggs		Yolk-sac Larvae		Post Yolk-sac Larvae		Young-of-Year	
	1974-2013	2014	1974-2013	2014	1974-2013	2014	1974-2013	2014
18	0.19661	0.01677	0.07708	0	0.00052	0	0	0
19	0.30634	0.25803	0.12892	0.28108	0.01120	0	0	0
20	0.26396	0.04534	0.25705	0.16900	0.08915	0.01327	0.00012	0
21	0.14058	0.30365	0.21810	0.03428	0.14137	0.03289	0.00020	0
22	0.05608	0.30281	0.17019	0.45576	0.21918	0.27652	0.00005	0
23	0.03004	0.07340	0.09073	0.05987	0.15636	0.37905	0.03630	0
24	0.00514	0	0.05351	0	0.19260	0.13361	0.12459	0.36439
25	0.00110	0	0.00353	0	0.11842	0.16465	0.30717	0.63561
26	0.00014	NS	0.00089	NS	0.07121	NS	0.53157	NS

NS = No sampling in week 26 during 2014 LRS.

Table E-14 American Shad Geographical Distribution Indices Based on Long River Survey, 1974-2014

Region	Eggs		Yolk-sac Larvae		Post Yolk-sac Larvae		Young-of-Year	
	1974-2013	2014	1974-2013	2014	1974-2013	2014	1974-2013	2014
Yonkers	0.0005	0	0.00015	0	0.00013	0	0.00295	0
Tappan Zee	0.0001	0	0.00051	0	0.00047	0	0.00426	0
Croton-Haverstraw	0.00003	0	0.00176	0	0.00172	0	0.00663	0
Indian Point	0.00031	0	0.00786	0	0.00805	0	0.01527	0.02340
West Point	0.00103	0	0.01070	0	0.01107	0.00090	0.03524	0
Cornwall	0.00185	0	0.00712	0	0.01902	0.00038	0.04235	0.01588
Poughkeepsie	0.00438	0	0.04828	0	0.05183	0.00978	0.11178	0.03457
Hyde Park	0.00346	0	0.02537	0	0.05685	0.04533	0.08625	0.11876
Kingston	0.04019	0.00192	0.07266	0.03428	0.11954	0.10539	0.11737	0.31732
Saugerties	0.22512	0.13380	0.15264	0	0.25814	0.21436	0.22234	0.09040
Catskill	0.29007	0.68276	0.25406	0.21505	0.37385	0.52571	0.28821	0.16804
Albany	0.43295	0.18152	0.41890	0.75066	0.09934	0.09817	0.06734	0.23163

Table E-15 American Shad Geographical Distribution Indices Based on Beach Seine Survey, 1974-2014

Region	Young-of-Year	
	1974-2013	2014
Yonkers	0.00582	0
Tappan Zee	0.06608	0.00938
Croton-Haverstraw	0.06704	0.14446
Indian Point	0.02522	0.01290
West Point	0.01464	0.01491
Cornwall	0.12382	0.09781
Poughkeepsie	0.07950	0.03475
Hyde Park	0.01135	0.00904
Kingston	0.06645	0.05019
Saugerties	0.18035	0.23087
Catskill	0.20767	0.13995
Albany	0.15206	0.25575

Table E-16 *Alosa* spp. Temporal Distribution Indices Based on Long River Survey, 1974-2014

Week	Eggs		Yolk-sac Larvae		Post Yolk-sac Larvae		Young-of-Year	
	1974-2013	2014	1974-2013	2014	1974-2013	2014	1974-2013	2014
18	0.22675	0.05507	0.04893	0.02475	0.00373	0.00065	0	--[1]
19	0.19477	0.74560	0.11027	0.14794	0.02057	0.00969	0.00010	--
20	0.31488	0.07301	0.28716	0.14223	0.07258	0.16499	0.00008	--
21	0.10616	0.11454	0.27203	0.63388	0.14343	0.18956	0.00090	--
22	0.07921	0.01012	0.14883	0.04642	0.22793	0.33241	0.00017	--
23	0.07176	0.00165	0.10328	0.00363	0.20962	0.13449	0.00081	--
24	0.00614	0	0.02419	0.00022	0.16266	0.08574	0.01894	--
25	0.00023	0	0.00469	0.00093	0.09838	0.08248	0.08946	--
26	0.00010	NS	0.00062	NS	0.06110	NS	0.88954	NS

[1] No *Alosa* spp. young-of-year were collected within the temporal limits of this index in 2014.

NS = No sampling in week 26 during 2014 LRS.

Table E-17 *Alosa* spp. Geographical Distribution Indices Based on Long River Survey, 1974-2014

Region	Eggs		Yolk-sac Larvae		Post Yolk-sac Larvae		Young-of-Year	
	1974-2013	2014	1974-2013	2014	1974-2013	2014	1974-2013	2014
Yonkers	0.00086	0	0.00467	0.00126	0.00621	0.00260	0.00052	--[1]
Tappan Zee	0.00004	0.00007	0.00179	0.00042	0.00708	0.00184	0.00011	--
Croton-Haverstraw	0.00003	0	0.00188	0.00035	0.00741	0.00190	0.00041	--
Indian Point	0.00009	0	0.00314	0.00050	0.01726	0.00989	0.00052	--
West Point	0.00027	0	0.00864	0.00287	0.02557	0.01636	0.01645	--
Cornwall	0.00019	0.00012	0.00869	0.00214	0.03213	0.04011	0.01510	--
Poughkeepsie	0.01017	0.00365	0.03970	0.00767	0.12847	0.11016	0.07250	--
Hyde Park	0.00635	0.06540	0.04046	0.01323	0.10192	0.07274	0.08698	--
Kingston	0.02525	0.03952	0.07124	0.06677	0.15641	0.33009	0.16367	--
Saugerties	0.13023	0.13581	0.17662	0.04761	0.22762	0.21891	0.22692	--
Catskill	0.56809	0.30320	0.33923	0.31079	0.24151	0.16656	0.34555	--
Albany	0.25843	0.45223	0.30394	0.54638	0.04841	0.02883	0.07126	--

[1] No *Alosa* spp. young-of-year were collected within the temporal limits of this index in 2014.

Table E-18 *Alosa* spp. Geographical Distribution Indices Based on Beach Seine Survey, 1974-2014

Region	Young-of-Year	
	1974-2013	2014
Yonkers	0	0
Tappan Zee	0.00050	0
Croton-Haverstraw	0.00013	0
Indian Point	0.00056	0
West Point	0.00564	0
Cornwall	0.11547	0
Poughkeepsie	0.05335	0
Hyde Park	0.00752	0
Kingston	0.08827	0.74399
Saugerties	0.18356	0.16100
Catskill	0.36152	0.05732
Albany	0.18349	0.03769

Table E-19 Alewife Geographical Distribution Indices Based on Beach Seine Survey, 1974-2014

Region	Young-of-Year	
	1974-2013	2014
Yonkers	0.00345	0
Tappan Zee	0.10989	0.03051
Croton-Haverstraw	0.15856	0.73951
Indian Point	0.05417	0
West Point	0.02758	0.00094
Cornwall	0.13139	0.15576
Poughkeepsie	0.07811	0.00254
Hyde Park	0.01574	0.00044
Kingston	0.07383	0
Saugerties	0.18004	0.02096
Catskill	0.13652	0.04933
Albany	0.03072	0

Table E-20 Blueback Herring Geographical Distribution Indices Based on Beach Seine Survey, 1974-2014

Region	Young-of-Year	
	1974-2013	2014
Yonkers	0.00172	0
Tappan Zee	0.03167	0.00009
Croton-Haverstraw	0.01205	0.00422
Indian Point	0.01567	0.00214
West Point	0.02587	0.02806
Cornwall	0.08391	0.09042
Poughkeepsie	0.12919	0.01006
Hyde Park	0.03329	0.00130
Kingston	0.18119	0.04204
Saugerties	0.18649	0.07840
Catskill	0.18439	0.69238
Albany	0.11456	0.05089

Table E-21 Gizzard Shad Geographical Distribution Indices Based on Beach Seine Survey, 1974-2014

Region	Young-of-Year		Yearling and Older	
	1974-2013	2014	1974-2013	2014
Yonkers	0.00597	--[1]	0.00550	0
Tappan Zee	0.19719	--	0.09482	0
Croton-Haverstraw	0.10982	--	0.18742	0
Indian Point	0.06364	--	0.07003	0.37839
West Point	0.03730	--	0.03596	0.01804
Cornwall	0.08743	--	0.17475	0.24296
Poughkeepsie	0.22654	--	0.14828	0.24279
Hyde Park	0.00688	--	0.00985	0
Kingston	0.05815	--	0.05501	0.11783
Saugerties	0.08900	--	0.10342	0
Catskill	0.04837	--	0.03271	0
Albany	0.06972	--	0.08227	0

[1] No young-of-year gizzard shad were collected in the 2014 BSS.

Table E-22 Rainbow Smelt Temporal Distribution Indices Based on Long River Survey, 1974-2014

Week	Eggs		Yolk-sac Larvae		Post Yolk-sac Larvae		Young-of-Year	
	1974-2013	2014	1974-2013	2014	1974-2013	2014	1974-2013	2014
18	0.03957	--[1]	0.69386	--[1]	0.07541	--[1]	0	--[1]
19	0.95809	--	0.21789	--	0.15019	--	0.00013	--
20	0	--	0.06783	--	0.19350	--	0.00002	--
21	0.00234	--	0.00786	--	0.18431	--	0.00222	--
22	0	--	0.00243	--	0.15550	--	0.01413	--
23	0	--	0	--	0.10114	--	0.03356	--
24	0	--	0.00984	--	0.07954	--	0.11077	--
25	0	--	0.00029	--	0.04446	--	0.36929	--
26	0	NS	0	NS	0.01595	NS	0.46988	NS

[1] No rainbow smelt were collected in 2014.

NS = No sampling in week 26 during 2014 LRS.

Table E-23 Rainbow Smelt Geographical Distribution Indices Based on Long River Survey, 1974-2014

Region	Eggs		Yolk-sac Larvae		Post Yolk-sac Larvae		Young-of-Year	
	1974-2013	2014	1974-2013	2014	1974-2013	2014	1974-2013	2014
Yonkers	0	--[1]	0.00080	--[1]	0.04248	--[1]	0.10349	--[1]
Tappan Zee	0	--	0.00728	--	0.12609	--	0.18854	--
Croton-Haverstraw	0.00234	--	0.00631	--	0.07782	--	0.13802	--
Indian Point	0	--	0.03463	--	0.12192	--	0.14450	--
West Point	0	--	0.05207	--	0.07569	--	0.11124	--
Cornwall	0	--	0.04963	--	0.11478	--	0.13313	--
Poughkeepsie	0	--	0.26208	--	0.22658	--	0.10991	--
Hyde Park	0	--	0.19434	--	0.08111	--	0.04019	--
Kingston	0.06470	--	0.14258	--	0.07031	--	0.01542	--
Saugerties	0.74244	--	0.14055	--	0.04575	--	0.01522	--
Catskill	0.10925	--	0.09998	--	0.01629	--	0.00035	--
Albany	0.08127	--	0.00976	--	0.00118	--	0	--

[1] No rainbow smelt were collected in 2014.

Table E-24 Rainbow Smelt Geographical Distribution Indices Based on Fall Juvenile Survey, 1979-2014

Region	Young-of-Year		Yearling and Older	
	1979-2013	2014	1979-2013	2014
Yonkers	0.03811	--[1]	0	--[1]
Tappan Zee	0.02716	--	0	--
Croton-Haverstraw	0.00993	--	0.00211	--
Indian Point	0.06389	--	0.13066	--
West Point	0.36799	--	0.48710	--
Cornwall	0.36955	--	0.08808	--
Poughkeepsie	0.10437	--	0.22565	--
Hyde Park	0.01847	--	0.06600	--
Kingston	0.00014	--	0.00040	--
Saugerties	0.00025	--	0	--
Catskill	0	--	0	--
Albany	0.00014	--	0	--

[1] No rainbow smelt were collected in the 2014 FJS.

Table E-25 Hogchoker Geographical Distribution Indices Based on Fall Juvenile Survey, 1979-2014

Region	Young-of-Year		Yearling and Older	
	1979-2013	2014	1979-2013	2014
Yonkers	0.02227	0	0.08947	0.04394
Tappan Zee	0.07701	0	0.29304	0.04003
Croton-Haverstraw	0.05588	0.01879	0.11270	0.05479
Indian Point	0.15155	0.23543	0.13716	0.21403
West Point	0.16357	0.15727	0.06989	0.17400
Cornwall	0.14659	0.24401	0.09995	0.26842
Poughkeepsie	0.13297	0.15622	0.07250	0.09871
Hyde Park	0.07795	0.09254	0.02172	0.00964
Kingston	0.07204	0.04567	0.04242	0.04242
Saugerties	0.07715	0.03769	0.03826	0.04550
Catskill	0.01693	0.01239	0.01174	0.00607
Albany	0.00609	0	0.01114	0.00244

Table E-26 Spottail Shiner Geographical Distribution Indices Based on Beach Seine Survey, 1974-2014

Region	Young-of-Year		Yearling and Older	
	1974-2013	2014	1974-2013	2014
Yonkers	0.00087	0	0.00720	0
Tappan Zee	0.00465	0	0.02017	0
Croton-Haverstraw	0.01169	0.00911	0.01806	0.02318
Indian Point	0.01301	0	0.01859	0
West Point	0.01477	0.01192	0.01736	0.00463
Cornwall	0.03020	0.03334	0.05656	0.05454
Poughkeepsie	0.08649	0.03623	0.09415	0.01401
Hyde Park	0.02985	0.00081	0.02216	0.00327
Kingston	0.09834	0.05149	0.06543	0.08691
Saugerties	0.23813	0.70566	0.25517	0.32105
Catskill	0.21758	0.04987	0.21780	0.03238
Albany	0.25443	0.10157	0.20736	0.46003

Table E-27 White Catfish Geographical Distribution Indices Based on Fall Juvenile Survey, 1979-2014

Region	Young-of-Year		Yearling and Older	
	1979-2013	2014	1979-2013	2014
Yonkers	0	0	0.00701	0
Tappan Zee	0.00354	0	0.12668	0
Croton-Haverstraw	0.00098	0	0.12373	0
Indian Point	0.00615	0.00402	0.08584	0.57911
West Point	0.02331	0.00577	0.03569	0.01740
Cornwall	0.03853	0.03274	0.05534	0.11736
Poughkeepsie	0.12294	0.03828	0.06668	0.01868
Hyde Park	0.06420	0.01933	0.04700	0
Kingston	0.08003	0.25203	0.05995	0.03982
Saugerties	0.17555	0.34143	0.08730	0.04743
Catskill	0.28380	0.28457	0.20157	0.11665
Albany	0.20098	0.02182	0.10320	0.06355

Table E-28 Weakfish Geographical Distribution Indices Based on Fall Juvenile Survey, 1979-2014

Region	Young-of-Year		Yearling and Older	
	1979-2013	2014	1979-2013	2014
Yonkers	0.38307	0.21748	0.54357	0
Tappan Zee	0.27314	0.12185	0.21170	1
Croton-Haverstraw	0.08890	0.10739	0.03127	0
Indian Point	0.13850	0.44814	0.02028	0
West Point	0.07996	0.06638	0.17958	0
Cornwall	0.02646	0.01464	0.01359	0
Poughkeepsie	0.00815	0	0	0
Hyde Park	0.00084	0	0	0
Kingston	0.00079	0.02413	0	0
Saugerties	0.00006	0	0	0
Catskill	0.00012	0	0	0
Albany	0	0	0	0

Table E-29 Bluefish Geographical Distribution Indices Based on Beach Seine Survey, 1974-2014

Region	Young-of-Year	
	1974-2013	2014
Yonkers	0.09558	0.01002
Tappan Zee	0.54107	0.56045
Croton-Haverstraw	0.29503	0.27473
Indian Point	0.04340	0.14714
West Point	0.00917	0.00175
Cornwall	0.01201	0.00590
Poughkeepsie	0.00287	0
Hyde Park	0.00002	0
Kingston	0	0
Saugerties	0.00086	0
Catskill	0	0
Albany	0	0

Appendix F

Annual Abundance Indices

APPENDIX F

LIST OF TABLES

Table F-1 Striped Bass Indices of Annual Abundance Based on Long River Survey and Beach Seine Survey, 1974-2014

	Long River Survey						Beach Seine Survey	
	Egg		Yolk-Sac Larvae		Post Yolk-Sac Larvae		Juvenile	
	Index	Std. Err.	Index	Std. Err.	Index	Std. Err.	Index	Std. Err.
1974	0.062	0.044	0.080	0.018	0.424	0.033	5.652	0.869
1975	0.076	0.012	0.487	0.031	0.694	0.044	4.557	0.301
1976	0.097	0.011	0.253	0.014	0.265	0.017	3.445	0.392
1977	0.195	0.022	0.566	0.029	0.605	0.036	5.919	0.411
1978	0.077	0.010	0.306	0.019	0.538	0.038	9.115	1.884
1979	0.075	0.008	0.359	0.022	0.468	0.032	3.760	0.756
1980	0.072	0.009	0.319	0.024	0.833	0.062	5.605	0.829
1981	0.137	0.015	0.486	0.055	2.482	0.116	6.611	0.912
1982	0.073	0.007	0.745	0.078	0.825	0.061	3.826	0.539
1983	0.276	0.189	0.391	0.026	0.589	0.033	6.580	1.249
1984	0.152	0.019	0.358	0.030	0.867	0.096	5.059	1.008
1985	0.050	0.005	0.202	0.017	0.405	0.033	1.069	0.237
1986	0.060	0.008	0.421	0.032	0.721	0.036	1.618	0.388
1987	0.059	0.007	1.449	0.085	1.697	0.066	12.823	2.245
1988	0.024	0.008	0.706	0.068	1.481	0.139	4.912	0.607
1989	0.588	0.269	2.941	0.277	4.540	0.344	5.665	0.897
1990	1.219	0.182	3.271	0.295	5.642	0.535	6.415	0.703
1991	0.363	0.064	2.855	0.257	8.005	0.770	5.032	1.070
1992	0.874	0.154	3.884	0.219	6.380	0.426	3.678	0.581
1993	0.633	0.122	4.812	0.969	8.247	0.727	7.496	1.626
1994	9.825	1.869	3.678	0.526	8.454	0.795	5.880	1.056
1995	6.266	1.010	1.305	0.199	3.942	0.389	6.043	0.903
1996	4.497	0.649	12.743	1.796	15.404	1.465	1.252	0.330
1997	1.029	0.185	1.795	0.296	4.887	0.745	9.185	0.829
1998	1.131	0.343	3.173	0.548	6.133	0.490	6.287	0.709
1999	0.460	0.087	4.265	0.393	14.788	1.343	7.621	1.486
2000	2.144	0.194	8.061	0.817	25.886	2.823	2.320	0.691
2001	1.030	0.235	9.057	0.748	21.999	1.364	14.215	1.551
2002	0.291	0.042	0.879	0.054	2.625	0.151	7.649	0.860

Continued

	Long River Survey						Beach Seine Survey	
	Egg		Yolk-Sac Larvae		Post Yolk-Sac Larvae		Juvenile	
	Index	Std. Err.	Index	Std. Err.	Index	Std. Err.	Index	Std. Err.
2003	8.721	4.871	5.889	0.634	7.185	0.718	9.834	1.554
2004	2.018	0.402	4.534	0.372	6.254	0.352	3.752	0.822
2005	0.960	0.158	3.786	0.874	7.169	0.621	11.582	1.469
2006	0.361	0.051	0.752	0.080	1.727	0.102	4.171	0.722
2007	0.920	0.196	6.353	1.267	9.157	0.600	7.201	0.961
2008	0.580	0.106	1.268	0.169	3.995	0.476	4.203	0.548
2009	0.827	0.107	2.871	0.259	8.256	1.150	2.768	0.252
2010	2.534	0.437	4.448	0.494	6.636	0.656	5.380	0.799
2011	3.107	0.648	1.302	0.165	2.390	0.224	2.040	0.424
2012	1.324	0.253	0.386	0.035	1.890	0.112	3.559	0.383
2013	2.733	0.454	3.574	0.430	3.004	0.193	2.184	0.681
2014	6.355	0.787	9.969	0.752	17.084	0.818	7.554	1.121

Table F-2 White Perch Indices of Annual Abundance Based on Long River Survey and Beach Seine Survey, 1974-2014

	Long River Survey						Beach Seine Survey			
	Egg		Yolk-Sac Larvae		Post Yolk-Sac Larvae		Juvenile		Yearling	
	Index	Std. Err.	Index	Std. Err.	Index	Std. Err.	Index	Std. Err.	Index	Std. Err.
1974	0.122	0.049	0.040	0.010	0.464	0.037	4.091	0.556	9.57	2.24
1975	0.335	0.095	0.198	0.016	1.783	0.147	8.040	1.954	2.68	1.41
1976	0.480	0.092	0.388	0.015	2.214	0.239	9.537	1.341	3.31	0.43
1977	0.112	0.019	0.264	0.014	2.431	0.128	6.782	1.114	0.45	0.07
1978	0.687	0.083	0.261	0.021	3.438	0.195	13.934	2.838	4.92	2.37
1979	0.533	0.070	0.336	0.017	3.571	0.103	17.033	2.747	5.31	1.63
1980	0.411	0.038	0.328	0.015	2.954	0.110	10.682	2.306	3.24	0.94
1981	1.282	0.080	0.360	0.032	3.467	0.174	10.297	1.291	3.22	0.62
1982	1.374	0.158	0.986	0.050	5.757	0.221	9.995	1.139	4.31	0.80
1983	1.089	0.084	0.776	0.040	2.977	0.101	10.363	2.016	4.08	1.60
1984	2.691	0.659	0.310	0.015	2.754	0.119	4.175	0.684	4.31	1.11
1985	1.036	0.117	0.463	0.040	5.640	0.214	4.353	1.076	1.47	0.53
1986	2.306	0.338	1.375	0.080	8.106	0.378	5.597	1.129	1.71	0.43
1987	0.528	0.063	0.483	0.022	3.974	0.119	8.880	1.678	2.21	0.26
1988	0.781	0.104	0.381	0.037	2.905	0.147	7.606	1.296	1.23	0.25
1989	0.171	0.014	0.568	0.051	4.057	0.374	6.281	1.715	2.84	0.51
1990	1.633	0.350	0.460	0.034	2.919	0.261	3.844	0.416	2.25	0.59
1991	0.443	0.059	0.241	0.017	3.637	0.236	4.033	0.754	1.57	0.43
1992	0.665	0.062	1.052	0.062	4.921	0.202	3.677	0.645	1.34	0.18
1993	0.431	0.060	0.792	0.044	4.958	0.185	5.842	0.949	1.89	0.55
1994	0.378	0.035	0.812	0.043	4.106	0.173	2.837	0.581	0.65	0.19
1995	0.454	0.070	0.427	0.020	2.506	0.108	3.209	0.484	1.14	0.34
1996	1.071	0.134	0.721	0.051	6.123	0.269	0.309	0.125	0.29	0.10
1997	0.265	0.047	0.127	0.005	1.461	0.075	3.912	0.558	0.45	0.07
1998	0.370	0.056	0.192	0.014	2.300	0.142	1.930	0.486	1.39	0.29
1999	0.192	0.026	0.210	0.017	2.696	0.152	11.218	2.992	1.29	0.43
2000	0.396	0.030	0.480	0.027	4.841	0.504	1.766	0.391	0.89	0.29
2001	0.091	0.010	0.253	0.017	2.997	0.237	6.997	0.817	0.42	0.13
2002	0.397	0.037	0.677	0.027	2.125	0.147	6.766	1.038	3.33	0.87

Continued

	Long River Survey						Beach Seine Survey			
	Egg		Yolk-Sac Larvae		Post Yolk-Sac Larvae		Juvenile		Yearling	
	Index	Std. Err.	Index	Std. Err.	Index	Std. Err.	Index	Std. Err.	Index	Std. Err.
2003	0.329	0.034	0.478	0.023	2.845	0.171	15.671	3.697	0.71	0.13
2004	0.355	0.036	0.526	0.036	2.782	0.127	4.203	0.985	3.10	1.03
2005	0.198	0.013	0.470	0.029	2.233	0.133	6.441	0.998	0.313	0.085
2006	0.465	0.040	0.249	0.014	0.335	0.074	3.162	0.521	1.545	0.201
2007	0.075	0.012	0.186	0.018	2.264	0.180	1.519	0.260	0.391	0.127
2008	0.739	0.070	0.338	0.030	1.777	0.114	6.729	1.362	0.533	0.533
2009	0.473	0.034	0.265	0.017	1.823	0.116	4.852	0.947	1.462	0.322
2010	0.329	0.050	0.367	0.025	2.837	0.149	5.280	0.686	0.561	0.103
2011	0.758	0.155	0.731	0.042	2.518	0.157	3.056	0.889	2.179	1.265
2012	0.163	0.027	0.109	0.009	1.403	0.068	1.766	0.238	0.889	0.180
2013	0.462	0.074	0.389	0.048	1.914	0.124	1.130	0.500	0.931	0.381
2014	0.121	0.014	0.328	0.017	2.069	0.110	2.539	0.540	0.196	0.061

Table F-3 Atlantic Tomcod Indices of Annual Abundance Based on Long River Survey, 1974-2014

	Long River Survey	
	Post Yolk-Sac Larvae and Juvenile	
	Index	Std. Err.
1974	0.093	0.016
1975	0.035	0.009
1976	0.011	0.003
1977	0.412	0.267
1978	0.110	0.031
1979	0.026	0.006
1980	0.234	0.078
1981	0.149	0.037
1982	0.064	0.024
1983	0.035	0.012
1984	0.155	0.070
1985	0.149	0.027
1986	0.077	0.010
1987	0.319	0.049
1988	0.151	0.034
1989	0.365	0.089
1990	0.306	0.135
1991	0.193	0.029
1992	0.065	0.021
1993	0.214	0.061
1994	0.106	0.022
1995	0.148	0.024
1996	0.094	0.014
1997	0.049	0.011
1998	0.036	0.008
1999	0.030	0.007
2000	0.009	0.002
2001	0.176	0.029
2002	0.005	0.001
2003	0.042	0.006
2004	0.088	0.012
2005	0.088	0.014
2006	0.022	0.005
2007	0.011	0.001
2008	0.035	0.010
2009	0.029	0.005
2010	0.043	0.006

Continued

	Long River Survey	
	Post Yolk-Sac Larvae and Juvenile	
	Index	Std. Err.
2011	0.043	0.008
2012	0.018	0.005
2013	0.008	0.001
2014	0.073	0.010

Table F-4 Bay Anchovy Indices of Annual Abundance Based on Fall Juvenile Survey, 1979-2014

	Fall Juvenile Survey	
	Juvenile	
	Index	Std. Err.
1979	63	10
1980	216	53
1981	149	24
1982	197	25
1983	115	32
1984	160	33
1985	153	16
1986	109	16
1987	196	42
1988	341	51
1989	289	40
1990	110	12
1991	111	8
1992	147	35
1993	161	20
1994	138	33
1995	266	44
1996	76	20
1997	148	27
1998	132	20
1999	98	25
2000	37	4
2001	63	10
2002	120	16
2003	80	7
2004	147	48
2005	68	7
2006	106	32
2007	163	19
2008	133	14
2009	78	12
2010	85	20
2011	28	12
2012	267	26
2013	84	9
2014	49	5

Table F-5 American Shad Indices of Annual Abundance Based on Long River Survey and Beach Seine Survey, 1974-2014

	Long River Survey						Beach Seine Survey	
	Egg		Yolk-Sac Larvae		Post Yolk-Sac Larvae		Juvenile	
	Index	Std. Err.	Index	Std. Err.	Index	Std. Err.	Index	Std. Err.
1974	0.097	0.031	0.004	0.001	0.171	0.065	11.499	0.825
1975	0.060	0.016	0.025	0.004	0.276	0.176	10.630	1.431
1976	0.037	0.009	0.017	0.002	0.155	0.049	13.325	0.869
1977	0.036	0.004	0.024	0.002	0.170	0.033	13.702	1.388
1978	0.044	0.008	0.034	0.003	0.092	0.031	23.671	2.658
1979	0.045	0.007	0.053	0.006	0.492	0.069	11.645	1.741
1980	0.046	0.009	0.111	0.012	0.479	0.216	10.747	2.464
1981	0.161	0.075	0.106	0.012	0.777	0.309	17.615	2.167
1982	0.123	0.041	0.149	0.016	0.586	0.120	16.312	1.919
1983	0.356	0.114	0.134	0.015	0.573	0.092	19.679	3.887
1984	0.472	0.112	0.240	0.019	0.376	0.168	8.686	1.839
1985	0.262	0.039	0.247	0.041	0.672	0.165	8.078	1.297
1986	0.770	0.325	0.122	0.015	1.054	0.150	19.060	3.735
1987	0.349	0.077	0.063	0.007	0.177	0.077	13.473	2.275
1988	0.259	0.051	0.093	0.030	0.729	0.344	7.717	1.010
1989	0.327	0.063	0.075	0.010	1.040	0.794	22.052	2.414
1990	0.270	0.062	0.400	0.053	1.170	0.733	18.674	1.742
1991	0.086	0.016	0.042	0.008	0.319	0.115	11.966	3.155
1992	0.075	0.021	0.082	0.011	0.622	0.213	13.923	1.051
1993	0.120	0.031	0.011	0.002	0.228	0.116	7.065	0.869
1994	0.227	0.036	0.038	0.005	0.366	0.126	17.557	3.276
1995	0.121	0.030	0.021	0.003	0.191	0.060	3.786	0.433
1996	0.262	0.042	0.012	0.003	0.260	0.061	11.773	1.928
1997	0.036	0.005	0.008	0.001	0.153	0.033	12.537	2.036
1998	0.086	0.012	0.008	0.001	0.089	0.028	2.361	0.415
1999	0.085	0.018	0.003	0.001	0.184	0.066	8.813	2.441
2000	0.119	0.015	0.013	0.002	0.090	0.026	5.925	0.930
2001	0.039	0.012	0.014	0.004	0.459	0.182	24.402	1.827
2002	0.034	0.004	0.016	0.003	0.100	0.037	4.792	0.468

Continued

	Long River Survey						Beach Seine Survey	
	Egg		Yolk-Sac Larvae		Post Yolk-Sac Larvae		Juvenile	
	Index	Std. Err.	Index	Std. Err.	Index	Std. Err.	Index	Std. Err.
2003	0.072	0.019	0.011	0.001	0.093	0.025	8.686	1.204
2004	0.033	0.008	0.008	0.001	0.141	0.062	3.397	0.613
2005	0.042	0.005	0.004	0.001	0.032	0.015	3.208	0.601
2006	0.008	0.001	0.001	0.000	0.009	0.004	0.631	0.116
2007	0.010	0.007	0.002	0.001	0.021	0.022	1.522	0.370
2008	0.011	0.003	0.001	0.000	0.006	0.003	0.774	0.143
2009	0.007	0.002	0.003	<0.001	0.021	0.010	1.880	0.389
2010	0.005	0.001	0.001	<0.001	0.010	0.012	1.826	0.395
2011	0.040	0.005	0.003	0.001	0.016	0.011	1.056	0.229
2012	0.013	0.005	0.001	<0.001	0.002	0.001	0.689	0.175
2013	0.015	0.007	0.002	0.001	0.022	0.014	0.775	0.284
2014	0.012	0.004	0.002	0.001	0.143	0.104	6.839	1.029

Table F-6 Alewife Indices of Annual Abundance Based on Fall Juvenile Survey, 1979-2014, and Beach Seine Survey, 1974-2014

	Fall Juvenile Survey		Beach Seine Survey	
	Juvenile		Juvenile	
	Index	Std. Err.	Index	Std. Err.
1974			2.917	0.439
1975			2.473	0.404
1976			2.400	0.632
1977			4.182	0.605
1978			5.485	0.971
1979	0.199	0.077	1.347	0.232
1980	0.686	0.353	0.498	0.161
1981	0.634	0.214	4.148	0.936
1982	0.275	0.084	0.794	0.237
1983	0.188	0.067	1.791	0.273
1984	0.213	0.125	0.490	0.136
1985	0.930	0.407	0.741	0.173
1986	0.263	0.079	0.834	0.505
1987	0.524	0.268	0.651	0.121
1988	0.268	0.129	0.417	0.089
1989	0.226	0.068	0.163	0.040
1990	0.350	0.137	1.047	0.167
1991	0.328	0.115	3.473	0.569
1992	0.165	0.084	0.299	0.118
1993	0.234	0.083	0.544	0.159
1994	0.120	0.062	1.402	0.343
1995	0.113	0.034	1.136	0.346
1996	0.489	0.146	0.103	0.040
1997	0.319	0.101	2.262	0.439
1998	0.025	0.015	0.214	0.154
1999	0.697	0.173	4.533	1.073
2000	0.203	0.077	0.597	0.315
2001	0.871	0.720	2.733	0.783
2002	0.017	0.014	0.580	0.102
2003	0.286	0.117	3.392	0.895
2004	0.100	0.039	1.274	0.355
2005	0.338	0.092	5.289	1.232
2006	0.037	0.017	0.795	0.435
2007	1.870	1.144	6.688	2.003
2008	0.800	0.542	3.888	0.999
2009	0.038	0.031	1.371	0.467
2010	0.798	0.337	7.282	2.028
2011	0.312	0.111	1.791	0.358

Continued

	Fall Juvenile Survey		Beach Seine Survey	
	Juvenile		Juvenile	
	Index	Std. Err.	Index	Std. Err.
2012	0.151	0.055	0.249	0.090
2013	0.041	0.026	0.253	0.091
2014	1.149	0.264	0.526	0.140

Table F-7 Blueback Herring Indices of Annual Abundance Based on Fall Juvenile Survey, 1979-2014, and Beach Seine Survey, 1974-2014

	Fall Juvenile Survey		Beach Seine Survey	
	Juvenile		Juvenile	
	Index	Std. Err.	Index	Std. Err.
1974			23.509	3.394
1975			69.660	9.490
1976			155.551	23.842
1977			219.365	26.383
1978			229.189	44.491
1979	3.695	0.746	54.451	8.318
1980	2.606	0.753	100.836	53.797
1981	21.197	5.861	181.931	72.898
1982	10.331	2.061	121.724	31.431
1983	6.082	1.073	190.860	41.849
1984	20.385	3.673	22.662	5.412
1985	17.424	4.584	18.816	3.904
1986	6.482	1.383	14.102	4.410
1987	25.608	12.357	69.798	15.687
1988	26.693	4.297	47.408	14.021
1989	16.825	5.408	35.877	8.094
1990	29.688	10.639	97.854	13.970
1991	12.648	4.469	47.440	11.057
1992	15.523	3.874	31.096	6.530
1993	7.717	1.594	35.277	5.517
1994	5.765	1.899	88.839	13.782
1995	1.266	0.417	38.176	23.296
1996	50.160	15.888	36.708	17.548
1997	7.301	1.428	162.109	35.436
1998	0.032	0.029	1.282	0.314
1999	2.073	0.783	58.668	17.791
2000	2.677	1.163	25.980	14.975
2001	5.845	4.998	57.605	11.398
2002	0.797	0.546	12.630	5.767
2003	5.920	1.891	119.197	27.386
2004	1.523	0.347	49.563	11.708
2005	2.332	1.049	65.857	20.089
2006	0.525	0.146	8.278	3.437
2007	5.236	0.907	71.601	9.047
2008	5.557	1.353	39.985	8.850
2009	0.866	0.247	3.881	1.136
2010	4.001	2.107	66.642	20.062
2011	13.627	1.956	41.617	6.286

Continued

	Fall Juvenile Survey		Beach Seine Survey	
	Juvenile		Juvenile	
	Index	Std. Err.	Index	Std. Err.
2012	4.316	1.428	34.657	10.547
2013	0.017	0.017	0.777	0.452
2014	27.206	9.104	74.183	21.591

Table F-8 Rainbow Smelt Indices of Annual Abundance Based on Fall Juvenile Survey, 1979-2014, and Long River Survey, 1974-2014

	Fall Juvenile Survey		Long River Survey	
	Juvenile		Juvenile	
	Index	Std. Err.	Index	Std. Err.
1974			0.020	0.004
1975			0.001	0.000
1976			0.000	0.000
1977			0.006	0.002
1978			0.069	0.006
1979	0.226	0.092	0.020	0.003
1980	0.099	0.088	0.031	0.002
1981	0.000	0.000	0.001	0.000
1982	0.129	0.055	0.002	0.000
1983	0.000	0.000	0.000	0.000
1984	0.419	0.165	0.003	0.000
1985	0.074	0.057	0.002	0.000
1986	0.959	0.165	0.016	0.001
1987	0.122	0.065	0.006	0.001
1988	0.041	0.027	0.051	0.008
1989	0.000	0.000	0.000	0.000
1990	1.140	0.340	0.027	0.002
1991	0.000	0.000	0.010	0.003
1992	6.721	2.340	0.045	0.005
1993	1.190	0.563	0.011	0.003
1994	0.104	0.104	0.008	0.002
1995	0.000	0.000	0.010	0.002
1996	0.000	0.000	0.000	0.000
1997	0.000	0.000	0.000	0.000
1998	0.000	0.000	0.000	0.000
1999	0.000	0.000	0.000	0.000
2000	0.000	0.000	0.000	0.000
2001	0.000	0.000	0.000	0.000
2002	0.000	0.000	0.000	0.000
2003	0.000	0.000	0.000	0.000
2004	0.000	0.000	0.000	0.000
2005	0.000	0.000	0.000	0.000
2006	0.000	0.000	0.000	0.000
2007	0.000	0.000	0.000	0.000
2008	0.000	0.000	0.000	0.000
2009	0.000	0.000	0.000	0.000
2010	0.000	0.000	0.000	0.000

Continued

	Fall Juvenile Survey		Long River Survey	
	Juvenile		Juvenile	
	Index	Std. Err.	Index	Std. Err.
2011	0.000	0.000	0.000	0.000
2012	0.000	0.000	0.000	0.000
2013	0.000	0.000	0.000	0.000
2014	0.000	0.000	0.000	0.000

Table F-9 Hogchoker Indices of Annual Abundance Based on Fall Juvenile Survey, 1974-2014

	Fall Juvenile Survey	
	Juvenile	
	Index	Std. Err.
1974	0.147	0.033
1975	2.748	1.910
1976	0.021	0.017
1977	2.089	1.393
1978	1.925	0.806
1979	0.786	0.172
1980	0.620	0.183
1981	2.735	0.775
1982	0.975	--
1983	6.789	4.522
1984	1.767	0.428
1985	1.396	0.257
1986	3.298	1.587
1987	2.227	0.568
1988	7.832	0.914
1989	1.318	0.406
1990	1.728	1.024
1991	6.772	4.728
1992	0.502	0.234
1993	1.189	0.308
1994	10.079	1.418
1995	0.878	0.333
1996	0.295	0.066
1997	0.026	0.026
1998	0.932	0.129
1999	0.145	0.136
2000	0.983	0.363
2001	1.264	0.426
2002	0.956	0.346
2003	0.511	0.508
2004	0.319	0.079
2005	1.873	0.785
2006	0.402	0.168
2007	1.442	0.774
2008	0.796	0.206
2009	0.878	0.462
2010	2.922	1.435
2011	0.426	0.288

Continued

	Fall Juvenile Survey	
	Juvenile	
	Index	Std. Err.
2012	10.309	4.367
2013	0.455	0.088
2014	3.725	1.870

Table F-10 Spottail Shiner Indices of Annual Abundance Based on Beach Seine Survey, 1974-2014

	Beach Seine Survey	
	Juvenile	
	Index	Std. Err.
1974	6.406	1.419
1975	13.648	3.194
1976	9.211	1.452
1977	4.860	1.112
1978	12.232	1.725
1979	8.562	1.357
1980	6.785	1.281
1981	19.134	3.977
1982	4.991	0.815
1983	11.890	3.007
1984	8.202	1.942
1985	4.916	0.780
1986	4.629	1.165
1987	5.868	1.403
1988	4.663	0.722
1989	6.626	1.472
1990	9.098	1.505
1991	11.223	1.880
1992	6.987	1.066
1993	6.379	0.797
1994	14.684	2.022
1995	4.875	0.696
1996	1.681	0.632
1997	11.880	1.742
1998	2.478	0.568
1999	24.848	5.432
2000	2.287	0.634
2001	19.556	4.314
2002	12.833	1.847
2003	25.669	4.877
2004	8.613	1.323
2005	13.370	4.976
2006	2.849	0.461
2007	13.419	3.931
2008	18.279	2.781
2009	11.380	5.983
2010	18.328	2.305

Continued

	Beach Seine Survey	
	Juvenile	
	Index	Std. Err.
2011	8.980	2.648
2012	2.521	0.726
2013	0.825	0.284
2014	7.907	3.147

Table F-11 White Catfish Indices of Annual Abundance Based on Beach Seine Survey, 1974-2014

	Beach Seine Survey Yearling and Older	
	Index	Std. Err.
1974	0.034	0.020
1975	0.021	0.011
1976	0.030	0.010
1977	0.072	0.022
1978	0.069	0.030
1979	0.054	0.028
1980	0.023	0.008
1981	0.050	0.029
1982	0.048	0.026
1983	0.064	0.044
1984	0.019	0.006
1985	0.010	0.005
1986	0.026	0.012
1987	0.031	0.015
1988	0.049	0.018
1989	0.123	0.056
1990	0.010	0.005
1991	0.016	0.008
1992	0.005	0.003
1993	0.013	0.009
1994	0.002	0.002
1995	0.012	0.008
1996	0.028	0.016
1997	0.002	0.001
1998	0.028	0.022
1999	0.000	0.000
2000	0.004	0.003
2001	0.002	0.002
2002	0.009	0.008
2003	0.002	0.001
2004	0.001	0.001
2005	0.000	0.000
2006	0.022	0.013
2007	0.002	0.002
2008	0.002	0.002
2009	0.005	0.003
2010	0.000	0.000

Continued

	Beach Seine Survey	
	Yearling and Older	
	Index	Std. Err.
2011	0.012	0.005
2012	0.004	0.002
2013	0.000	0.000
2014	0.000	0.000

Table F-12 Weakfish Indices of Annual Abundance Based on Fall Juvenile Survey, 1979-2014

	Fall Juvenile Survey	
	Juvenile	
	Index	Std. Err.
1979	0.133	0.070
1980	0.599	0.284
1981	0.215	0.125
1982	0.663	0.306
1983	0.125	0.088
1984	1.588	0.633
1985	0.977	0.481
1986	0.294	0.105
1987	0.253	0.180
1988	1.444	0.599
1989	0.763	0.248
1990	0.149	0.090
1991	0.100	0.061
1992	0.025	0.017
1993	0.252	0.149
1994	0.130	0.058
1995	0.229	0.128
1996	0.213	0.160
1997	0.156	0.053
1998	0.377	0.277
1999	0.117	0.047
2000	0.167	0.115
2001	0.019	0.009
2002	0.007	0.007
2003	0.095	0.049
2004	0.094	0.062
2005	0.014	0.014
2006	0.011	0.011
2007	0.077	0.054
2008	0.000	0.000
2009	0.044	0.021
2010	0.000	0.000
2011	0.026	0.017
2012	0.006	0.006
2013	0.105	0.049
2014	0.012	0.012

Table F-13 Bluefish Indices of Annual Abundance Based on Beach Seine Survey, 1974-2014

	Beach Seine Survey	
	Juvenile	
	Index	Std. Err.
1974	0.712	0.210
1975	0.283	0.074
1976	0.189	0.028
1977	0.325	0.097
1978	0.350	0.075
1979	0.217	0.054
1980	0.303	0.053
1981	0.464	0.119
1982	0.295	0.059
1983	0.320	0.101
1984	0.153	0.034
1985	0.245	0.068
1986	0.127	0.054
1987	0.173	0.049
1988	0.176	0.027
1989	0.176	0.043
1990	0.237	0.053
1991	0.156	0.043
1992	0.133	0.050
1993	0.098	0.033
1994	0.058	0.017
1995	0.182	0.043
1996	0.036	0.012
1997	0.185	0.028
1998	0.155	0.026
1999	2.660	1.116
2000	0.065	0.027
2001	0.692	0.242
2002	0.863	0.300
2003	0.204	0.073
2004	0.103	0.037
2005	0.214	0.071
2006	0.206	0.069
2007	0.149	0.026
2008	0.190	0.046
2009	0.217	0.030
2010	0.287	0.072
2011	0.025	0.019

Continued

	Beach Seine Survey	
	Juvenile	
	Index	Std. Err.
2012	0.178	0.050
2013	0.072	0.016
2014	0.251	0.051

Appendix G

Length Frequency Distributions

APPENDIX G

LIST OF TABLES

APPENDIX G

LIST OF TABLES (CONTINUED)

Table G-1 Length Frequency Distribution of Larval and Young-of-Year Striped Bass in Hudson River Estuary Determined from Long River Survey, 2014

DATES	0.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.9	10.0-11.9	12.0-13.9	14.0-15.9	16.0-17.9	18.0-19.9	20.0-24.9	25.0-29.9	30.0-34.9	35.0-39.9	40.0-44.9	45.0-49.9	50.0-54.9	55.0-59.9
31MAR-04APR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07APR-11APR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14APR-17APR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22APR-25APR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29APR-02MAY	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06MAY-08MAY	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13MAY-16MAY	0	98	372	27	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20MAY-23MAY	0	197	1648	737	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28MAY-31MAY	0	139	783	2391	54	0	0	0	0	0	0	0	0	0	0	0	0	0
03JUN-06JUN	0	65	603	2102	288	11	0	0	0	0	0	0	0	0	0	0	0	0
10JUN-13JUN	0	9	435	1265	537	253	96	9	3	2	0	0	0	0	0	0	0	0
17JUN-20JUN	0	20	296	1151	909	444	158	27	9	3	7	2	0	0	0	0	0	0
24JUN-27JUN	0	7	128	501	795	668	322	110	48	23	34	20	10	0	0	0	0	0
08JUL-11JUL	0	0	0	1	9	53	120	170	144	74	36	42	57	45	23	8	0	2
22JUL-25JUL	0	0	0	0	0	1	3	22	20	15	22	22	27	32	16	16	10	4
05AUG-07AUG	0	0	0	0	0	0	1	1	0	0	8	18	14	17	26	29	26	17
19AUG-21AUG	0	0	0	0	0	0	0	0	0	0	1	6	9	7	4	6	16	14
03SEP-05SEP	0	0	0	0	0	0	0	0	0	0	0	0	1	2	1	2	4	3
16SEP-18SEP	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	4	3	3
29SEP-01OCT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	0	535	4266	8175	2592	1430	700	339	224	117	108	110	118	104	72	65	59	44

DATES	60.0-64.9	65.0-69.9	70.0-74.9	75.0-79.9	80.0-84.9	85.0-89.9	90.0-94.9	95.0-99.9	100.0-104.9	105.0-109.9	110.0-114.9+	N	MEAN	MIN	MED	MAX	SD
31MAR-04APR	0	0	0	0	0	0	0	0	0	0	0	0	.	.	.	.	.
07APR-11APR	0	0	0	0	0	0	0	0	0	0	0	0	.	.	.	.	.
14APR-17APR	0	0	0	0	0	0	0	0	0	0	0	0	.	.	.	.	.
22APR-25APR	0	0	0	0	0	0	0	0	0	0	0	0	.	.	.	.	.
29APR-02MAY	0	0	0	0	0	0	0	0	0	0	0	0	.	.	.	.	.
06MAY-08MAY	0	0	0	0	0	0	0	0	0	0	0	1	4.1	4.1	4.1	4.1	.
13MAY-16MAY	0	0	0	0	0	0	0	0	0	0	0	497	4.7	2.7	4.8	6.4	0.8
20MAY-23MAY	0	0	0	0	0	0	0	0	0	0	0	2582	5.3	2.8	5.3	7.6	0.9
28MAY-31MAY	0	0	0	0	0	0	0	0	0	0	0	3367	6.1	2.7	6.4	9.2	1.0
03JUN-06JUN	0	0	0	0	0	0	0	0	0	0	0	3069	6.6	2.5	6.5	11.4	1.1
10JUN-13JUN	0	0	0	0	0	0	0	0	0	0	0	2609	7.6	3.0	7.0	19.2	2.0
17JUN-20JUN	0	0	0	0	0	0	0	0	0	0	0	3026	8.4	2.5	8.0	25.0	2.3
24JUN-27JUN	0	0	0	0	0	0	0	0	0	0	0	2666	10.2	3.1	9.7	34.0	3.6
08JUL-11JUL	0	0	0	0	0	0	0	0	0	0	0	785	19.7	7.6	16.3	60.0	8.9
22JUL-25JUL	1	2	1	0	0	0	0	0	0	0	0	215	30.7	11.5	30.0	70.0	12.7
05AUG-07AUG	5	6	7	4	1	0	0	0	0	0	0	183	45.5	12.8	45.0	81.0	13.8
19AUG-21AUG	7	6	4	1	0	1	0	2	0	0	0	86	51.1	24.6	53.0	97.0	15.6
03SEP-05SEP	4	9	12	8	12	8	5	3	2	0	2	80	74.3	31.0	74.5	114.0	16.3
16SEP-18SEP	2	12	16	10	6	7	4	0	0	1	0	71	71.0	37.0	72.0	105.0	13.4
29SEP-01OCT	0	0	2	3	3	4	3	1	1	0	0	18	83.1	57.0	83.5	102.0	10.6
	19	35	42	26	22	20	12	6	3	1	2	19255					

NOTE: Lengths are total lengths in mm, N = Number of lengths, MEAN = Mean length, MIN = Minimum length, MED = Median length, MAX = Maximum length, SD = Standard deviation.

Table G-2 Length Frequency Distribution of Young-of-Year Striped Bass in Hudson River Estuary Determined from Fall Juvenile Survey, 2014

DATES	10.0-14.9	15.0-19.9	20.0-24.9	25.0-29.9	30.0-34.9	35.0-39.9	40.0-44.9	45.0-49.9	50.0-54.9	55.0-59.9	60.0-64.9	65.0-69.9	70.0-74.9	75.0-79.9	80.0-84.9	85.0-89.9	90.0-94.9
30JUN-04JUL	6	37	30	22	33	22	6	0	0	0	0	0	0	0	0	0	0
15JUL-19JUL	4	18	20	18	26	29	23	12	11	4	2	2	1	0	0	0	0
28JUL-01AUG	0	4	12	10	11	14	26	19	15	17	8	14	5	4	1	0	0
12AUG-15AUG	0	0	0	1	5	4	4	10	16	23	19	21	10	13	17	5	3
26AUG-29AUG	0	0	0	0	3	0	3	3	8	9	8	14	10	13	11	12	8
09SEP-12SEP	0	0	0	0	0	0	2	3	8	9	8	13	16	3	16	13	13
23SEP-26SEP	0	0	0	0	0	0	0	0	1	4	2	9	9	14	12	10	8
07OCT-10OCT	0	0	0	0	0	0	0	0	2	4	5	11	11	10	10	7	14
21OCT-24OCT	0	0	0	0	0	0	0	0	0	2	2	1	6	6	11	9	10
04NOV-07NOV	0	0	0	0	0	0	0	0	0	0	2	9	10	12	7	6	10
18NOV-22NOV	0	0	0	0	0	0	0	0	1	2	4	5	11	6	13	2	3
	10	59	62	51	78	69	64	47	62	74	60	99	89	81	98	64	69

DATES	95.0-99.9	100.0-104.9	105.0-109.9	110.0-114.9	115.0-119.9	120.0-124.9	125.0-129.9	130.0-134.9	135.0-139.9	140.0-144.9+	N	MEAN	MIN	MED	MAX	SD
30JUN-04JUL	0	0	0	0	0	0	0	0	0	0	156	25.9	11.0	26.0	44.0	8.1
15JUL-19JUL	0	0	0	0	0	0	0	0	0	0	170	34.1	10.0	34.0	74.0	12.3
28JUL-01AUG	0	0	0	0	0	0	0	0	0	0	164	46.2	16.0	45.5	80.0	15.4
12AUG-15AUG	2	2	0	0	0	0	0	0	0	0	161	63.8	27.0	63.0	100.0	15.1
26AUG-29AUG	4	1	1	0	0	0	0	0	0	0	110	71.0	30.0	71.0	105.0	16.0
09SEP-12SEP	5	4	6	2	0	0	0	0	0	0	127	76.1	44.0	74.0	112.0	16.9
23SEP-26SEP	10	5	5	4	1	1	0	0	0	0	96	84.1	54.0	83.0	121.0	15.0
07OCT-10OCT	12	3	3	8	2	9	0	1	0	0	114	86.7	51.0	85.0	133.0	19.2
21OCT-24OCT	7	2	3	5	3	2	1	1	0	0	72	89.6	55.0	89.0	133.0	16.8
04NOV-07NOV	1	4	3	2	4	4	1	0	2	0	77	88.0	62.0	83.0	137.0	18.9
18NOV-22NOV	6	5	7	6	3	2	0	4	0	1	82	89.4	53.0	83.0	140.0	20.9
	47	26	28	27	13	18	2	6	2	1	1329					

NOTE: Lengths are total lengths in mm, N = Number of lengths, MEAN = Mean length, MIN = Minimum length, MED = Median length, MAX = Maximum length, SD = Standard deviation.

Table G-3 Length Frequency Distribution of Young-of-Year Striped Bass in Hudson River Estuary Determined from Beach Seine Survey, 2014

DATES	10.0-14.9	15.0-19.9	20.0-24.9	25.0-29.9	30.0-34.9	35.0-39.9	40.0-44.9	45.0-49.9	50.0-54.9	55.0-59.9	60.0-64.9	65.0-69.9	70.0-74.9	75.0-79.9	80.0-84.9	85.0-89.9
09JUN-12JUN	2	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23JUN-26JUN	0	3	24	62	26	0	0	0	0	0	0	0	0	0	0	0
08JUL-10JUL	0	0	2	23	40	33	17	15	13	9	0	0	0	0	0	0
21JUL-24JUL	0	0	4	7	17	20	25	30	16	18	12	13	11	2	0	0
05AUG-08AUG	0	0	0	0	1	7	25	27	33	22	10	14	14	6	6	2
19AUG-22AUG	0	0	0	0	4	2	6	10	21	23	23	20	14	11	10	8
02SEP-05SEP	0	0	0	0	0	2	1	1	10	14	16	35	24	15	16	11
16SEP-19SEP	0	0	0	0	0	0	2	1	3	7	13	20	29	23	19	16
30SEP-03OCT	0	0	0	0	0	0	0	0	0	0	4	27	23	21	22	23
14OCT-17OCT	0	0	0	0	0	0	0	0	1	1	14	14	22	27	21	10
	2	7	30	92	88	64	76	84	97	94	92	143	137	105	94	70

DATES	90.0-94.9	95.0-99.9	100.0-104.9	105.0-109.9	110.0-114.9	115.0-119.9	120.0-124.9	125.0-129.9	130.0-134.9	135.0-139.9+	N	MEAN	MIN	MED	MAX	SD
09JUN-12JUN	0	0	0	0	0	0	0	0	0	0	6	15.3	14.0	15.5	17.0	1.2
23JUN-26JUN	0	0	0	0	0	0	0	0	0	0	115	26.8	18.0	27.0	34.0	3.4
08JUL-10JUL	0	0	0	0	0	0	0	0	0	0	153	38.0	23.0	36.0	60.0	9.1
21JUL-24JUL	0	0	0	0	0	0	0	0	0	0	180	48.3	20.0	46.5	77.0	13.1
05AUG-08AUG	1	0	0	0	0	0	0	0	0	0	176	55.6	30.0	53.0	91.0	12.4
19AUG-22AUG	3	2	1	1	0	0	0	0	0	0	165	63.6	32.0	62.0	106.0	14.4
02SEP-05SEP	8	7	4	0	0	0	0	0	0	0	172	71.1	36.0	68.0	103.0	13.3
16SEP-19SEP	8	7	9	4	3	2	0	0	0	0	167	77.8	42.0	75.0	118.0	14.7
30SEP-03OCT	10	8	10	2	6	2	4	4	0	0	168	83.6	60.0	81.0	127.0	15.7
14OCT-17OCT	14	7	11	4	6	3	2	1	2	3	164	84.3	53.0	80.5	137.0	17.7
	44	31	35	11	15	7	6	5	2	3	1466					

NOTE: Lengths are total lengths in mm, N = Number of lengths, MEAN = Mean length, MIN = Minimum length, MED = Median length, MAX = Maximum length, SD = Standard deviation.

Table G-4 Length Frequency Distribution of Larval and Young-of-Year White Perch in Hudson River Estuary Determined from Long River Survey, 2014

DATES	0.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.9	10.0-11.9	12.0-13.9	14.0-15.9	16.0-17.9	18.0-19.9	20.0-24.9	25.0-29.9	30.0-34.9	35.0-39.9	40.0-44.9
31MAR-04APR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07APR-11APR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14APR-17APR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22APR-25APR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29APR-02MAY	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
06MAY-08MAY	0	45	5	0	0	0	0	0	0	0	0	0	0	0	0
13MAY-16MAY	0	677	192	0	0	0	0	0	0	0	0	0	0	0	0
20MAY-23MAY	0	224	486	0	0	0	0	0	0	0	0	0	0	0	0
28MAY-31MAY	0	512	1001	387	13	0	0	0	0	0	0	0	0	0	0
03JUN-06JUN	0	563	716	504	81	0	0	0	0	0	0	0	0	0	0
10JUN-13JUN	0	369	606	256	167	33	1	0	0	0	0	0	0	0	0
17JUN-20JUN	0	171	752	565	410	81	12	0	2	0	1	0	0	0	0
24JUN-27JUN	0	75	148	373	252	31	47	13	1	0	0	0	0	0	0
08JUL-11JUL	0	0	0	3	5	21	51	47	6	3	3	1	0	0	0
22JUL-25JUL	0	0	0	0	0	0	5	10	14	6	4	2	3	2	0
05AUG-07AUG	0	0	0	0	0	0	0	0	0	0	4	9	5	1	0
19AUG-21AUG	0	0	0	0	0	0	0	0	0	0	0	0	0	10	10
03SEP-05SEP	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2
16SEP-18SEP	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
29SEP-01OCT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	2637	3906	2088	928	166	116	70	23	9	12	12	9	15	12

DATES	45.0-49.9	50.0-54.9	55.0-59.9	60.0-64.9	65.0-69.9	70.0-74.9	75.0-79.9	80.0-84.9+	N	MEAN	MIN	MED	MAX	SD
31MAR-04APR	0	0	0	0	0	0	0	0	0	.	.	.	.	.
07APR-11APR	0	0	0	0	0	0	0	0	0	.	.	.	.	.
14APR-17APR	0	0	0	0	0	0	0	0	0	.	.	.	.	.
22APR-25APR	0	0	0	0	0	0	0	0	0	.	.	.	.	.
29APR-02MAY	0	0	0	0	0	0	0	0	1	3.7	3.7	3.7	3.7	.
06MAY-08MAY	0	0	0	0	0	0	0	0	50	3.3	2.7	3.2	4.2	0.4
13MAY-16MAY	0	0	0	0	0	0	0	0	869	3.7	2.2	3.7	4.4	0.4
20MAY-23MAY	0	0	0	0	0	0	0	0	710	4.2	2.4	4.2	5.9	0.5
28MAY-31MAY	0	0	0	0	0	0	0	0	1913	4.8	2.4	4.7	8.5	1.2
03JUN-06JUN	0	0	0	0	0	0	0	0	1864	5.1	2.2	4.6	9.9	1.5
10JUN-13JUN	0	0	0	0	0	0	0	0	1432	5.5	2.3	5.0	12.8	1.9
17JUN-20JUN	0	0	0	0	0	0	0	0	1994	6.5	2.3	6.1	21.8	2.1
24JUN-27JUN	0	0	0	0	0	0	0	0	940	7.4	2.5	7.3	17.2	2.4
08JUL-11JUL	0	0	0	0	0	0	0	0	140	13.7	7.6	13.6	28.0	2.7
22JUL-25JUL	3	0	1	0	1	0	0	0	51	22.1	12.7	17.2	67.0	11.9
05AUG-07AUG	0	0	1	1	1	0	0	0	23	33.7	22.0	29.0	65.0	13.4
19AUG-21AUG	4	3	1	0	3	1	0	0	33	46.5	36.0	43.0	71.0	10.1
03SEP-05SEP	11	12	1	2	1	0	1	0	32	50.7	32.0	50.0	76.0	8.4
16SEP-18SEP	2	3	6	1	1	0	0	1	18	56.6	37.0	57.5	84.0	9.6
29SEP-01OCT	0	0	2	2	2	1	0	0	9	63.1	58.0	63.0	74.0	4.9
	20	18	12	6	9	2	1	1	10079					

NOTE: Lengths are total lengths in mm, N = Number of lengths, MEAN = Mean length, MIN = Minimum length, MED = Median length, MAX = Maximum length, SD = Standard deviation.

Table G-5 Length Frequency Distribution of Young-of-Year White Perch in Hudson River Estuary Determined from Fall Juvenile Survey, 2014

DATES	10.0-14.9	15.0-19.9	20.0-24.9	25.0-29.9	30.0-34.9	35.0-39.9	40.0-44.9	45.0-49.9	50.0-54.9	55.0-59.9	60.0-64.9	65.0-69.9	70.0-74.9
30JUN-04JUL	2	11	7	1	0	0	0	0	0	0	0	0	0
15JUL-19JUL	1	31	26	6	5	3	5	1	0	0	0	0	0
28JUL-01AUG	0	1	16	20	11	5	10	4	4	2	0	1	0
12AUG-15AUG	0	0	1	4	24	17	10	9	3	1	0	2	1
26AUG-29AUG	0	0	0	1	0	5	17	12	7	5	3	8	1
09SEP-12SEP	0	0	0	0	0	0	3	13	12	17	5	1	10
23SEP-26SEP	0	0	0	0	0	0	0	0	4	11	11	17	4
07OCT-10OCT	0	0	0	0	0	0	0	1	1	3	10	21	9
21OCT-24OCT	0	0	0	0	0	0	0	0	1	8	7	19	13
04NOV-07NOV	0	0	0	0	0	0	0	0	0	2	10	13	19
18NOV-22NOV	0	0	0	0	0	0	0	0	0	1	12	6	16
	3	43	50	32	40	30	45	40	32	50	58	88	73

DATES	75.0-79.9	80.0-84.9	85.0-89.9	90.0-94.9	95.0-99.9	100.0-104.9+	N	MEAN	MIN	MED	MAX	SD
30JUN-04JUL	0	0	0	0	0	0	21	18.1	12.0	17.0	26.0	3.6
15JUL-19JUL	0	0	0	0	0	0	78	22.9	12.0	20.0	45.0	7.7
28JUL-01AUG	0	0	0	0	0	0	74	33.0	17.0	29.5	65.0	10.6
12AUG-15AUG	0	0	0	0	0	0	72	38.4	24.0	35.0	71.0	9.5
26AUG-29AUG	2	2	0	0	0	0	63	51.1	29.0	46.0	81.0	12.2
09SEP-12SEP	4	1	1	0	0	0	72	58.4	43.0	56.5	86.0	10.3
23SEP-26SEP	2	1	1	0	0	0	56	63.4	51.0	63.0	87.0	7.2
07OCT-10OCT	3	2	1	0	0	0	55	66.7	45.0	67.0	85.0	7.0
21OCT-24OCT	5	5	4	3	2	0	68	71.1	54.0	69.0	97.0	10.3
04NOV-07NOV	6	10	6	4	2	0	75	73.3	58.0	71.0	97.0	9.9
18NOV-22NOV	8	12	10	8	4	0	78	76.7	55.0	76.5	96.0	10.5
	30	33	23	15	8	0	712					

NOTE: Lengths are total lengths in mm, N = Number of lengths, MEAN = Mean length, MIN = Minimum length, MED = Median length, MAX = Maximum length, SD = Standard deviation.

Table G-6 Length Frequency Distribution of Young-of-Year White Perch in Hudson River Estuary Determined from Beach Seine Survey, 2014

DATES	10.0-14.9	15.0-19.9	20.0-24.9	25.0-29.9	30.0-34.9	35.0-39.9	40.0-44.9	45.0-49.9	50.0-54.9	55.0-59.9	60.0-64.9	65.0-69.9
09JUN-12JUN	0	0	0	0	0	0	0	0	0	0	0	0
23JUN-26JUN	0	0	3	13	1	0	0	0	0	0	0	0
08JUL-10JUL	0	1	12	16	13	2	1	0	0	0	0	0
21JUL-24JUL	0	0	0	4	20	22	18	12	11	2	1	0
05AUG-08AUG	0	0	0	4	1	5	7	16	24	11	6	5
19AUG-22AUG	0	0	0	0	0	5	8	4	10	17	17	21
02SEP-05SEP	0	0	0	0	0	0	1	1	4	11	15	17
16SEP-19SEP	0	0	0	0	0	0	0	0	3	3	8	13
30SEP-03OCT	0	0	0	0	0	0	0	0	1	0	6	14
14OCT-17OCT	0	0	0	0	0	0	0	0	1	1	4	12
	0	1	15	37	35	34	35	33	54	45	57	82

DATES	70.0-74.9	75.0-79.9	80.0-84.9	85.0-89.9	90.0-94.9+	N	MEAN	MIN	MED	MAX	SD
09JUN-12JUN	0	0	0	0	0	0	.	.	.	.	.
23JUN-26JUN	0	0	0	0	0	17	26.5	21.0	27.0	30.0	2.3
08JUL-10JUL	0	0	0	0	0	45	27.3	18.0	27.0	40.0	5.0
21JUL-24JUL	0	1	0	0	0	91	40.4	27.0	39.0	75.0	8.6
05AUG-08AUG	1	0	0	0	0	84	50.5	25.0	50.5	72.0	9.6
19AUG-22AUG	11	4	0	0	0	105	59.3	37.0	61.0	78.0	9.7
02SEP-05SEP	20	14	3	2	1	95	67.0	40.0	67.0	93.0	9.2
16SEP-19SEP	23	16	10	3	0	85	70.7	53.0	71.0	86.0	8.1
30SEP-03OCT	17	13	14	5	0	71	73.5	54.0	74.0	89.0	7.5
14OCT-17OCT	11	7	7	3	1	50	71.9	51.0	72.0	93.0	8.7
	83	55	34	13	2	643					

NOTE: Lengths are total lengths in mm, N = Number of lengths, MEAN = Mean length, MIN = Minimum length, MED = Median length, MAX = Maximum length, SD = Standard deviation.

Table G-7 Length Frequency Distribution of Larval and Young-of-Year Atlantic Tomcod in Hudson River Estuary Determined from Long River Survey, 2014

DATES	0.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.9	10.0-11.9	12.0-13.9	14.0-15.9	16.0-17.9	18.0-19.9	20.0-24.9	25.0-29.9	30.0-34.9	35.0-39.9	40.0-44.9	45.0-49.9	50.0-54.9	55.0-59.9
31MAR-04APR	0	0	1	355	144	4	0	0	0	0	0	0	0	0	0	0	0	0
07APR-11APR	0	0	0	52	261	53	0	0	0	0	0	0	0	0	0	0	0	0
14APR-17APR	0	0	0	13	148	166	32	3	0	0	0	0	0	0	0	0	0	0
22APR-25APR	0	0	0	1	10	33	152	195	75	15	1	0	0	0	0	0	0	0
29APR-02MAY	0	0	0	0	0	1	8	55	115	134	121	4	0	0	0	0	0	0
06MAY-08MAY	0	0	0	0	0	0	0	1	3	15	139	52	14	0	0	0	0	0
13MAY-16MAY	0	0	0	0	0	0	0	0	1	1	32	125	232	242	78	0	0	0
20MAY-23MAY	0	0	0	0	0	0	0	0	0	0	0	1	19	97	221	192	79	11
28MAY-31MAY	0	0	0	0	0	0	0	0	0	0	0	0	0	11	74	184	220	187
03JUN-06JUN	0	0	0	0	0	0	0	0	0	0	0	0	0	5	28	66	164	185
10JUN-13JUN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	8	47	94
17JUN-20JUN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	36
24JUN-27JUN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	11
08JUL-11JUL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
22JUL-25JUL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05AUG-07AUG	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19AUG-21AUG	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03SEP-05SEP	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16SEP-18SEP	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29SEP-01OCT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	421	563	257	192	254	194	165	293	182	265	355	404	450	524	527

DATES	60.0-64.9	65.0-69.9	70.0-74.9	75.0-79.9	80.0-84.9	85.0-89.9	90.0-94.9	95.0-99.9	100.0-104.9	105.0-109.9	110.0-114.9	115.0-119.9+	N	MEAN	MIN	MED	MAX	SD
31MAR-04APR	0	0	0	0	0	0	0	0	0	0	0	0	504	7.6	5.9	7.5	10.5	0.8
07APR-11APR	0	0	0	0	0	0	0	0	0	0	0	0	366	8.9	6.7	8.9	11.5	1.0
14APR-17APR	0	0	0	0	0	0	0	0	0	0	0	0	362	10.2	7.0	10.1	14.3	1.3
22APR-25APR	0	0	0	0	0	0	0	0	0	0	0	0	482	14.3	7.9	14.4	20.0	1.9
29APR-02MAY	0	0	0	0	0	0	0	0	0	0	0	0	438	18.7	11.9	18.6	26.2	2.6
06MAY-08MAY	0	0	0	0	0	0	0	0	0	0	0	0	224	23.7	14.0	23.5	33.0	3.2
13MAY-16MAY	0	0	0	0	0	0	0	0	0	0	0	0	711	33.5	16.8	34.0	44.0	5.0
20MAY-23MAY	0	0	0	0	0	0	0	0	0	0	0	0	620	44.1	29.0	44.0	58.0	5.0
28MAY-31MAY	85	47	11	0	0	0	0	0	0	0	0	0	863	53.5	36.0	53.0	73.0	7.0
03JUN-06JUN	163	166	118	52	9	2	0	0	0	0	0	0	995	60.6	37.0	61.0	86.0	8.9
10JUN-13JUN	105	116	101	60	29	6	1	0	0	0	0	0	587	65.6	41.0	65.0	90.0	8.6
17JUN-20JUN	75	98	98	85	39	20	9	1	0	0	0	0	490	70.2	50.0	70.0	95.0	8.6
24JUN-27JUN	32	58	60	54	39	31	17	9	0	0	0	0	322	74.3	51.0	74.0	99.0	10.0
08JUL-11JUL	7	24	37	51	60	52	28	10	8	3	0	1	285	80.9	56.0	81.0	117.0	9.8
22JUL-25JUL	2	9	16	23	38	22	14	9	6	5	0	1	146	83.3	60.0	82.0	118.0	10.5
05AUG-07AUG	0	8	34	37	37	26	14	10	4	0	2	0	172	81.4	65.0	80.5	111.0	8.9
19AUG-21AUG	0	3	3	8	8	6	1	1	1	1	1	0	33	82.2	67.0	81.0	111.0	10.3
03SEP-05SEP	0	1	4	19	18	12	7	6	2	3	2	0	74	85.2	68.0	83.5	111.0	9.9
16SEP-18SEP	0	0	2	9	9	9	3	2	5	4	0	0	43	87.3	70.0	85.0	109.0	10.5
29SEP-01OCT	0	0	0	0	1	3	6	7	3	1	1	0	22	95.3	81.0	95.0	110.0	6.8
	469	530	484	398	287	189	100	55	29	17	6	2	7739					

NOTE: Lengths are total lengths in mm, N = Number of lengths, MEAN = Mean length, MIN = Minimum length, MED = Median length, MAX = Maximum length, SD = Standard deviation.

Table G-8 Length Frequency Distribution of Young-of-Year Atlantic Tomcod in Hudson River Estuary Determined from Fall Juvenile Survey, 2014

DATES	10.0-14.9	15.0-19.9	20.0-24.9	25.0-29.9	30.0-34.9	35.0-39.9	40.0-44.9	45.0-49.9	50.0-54.9	55.0-59.9	60.0-64.9	65.0-69.9
30JUN-04JUL	0	0	0	0	0	0	0	0	0	0	3	8
15JUL-19JUL	0	0	0	0	0	0	0	1	0	0	1	10
28JUL-01AUG	0	0	0	0	0	0	0	0	0	0	2	4
12AUG-15AUG	0	0	0	0	0	0	0	0	0	0	1	8
26AUG-29AUG	0	0	0	0	0	0	0	0	0	0	0	3
09SEP-12SEP	0	0	0	0	0	0	0	0	0	0	0	1
23SEP-26SEP	0	0	0	0	0	0	0	0	0	0	0	0
07OCT-10OCT	0	0	0	0	0	0	0	0	0	0	0	0
21OCT-24OCT	0	0	0	0	0	0	0	0	0	0	0	0
04NOV-07NOV	0	0	0	0	0	0	0	0	0	0	0	0
18NOV-22NOV	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	1	0	0	7	34

DATES	70.0-74.9	75.0-79.9	80.0-84.9	85.0-89.9	90.0-94.9	95.0-99.9	100.0-104.9	105.0-109.9	110.0-114.9	115.0-119.9	120.0-124.9	125.0-129.9
30JUN-04JUL	14	26	15	14	4	3	1	1	0	0	0	0
15JUL-19JUL	17	11	20	16	5	5	4	1	0	0	0	0
28JUL-01AUG	10	21	15	22	14	10	6	1	0	0	0	0
12AUG-15AUG	12	14	20	29	13	11	8	4	1	1	2	0
26AUG-29AUG	3	10	19	14	16	13	1	2	1	0	0	0
09SEP-12SEP	10	10	22	16	11	11	8	2	1	1	2	0
23SEP-26SEP	1	6	10	19	18	5	7	6	2	3	0	0
07OCT-10OCT	0	2	2	6	14	6	7	14	7	8	2	6
21OCT-24OCT	0	0	1	2	3	6	10	10	12	14	7	12
04NOV-07NOV	0	0	0	0	1	2	4	10	8	11	10	6
18NOV-22NOV	0	0	0	0	0	0	1	1	3	4	7	3
	67	100	124	138	99	72	57	52	35	42	30	27

DATES	130.0-134.9	135.0-139.9	140.0-144.9	145.0-149.9	150.0-154.9+	N	MEAN	MIN	MED	MAX	SD
30JUN-04JUL	0	0	0	0	0	91	78.6	60.0	78.0	106.0	8.9
15JUL-19JUL	0	0	0	0	0	91	80.4	49.0	80.0	105.0	10.3
28JUL-01AUG	0	0	0	0	0	105	84.0	63.0	85.0	105.0	9.7
12AUG-15AUG	0	0	0	0	0	124	85.9	63.0	85.0	121.0	11.5
26AUG-29AUG	0	0	0	0	0	82	86.5	65.0	86.5	111.0	9.0
09SEP-12SEP	0	0	0	0	0	95	87.4	67.0	85.0	121.0	10.9
23SEP-26SEP	0	0	0	0	0	77	91.8	71.0	90.0	118.0	10.5
07OCT-10OCT	0	0	1	0	0	75	103.5	75.0	105.0	140.0	13.4
21OCT-24OCT	7	5	1	1	0	91	114.9	84.0	115.0	145.0	13.5
04NOV-07NOV	14	4	1	3	0	74	120.1	93.0	120.0	149.0	12.8
18NOV-22NOV	14	9	8	3	0	53	129.9	100.0	131.0	149.0	10.9
	35	18	11	7	0	958					

NOTE: Lengths are total lengths in mm, N = Number of lengths, MEAN = Mean length, MIN = Minimum length, MED = Median length, MAX = Maximum length, SD = Standard deviation.

Table G-9 Length Frequency Distribution of Young-of-Year Atlantic Tomcod in Hudson River Estuary Determined from Beach Seine Survey, 2014

DATES	10.0-14.9	15.0-19.9	20.0-24.9	25.0-29.9	30.0-34.9	35.0-39.9	40.0-44.9	45.0-49.9	50.0-54.9	55.0-59.9	60.0-64.9	65.0-69.9	70.0-74.9	75.0-79.9	80.0-84.9
09JUN-12JUN	0	0	0	0	0	0	0	0	0	0	1	0	2	1	3
23JUN-26JUN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08JUL-10JUL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21JUL-24JUL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05AUG-08AUG	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19AUG-22AUG	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02SEP-05SEP	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16SEP-19SEP	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30SEP-03OCT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14OCT-17OCT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	1	0	2	1	3

DATES	85.0-89.9	90.0-94.9	95.0-99.9	100.0-104.9	105.0-109.9	110.0-114.9	115.0-119.9	120.0-124.9+	N	MEAN	MIN	MED	MAX	SD
09JUN-12JUN	0	0	0	0	0	0	0	0	7	75.4	61.0	79.0	84.0	8.4
23JUN-26JUN	0	0	0	0	0	0	0	0	0	.	.	.	.	.
08JUL-10JUL	0	0	0	0	0	0	0	0	0	.	.	.	.	.
21JUL-24JUL	0	0	0	0	0	0	0	0	0	.	.	.	.	.
05AUG-08AUG	0	0	0	0	0	0	0	0	0	.	.	.	.	.
19AUG-22AUG	0	0	0	0	0	0	0	0	0	.	.	.	.	.
02SEP-05SEP	0	0	0	0	0	0	0	1	1	122.0	122.0	122.0	122.0	.
16SEP-19SEP	0	0	0	0	0	0	0	0	0	.	.	.	.	.
30SEP-03OCT	0	0	0	0	0	0	0	0	0	.	.	.	.	.
14OCT-17OCT	0	0	0	0	0	0	0	0	0	.	.	.	.	.
	0	0	0	0	0	0	0	1	8					

NOTE: Lengths are total lengths in mm, N = Number of lengths, MEAN = Mean length, MIN = Minimum length, MED = Median length, MAX = Maximum length, SD = Standard deviation.

Table G-10 Length Frequency Distribution of Larval and Young-of-Year Bay Anchovy in Hudson River Estuary Determined from Long River Survey, 2014

DATES	0.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.9	10.0-11.9	12.0-13.9	14.0-15.9	16.0-17.9	18.0-19.9	20.0-24.9	25.0-29.9	30.0-34.9	35.0-39.9	40.0-44.9
31MAR-04APR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07APR-11APR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14APR-17APR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22APR-25APR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29APR-02MAY	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06MAY-08MAY	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13MAY-16MAY	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20MAY-23MAY	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28MAY-31MAY	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03JUN-06JUN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10JUN-13JUN	1	265	178	6	0	1	0	0	0	0	0	0	0	0	0
17JUN-20JUN	0	9	111	167	128	31	1	2	0	1	0	0	0	0	0
24JUN-27JUN	0	52	175	161	191	196	143	81	31	5	0	0	0	0	0
08JUL-11JUL	1	109	159	124	144	118	112	122	119	92	161	28	0	0	0
22JUL-25JUL	0	60	48	57	175	305	247	173	124	78	129	52	34	19	5
05AUG-07AUG	0	8	51	122	233	191	116	152	214	199	265	67	114	83	50
19AUG-21AUG	0	2	34	45	88	170	233	208	155	158	436	165	154	82	49
03SEP-05SEP	0	0	5	45	77	63	133	182	122	141	218	69	245	417	231
16SEP-18SEP	0	0	8	7	58	85	38	61	86	75	297	141	150	290	316
29SEP-01OCT	0	0	0	8	22	39	28	50	41	33	102	127	183	190	228
	2	505	769	742	1116	1199	1051	1031	892	782	1608	649	880	1081	879

DATES	45.0-49.9	50.0-54.9	55.0-59.9	60.0-64.9	65.0-69.9	70.0-74.9	75.0-79.9	80.0-84.9	85.0-89.9+	N	MEAN	MIN	MED	MAX	SD
31MAR-04APR	0	0	0	0	0	0	0	0	0	0	.	.	.	.	.
07APR-11APR	0	0	0	0	0	0	0	0	0	0	.	.	.	.	.
14APR-17APR	0	0	0	0	0	0	0	0	0	0	.	.	.	.	.
22APR-25APR	0	0	0	0	0	0	0	0	0	0	.	.	.	.	.
29APR-02MAY	0	0	0	0	0	0	0	0	0	0	.	.	.	.	.
06MAY-08MAY	0	0	0	0	0	0	0	0	0	0	.	.	.	.	.
13MAY-16MAY	0	0	0	0	0	0	0	0	0	0	.	.	.	.	.
20MAY-23MAY	1	1	1	2	1	1	6	4	1	18	72.6	48.0	76.5	86.0	11.1
28MAY-31MAY	0	0	0	0	0	0	0	0	0	0	.	.	.	.	.
03JUN-06JUN	0	0	0	0	0	0	0	0	0	0	.	.	.	.	.
10JUN-13JUN	0	0	0	0	0	0	0	0	0	451	3.9	1.8	3.8	10.2	0.8
17JUN-20JUN	0	0	0	0	0	0	0	0	0	450	7.3	2.8	7.2	18.1	1.9
24JUN-27JUN	0	0	0	0	0	0	0	0	0	1035	9.3	2.2	9.2	19.9	3.6
08JUL-11JUL	0	0	0	0	0	0	0	0	0	1289	12.3	1.8	11.6	29.0	6.4
22JUL-25JUL	0	0	0	0	0	0	0	0	0	1506	14.2	2.0	12.6	43.0	6.6
05AUG-07AUG	27	4	0	0	0	0	0	0	0	1896	18.1	3.1	16.7	51.0	9.6
19AUG-21AUG	38	5	1	0	0	0	0	0	0	2023	20.4	3.2	19.1	57.0	9.2
03SEP-05SEP	93	36	8	0	0	0	0	0	0	2085	27.4	5.0	28.3	59.0	12.1
16SEP-18SEP	180	43	13	0	1	0	0	0	0	1849	30.6	4.3	32.0	68.0	12.2
29SEP-01OCT	245	76	25	3	1	1	0	0	0	1406	34.5	6.8	36.0	70.0	12.2
	584	165	48	5	3	2	6	4	1	14008					

NOTE: Lengths are total lengths in mm, N = Number of lengths, MEAN = Mean length, MIN = Minimum length, MED = Median length, MAX = Maximum length, SD = Standard deviation.

Table G-11 Length Frequency Distribution of Young-of-Year Bay Anchovy in Hudson River Estuary Determined from Fall Juvenile Survey, 2014

DATES	10.0-14.9	15.0-19.9	20.0-24.9	25.0-29.9	30.0-34.9	35.0-39.9	40.0-44.9	45.0-49.9	50.0-54.9	55.0-59.9
30JUN-04JUL	1	8	10	0	0	0	0	0	0	0
15JUL-19JUL	0	5	33	36	10	0	0	0	0	0
28JUL-01AUG	0	1	8	29	49	30	14	3	0	0
12AUG-15AUG	0	1	31	37	35	39	20	8	3	2
26AUG-29AUG	0	4	18	52	72	48	10	3	1	0
09SEP-12SEP	0	1	14	28	46	31	55	17	6	0
23SEP-26SEP	0	0	1	17	40	27	46	42	11	5
07OCT-10OCT	0	0	0	3	15	32	61	45	24	5
21OCT-24OCT	0	0	0	1	11	11	11	26	30	22
04NOV-07NOV	0	0	0	4	16	16	14	14	13	12
18NOV-22NOV	0	0	0	6	22	27	21	9	7	7
	1	20	115	213	316	261	252	167	95	53

DATES	60.0-64.9	65.0-69.9	70.0-74.9+	N	MEAN	MIN	MED	MAX	SD
30JUN-04JUL	0	0	0	19	18.5	11.0	20.0	22.0	2.9
15JUL-19JUL	0	0	0	84	24.6	17.0	25.0	32.0	3.6
28JUL-01AUG	0	0	0	134	32.5	18.0	31.5	47.0	5.8
12AUG-15AUG	0	0	0	176	32.4	19.0	32.0	55.0	7.8
26AUG-29AUG	0	0	0	208	31.3	16.0	31.0	50.0	5.8
09SEP-12SEP	0	0	0	198	35.7	19.0	35.0	54.0	7.7
23SEP-26SEP	1	0	0	190	39.7	24.0	41.0	63.0	7.7
07OCT-10OCT	4	0	0	190	43.0	25.0	42.0	64.0	6.9
21OCT-24OCT	19	6	0	147	50.7	28.0	52.0	67.0	9.8
04NOV-07NOV	13	4	1	110	46.4	27.0	45.0	70.0	11.5
18NOV-22NOV	1	1	0	103	40.5	26.0	39.0	65.0	9.2
	38	11	1	1559					

NOTE: Lengths are total lengths in mm, N = Number of lengths, MEAN = Mean length, MIN = Minimum length, MED = Median length, MAX = Maximum length, SD = Standard deviation.

Table G-12 Length Frequency Distribution of Young-of-Year Bay Anchovy in Hudson River Estuary Determined from Beach Seine Survey, 2014

DATES	10.0-14.9	15.0-19.9	20.0-24.9	25.0-29.9	30.0-34.9	35.0-39.9	40.0-44.9	45.0-49.9	50.0-54.9
09JUN-12JUN	0	0	0	0	0	0	0	0	0
23JUN-26JUN	0	0	0	0	0	0	0	0	0
08JUL-10JUL	0	0	0	0	0	0	0	0	0
21JUL-24JUL	0	0	1	2	9	3	1	0	0
05AUG-08AUG	0	1	3	1	1	0	0	0	1
19AUG-22AUG	0	2	25	10	5	2	5	4	4
02SEP-05SEP	0	0	6	4	6	8	6	6	2
16SEP-19SEP	0	0	4	12	15	9	9	8	7
30SEP-03OCT	0	0	0	2	2	3	3	4	3
14OCT-17OCT	0	0	0	0	0	1	6	15	4
	0	3	39	31	38	26	30	37	21

DATES	55.0-59.9	60.0-64.9	65.0-69.9+	N	MEAN	MIN	MED	MAX	SD
09JUN-12JUN	0	0	0	0	.	.	.	.	.
23JUN-26JUN	0	0	0	0	.	.	.	.	.
08JUL-10JUL	0	0	0	0	.	.	.	.	.
21JUL-24JUL	0	0	0	16	32.5	21.0	32.5	41.0	4.8
05AUG-08AUG	0	0	0	7	27.7	18.0	24.0	50.0	11.1
19AUG-22AUG	0	0	0	57	29.4	19.0	25.0	53.0	10.4
02SEP-05SEP	0	0	0	38	35.5	21.0	36.0	53.0	8.6
16SEP-19SEP	1	1	0	66	37.0	21.0	35.0	61.0	9.5
30SEP-03OCT	5	2	0	24	46.3	28.0	47.5	63.0	10.4
14OCT-17OCT	5	2	1	35	49.6	38.0	48.0	65.0	6.7
	11	5	1	243					

NOTE: Lengths are total lengths in mm, N = Number of lengths, MEAN = Mean length, MIN = Minimum length, MED = Median length, MAX = Maximum length, SD = Standard deviation.

Table G-13 Length Frequency Distribution of Larval and Young-of-Year American Shad in Hudson River Estuary Determined from Long River Survey, 2014

DATES	0.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.9	10.0-11.9	12.0-13.9	14.0-15.9	16.0-17.9	18.0-19.9	20.0-24.9	25.0-29.9	30.0-34.9	35.0-39.9	40.0-44.9
31MAR-04APR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07APR-11APR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14APR-17APR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22APR-25APR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29APR-02MAY	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06MAY-08MAY	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13MAY-16MAY	0	0	0	0	3	11	0	0	0	0	0	0	0	0	0
20MAY-23MAY	0	0	0	0	5	6	1	1	0	0	0	0	0	0	0
28MAY-31MAY	0	0	0	0	0	2	1	0	0	0	0	0	0	0	0
03JUN-06JUN	0	0	3	0	0	26	9	8	3	2	0	0	0	0	0
10JUN-13JUN	0	0	0	0	1	0	0	5	6	8	30	15	0	0	0
17JUN-20JUN	0	0	0	0	0	0	1	3	15	14	34	31	19	1	0
24JUN-27JUN	0	0	0	0	0	0	10	19	27	31	39	45	34	16	3
08JUL-11JUL	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1
22JUL-25JUL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05AUG-07AUG	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19AUG-21AUG	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03SEP-05SEP	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16SEP-18SEP	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29SEP-01OCT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	3	0	9	45	22	36	51	55	103	92	53	18	4

DATES	45.0-49.9	50.0-54.9	55.0-59.9	60.0-64.9	65.0-69.9	70.0-74.9	75.0-79.9	80.0-84.9	85.0-89.9+	N	MEAN	MIN	MED	MAX	SD
31MAR-04APR	0	0	0	0	0	0	0	0	0	0	.	.	.	.	.
07APR-11APR	0	0	0	0	0	0	0	0	0	0	.	.	.	.	.
14APR-17APR	0	0	0	0	0	0	0	0	0	0	.	.	.	.	.
22APR-25APR	0	0	0	0	0	0	0	0	0	0	.	.	.	.	.
29APR-02MAY	0	0	0	0	0	0	0	0	0	0	.	.	.	.	.
06MAY-08MAY	0	0	0	0	0	0	0	0	0	0	.	.	.	.	.
13MAY-16MAY	0	0	0	0	0	0	0	0	0	14	10.4	8.1	10.8	11.5	0.9
20MAY-23MAY	0	0	0	0	0	0	0	0	0	13	10.6	8.7	10.2	14.1	1.5
28MAY-31MAY	0	0	0	0	0	0	0	0	0	3	12.1	11.3	11.9	13.2	1.0
03JUN-06JUN	0	0	0	0	0	0	0	0	0	51	12.3	4.5	11.7	18.4	2.9
10JUN-13JUN	0	0	0	0	0	0	0	0	0	65	21.6	9.8	21.3	28.6	4.0
17JUN-20JUN	0	0	0	0	0	0	0	0	0	118	23.9	12.9	23.7	35.0	5.2
24JUN-27JUN	0	1	0	0	0	0	0	0	0	225	24.0	12.1	23.5	50.0	7.4
08JUL-11JUL	3	3	6	3	0	0	0	0	0	19	52.8	25.4	55.0	64.0	9.3
22JUL-25JUL	1	2	0	3	1	0	0	0	0	8	58.3	49.0	60.5	67.0	6.7
05AUG-07AUG	0	0	0	0	1	0	0	0	0	1	65.0	65.0	65.0	65.0	.
19AUG-21AUG	0	0	0	0	0	0	0	0	0	0	.	.	.	.	.
03SEP-05SEP	0	0	0	0	0	0	0	0	0	0	.	.	.	.	.
16SEP-18SEP	0	0	0	0	0	0	0	0	0	0	.	.	.	.	.
29SEP-01OCT	0	0	0	0	0	0	0	0	1	1	88.0	88.0	88.0	88.0	.
	4	6	6	6	2	0	0	0	1	518					

NOTE: Lengths are total lengths in mm, N = Number of lengths, MEAN = Mean length, MIN = Minimum length, MED = Median length, MAX = Maximum length, SD = Standard deviation.

Table G-14 Length Frequency Distribution of Young-of-Year American Shad in Hudson River Estuary Determined from Fall Juvenile Survey, 2014

DATES	10.0-14.9	15.0-19.9	20.0-24.9	25.0-29.9	30.0-34.9	35.0-39.9	40.0-44.9	45.0-49.9	50.0-54.9	55.0-59.9	60.0-64.9	65.0-69.9	70.0-74.9	75.0-79.9	80.0-84.9
30JUN-04JUL	0	0	0	6	5	11	10	5	10	3	0	0	0	0	0
15JUL-19JUL	0	0	0	0	1	5	15	19	16	12	6	6	3	0	0
28JUL-01AUG	0	0	0	0	0	0	0	2	10	13	10	17	17	3	0
12AUG-15AUG	0	0	0	0	0	0	0	0	0	0	3	14	12	4	6
26AUG-29AUG	0	0	0	0	0	0	0	0	0	0	1	4	9	7	3
09SEP-12SEP	0	0	0	0	0	0	0	0	0	0	0	0	4	2	5
23SEP-26SEP	0	0	0	0	0	0	0	0	0	0	0	0	0	3	10
07OCT-10OCT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21OCT-24OCT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04NOV-07NOV	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18NOV-22NOV	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	6	6	16	25	26	36	28	20	41	45	19	24

DATES	85.0-89.9	90.0-94.9	95.0-99.9	100.0-104.9	105.0-109.9	110.0-114.9	115.0-119.9	120.0-124.9+	N	MEAN	MIN	MED	MAX	SD
30JUN-04JUL	0	0	0	0	0	0	0	0	51	41.5	25.0	40.0	60.0	9.1
15JUL-19JUL	0	0	0	0	0	0	0	0	87	51.4	33.0	51.0	73.0	9.2
28JUL-01AUG	0	0	0	0	0	0	0	0	73	63.2	48.0	65.0	78.0	7.5
12AUG-15AUG	3	2	0	0	0	0	0	0	46	72.7	60.0	71.0	93.0	8.1
26AUG-29AUG	0	2	1	0	0	0	1	0	28	77.0	61.0	74.5	115.0	10.9
09SEP-12SEP	5	0	0	0	0	1	0	0	17	82.1	70.0	82.0	114.0	10.2
23SEP-26SEP	7	5	1	2	1	4	1	0	34	91.0	77.0	88.0	117.0	11.2
07OCT-10OCT	8	5	3	3	2	1	1	1	24	96.6	85.0	92.5	124.0	10.1
21OCT-24OCT	0	2	0	0	0	0	0	1	3	104.0	93.0	94.0	125.0	18.2
04NOV-07NOV	0	0	0	0	0	0	0	0	0	.	.	.	.	.
18NOV-22NOV	0	1	0	0	0	1	0	0	2	102.0	94.0	102.0	110.0	11.3
	23	17	5	5	3	7	3	2	365					

NOTE: Lengths are total lengths in mm, N = Number of lengths, MEAN = Mean length, MIN = Minimum length, MED = Median length, MAX = Maximum length, SD = Standard deviation.

Table G-15 Length Frequency Distribution of Young-of-Year American Shad in Hudson River Estuary Determined from Beach Seine Survey, 2014

DATES	10.0-14.9	15.0-19.9	20.0-24.9	25.0-29.9	30.0-34.9	35.0-39.9	40.0-44.9	45.0-49.9	50.0-54.9	55.0-59.9	60.0-64.9	65.0-69.9	70.0-74.9
09JUN-12JUN	0	0	8	14	3	0	0	0	0	0	0	0	0
23JUN-26JUN	0	0	0	0	10	37	24	4	0	0	0	0	0
08JUL-10JUL	0	0	0	0	7	23	29	33	18	6	2	0	0
21JUL-24JUL	0	0	0	0	0	0	10	49	45	24	2	1	2
05AUG-08AUG	0	0	0	0	0	0	0	1	15	39	30	17	4
19AUG-22AUG	0	0	0	0	0	0	0	0	0	2	26	51	27
02SEP-05SEP	0	0	0	0	0	0	0	1	0	0	1	14	50
16SEP-19SEP	0	0	0	0	0	0	0	0	0	0	0	3	20
30SEP-03OCT	0	0	0	0	0	0	0	0	0	0	3	4	7
14OCT-17OCT	0	0	0	0	0	0	0	0	0	0	0	0	1
	0	0	8	14	20	60	63	88	78	71	64	90	111

DATES	75.0-79.9	80.0-84.9	85.0-89.9	90.0-94.9	95.0-99.9	100.0-104.9+	N	MEAN	MIN	MED	MAX	SD
09JUN-12JUN	0	0	0	0	0	0	25	25.6	22.0	25.0	31.0	2.4
23JUN-26JUN	0	0	0	0	0	0	75	38.4	30.0	38.0	49.0	3.9
08JUL-10JUL	0	0	0	0	0	0	119	44.3	30.0	45.0	62.0	6.7
21JUL-24JUL	0	0	0	0	0	0	135	51.0	41.0	50.0	71.0	5.3
05AUG-08AUG	5	1	0	1	0	0	126	60.8	46.0	60.0	90.0	6.5
19AUG-22AUG	4	1	0	1	0	0	117	67.1	58.0	67.0	90.0	4.7
02SEP-05SEP	39	8	1	0	0	0	114	73.5	45.0	74.0	85.0	4.9
16SEP-19SEP	46	31	5	1	1	0	107	77.6	65.0	77.0	98.0	4.9
30SEP-03OCT	9	48	29	8	2	0	110	82.2	61.0	83.0	98.0	6.6
14OCT-17OCT	4	20	40	31	5	3	104	87.7	70.0	88.0	102.0	5.2
	107	109	75	42	8	3	1032					

NOTE: Lengths are total lengths in mm, N = Number of lengths, MEAN = Mean length, MIN = Minimum length, MED = Median length, MAX = Maximum length, SD = Standard deviation.

Table G-16 Length Frequency Distribution of Young-of-Year Alewife in Hudson River Estuary Determined from Fall Juvenile Survey, 2014

DATES	10.0-14.9	15.0-19.9	20.0-24.9	25.0-29.9	30.0-34.9	35.0-39.9	40.0-44.9	45.0-49.9	50.0-54.9	55.0-59.9	60.0-64.9	65.0-69.9	70.0-74.9	75.0-79.9	80.0-84.9	85.0-89.9
30JUN-04JUL	0	0	0	0	0	0	40	24	2	0	0	0	0	0	0	0
15JUL-19JUL	0	0	0	0	0	0	49	34	23	5	1	1	1	0	0	0
28JUL-01AUG	0	0	0	0	0	0	26	23	34	42	8	9	3	1	1	0
12AUG-15AUG	0	0	0	0	0	0	11	20	18	16	16	16	6	5	2	0
26AUG-29AUG	0	0	0	0	0	0	14	11	13	8	7	14	6	3	0	0
09SEP-12SEP	0	0	0	0	0	0	1	3	19	14	4	9	5	9	6	0
23SEP-26SEP	0	0	0	0	0	0	0	3	5	5	7	8	7	8	8	4
07OCT-10OCT	0	0	0	0	0	0	0	3	3	8	4	8	9	14	6	8
21OCT-24OCT	0	0	0	0	0	0	0	0	1	0	2	5	5	5	5	6
04NOV-07NOV	0	0	0	0	0	0	0	0	2	1	1	6	7	7	11	4
18NOV-22NOV	0	0	0	0	0	0	0	0	0	3	6	10	17	9	12	10
	0	0	0	0	0	0	141	121	120	102	56	86	66	61	51	32

DATES	90.0-94.9	95.0-99.9	100.0-104.9	105.0-109.9	110.0-114.9	115.0-119.9	120.0-124.9	125.0-129.9	130.0-134.9+	N	MEAN	MIN	MED	MAX	SD
30JUN-04JUL	0	0	0	0	0	0	0	0	0	66	43.7	41.0	43.0	51.0	2.7
15JUL-19JUL	0	0	0	0	0	0	0	0	0	116	46.7	41.0	45.0	70.0	5.6
28JUL-01AUG	0	0	0	0	0	0	0	0	0	157	53.4	41.0	54.0	80.0	8.1
12AUG-15AUG	0	1	0	0	0	0	1	0	0	118	57.7	41.0	56.0	120.0	12.0
26AUG-29AUG	0	0	0	0	0	0	0	0	0	77	56.1	41.0	55.0	79.0	10.6
09SEP-12SEP	2	0	0	0	2	0	0	0	0	75	64.3	44.0	60.0	113.0	14.3
23SEP-26SEP	0	1	0	0	0	0	0	0	0	58	68.5	45.0	67.0	97.0	12.3
07OCT-10OCT	3	1	1	0	1	0	0	0	0	72	72.1	47.0	73.0	111.0	13.1
21OCT-24OCT	4	3	7	3	2	0	0	1	1	51	86.3	50.0	85.0	134.0	17.4
04NOV-07NOV	8	7	3	1	3	1	0	0	1	63	84.6	52.0	81.0	132.0	15.6
18NOV-22NOV	7	6	1	1	0	0	0	0	0	85	77.8	56.0	77.0	109.0	11.8
	24	19	12	5	8	1	1	1	2	938					

NOTE: Lengths are total lengths in mm, N = Number of lengths, MEAN = Mean length, MIN = Minimum length, MED = Median length, MAX = Maximum length, SD = Standard deviation.

Table G-17 Length Frequency Distribution of Young-of-Year Alewife in Hudson River Estuary Determined from Beach Seine Survey, 2014

DATES	10.0-14.9	15.0-19.9	20.0-24.9	25.0-29.9	30.0-34.9	35.0-39.9	40.0-44.9	45.0-49.9	50.0-54.9	55.0-59.9	60.0-64.9	65.0-69.9	70.0-74.9	75.0-79.9	80.0-84.9
09JUN-12JUN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23JUN-26JUN	0	0	0	0	0	0	10	3	8	4	0	0	0	0	0
08JUL-10JUL	0	0	0	0	0	0	36	35	18	4	1	0	0	0	0
21JUL-24JUL	0	0	0	0	0	0	15	13	5	4	0	0	1	0	0
05AUG-08AUG	0	0	0	0	0	0	1	1	5	12	2	0	0	0	1
19AUG-22AUG	0	0	0	0	0	0	0	0	0	7	3	8	2	0	0
02SEP-05SEP	0	0	0	0	0	0	0	1	1	3	3	15	7	2	0
16SEP-19SEP	0	0	0	0	0	0	0	0	0	0	1	6	11	8	2
30SEP-03OCT	0	0	0	0	0	0	0	0	0	0	0	1	7	3	4
14OCT-17OCT	0	0	0	0	0	0	0	0	0	1	0	1	5	2	4
	0	0	0	0	0	0	62	53	37	35	10	31	33	15	11

DATES	85.0-89.9	90.0-94.9	95.0-99.9	100.0-104.9	105.0-109.9	110.0-114.9	115.0-119.9	120.0-124.9+	N	MEAN	MIN	MED	MAX	SD
09JUN-12JUN	0	0	0	0	0	0	0	0	0	.	.	.	.	.
23JUN-26JUN	0	0	0	0	0	0	0	0	26	48.5	41.0	49.5	60.0	6.1
08JUL-10JUL	0	0	0	0	0	0	0	0	95	46.7	41.0	46.0	62.0	4.5
21JUL-24JUL	0	0	0	0	0	0	0	0	39	47.6	41.0	46.0	74.0	6.5
05AUG-08AUG	0	0	0	0	0	0	0	0	23	55.9	43.0	57.0	80.0	6.9
19AUG-22AUG	0	0	0	0	0	0	0	0	25	62.2	55.0	61.0	73.0	5.0
02SEP-05SEP	0	0	0	0	0	0	0	0	33	65.8	46.0	66.0	78.0	6.5
16SEP-19SEP	0	0	0	0	0	0	0	0	28	72.3	64.0	72.5	81.0	4.1
30SEP-03OCT	0	1	0	0	0	0	0	0	17	75.1	60.0	74.0	90.0	6.7
14OCT-17OCT	3	2	0	0	0	0	0	1	19	79.8	55.0	80.0	124.0	13.7
	3	3	0	0	0	0	0	1	305					

NOTE: Lengths are total lengths in mm, N = Number of lengths, MEAN = Mean length, MIN = Minimum length, MED = Median length, MAX = Maximum length, SD = Standard deviation.

Table G-18 Length Frequency Distribution of Young-of-Year Blueback Herring in Hudson River Estuary Determined from Fall Juvenile Survey, 2014

DATES	10.0-14.9	15.0-19.9	20.0-24.9	25.0-29.9	30.0-34.9	35.0-39.9	40.0-44.9	45.0-49.9	50.0-54.9	55.0-59.9	60.0-64.9
30JUN-04JUL	0	0	0	0	0	0	1	0	0	0	0
15JUL-19JUL	0	0	0	0	0	1	74	37	13	0	0
28JUL-01AUG	0	0	0	0	0	0	155	23	12	4	0
12AUG-15AUG	0	0	0	0	0	0	50	75	47	7	3
26AUG-29AUG	0	0	0	0	0	0	27	43	27	22	5
09SEP-12SEP	0	0	0	0	0	0	2	19	37	22	14
23SEP-26SEP	0	0	0	0	0	0	3	35	41	15	14
07OCT-10OCT	0	0	0	0	0	0	3	42	45	25	19
21OCT-24OCT	0	0	0	0	0	0	1	14	18	9	4
04NOV-07NOV	0	0	0	0	0	0	1	1	4	1	2
18NOV-22NOV	0	0	0	0	0	0	1	3	3	1	2
	0	0	0	0	0	1	318	292	247	106	63

DATES	65.0-69.9	70.0-74.9	75.0-79.9	80.0-84.9	85.0-89.9+	N	MEAN	MIN	MED	MAX	SD
30JUN-04JUL	0	0	0	0	0	1	42.0	42.0	42.0	42.0	.
15JUL-19JUL	0	0	0	0	0	125	44.3	39.0	43.0	53.0	3.1
28JUL-01AUG	0	0	0	0	0	194	43.2	41.0	41.5	58.0	3.6
12AUG-15AUG	1	0	0	0	0	183	47.3	40.0	47.0	66.0	4.5
26AUG-29AUG	4	0	0	0	0	132	49.9	40.0	49.0	67.0	6.3
09SEP-12SEP	7	1	0	0	0	107	54.8	44.0	53.0	70.0	6.0
23SEP-26SEP	13	2	0	3	0	126	54.5	44.0	52.5	84.0	8.2
07OCT-10OCT	9	2	1	1	2	151	54.4	44.0	52.0	88.0	8.0
21OCT-24OCT	1	0	0	0	0	48	52.6	43.0	51.0	65.0	5.3
04NOV-07NOV	0	0	0	0	0	9	53.4	42.0	54.0	62.0	6.4
18NOV-22NOV	0	0	0	0	0	10	51.8	42.0	50.0	64.0	6.9
	35	5	1	4	2	1086					

NOTE: Lengths are total lengths in mm, N = Number of lengths, MEAN = Mean length, MIN = Minimum length, MED = Median length, MAX = Maximum length, SD = Standard deviation.

Table G-19 Length Frequency Distribution of Young-of-Year Blueback Herring in Hudson River Estuary Determined from Beach Seine Survey, 2014

DATES	10.0-14.9	15.0-19.9	20.0-24.9	25.0-29.9	30.0-34.9	35.0-39.9	40.0-44.9	45.0-49.9	50.0-54.9	55.0-59.9	60.0-64.9
09JUN-12JUN	0	0	0	0	0	0	0	0	0	0	0
23JUN-26JUN	0	0	0	0	0	0	2	0	0	0	0
08JUL-10JUL	0	0	0	0	0	0	27	9	4	0	0
21JUL-24JUL	0	0	0	0	0	0	55	26	5	1	0
05AUG-08AUG	0	0	0	0	0	0	70	20	9	2	0
19AUG-22AUG	0	0	0	0	0	0	19	42	18	4	0
02SEP-05SEP	0	0	0	0	0	0	7	30	25	18	7
16SEP-19SEP	0	0	0	0	0	0	11	20	31	11	6
30SEP-03OCT	0	0	0	0	0	0	0	7	13	19	8
14OCT-17OCT	0	0	0	0	0	0	2	4	23	21	4
	0	0	0	0	0	0	193	158	128	76	25

DATES	65.0-69.9	70.0-74.9	75.0-79.9	80.0-84.9	85.0-89.9+	N	MEAN	MIN	MED	MAX	SD
09JUN-12JUN	0	0	0	0	0	0	.	.	.	.	.
23JUN-26JUN	0	0	0	0	0	2	41.5	41.0	41.5	42.0	0.7
08JUL-10JUL	0	0	0	0	0	40	44.1	41.0	43.0	53.0	3.3
21JUL-24JUL	0	0	0	0	0	87	44.1	41.0	43.0	55.0	3.3
05AUG-08AUG	0	0	0	0	0	101	43.8	40.0	42.0	56.0	3.6
19AUG-22AUG	0	0	0	0	0	83	46.9	41.0	46.0	58.0	3.6
02SEP-05SEP	5	3	0	0	0	98	52.6	41.0	50.0	72.0	7.2
16SEP-19SEP	10	7	0	1	0	99	54.3	41.0	52.0	80.0	8.9
30SEP-03OCT	7	5	0	4	0	66	59.2	45.0	57.0	81.0	8.9
14OCT-17OCT	0	2	0	0	0	59	54.7	43.0	55.0	72.0	5.5
	22	17	0	5	0	635					

NOTE: Lengths are total lengths in mm, N = Number of lengths, MEAN = Mean length, MIN = Minimum length, MED = Median length, MAX = Maximum length, SD = Standard deviation.

Table G-20 Length Frequency Distribution of Young-of-Year Spottail Shiner in Hudson River Estuary Determined from Fall Juvenile Survey, 2014

DATES	10.0-14.9	15.0-19.9	20.0-24.9	25.0-29.9	30.0-34.9	35.0-39.9	40.0-44.9	45.0-49.9	50.0-54.9	55.0-59.9	60.0-64.9
30JUN-04JUL	0	0	4	6	2	0	0	0	0	0	0
15JUL-19JUL	0	0	0	1	6	15	13	0	1	0	0
28JUL-01AUG	0	0	0	0	0	0	8	17	8	1	0
12AUG-15AUG	0	0	0	0	0	0	0	3	1	3	2
26AUG-29AUG	0	0	0	0	0	0	0	0	2	5	2
09SEP-12SEP	0	0	0	0	0	0	0	0	0	1	1
23SEP-26SEP	0	0	0	0	0	0	0	0	1	1	0
07OCT-10OCT	0	0	0	0	0	0	0	0	0	0	0
21OCT-24OCT	0	0	0	0	0	0	0	0	0	4	3
04NOV-07NOV	0	0	0	0	0	0	0	0	0	0	0
18NOV-22NOV	0	0	0	0	0	0	0	0	0	0	0
	0	0	4	7	8	15	21	20	13	15	8

DATES	65.0-69.9	70.0-74.9	75.0-79.9	80.0-84.9	85.0-89.9+	N	MEAN	MIN	MED	MAX	SD
30JUN-04JUL	0	0	0	0	0	12	25.8	20.0	25.5	33.0	3.6
15JUL-19JUL	0	0	0	0	0	36	38.0	25.0	38.5	50.0	4.6
28JUL-01AUG	0	0	0	0	0	34	47.1	40.0	47.0	55.0	3.9
12AUG-15AUG	0	0	0	0	0	10	54.6	48.0	55.0	63.0	5.4
26AUG-29AUG	3	1	1	0	0	14	61.5	54.0	60.0	75.0	6.4
09SEP-12SEP	0	0	0	0	0	2	60.0	58.0	60.0	62.0	2.8
23SEP-26SEP	1	2	6	2	0	13	72.6	52.0	76.0	80.0	8.4
07OCT-10OCT	2	3	2	0	0	7	71.6	65.0	72.0	79.0	4.9
21OCT-24OCT	3	7	10	1	0	28	70.6	55.0	73.0	84.0	7.7
04NOV-07NOV	0	0	1	0	1	2	82.0	79.0	82.0	85.0	4.2
18NOV-22NOV	1	1	2	3	0	7	77.6	69.0	79.0	83.0	5.2
	10	14	22	6	1	165					

NOTE: Lengths are total lengths in mm, N = Number of lengths, MEAN = Mean length, MIN = Minimum length, MED = Median length, MAX = Maximum length, SD = Standard deviation.

Table G-21 Length Frequency Distribution of Young-of-Year Spottail Shiner in Hudson River Estuary Determined from Beach Seine Survey, 2014

DATES	10.0-14.9	15.0-19.9	20.0-24.9	25.0-29.9	30.0-34.9	35.0-39.9	40.0-44.9	45.0-49.9	50.0-54.9	55.0-59.9	60.0-64.9
09JUN-12JUN	0	1	0	0	0	0	0	0	0	0	0
23JUN-26JUN	0	2	14	8	0	0	0	0	0	0	0
08JUL-10JUL	0	0	2	5	25	19	8	0	0	0	0
21JUL-24JUL	0	0	0	0	3	15	39	20	14	4	0
05AUG-08AUG	0	0	0	0	0	1	8	19	32	14	1
19AUG-22AUG	0	0	0	0	0	0	1	0	13	26	17
02SEP-05SEP	0	0	0	0	0	0	0	1	4	15	12
16SEP-19SEP	0	0	0	0	0	0	0	0	2	2	10
30SEP-03OCT	0	0	0	0	0	0	0	0	0	8	11
14OCT-17OCT	0	0	0	0	0	0	0	0	0	2	5
	0	3	16	13	28	35	56	40	65	71	56

DATES	65.0-69.9	70.0-74.9	75.0-79.9	80.0-84.9+	N	MEAN	MIN	MED	MAX	SD
09JUN-12JUN	0	0	0	0	1	17.0	17.0	17.0	17.0	.
23JUN-26JUN	0	0	0	0	24	22.8	17.0	23.0	27.0	2.5
08JUL-10JUL	0	0	0	0	59	34.1	23.0	33.0	44.0	4.7
21JUL-24JUL	0	0	0	0	95	43.9	31.0	43.0	57.0	5.4
05AUG-08AUG	1	0	0	0	78	50.7	37.0	51.0	66.0	5.3
19AUG-22AUG	14	3	0	0	81	59.6	42.0	60.0	70.0	5.4
02SEP-05SEP	12	4	0	0	50	60.9	47.0	61.5	72.0	5.9
16SEP-19SEP	18	13	9	4	60	68.3	50.0	67.0	84.0	7.1
30SEP-03OCT	21	19	11	5	75	68.8	55.0	69.0	80.0	6.2
14OCT-17OCT	16	27	15	3	68	71.1	58.0	71.5	80.0	5.1
	82	66	35	12	591					

NOTE: Lengths are total lengths in mm, N = Number of lengths, MEAN = Mean length, MIN = Minimum length, MED = Median length, MAX = Maximum length, SD = Standard deviation.

Table G-22 Length Frequency Distribution of Young-of-Year White Catfish in Hudson River Estuary Determined from Fall Juvenile Survey, 2014

DATES	10.0-14.9	15.0-19.9	20.0-24.9	25.0-29.9	30.0-34.9	35.0-39.9	40.0-44.9	45.0-49.9	50.0-54.9	55.0-59.9	60.0-64.9	65.0-69.9	70.0-74.9	75.0-79.9
30JUN-04JUL	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15JUL-19JUL	0	0	2	4	3	0	0	0	0	0	0	0	0	0
28JUL-01AUG	0	1	1	4	4	7	2	1	0	0	0	0	0	0
12AUG-15AUG	0	0	1	1	1	3	0	2	3	5	3	0	1	1
26AUG-29AUG	0	0	0	0	0	0	2	0	0	0	1	0	3	4
09SEP-12SEP	0	0	0	0	0	0	0	0	1	1	0	1	0	3
23SEP-26SEP	0	0	0	0	0	0	0	0	0	1	0	1	0	0
07OCT-10OCT	0	0	0	0	0	0	0	0	0	0	0	0	0	2
21OCT-24OCT	0	0	0	0	0	0	0	0	0	0	2	0	0	2
04NOV-07NOV	0	0	0	0	0	0	0	0	0	1	1	0	1	1
18NOV-22NOV	0	0	0	0	0	0	0	0	0	0	2	1	4	2
	0	1	4	9	8	10	4	3	4	8	9	3	9	15

DATES	80.0-84.9	85.0-89.9	90.0-94.9	95.0-99.9	100.0-104.9	105.0-109.9	110.0-114.9	115.0-119.9+	N	MEAN	MIN	MED	MAX	SD
30JUN-04JUL	0	0	0	0	0	0	0	0	0	.	.	.	.	.
15JUL-19JUL	0	0	0	0	0	0	0	0	9	27.2	21.0	28.0	33.0	4.1
28JUL-01AUG	0	0	0	0	0	0	0	0	20	32.9	17.0	34.5	45.0	7.4
12AUG-15AUG	0	0	0	0	0	0	0	0	23	51.5	22.0	55.0	78.0	14.3
26AUG-29AUG	3	2	0	0	0	0	0	0	17	70.9	41.0	75.0	89.0	13.7
09SEP-12SEP	2	4	1	3	0	0	0	0	16	80.9	50.0	84.0	97.0	13.8
23SEP-26SEP	4	3	1	1	0	0	0	0	11	81.4	55.0	84.0	98.0	11.8
07OCT-10OCT	0	1	0	2	0	2	0	0	7	93.1	78.0	97.0	109.0	13.1
21OCT-24OCT	3	1	1	6	3	5	3	0	26	94.3	63.0	98.0	113.0	14.0
04NOV-07NOV	2	2	2	5	0	1	1	1	18	89.3	59.0	91.5	116.0	15.4
18NOV-22NOV	2	3	3	4	3	5	1	1	31	90.1	63.0	92.0	116.0	15.0
	16	16	8	21	6	13	5	2	178					

NOTE: Lengths are total lengths in mm, N = Number of lengths, MEAN = Mean length, MIN = Minimum length, MED = Median length, MAX = Maximum length, SD = Standard deviation.

Table G-23 Length Frequency Distribution of Young-of-Year White Catfish in Hudson River Estuary Determined from Beach Seine Survey, 2014

DATES	10.0-14.9	15.0-19.9	20.0-24.9	25.0-29.9	30.0-34.9	35.0-39.9	40.0-44.9	45.0-49.9	50.0-54.9	55.0-59.9	60.0-64.9
09JUN-12JUN	0	0	0	0	0	0	0	0	0	0	0
23JUN-26JUN	0	0	0	0	0	0	0	0	0	0	0
08JUL-10JUL	0	0	0	0	0	0	0	0	0	0	0
21JUL-24JUL	0	0	0	0	0	0	0	0	0	0	0
05AUG-08AUG	0	0	0	0	0	0	0	0	0	0	0
19AUG-22AUG	0	0	0	0	0	0	0	0	0	0	0
02SEP-05SEP	0	0	0	0	0	0	0	0	0	0	0
16SEP-19SEP	0	0	0	0	0	0	0	0	0	0	0
30SEP-03OCT	0	0	0	0	0	0	0	0	0	0	0
14OCT-17OCT	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0

DATES	65.0-69.9	70.0-74.9	75.0-79.9	80.0-84.9+	N	MEAN	MIN	MED	MAX	SD
09JUN-12JUN	0	0	0	0	0	.	.	.	.	.
23JUN-26JUN	0	0	0	0	0	.	.	.	.	.
08JUL-10JUL	0	0	0	0	0	.	.	.	.	.
21JUL-24JUL	0	0	0	0	0	.	.	.	.	.
05AUG-08AUG	0	0	0	0	0	.	.	.	.	.
19AUG-22AUG	0	0	0	0	0	.	.	.	.	.
02SEP-05SEP	0	0	0	0	0	.	.	.	.	.
16SEP-19SEP	0	0	0	0	0	.	.	.	.	.
30SEP-03OCT	0	0	0	0	0	.	.	.	.	.
14OCT-17OCT	0	0	0	0	0	.	.	.	.	.
	0	0	0	0	0					

NOTE: Lengths are total lengths in mm, N = Number of lengths, MEAN = Mean length, MIN = Minimum length, MED = Median length, MAX = Maximum length, SD = Standard deviation.

Table G-24 Length Frequency Distribution of Young-of-Year Weakfish in Hudson River Estuary Determined from Fall Juvenile Survey, 2014

DATES	10.0-14.9	15.0-19.9	20.0-24.9	25.0-29.9	30.0-34.9	35.0-39.9	40.0-44.9	45.0-49.9	50.0-54.9	55.0-59.9	60.0-64.9	65.0-69.9	70.0-74.9	75.0-79.9	80.0-84.9
30JUN-04JUL	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0
15JUL-19JUL	0	0	0	1	0	0	0	1	0	0	1	1	1	0	1
28JUL-01AUG	0	1	4	3	2	1	0	0	0	1	0	0	0	1	2
12AUG-15AUG	0	0	1	0	1	0	6	10	17	13	4	5	1	2	1
26AUG-29AUG	0	0	0	0	0	2	1	1	2	0	3	0	9	6	8
09SEP-12SEP	0	0	0	0	0	0	0	0	1	0	2	0	0	2	7
23SEP-26SEP	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
07OCT-10OCT	0	0	0	0	0	0	0	0	0	1	0	0	0	2	1
21OCT-24OCT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04NOV-07NOV	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18NOV-22NOV	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	1	5	6	3	3	7	12	20	15	10	6	12	13	20

DATES	85.0-89.9	90.0-94.9	95.0-99.9	100.0-104.9	105.0-109.9	110.0-114.9	115.0-119.9	120.0-124.9	125.0-129.9	130.0-134.9	135.0-139.9	140.0-144.9	145.0-149.9	150.0-154.9	155.0-159.9
30JUN-04JUL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15JUL-19JUL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28JUL-01AUG	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0
12AUG-15AUG	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26AUG-29AUG	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0
09SEP-12SEP	0	3	7	6	6	2	3	0	0	0	1	0	0	0	0
23SEP-26SEP	2	2	1	2	1	6	2	1	2	0	0	0	0	0	0
07OCT-10OCT	0	3	3	3	4	3	2	2	1	2	1	1	0	0	1
21OCT-24OCT	0	0	1	1	1	5	2	9	6	7	7	1	0	1	0
04NOV-07NOV	0	1	0	0	3	3	1	3	1	1	3	4	0	1	1
18NOV-22NOV	0	0	0	0	0	0	2	1	1	3	1	2	2	1	0
	6	10	12	12	15	19	12	16	11	13	13	8	2	4	2

DATES	160.0-164.9	165.0-169.9	170.0-174.9	175.0-179.9	180.0-184.9	185.0-189.9	190.0-194.9	195.0-199.9+	N	MEAN	MIN	MED	MAX	SD
30JUN-04JUL	0	0	0	0	0	0	0	0	2	26.5	25.0	26.5	28.0	2.1
15JUL-19JUL	0	0	0	0	0	0	0	0	7	58.6	26.0	64.0	80.0	17.8
28JUL-01AUG	0	0	0	0	0	0	0	0	18	46.8	18.0	33.0	90.0	28.5
12AUG-15AUG	0	0	0	0	0	0	0	0	69	54.6	23.0	54.0	86.0	10.7
26AUG-29AUG	0	0	0	0	0	0	0	0	34	71.9	35.0	74.0	150.0	19.2
09SEP-12SEP	0	0	0	0	0	0	0	0	40	95.3	53.0	98.5	136.0	16.5
23SEP-26SEP	0	0	0	0	0	0	0	0	20	106.0	70.0	111.0	128.0	14.7
07OCT-10OCT	0	0	0	0	0	0	0	0	30	107.6	57.0	107.0	156.0	21.1
21OCT-24OCT	0	0	0	0	0	0	0	0	41	124.7	95.0	125.0	153.0	11.3
04NOV-07NOV	1	0	0	0	0	0	0	1	24	130.4	90.0	128.5	196.0	22.8
18NOV-22NOV	0	0	0	0	0	0	0	0	13	133.5	115.0	134.0	150.0	11.3
	1	0	0	0	0	0	0	1	298					

NOTE: Lengths are total lengths in mm, N = Number of lengths, MEAN = Mean length, MIN = Minimum length, MED = Median length, MAX = Maximum length, SD = Standard deviation.

Table G-25 Length Frequency Distribution of Young-of-Year Weakfish in Hudson River Estuary Determined from Beach Seine Survey, 2014

DATES	10.0-14.9	15.0-19.9	20.0-24.9	25.0-29.9	30.0-34.9	35.0-39.9	40.0-44.9	45.0-49.9	50.0-54.9	55.0-59.9	60.0-64.9
09JUN-12JUN	0	0	0	0	0	0	0	0	0	0	0
23JUN-26JUN	0	0	0	0	0	0	0	0	0	0	0
08JUL-10JUL	0	0	0	0	0	0	0	0	0	0	0
21JUL-24JUL	0	0	0	0	0	0	0	0	0	0	0
05AUG-08AUG	0	0	0	0	0	0	0	0	0	0	0
19AUG-22AUG	0	0	0	0	0	0	0	0	0	0	0
02SEP-05SEP	0	0	0	0	0	0	0	0	0	0	0
16SEP-19SEP	0	0	0	0	0	0	0	0	0	0	0
30SEP-03OCT	0	0	0	0	0	0	0	0	0	0	0
14OCT-17OCT	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0

DATES	65.0-69.9	70.0-74.9	75.0-79.9	80.0-84.9+	N	MEAN	MIN	MED	MAX	SD
09JUN-12JUN	0	0	0	0	0	.	.	.	.	.
23JUN-26JUN	0	0	0	0	0	.	.	.	.	.
08JUL-10JUL	0	0	0	0	0	.	.	.	.	.
21JUL-24JUL	0	0	0	0	0	.	.	.	.	.
05AUG-08AUG	0	0	0	0	0	.	.	.	.	.
19AUG-22AUG	0	0	0	0	0	.	.	.	.	.
02SEP-05SEP	0	0	0	0	0	.	.	.	.	.
16SEP-19SEP	0	0	0	0	0	.	.	.	.	.
30SEP-03OCT	0	0	0	0	0	.	.	.	.	.
14OCT-17OCT	0	0	0	0	0	.	.	.	.	.
	0	0	0	0	0					

NOTE: Lengths are total lengths in mm, N = Number of lengths, MEAN = Mean length, MIN = Minimum length, MED = Median length, MAX = Maximum length, SD = Standard deviation.

CHAPTER 1
INTRODUCTION

Since 1973, an annual Year Class Report has been prepared on behalf of the several electric utility companies (collectively, the "Utilities") operating generating stations in the Hudson River estuary. This report, which is based on the 2014 Hudson River Biological Monitoring Program, has been prepared on behalf of Entergy Nuclear Indian Point 2 L.L.C., Entergy Nuclear Indian Point 3 L.L.C., and Entergy Nuclear Operations, Inc. The principal reporting objective has been to present and analyze data on the distribution and abundance of early life stages of selected fish species based on field surveys conducted throughout the Hudson River estuary by Normandeau Associates, Incorporated (NAI). The content and scope of these reports have varied over time from estimating the environmental impact of five Hudson River generating stations to focusing on indices of year class strength to describing the spatiotemporal distribution of selected fish species. Since the early 1990's, the annual Year Class Report has been standardized to describe the physical/chemical parameter patterns in the Hudson River estuary and the spatiotemporal distribution of 16 selected species of fish. These 16 species were identified by the New York State Department of Environmental Conservation (NYSDEC) of interest for discharge permitting and other purposes.

This report adds to the historical database by presenting the results of the Longitudinal River Ichthyoplankton Survey, the Fall Juvenile Survey (formerly, the Fall Shoals Survey), and the Beach Seine Survey for 2014. However, the format of this report differs from that of reports for 2009 and previous years in that it is primarily a data report, supplying summarizing figures and tables without accompanying text. The 2014 Year Class Report presents basic abundance and distribution data with the following objectives:

- Present the patterns and variability of environmental parameters occurring in the Hudson River estuary in 2014.
- Present the distribution and abundance of 16 selected species of fish (Table 1-1) in the Hudson River estuary in 2014.
- Present patterns in growth for the 2014 year class of key species.

This report is organized into four chapters with supporting appendixes. Data collection and analysis methods are described in Chapter 2. Physical and chemical parameters are presented in Chapter 3 and spatiotemporal distribution of selected fish species are presented in Chapter 4. Detailed data tables supporting report figures are contained within the appendix sections as follows:

- Appendix A – Quality Control Report for the 2014 Hudson River Ichthyoplankton Laboratory Program and 2014 Fall Juvenile Survey;
- Appendix B – Physical/Chemical Parameters;
- Appendix C – Numbers of Fish Collected in the Long River (1988-2014), Fall Juvenile (1985-2014), and Beach Seine (1985-2014) Surveys;
- Appendix D – Density and Standing Crop Estimates;
- Appendix E – Temporal and Geographical Indices;
- Appendix F – Annual Abundance Indices; and
- Appendix G – Length Frequency Distributions.

Link to Chapter 2

Table 1-1 Fish Species Data Presented in the 2014 Year Class Report

Common Name	Scientific Name[1]
Alewife	*Alosa pseudoharengus*
American shad	*Alosa sapidissima*
Atlantic sturgeon	*Acipenser oxyrinchus*
Atlantic tomcod	*Microgadus tomcod*
Bay anchovy	*Anchoa mitchilli*
Blueback herring	*Alosa aestivalis*
Bluefish	*Pomatomus saltatrix*
Gizzard shad	*Dorosoma cepedianum*
Hogchoker	*Trinectes maculatus*
Rainbow smelt	*Osmerus mordax*
Shortnose sturgeon	*Acipenser brevirostrum*
Spottail shiner	*Notropis hudsonius*
Striped bass	*Morone saxatilis*
Weakfish	*Cynoscion regalis*
White catfish	*Ameiurus catus*
White perch	*Morone americana*

1. Names listed in Nelson et al. 2004.

CHAPTER 2
MATERIALS AND METHODS

2.1 SAMPLING DESIGN

2.1.1 Overview

Several fishery techniques were employed in three separate sampling surveys to obtain comprehensive information on the abundance and distribution of selected larval, juvenile or young-of-year (YOY), and adult fish species in the Hudson River estuary. Temporally, the monitoring program encompassed the spring through fall season, the period of greatest biological activity in northern U.S. temperate waters. The surveys were designed to sample the full range of Hudson River habitat toward a representative assessment of species-specific spatial distribution patterns. During 2014, survey-specific techniques were employed which were consistent with previous Hudson River Monitoring Programs.

The scope and objectives of the three sampling surveys comprising the overall monitoring program are summarized as follows.

1. **Longitudinal River Ichthyoplankton Survey** (LRS or Long River Survey)—Sampling encompassed the entire length of the Hudson River estuary, from River Mile (RM) 1 at the Battery in Manhattan to RM 152 at the Federal Dam in Troy. The LRS yielded ichthyoplankton data to support calculations of standing crop, temporal and geographic indices, and growth rates for selected Hudson River fish species. The primary species were Atlantic tomcod (*Microgadus tomcod*), American shad (*Alosa sapidissima*), striped bass (*Morone saxatilis*), white perch (*M. americana*) and bay anchovy (*Anchoa mitchilli*). LRS sampling was concentrated during the spring, summer, and early fall when eggs and larvae of the primary species have historically been abundant.

2. **Fall Juvenile Survey** (FJS or Fall Shoals Survey)—Samples were collected every other week from the Battery to the Troy Dam in mid-summer and fall. The objective was to provide data on YOY fish to support calculation of standing crop and temporal and geographic indices for selected Hudson River fish species. The target species were Atlantic tomcod, American shad, striped bass, and white perch.

3. **Beach Seine Survey** (BSS)—Beach seine samples were collected in alternate weeks relative to the FJS at stations ranging from the George Washington Bridge (RM 12) to the Troy Dam. The objective was to obtain distribution and relative abundance information on YOY American shad, Atlantic tomcod, striped bass, and white perch during periods when these species were concentrated primarily in the shallow, near-shore areas. The survey was conducted from mid-June through October, when YOY of these species were typically abundant in the shorezone nursery areas.

Sampling for all surveys was conducted according to a stratified random design in which the Hudson River estuary from the Battery (RM 1) to the Federal Dam at Troy (RM 152) was divided into 13 regions (Figure 2-1). Each region was further divided into "strata" on the basis

of river depth. The strata, based on river depth, are graphically presented in Figure 2-2 and defined below:

- **Shore**—That portion of the Hudson River estuary extending from the shore to a depth of 10 ft (the stratum defined only for BSS).
- **Shoal**— That portion of the Hudson River estuary extending from the shore to a depth of 20 ft at mean low tide.
- **Bottom**—That portion of the Hudson River estuary extending from the bottom to 10 ft above the bottom where river depth is greater than 20 ft at mean low tide.
- **Channel**—That portion of the Hudson River estuary not considered bottom where river depth is greater than 20 ft at mean low tide.

The relative area and configuration of the shoal, bottom, and channel strata vary over the length of the Hudson River estuary but may be characterized using the three cross section views presented in Figure 2-2. For example, the low relief sectional is characteristic of the Tappan Zee and Croton-Haverstraw regions, the high relief sectional is exemplified by the Yonkers and Poughkeepsie regions, and the fjord relief sectional represents the West Point region.

A minimum of two samples was assigned to each stratum in most regions for the LRS. However, no samples were allocated in the Poughkeepsie through Albany regions during the first three scheduled sampling weeks of the LRS (10 March – 30 March) nor in the Hyde Park through Albany regions during the final seven sampling weeks of the LRS (30 June – 5 October) because few organisms of the target species were historically present in these regions during these weeks. A minimum of two samples was assigned to each stratum in each region for the FJS except no channel samples were allocated during the final three sampling weeks (20 October – 23 November). A minimum of three samples was allocated in each region for the BSS. Shoal strata samples were not assigned in upriver regions nor were shoal or shore strata samples assigned in the Battery region. The strata actually sampled in each region during the 2014 survey period are presented in Table 2-1.

A general summary of the three sampling surveys for the annual monitoring program is presented in Table 2-2. The field and laboratory methods used for each survey are described in detail in the following sections.

2.1.2 Endangered Species Permit

The Long River Ichthyoplankton Survey and Fall Juvenile Survey programs have been in existence since 1974 without significant sampling disruptions, except in rare events such as September 11, 2001 and extreme weather events such as Hurricane Irene in late August 2011. During most of the time between 1974 and 2011, sampling was completed with a Permit to Take Protected Species for Scientific Purposes issued by the National Marine Fisheries Service (NMFS) Office of Protected Resources (the Permit) for shortnose sturgeon, which has been listed as endangered since March 1967. This Permit regulates the handling and take of shortnose sturgeon for research sampling programs like the Hudson River Biological Monitoring Program (HRBMP). An initial Permit was granted on 30 September 1976 for a period of five years. The Permit was extended and later renewed in 1982, 2000 (Permit No. 1254 was issued

on 29 November 2000 and expired 31 August 2005, but was extended without increasing the take limits until new Permit 1580 issued on 29 March 2007), 2007 (Permit 1580 was issued 29 March 2007 and expired on 31 March 2012), and 2012 (Permit No. 17095 was issued 28 August 2012 and expires 28 August 2017).

The inclusion of several distinct population segments (DPS) of Atlantic sturgeon, including the New York Bight DPS, to the federal endangered species list effective April 6, 2012 complicated the Permit renewal process in 2012 because all previous Permits regulated the catch and handling of just shortnose sturgeon. Furthermore, the intervening listing of Atlantic sturgeon prevented the extension of the existing Permit No. 1580 to allow the Permit holder to continue sampling until renewed. Dynegy, the holder of the prior Permits for the HRBMP, had transferred responsibility for the renewed Permit to Entergy, who filed the completed permit application on 23 March 2012. The Permit application was noticed in the Federal Register on 11 April 2012; CFR 77, No. 70, 21750-21751. Thursday, 10 May 2012 ended the 30-day public comment period with no objections. A draft Permit No. 17095 was issued for Entergy review on 27 July 2012 that contained new provisions limiting the conduct of the HRBMP sampling in water with low dissolved oxygen concentrations or high ambient temperatures. NMFS issued draft Permit No. 17095 with the temperature and dissolved oxygen restrictions in a public notice on 10 August 2012. The final Permit no. 17095 was issued eighteen days later on 28 August 2012 for a five year period expiring on 28 August 2017.

On 20 November 2012, Entergy requested a modification (No. 01) to increase the annual non-lethal take allowed under Permit No. 17095 from 82 juvenile, sub-adult, and adult of Atlantic sturgeon. Permit No.17095 Modification 01 was issued by the NMFS on 13 March 2013 to allow an increased non-lethal take of up to 200 juvenile, sub-adult or adult Atlantic sturgeon during each Permit year (29 August – 28 August), with a cumulative non-lethal take limit of 600 juvenile, sub-adult or adult Atlantic sturgeon over the Permit life.

As detailed in permit No. 17095, samples cannot be taken if the dissolved oxygen level is less than 4.5 mg/l or if the temperature exceeds 28ºC. There are occasionally periods in the summer months when ambient water in one or more regions of the Hudson River exceeds these limits. Standard operating procedures for the three surveys were modified, and samples at some randomly selected locations exceeding the temperature or dissolved oxygen thresholds were not taken. In 2014, there were 14 scheduled samples that could not be taken due to the restrictions in the permit (Table 2-3); 10 during the LRS from the Tappan Zee to Indian Point regions and 4 during the FJS in the Yonkers region.

2.2 LONGITUDINAL RIVER ICHTHYOPLANKTON SURVEY

2.2.1 Field Methods

The 2014 LRS was performed over a period of 27 weeks from 31 March to 5 October with all sampling prior to 19 May conducted during the day and all subsequent sampling conducted at night (Table 2-2 and Figure 2-3). For the first three scheduled sampling weeks (10 March – 30 March), sampling was to be conducted between RM 1 and RM 61, but could not be completed due to ice conditions in the Hudson River. For the next 13 weeks beginning 31 March, weekly sampling encompassed RM 1 to RM 152. In the final phase of sampling from 30 June through 5 October, sampling was conducted biweekly between RM 1 and RM 76.

The allocation of sampling effort among river regions and strata was temporally adjusted in response to the projected presence and distribution of target species and life stages. The 2014

LRS sampling program was scheduled as 6 separate multi-week efforts. The first sampling effort, scheduled in March, focused on the collection of Atlantic tomcod post yolk-sac larvae (PYSL). The second effort, performed during April, focused on the collection of American shad eggs. The third effort, from late April to mid-May, was designed to collect eggs of *Morone* spp. and American shad. The fourth effort, performed in late May, targeted *Morone* spp. and American shad yolk-sac larvae (YSL). The fifth effort, in June, was designed to collect *Morone* spp. and American shad PYSL. The LRS sampling program concluded with a 14-week period, sampled biweekly, from July to early October. The final sampling effort was designed to collect all life stages of bay anchovy.

The allocation of sampling effort among regions and strata is presented in Table 2-4. Of the 3228 ichthyoplankton samples scheduled for collection during 2014 (which excludes 294 samples from the scheduled first sampling effort in March), 3188 samples were collected, accounting for 98.8 percent of the scheduled total. LRS samples excluded due to compliance with the Permit to Take Protected Species for Scientific Purposes in 2014 numbered 10.

Two distinct gear types were used for field collections during the 2014 LRS:

- 1.0-m^2 Tucker trawl (Figure 2-4 and Table 2-5) to sample the shoal and channel strata (non-bottom), and
- 1.0-m^2 epibenthic sled (Figure 2-5 and Table 2-5) to sample the bottom-only shoal and channel strata.

Both gear types were towed against the prevailing current for 5 minutes. The tow started with the remote opening of the net and terminated with its remote closing. If the river depth was 20 ft or less, an open set and retrieval of the net was performed. The tow speed for the Tucker trawl was adjusted to maintain a towing wire angle of approximately 45^o averaging approximately 0.9 m/second. The tow speed for the epibenthic sled-mounted net was maintained at approximately 1.0 m/second. An electronic flowmeter mounted along the side of the research vessel and equipped with an on-deck readout display was used to establish and maintain tow speed. A calibrated digital flowmeter mounted in the center of the net mouth was used to calculate the volume of water filtered for each sample.

Following deployment and retrieval of the sampling gear, net washing was performed to concentrate the sample into the codend bucket. The samples were then examined for yearling and older fish which were identified, enumerated, and returned to the Hudson River estuary. Special care was taken to observe sturgeon species for physical condition and for the presence of marks and/or tags. All yearling and older sturgeon were measured to the nearest millimeter, weighed to the nearest gram, and, if alive, returned to the river or, if dead, frozen and saved for the NYSDEC. After yearling and older fish were removed, the remaining sample was placed in container(s) so that the sample occupied no more than 25 percent of the container volume. The containers were filled with a 10 percent aqueous formalin solution.

In situ measurements of water temperature (°C), dissolved oxygen (mg/L), and specific conductance (microsieman/cm at 25°C) were taken with calibrated meters at fixed river mile and strata stations in conjunction with the biological sampling. The number of physical/chemical sampling locations, by river mile and strata, are presented in Table 2-6 for the 2014 LRS. Physical/chemical measurements were recorded from surface, mid-depth, and bottom water depth at channel stations and from the surface and bottom water depth at shoal stations. During the 20 collection weeks of the 2014 LRS, 3199 physical/chemical measurements were scheduled (which excludes 321 samples from the scheduled first sampling

effort in March) and 3274 measurements were actually recorded, accounting for more than 100 percent of the scheduled total.

2.2.2 Laboratory Methods

In 2014, approximately 70 percent of the regular LRS samples were selected for laboratory analysis. Selection of samples for laboratory analysis began with the grouping of samples according to river run (i.e., sampling week), region, and strata. Based on these groupings, samples were selected based on one of the following criteria:

1. If there were less than 6 samples in the group, then all were selected for analysis.

2. If there were between 6 and 12 samples in the group, then 50 percent of the samples were randomly selected for analysis.

3. If there were more than 12 samples in the group, then 20 percent of the samples were randomly selected for analysis.

The allocation of samples for laboratory analysis among regions, strata, and gear types based on these criteria is listed in Table 2-7. The total number of analyzed samples for 2014 was 2210, comprising 69.3 percent of the collected samples.

In 2014, as in previous years, splitting (or subsampling) was permitted. A trained technician first determined, by visual inspection, if the sample needed splitting. Samples containing large numbers of eggs may have been split so that eggs were only sorted from one or more aliquots containing a total of at least 250 eggs (all species combined).

Two different sets of criteria were used for subsampling of larval stages, depending on the river run. Beginning with the river run in which striped bass PYSL first appeared, and for the next 8 river runs (a total of 9 consecutive river runs), a minimum of 500 *Morone* larvae (i.e., the combined total of YSL, PYSL, and YOY of striped bass, white perch, and unidentified *Morone*) was sorted from the entire sample and a minimum of 50 non-*Morone* larvae was also sorted. Because some of the more difficult distinctions between species (e.g., striped bass versus white perch) or between life stages could not be made reliably during sorting, samples from these 9 river runs were typically sorted in their entirety for larvae (i.e., YSL, PYSL, and YOY combined) of all species combined. An exception to this may have been made, at the discretion of the laboratory supervisor, under the following circumstances: when extremely large numbers of non-*Morone* larvae occurred in the sample and a qualified identifier had verified that sufficient numbers of both *Morone* larvae and non-*Morone* larvae were sorted to meet their respective subsampling quotas. The purpose of this exception was to allow splitting before sorting of taxa such as clupeids which could readily be distinguished from *Morone* by sorters.

The second set of criteria for subsampling larvae applied to the 13 other river runs not covered in the previous paragraph (before and after the period of striped bass abundance). Any sample from these river runs may have been subsampled so that larvae were sorted from one or more splits containing at least 100 larvae (i.e., YSL, PYSL, and YOY combined) of all species combined.

To eliminate bias, some steps in the splitting procedure were performed by an assistant so that the sorter had no prior knowledge of which splits were to be used for the analysis. This procedure is explained in Figure 2-6. Randomness of the splitting procedure was monitored

and demonstrated by testing selected samples to determine whether splits from the same sample differed by more than random variation. Samples were selected to test for randomness by a continuous sampling plan, shown in Figure 2-7 (CSP-V from MIL-STD-1235, AOQL = 10 percent).

For each split sample evaluated, three fractions of the same aliquot size were sorted and compared by the chi-square test according to the following procedure. The counts of the three splits (including any quality control [QC] finds) were averaged to obtain the expected value for the sample. Chi-square was calculated as:

$$chi\,square = \frac{(O_1 - E)^2}{E} + \frac{(O_2 - E)^2}{E} + \frac{(O_3 - E)^2}{E}$$

where

O_1, O_2, and O_3 = Observed counts for splits 1, 2, and 3.

E = Expected value for the sample (average of O_1, O_2, and O_3).

If the calculated value for chi-square was less than 5.99, then the splits of that sample were considered random, and the sample passed the split QC (5.99 was the critical value of chi-square with two degrees of freedom at an alpha level of 0.05). If a sample was split for both eggs and larvae, then both stages were tested separately. The sample passed the split QC only if chi-square was below the critical value for both life stages.

Eggs and larvae were separated from detrital material, sorted by major taxonomic group and life stage, counted, and placed in vials containing 5 percent formalin or in ethyl alcohol. Sorted samples were evaluated by a trained technician under magnification and all organisms were identified and enumerated. The following life stage designations were used in identification:

Life Stage	Description
Egg	Embryonic stage from spawning to hatching,
YSL	From hatching to development of a complete and functional digestive system,
PYSL	From development of a complete digestive system to transformation to juvenile form, and
YOY	From completed transformation to Age 1.

Whenever possible, a maximum of 30 striped bass, 30 white perch, 30 American shad, 30 Atlantic tomcod, and 30 bay anchovy per sample were measured. Organisms were chosen at random from each taxon regardless of life stage until the required numbers were obtained; life stages to be included were YSL, PYSL, and YOY. The total length of YSL and PYSL was measured to the nearest 0.1 mm and to the nearest 1 mm for YOY. Measurements were recorded on the laboratory data sheet. Selection of specimens for measuring was randomized by spreading them uniformly in a gridded container, selecting a starting point in the grid by means of a random number table, and then measuring the first 30 measurable specimens encountered in a predetermined pattern commencing at the starting point. Every grid space had an equal probability of being selected as the starting point, so every specimen had an equal probability of being included in the subsample.

Continuous sampling inspection was employed during the sort and identification procedures to ensure an average outgoing quality limit of 10 percent or better. Two sampling modes were required in the continuous sampling plan (CSP-1):

> **Mode 1**—The first eight samples sorted or analyzed for larval identification by an individual are subject to 100 percent QC reanalysis. If all eight pass the reanalysis, i.e., if ≤10 percent of the ichthyoplankton are missed or misidentified per sample, the individual is placed in CSP Mode 2. If any sample fails during Mode 1, then Mode 1 is continued until eight consecutive samples pass. For example, if a sample with QC No. 7 fails, then samples with QC Nos. 8 through 15 are subject to QC resorting.
>
> **Mode 2**—Lots of seven consecutive samples per individual are assigned for identification QC and per laboratory facility for sort QC. One sample from each lot is randomly chosen for QC analysis. If a sample fails (>10 percent of organisms missed or misidentified) during Mode 2, the individual is placed back into Mode 1. For example, if a sample with QC No. 6 fails in a lot of seven samples, then samples with QC Nos. 7 through 14 are subject to QC reanalysis. If samples 7 through 14 pass, the individual is again placed in Mode 2.

Results of the 2014 CSP-1 Quality Control Program are contained in Appendix A.

2.3 FALL JUVENILE SURVEY

2.3.1 Field Methods

The 2014 FJS biweekly sampling program extended from RM 1 to 152 and covered 21 weeks from 30 June to 23 November (Figure 2-3). Samples were collected at night for the first 8 river runs from 30 June through 12 October, and during the day for last 3 river runs from 13 October through 23 November. These last river runs, which were conducted with a modified sampling design, were intended to examine Atlantic tomcod distribution. Table 2-8 presents the distribution of the FJS sampling effort among the 13 river regions by stratum. Of the 2130 samples scheduled for collection, 2126 were actually collected, yielding 99.8 percent completion. FJS samples excluded due to compliance with the Permit to Take Protected Species for Scientific Purposes in 2014 numbered 4.

A 1.0-m^2 Tucker trawl and a 3.0-m beam trawl were used to collect YOY fish in the 2014 FJS. The Tucker trawl with 3.0-mm mesh was used to collect samples in the channel stratum, while the beam trawl (Figure 2-8) was used to sample the shoal and bottom strata. The latter gear was first used in this capacity in the 1985 FJS; prior to 1985, an epibenthic sled-mounted Tucker trawl was used. With the modified sampling design of the last 3 river runs from 13 October through 23 November, no channel samples or Tucker trawl samples were scheduled for collection. Only beam trawl samples in the shoal and bottom strata were taken during these river runs. Design specifications for FJS gear currently in use are listed in Table 2-9.

Both gear types were towed against the prevailing current for approximately 5 minutes. For the Tucker trawl, vessel speed was adjusted as necessary to achieve and maintain a 45° wire angle; the resultant tow speed was recorded. The beam trawl was towed at a speed of approximately 1.5 m/second. Tow speed was established and maintained by use of an electronic flowmeter mounted along the side of the research vessel and equipped with an on-

deck readout display. Tucker trawl samples taken in greater than 20 ft of river depth were remotely opened and closed at sampling depth. A calibrated digital flowmeter mounted in the center of the net mouth was used to calculate the volume of water filtered for each sample.

Calibrated water quality instruments were used to measure water temperature (°C), dissolved oxygen (mg/L), and specific conductance (microsieman/cm at 25°C) at fixed river mile and strata stations in conjunction with field sampling. Sampling locations were the same as those used for the 2014 LRS sampling program (Table 2-6). Measurements of physical/chemical parameters were recorded from surface, mid-, and bottom water depths at channel stations and from surface and bottom water depths at shoal stations. During the 2014 FJS, of the 2002 samples scheduled for collection, 2015 were actually collected, yielding over 100 percent completion.

Because of the difficulty in differentiating some species, especially YOY *Morone* (striped bass, white perch) and *Alosa* (alewife, blueback herring), samples collected during the first three sampling periods (River Runs 1 through 3) for the 2014 FJS program were preserved with 10 percent formalin at the time of collection and returned to the laboratory for analysis. Before preservation, samples were examined for fish determined to be yearling or older, based on length categorization; live fish were returned to the river after count data were determined.

Beginning with the fourth biweekly sampling period, samples were evaluated in the field; only fish required to fill length measurement and food habit quotas were returned to the laboratory. The quota was to be 20 specimens of a selected species from each river region per river run; because of the necessity of returning fish to the river alive, the first 20 specimens of a selected species were brought to the laboratory for length measurements. The Hyde Park through Albany regions were considered one region for the purpose of filling length measurement quotas during the entire FJS and during River Runs 4 through 10 of the BSS. Also for the BSS during River Runs 1 through 3, the Yonkers through West Point regions were considered as one region for the same purpose. In river regions where fewer than 10 samples were collected per survey, no more than 10 specimens of each selected species from an individual sample were used to fill the length measurement quota. This criterion was used in the following surveys for the specified river regions:

Sampling Program	Region
BSS	YK, IP, WP, CW, PK
FJS	WP, PK

In all other regions, when the sample schedule resulted in 10 or more samples per survey, no more than 5 specimens per species in a sample were used to fill the length measurement quotas. If more specimens of a species were collected than needed, the individuals used to fill the quotas were randomly selected.

All fish not returned to the laboratory were identified and enumerated into length classes as described in the following section. All Atlantic sturgeon, shortnose sturgeon, and striped bass were examined for external and internal magnetic tags. All sturgeon were measured to the nearest millimeter, weighed to the nearest gram, and, if alive, returned to the river or, if dead, frozen and saved for the NYSDEC. All striped bass with external streamer tags were measured and a scale sample was taken.

2.3.2 Laboratory Methods

Fish from the FJS in both the field and laboratory were identified and enumerated into the following length classes:

Length Class 1—Less than or equal to the YOY length limit ("Division 1"), which was determined by the field contractor on a weekly basis for each species.

Length Class 2—Greater than Division 1 and less than or equal to the yearling length limit ("Division 2"); set at 150 mm for most species, also determined weekly by the field contractor. From 1 January through 31 May, Division 2 represents the upper length limit for yearling fish for all species. From 1 June through 31 December, Division 2 is assigned a static value of 150 mm total length for all species except alewife, American shad, blueback herring, striped bass, Atlantic tomcod, and white perch. For these species, Division 2 is maintained as a dynamic upper length limit for yearling fish throughout the year.

Length Class 3—Greater than Division 2 and less than or equal to 250 mm.

Length Class 4—Greater than 250 mm.

Twenty specimens of the following selected species collected in each river region per river run were measured for total length (nearest millimeter) in the laboratory (except for sturgeon species which were measured in the field):

- Alewife
- American shad
- Atlantic sturgeon
- Atlantic tomcod
- Bay anchovy
- Blueback herring
- Shortnose sturgeon
- Spottail shiner
- Striped bass
- Weakfish
- White catfish
- White perch.

2.4 BEACH SEINE SURVEY

2.4.1 Field Methods

The 2014 BSS utilized a 30.5-m (nominal 100 ft) total length beach seine to collect YOY fish in the shorezone of each region, except the Battery region. Table 2-10 presents specifications for the beach seine. One end of the net was held on shore and the other end was towed perpendicularly away from the shore by boat. The seine was then hauled, clockwise if possible, in a semicircular path toward shore. The complete beach seine deployment swept an area of approximately 450 m^2 (TI 1981). All BSS samples were collected on a diurnal schedule during alternate weeks of the FJS.

The 2014 BSS biweekly sampling program was conducted from 9 June through 19 October (Figure 2-3). Ten of the 19 weeks in this time period were collection weeks with 100 beach seine samples per week scheduled for collection. Allocation of the total number of samples by river region collected for the 2014 BSS is presented in Table 2-11. Of the 1000 samples projected for collection in 2014, 1000 were collected, yielding 100 percent completion.

Measurements of water temperature (°C), dissolved oxygen (mg/L), and specific conductance (microsieman/cm at 25°C) were taken with each beach seine sample using *in-situ* water quality instrumentation. Physical/chemical measurements were taken 1 ft below the water surface and approximately 50 ft from the shoreline. During the 10 collection weeks of the 2014 BSS, all of the 1000 scheduled water quality samples were collected.

YOY fishes collected during the first four beach seine river runs in 2014 were processed in the laboratory because of the difficulty in distinguishing species at the YOY life stage; adults were processed in the field. Beginning with River Run 5, all samples were field processed; 20 specimens of the selected species from each region per run were collected (as described in Section 2.3.1) for length determination in the laboratory. Samples maintained for laboratory analysis were preserved using 10 percent formalin. Fish from the BSS in both the field and laboratory were identified and enumerated into length classes as described in Section 2.3.2. Any sturgeon collected during the BSS were measured to the nearest 1 mm and weighed to the nearest 1 g. Sturgeon that remained alive were returned to the Hudson River estuary; dead fish were frozen and held for NYSDEC. All sturgeon and striped bass were examined for external and internal magnetic tags. Striped bass with external tags were measured and a scale sample was taken.

2.4.2 Laboratory Methods

All fish returned to the laboratory were measured for total length to the nearest 1.0 mm. Laboratory analysis was conducted in the same manner as described for samples collected during the FJS.

2.5 ANALYTICAL METHODS

2.5.1 Physical/Chemical Parameters

To display the spatial and temporal patterns of temperature, salinity, and dissolved oxygen, a mean of each parameter for each sampling location and sampling week, weighted by stratum volume, was calculated. Equation 1 was used to compute these means for the standard physical/chemical stations sampled in conjunction with the LRS and FJS. Equation 2 was used for data collected in conjunction with the BSS. Salinity data were computed from conductivity data (microsieman/cm at 25°C) using Equation 3 (TI 1976). This equation differs from that used in some of the previous Year Class reports in that pressure data are not required. The maximum deviation between this equation and the previous equation is 0.1 percent (TI 1976).

$$W_{lw} = \sum_{k=1}^{n_{lw}} P_{kr} \left[1/n_{klw} \sum_{d=1}^{n_{klw}} \left(1/n_{dklw} \sum_{i=1}^{n_{dklw}} W_{idklw} \right) \right] \quad (1)$$

where

W_{lw} = Weighted mean of a physical/chemical parameter at sampling location l during week w of the LRS and FJS.

W_{idklw} = Physical/chemical measurement for location i at depth d in stratum k at sampling location l during week w.

P_{kr} = Proportion of the river volume of region r containing sampling location l that is contained by stratum k (bottom and channel strata were combined for water quality analysis).

n_{dklw} = Number of sites at which measurements were made at depth d in stratum k at sampling location l during week w.

n_{klw} = Number of depths sampled in stratum k at sampling location l during week w.

n_{lw} = Number of strata sampled at sampling location l during week w.

$$W_{rw} = 1/ n_{rw} \sum_{i=1}^{n_{rw}} W_{irw} \quad (2)$$

where

W_{rw} = Mean of a physical/chemical parameter at river mile r during biweek w of the BSS.

W_{irw} = Physical/chemical measurement for location i at river mile r during biweek w.

n_{rw} = Number of physical/chemical measurements taken at river mile r during biweek w.

$$\text{Salinity} = -100 \, ln \, (1 - C_{25}/178.5) \quad (3)$$

where

C_{25} = Conductivity (millisieman/cm at 25°C).

2.5.2 Spatiotemporal Distribution Indices

2.5.2.1 Density and Catch-Per-Unit-Effort Estimates

Estimates of population densities were made for the LRS and FJS. For the LRS and FJS, the number of fish (by species and life stage) captured in individual samples was first converted to density (no./m^3 of water sampled) using Equation 4. The mean density and the standard error of the mean were calculated for each stratum, region, and sampling week using Equations 5 and 6. To obtain a mean density and standard error for each region during each sampling week, the stratum densities were weighted by the proportion of the regional river volume found in the stratum (Equations 7 and 8). If a stratum was not sampled, its volume was added to the volume of an adjacent stratum that was sampled. Stratum volume adjustments were made according to the following rules:

If This Stratum Was Not Sampled	Its Volume Was Added To This Stratum
Shoal Bottom	Bottom Channel

$$D_{ikrw} = \frac{C_{ikrw}}{V_{ikrw}} \quad (4)$$

where

D_{ikrw} = Density (for a life stage and species)/m^3 for sample i in stratum k in region r during week w.

C_{ikrw} = Number of fish caught in sample i in stratum k in region r during week w.

V_{ikrw} = Volume sampled (m^3) by sample i in stratum k in region r during week w.

$$D_{krw} = \frac{1}{n_{krw}} \sum_{i=1}^{n_{krw}} D_{ikrw} \quad (5)$$

where

D_{krw} = Average density in stratum k in region r during week w.

D_{ikrw} = Sample density calculated in Equation 4.

n_{krw} = Number of samples taken in stratum k in region r during week w.

$$SE(D_{krw}) = \sqrt{\frac{\sum_{i=1}^{n_{krw}} (D_{ikrw} - D_{krw})^2}{(n_{krw})(n_{krw} - 1)}} \quad (6)$$

where

$SE(D_{krw})$ = Standard error of the average density in stratum k in region r during week w.

D_{ikrw} = Sample density calculated in Equation 4.

D_{krw} = Average stratum density calculated in Equation 5.

$$D_{rw} = \sum_{k=1}^{n_{rw}} (D_{krw})(P_k) \quad (7)$$

where

D_{rw} = Average density in region r during week w.

D_{krw} = Average stratum density calculated in Equation 5.

P_k^* = Proportion of the regional river volume found in stratum k (Table 2-12).

n_{rw} = Number of strata sampled in region r during week w.

$$SE(D_{rw}) = \sqrt{\sum_{k=1}^{n_{rw}} \left[SE(D_{krw})^2 (P_k)^2 \right]} \quad (8)$$

where

$SE(D_{rw})$ = Standard error of average density in region r during week w.

$SE(D_{krw})$ = Standard error of the average stratum density calculated in Equation 6.

Catches from the BSS were reported as number caught per seine haul (catch-per-unit-effort [CPUE]) by life stage and species. The average CPUE for a region and its standard error were calculated using Equations 9 and 10:

$$C_{rw} = \frac{1}{n_{rw}} \sum_{i=1}^{n_{rw}} C_{irw} \quad (9)$$

where

C_{rw} = Average CPUE in region r during week w.

C_{irw} = CPUE for sample i in region r during week w.

n_{rw} = Number of samples taken in region r during week w.

* When a stratum is missing, P_k for the sampled stratum is equal to the sum of the P_k for the sampled stratum and the P_k for the unsampled stratum.

$$SE(C_{rw}) = \frac{\sum_{i=1}^{n_{rw}} (C_{irw} - C_{rw})^2}{n_{rw}(n_{rw} - 1)} \quad (10)$$

where

$SE(C_{rw})$ = Standard error of average CPUE in region r during week w.

C_{rw} = Average regional CPUE calculated in Equation 9.

2.5.2.2 Standing Crop Estimates

An index of standing crop (the number of fish in an area at a particular time) was estimated by life stage and species for each of the three surveys. Standing crop indices and the associated standard errors were calculated for each stratum in a region by taking the product of the average stratum density (or the standard error) and the volume of water contained in that stratum (Equations 11 and 12 for the LRS and FJS) (Table 2-12). The regional standing crop index was then estimated as the sum of the stratum index values (Equations 13 and 14). Similarly, an estimate of the standing crop index for the Hudson River estuary for each week was calculated by summing the standing crops for the 13 (12 for the BSS) river regions (Equations 15 and 16). This value is an index rather than an absolute standing crop value because no adjustment was applied for collection efficiency.

$$SC_{krw} = (V_{kr})(D_{krw}) \quad (11)$$

where

SC_{krw} = Standing crop index for stratum k in region r during week w.

V_{kr} = River volume contained by stratum k in region r.

D_{krw} = Average stratum density calculated in Equation 5.

$$SE(SC_{krw}) = (V_{kr})[SE(D_{krw})] \quad (12)$$

where

$SE(SC_{krw})$ = Standard error of the standing crop index for stratum k in region r during week w.

$SE(D_{krw})$ = Standard error of average stratum density calculated in Equation 6.

$$SC_{rw}^{**} = \sum_{k=1}^{3} SC_{krw} \quad (13)$$

where

SC_{rw} = Standing crop index for region r during week w.

SC_{krw} = Stratum standing crop index calculated in Equation 11.

$$SE(SC)_{rw}^{**} = \sqrt{\sum_{k=1}^{3}\left[SE(SC_{krw})\right]^2} \quad (14)$$

where

$SE(SC_{rw})$ = Standard error of standing crop index for region r during week w.

$SE(SC_{krw})$ = Standard error of stratum standing crop index calculated in Equation 12.

$$SC_{w} = \sum_{r=1}^{12} SC_{rw} \quad (15)$$

where

SC_{w} = Standing crop index for week w. For the LRS and FJS, regional standing crop indices include the Battery Region (r=0).

SC_{rw} = Regional standing crop index calculated in Equations 13 or 17.

$$SE(SC_{w}) = \sqrt{\sum_{r=1}^{12}\left[SE(SC_{rw})\right]^2} \quad (16)$$

where

$SE(SC_{w})$ = Standard error of standing crop index for week w. For the LRS and FJS, regional standing crop indices include the Battery Region (r=0).

** Volumes of unsampled strata were added to the volumes of an adjacent stratum according to the rules for stratum volumes in Section 2.5.2.

$SE(SC_{rw})$ = Standard error of regional standing crop index calculated in Equations 14 or 18.

An index of regional standing crop (and standard error) for the BSS was obtained by multiplying CPUE and the surface area of the shorezone and dividing by the empirically derived estimate of the area sampled by the 30.5-m beach seine (Equations 17 and 18). The weekly index of standing crop for the shorezone was calculated as the sum of the 12 regional standing crops (Equations 15 and 16).

$$SC_{rw} = (C_{rw} A_r) / A \quad (17)$$

where

SC_{rw} = Standing crop index for the shorezone in region r during week w.

C_{rw} = Average regional CPUE calculated in Equation 9.

A_r = Surface area (m^2) of the shorezone in region r.

A = Surface area (m^2) sampled by the beach seine (450 m^2) (TI 1981).

$$SE(SC_{rw}) = \frac{[SE(C_{rw})] (A_r)}{A} \quad (18)$$

where

$SE(SC_{rw})$ = Standard error of standing crop index for the shorezone in region r during week w.

$SE(C_{rw})$ = Standard error of average regional CPUE calculated in Equation 10.

2.5.2.3 Temporal and Geographic Distribution Indices

Distribution indices were computed to facilitate presentation of changes in distribution of selected species and life stages through time and space. To allow comparisons of 2014 data with historical data, only data from samples collected from Weeks 18 to 26 (where Week 1 begins with the first Monday in January) were used for LRS (except for bay anchovy which used Weeks 18-40); data from Weeks 33 to 40 were used for the FJS and BSS. In all cases, data were used only when Regions 1-12 were sampled (except for bay anchovy which included Region 0).

The LRS was used for calculating the temporal and geographic indices for early life stages of striped bass, white perch, Atlantic tomcod, bay anchovy, American shad, *Alosa* spp., and rainbow smelt. The FJS was used to calculate geographical distribution indices for hogchoker, white catfish, and weakfish. The BSS was used to calculate geographical distribution indices for striped bass, white perch, bay anchovy, American shad, alewife, blueback herring, gizzard shad, spottail shiner, and bluefish.

The periods used for the LRS and BSS spanned 1974-2014, whereas the time period for the FJS extended from 1979 (when the FJS sampled the river from RM 12 to RM 152) through 2014. Temporal and geographic indices for bay anchovy from the LRS used the period from 1988 to 2014, when the sampling design included the Battery region.

A geographic index that collapses data over weeks was calculated for LRS, FJS, and BSS data as the relative standing crop in each region. This geographic index was calculated as follows:

$$G_{ry} = \frac{\sum_{w=1}^{n_y} SC_{rwy}}{\sum_{r=1}^{12} \sum_{w=1}^{n_y} SC_{rwy}} \quad (19)$$

where

G_{ry} = Geographic index for region r in year y.

SC_{rwy} = Regional standing crop index for region r in week w in year y calculated in Equations 13 or 17.

n_y = Number of weeks sampled in year y.

A temporal index that collapses data for the entire Hudson River estuary was computed for early life stages from LRS standing crop indices (Equation 20):

$$T_{wy} = \frac{SC_{wy}}{\sum_{w=1}^{n_y} SC_{wy}} \quad (20)$$

where

T_{wy} = Temporal index for week w in year y.

SC_{wy} = Weekly standing crop index in year y calculated in Equation 15.

n_y = Number of weeks sampled in year y.

2.5.3 Annual Abundance Indices

Annual indices of abundance for 13 species of finfish were computed from data from the LRS, FJS and BSS from 1974 through 2014. For each of the 13 species, one or more sampling programs were selected to be the basis for the index of abundance. The selections considered

when and where each species was expected to be present in the Hudson River based on life-history characteristics of each species in relation to the times and places that sampling gear was deployed by each program. The selections were also based on observed catch rates from each of the three sampling programs. The sampling programs on which the indices of abundance were based as well as the life stages and weeks selected for analysis are summarized in Table 2-13.

The statistical methods used to estimate the annual indices of abundance are described in the following sections.

2.5.3.1 Beach Seine Survey

Indices of abundance using data from the BSS were calculated for juvenile striped bass, white perch, American shad, alewife, blueback herring, bluefish, and spottail shiner; for yearling white perch; and for yearling and older white catfish. Weeks 33 to 40 were selected as the only period consistently sampled in the BSS. The Beach Seine Survey Index of abundance (*B*) for each year and species is a measure of catch per haul and is calculated according to the following formula:

$$B = \frac{1}{n}\sum_{w=33}^{40}\left[\frac{\sum_{i=1}^{12} W_i\left(\frac{\sum_{j} Ct_{jiw}}{h_{iw}}\right)}{\sum_{i=1}^{12} W_i}\right]X_w,$$

where

B	=	the BSS index for a species in a year;
Ct_{jiw}	=	the count of a species in sample *j*, region *i*, and week *w*;
X_w	=	1 if week *w* was sampled during the year, 0 otherwise;
n	=	the number of weeks sampled in the year,
	=	$\sum_{w=33}^{40} X_w$;
h_{iw}	=	the number of seine hauls in region *i* and week *w*; and
W_i	=	the number of beaches in the sampling design in river region *i*.

The above equation can be expressed in terms of a weighted average catch per haul (CPH) as follows:

$$B = \frac{1}{n}\sum_{w=33}^{40}\bar{Y}_w X_w = \frac{1}{n}\sum_{w=33}^{40}\left[\frac{\sum_{i=1}^{12} W_i \bar{Y}_{wi}}{\sum_{i=1}^{12} W_i}\right]X_w,$$

where

$\overline{Y}_{wi}$ = the average CPH in week *w* and region *i* and

$\overline{Y}_{w}$ = the weighted average CPH in week *w.*

Because not all weeks within the period of week 33 to 40 were sampled by the BSS in each year, the variance of the BSS index in any year is calculated as a two-stage variance. The primary sampling unit in the first stage is weeks, and the design is assumed to be simple random sampling (i.e., weeks of sampling are construed to be a random sample of weeks within the period from week 33 through week 40). The sampling units in the second stage are regions, and the design is stratified random where regions are the statistical strata. The variance is calculated using a two-stage estimator based on equation 11.24 in Cochran (1977, p. 303):

$$\mathrm{var}\left(B\right)=\frac{\left(1-\frac{n}{N}\right)}{n}S_1^2+\frac{1}{N\,n}\sum_w S_{2,w}^2\,,$$

where

S_1^2 = the first stage variance (temporal, among weeks),

$S_{2,w}^2$ = the second stage variance (spatial) in week w, and

N = the number of weeks (8) within the selected period, i.e., weeks 33 through 40.

The first stage variance component is estimated as:

$$S_1^2=\frac{1}{n\ -1}\sum_{w=33}^{40}\left(\overline{Y}_w-B\ \right)^2\,.$$

The second stage variance component is estimated as:

$$S_{2,w}^2=\frac{\sum_{i=1}^{12}W_i^2\left[\frac{\sum_j\left(Ct_{jiw}-\frac{1}{h_{iw}}\sum_j Ct_{jiw}\right)^2}{\left(h_{iw}\right)\left(h_{iw}-1\right)}\right]}{\left(\sum_{i=1}^{12}W_i\right)^2}.$$

Then:

$$\text{std. err.}(B) = (\mathrm{var}(B))^{1/2}.$$

2.5.3.2 Fall Juvenile Survey

Indices of abundance using data from channel sampling by the FJS were calculated for juvenile blueback herring, alewife, bay anchovy, weakfish, and rainbow smelt for the years 1979 through 2014, the years that the channel was sampled. In addition, indices of abundance based on bottom sampling by the FJS were calculated for juvenile hogchoker. Weeks 33 to 40 were selected as the only period consistently sampled in the FJS for channel sampling and weeks 40 to 43 for bottom sampling. The Fall Juvenile Survey Index of abundance (*F*) for each year and species sampled in gear specific for either the channel or the bottom is a measure of average density and is calculated according to the following formula:

$$F_g = \frac{1}{n}\sum_{w=33}^{40}\left[\frac{\sum_{i=1}^{12}\sum_{s=1}^{3} V_{is}\left\{\frac{1000\sum_j Ct_{jiswg}}{\sum_j v_{jiswg}}\right\}}{\sum_{i=1}^{12}\sum_{s=1}^{3} V_{is}}\right]X_w$$

where

F_g = the FJS index (for gear *g*) for a species in a year;
Ct_{jiswg} = the count of a species in sample *j* from gear *g*, region *i*, stratum *s*, and week *w*;
X_w = 1 if week *w* was sampled during the year, 0 otherwise;
n = the number of weeks sampled in the year,
= $\sum_{w=33}^{40} X_w$;
v_{jiswg} = the volume of sample *j* from gear *g* in region *i* , stratum *s*, and week *w*; and
V_{isg} = the volume of stratum *s*, sampled by gear *g*, in river region *i*.

The above equation can be expressed in terms of weighted average sample densities as follows:

$$F_g = \frac{1}{n}\sum_{w=33}^{40}\overline{Y}_{wg}X_w = \frac{1}{n}\sum_{w=33}^{40}\left[\frac{\sum_{i=1}^{12}\sum_{s=1}^{3} V_{si}\overline{Y}_{iswg}}{\sum_{i=1}^{12}\sum_{s=1}^{3} V_{si}}\right]X_w,$$

where

$\overline{Y}_{iswg}$ = the average density (number per 1000 m^3) of a species in samples from region *i*, stratum *s*, week *w*, and gear *g* and
$\overline{Y}_{wg}$ = the weighted average density of a species in samples from week *w*, and gear *g*.

Because not all weeks within the period of week 33 to 40 (or 40 to 43 for bottom sampling) were sampled by the FSS in each year, the variance of the FSS index of abundance in any year is calculated as the sum of two components. The primary unit in the first stage is weeks, and the design is assumed to be simple random sampling (i.e., weeks of sampling are construed to be a random sample of weeks within the period from week 33 through week 40 or from week 40

through week 43). The sampling units in the second stage are region-(habitat) strata, and the design is stratified random where region-(habitat) strata are the statistical strata. The variance is calculated using a two-stage estimator based on equation 11.24 in Cochran (1977, p. 303):

$$\mathrm{var}\left(F_g\right) = \frac{\left(1-\frac{n}{N}\right)}{n} S_{1,g}^2 + \frac{1}{N\,n}\sum_w S_{2,gw}^2 ,$$

where

$S_{1,g}^2$ = the first stage variance (temporal, among weeks),
$S_{2,gw}^2$ = the second stage variance (spatial) in week w, and
N = the number of weeks (8 or 4) within the selected period, i.e., weeks 33 through 40 or weeks 40 through 43.

The first stage variance component is calculated as:

$$S_{1,g}^2 = \frac{1}{n-1}\sum_{w=33}^{40}\left(\overline{Y}_{wg} - F_g\right)^2 .$$

The second stage variance is calculated as:

$$S_{2,gw}^2 = \frac{\sum_{i=1}^{12}\sum_{s=1}^{3}\left[V_{isg}^2 \frac{\left(\frac{h_{iswg}\sum_j\left(Ct_{jiswg} - \overline{C}t_{iswg}\right)^2}{h_{iswg}-1}\right)}{\left(\sum_j v_{ijswg}\right)^2}\right]}{\left(\sum_{i=1}^{12}\sum_{s=1}^{3} V_{isg}\right)^2},$$

where

V_{isg} = the total volume of (habitat) stratum, *s*, and region, *i*, sampled by gear *g*.

Then:

$$\text{std. err. } (F_g) = (\mathrm{var}(F_g))^{1/2}.$$

2.5.3.3 Longitudinal River Survey

Indices of abundance using data from the LRS were calculated for striped bass, white perch, American shad, Atlantic tomcod and rainbow smelt. For striped bass, white perch and American shad, the indices are based on the egg, yolk-sac larvae (YSL), and post yolk-sac

larvae (PYSL) life stages and the weeks selected depend on the period of abundance. For Atlantic tomcod the index was based on PYSL and juveniles combined over weeks 19 through 22 and for rainbow smelt the index was based on the juvenile life stage in weeks 20 through 27. The Long River Survey Index of abundance (*L*) for each year and species is a measure of average density and is calculated according to the following formula:

$$L = \sum_{w=firstwk}^{lastwk} \left[\frac{\sum_{i=1}^{12}\sum_{s=1}^{5} V_{is} \left(\frac{\sum_{j} Ct_{jisw}}{\sum_{j} v_{jisw}} \right)}{\sum_{i=1}^{12}\sum_{s=1}^{5} V_{is}} \right],$$

where

L = the LRS index for any species in any year;
Ct_{jisw} = the count of a species in sample *j*, region *i*, stratum *s*, and week *w*;
v_{jisw} = the volume of sample *j* from in region *i* , stratum *s*, and week *w*;
V_{is} = the volume of stratum *s* in river region *i*;
firstwk = the first week included in the annual index of abundance:
striped bass, American shad, and white perch egg, YSL, and PYSL -- the first week of the year in which the sum of weekly density estimates (from the initial week of sampling in the year through the current week) exceeds 5% of the sum of densities over all weeks of sampling,
Atlantic tomcod PYSL and juveniles combined -- week 19, and
rainbow smelt juveniles -- week 20; and
lastwk = the last week included in the annual index of abundance:
striped bass, American shad, and white perch egg, YSL, and PYSL -- *firstwk* +7;
Atlantic tomcod PYSL and juveniles combined -- week 22; and
rainbow smelt juveniles -- week 27.

The above equation can be expressed in terms of average sample density as follows:

$$L = \sum_{w=firtswk}^{lastwk} \overline{Y}_{w} = \sum_{w=firstwk}^{lastwk} \left[\frac{\sum_{i=1}^{12}\sum_{s=1}^{5} V_{si}\overline{Y}_{isw}}{\sum_{i=1}^{12}\sum_{s=1}^{5} V_{si}} \right],$$

where

$\overline{Y}_{isw}$ = the average density of a species in samples from region *i*, stratum *s*, and week *w* [Note: for strata and regions that were not sampled, predicted densities (based on regression predictors and densities in adjacent strata) were used] and

$\overline{Y}_w$ = the weighted average density of a species in samples collected during week *w.*

Variance of the index was estimated using the following equation:

$$\mathrm{var}(L) = \sum_{w=firstwk}^{lastwk} \left[\frac{\sum_s \sum_i V_{is}^2 \left(\frac{n_{si} \left(\sum_j \frac{\left(Ct_{jisw} - \overline{Ct}_{isw}\right)^2}{n_{si} - 1} \right)}{\left(\sum_j v_{jisw} \right)^2} \right)}{\left(\sum_s \sum_i V_{is} \right)^2} \right],$$

where

V_{is} = the total volume in region *i* and stratum *s*.

Then:

$$\text{std. err.}(L) = (\mathrm{var}(L))^{1/2}.$$

As indicated in Heimbuch et al. (1992), for indices based on LRS sampling, the volume of water between the beach and 10 ft deep was divided into two substrata: beach and shore. The beach stratum, defined from the beach to water five ft deep, corresponds with the shallow waters sampled in the BSS. The shore stratum, defined as water greater than five ft deep and less than 10 ft deep, is an unsampleable region. Densities in these substrata were estimated based on fixed ratios to the densities in adjacent strata.

Link to Chapter 3

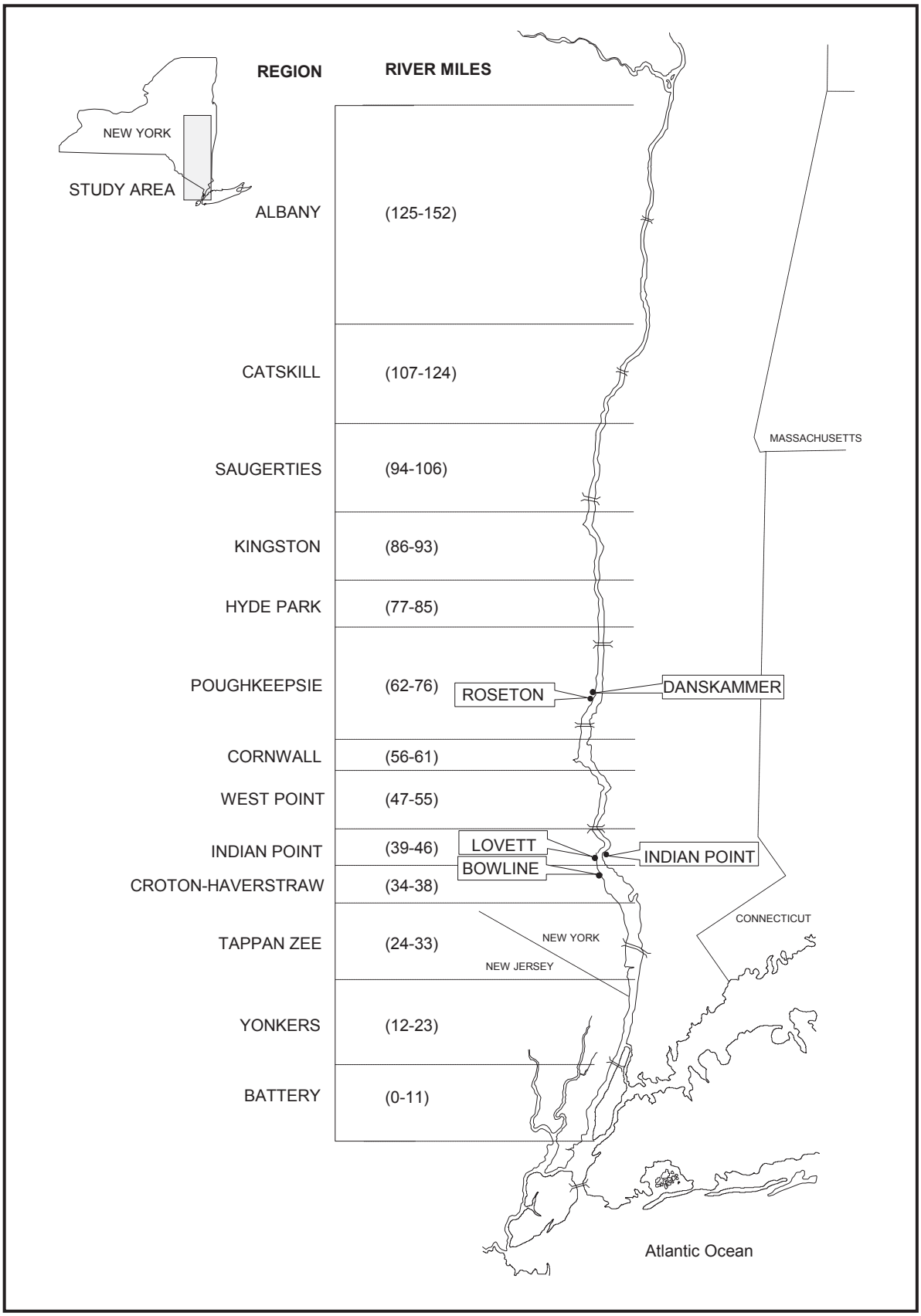


Figure 2-1. Location of 13 geographic regions (with river mile boundaries) sampled during the 2014 biological monitoring program in the Hudson River estuary.

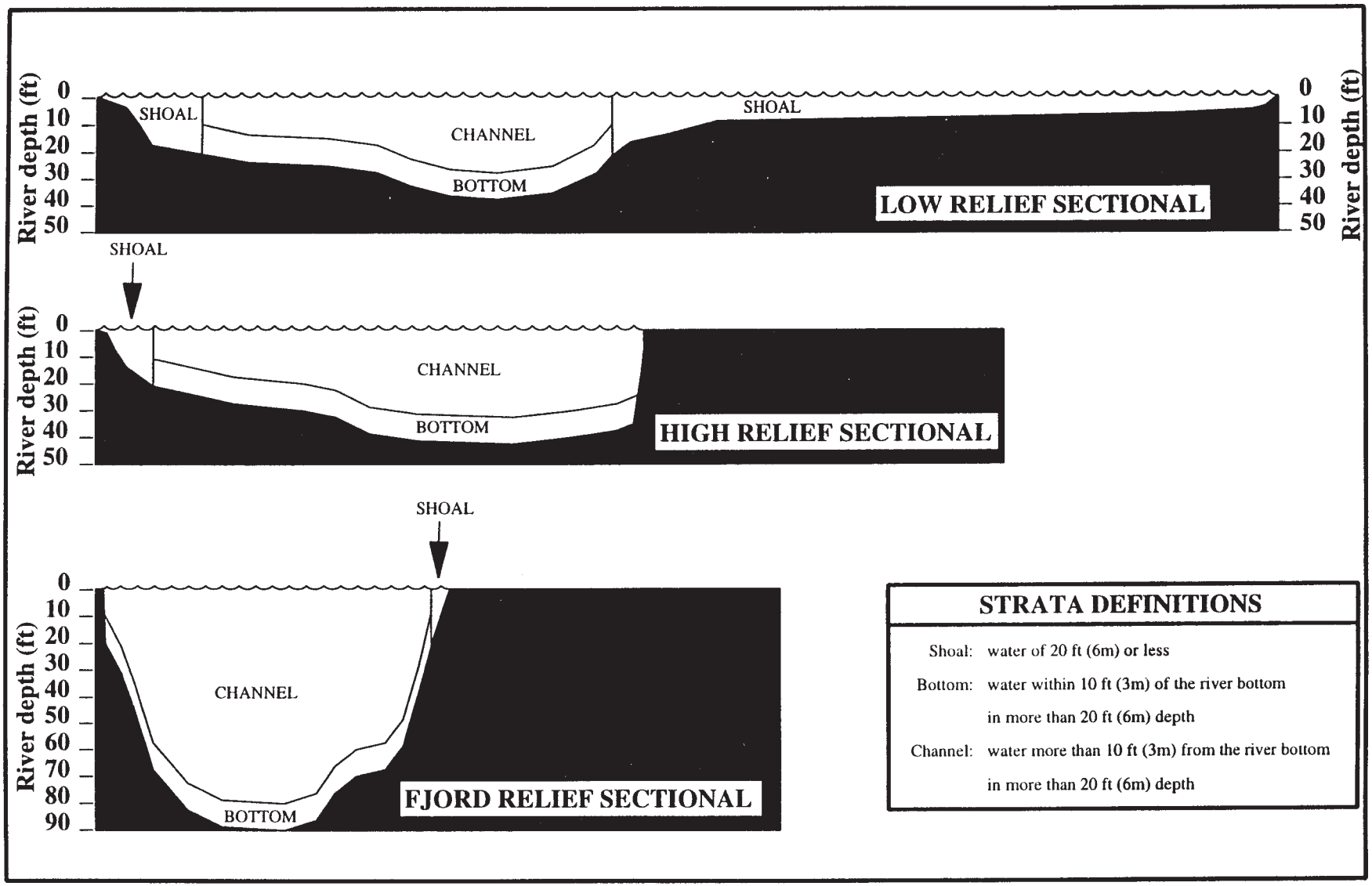


Figure 2-2. Cross sections of the Hudson River estuary showing locations and typical proportional relationships of the shoal, bottom, and channel strata.

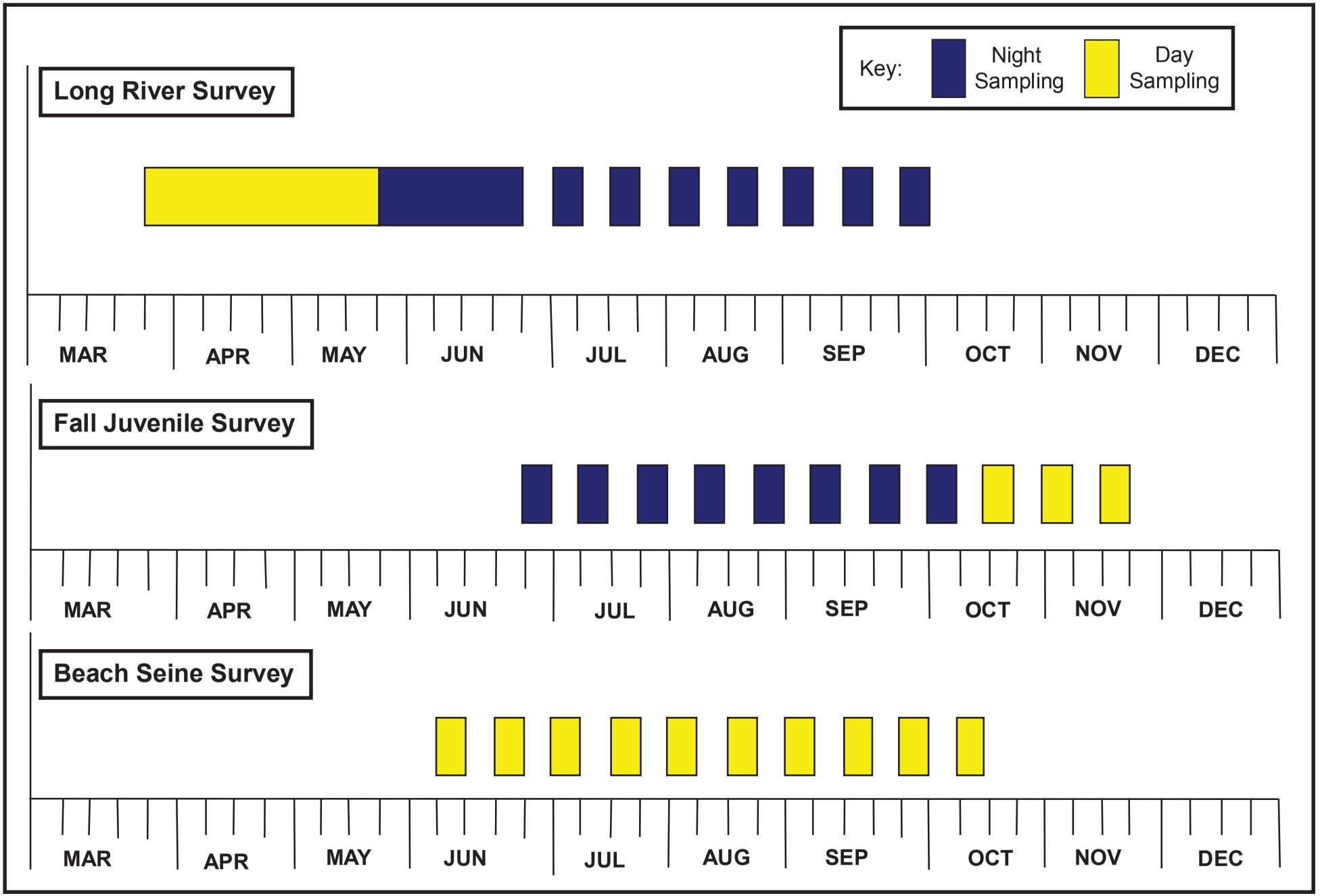


Figure 2-3. Completed sampling schedule for 2014.

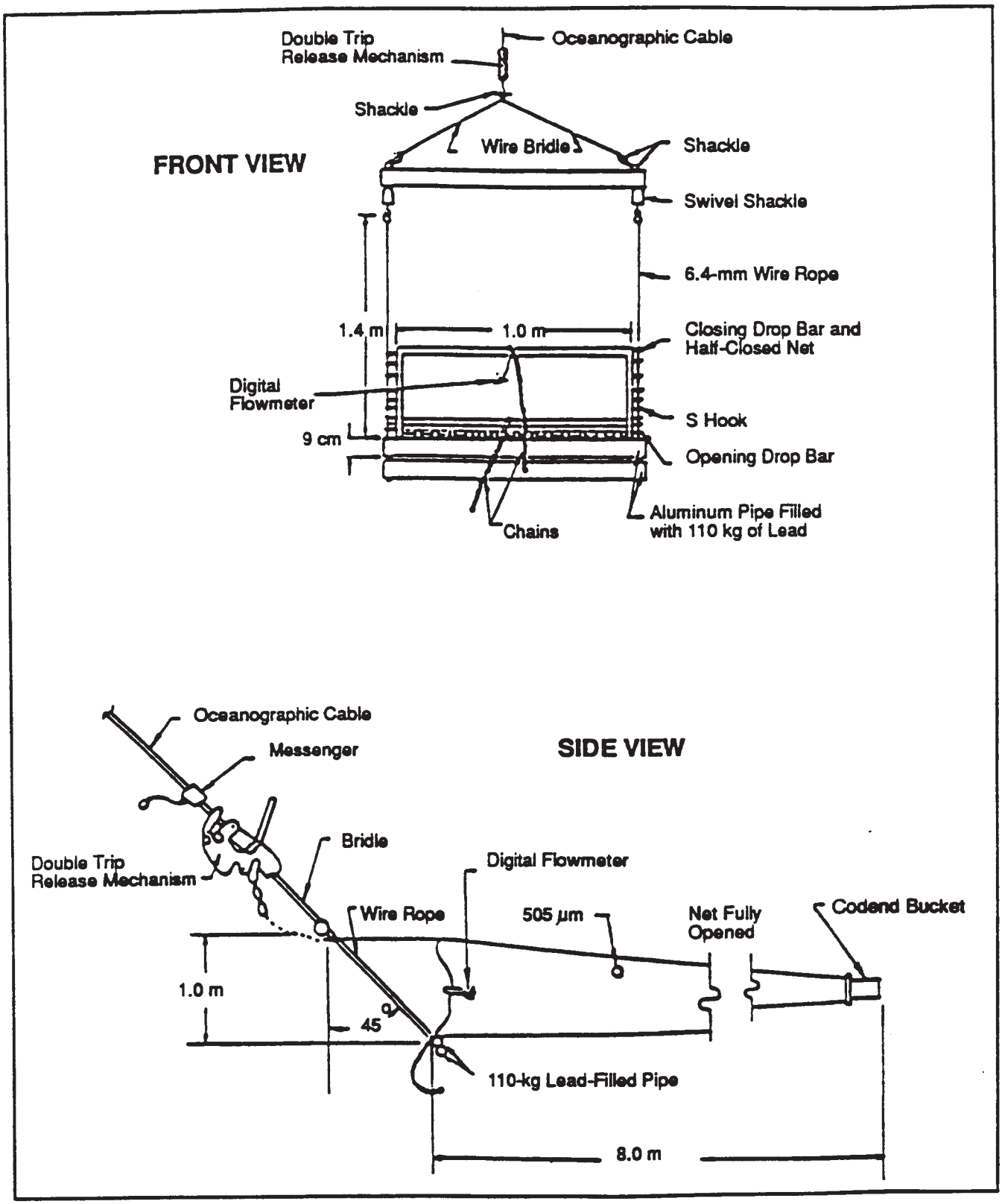


Figure 2-4. Design and dimensions of 1.0-m^2 Tucker trawl.

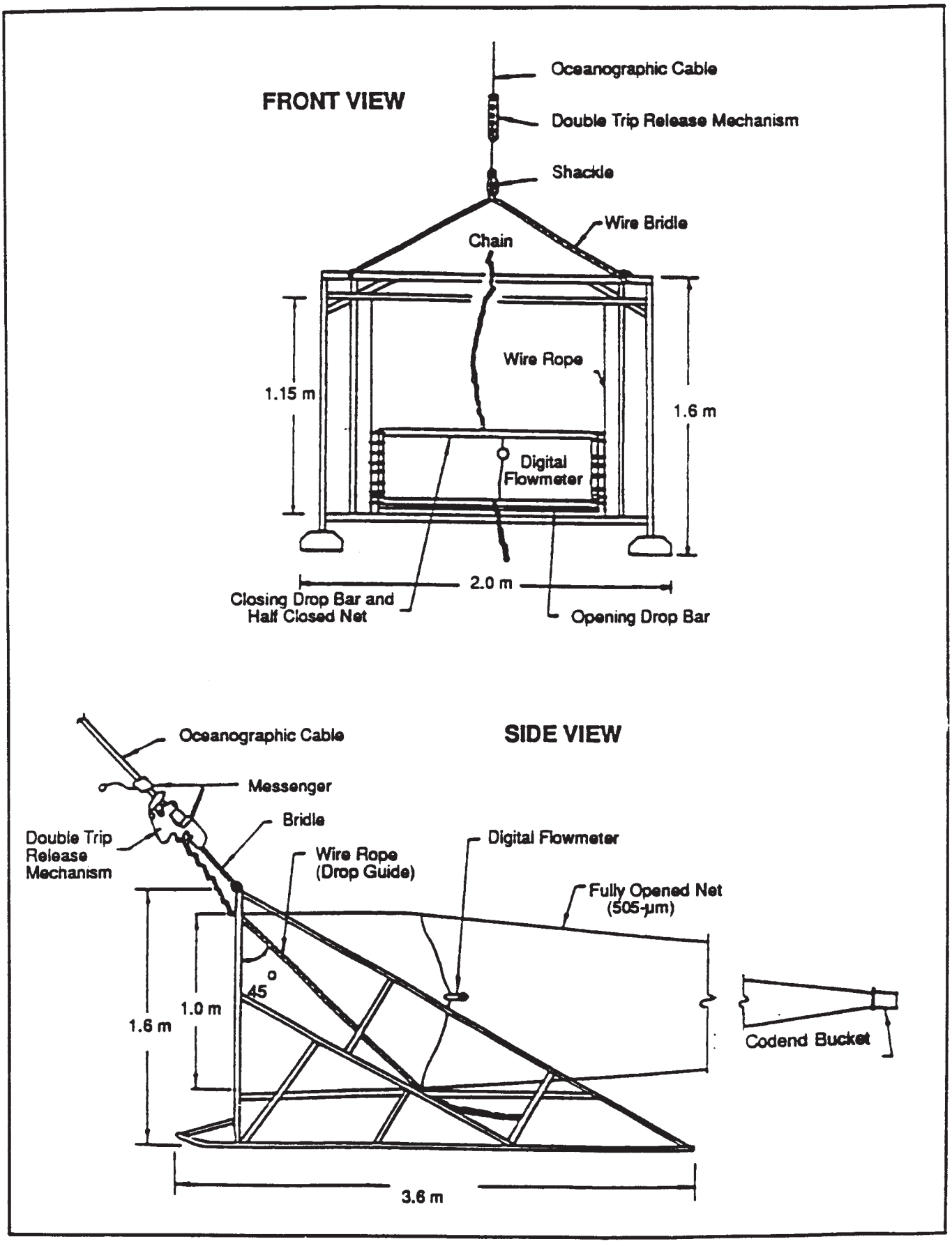


Figure 2-5. Design and dimensions of 1.0-m^2 Tucker trawl mounted on an epibenthic sled.

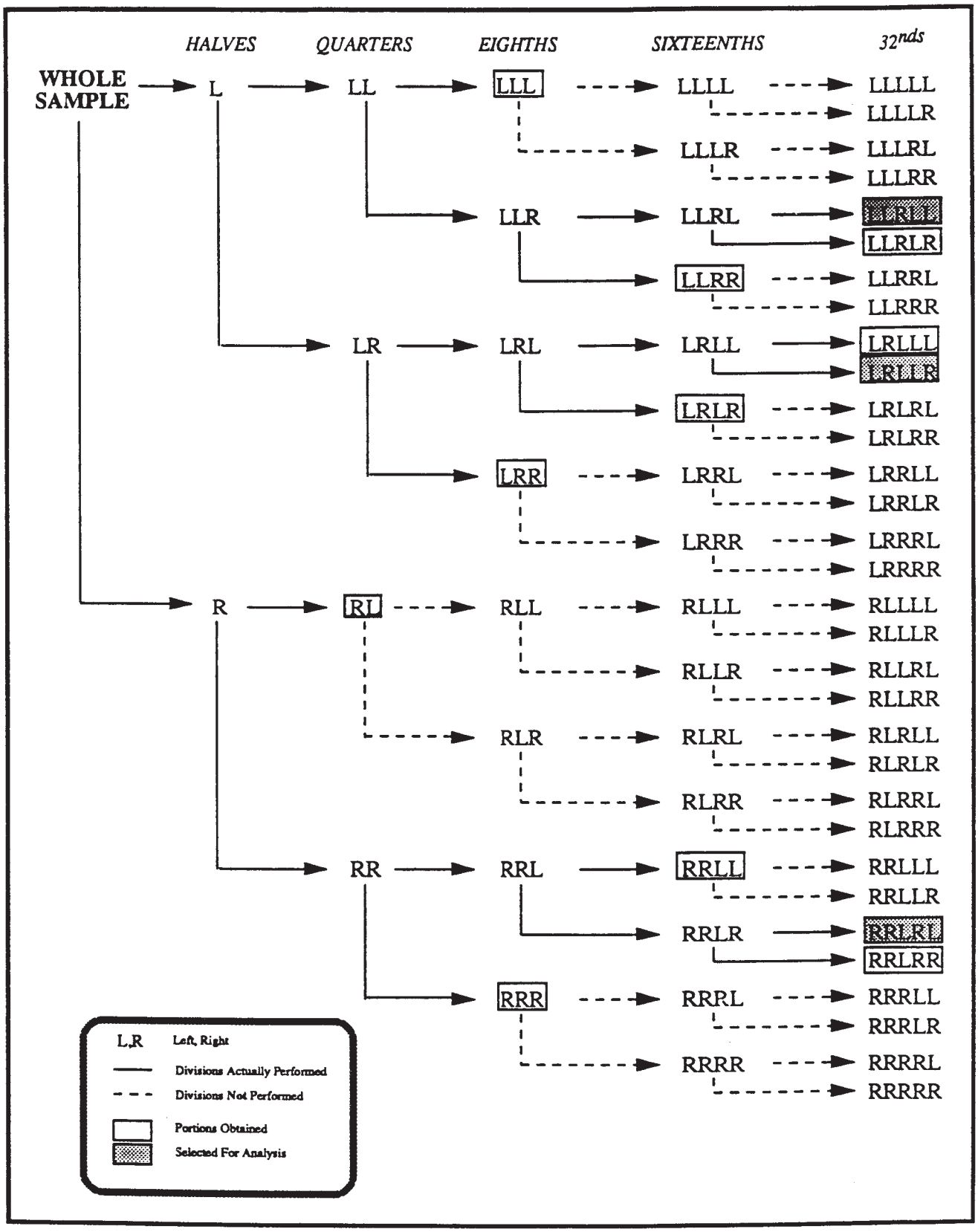


Figure 2-6. Conceptual diagram of the splitting process.

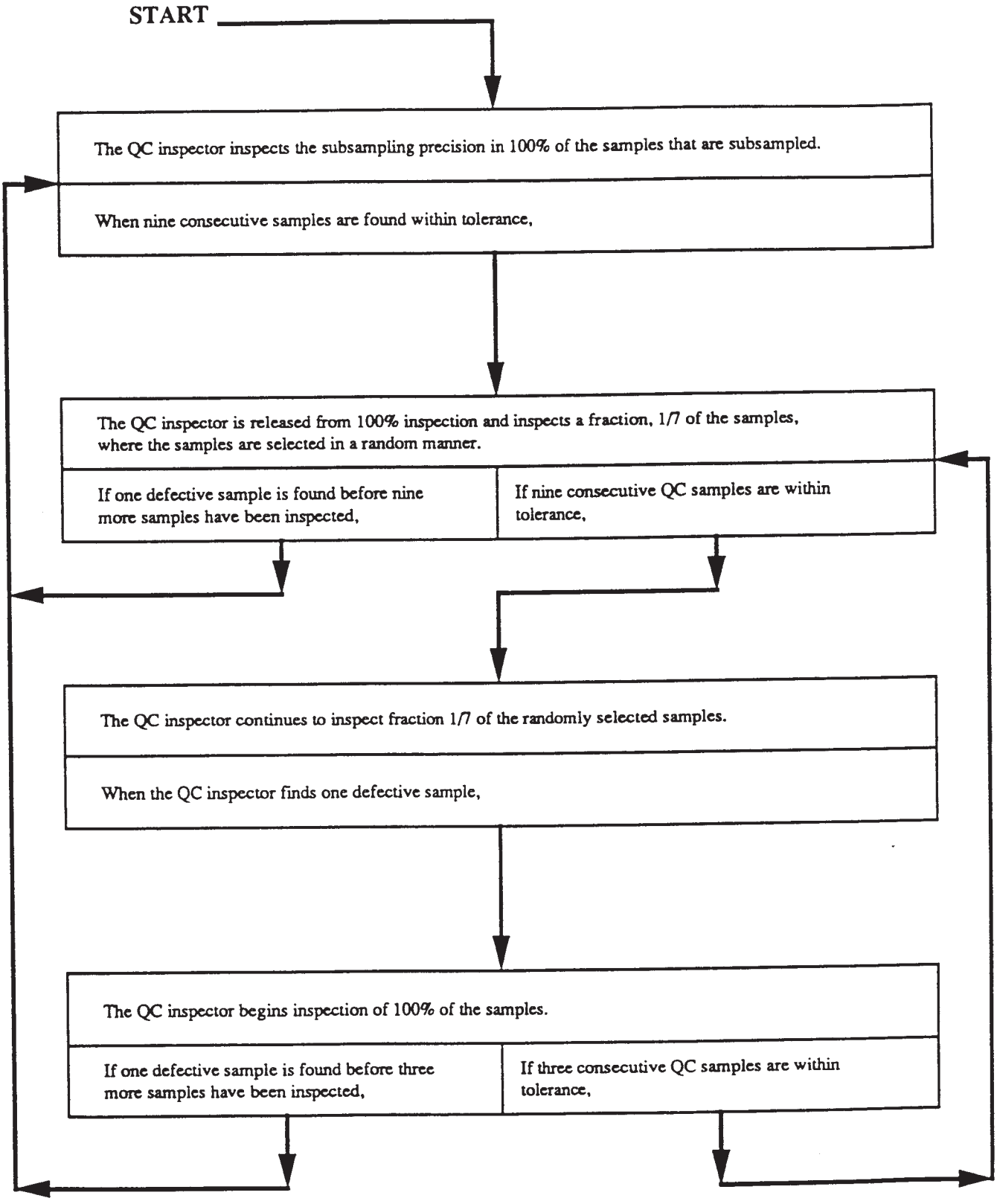


Figure 2-7. Inspection plan for evaluation of splitting precision.

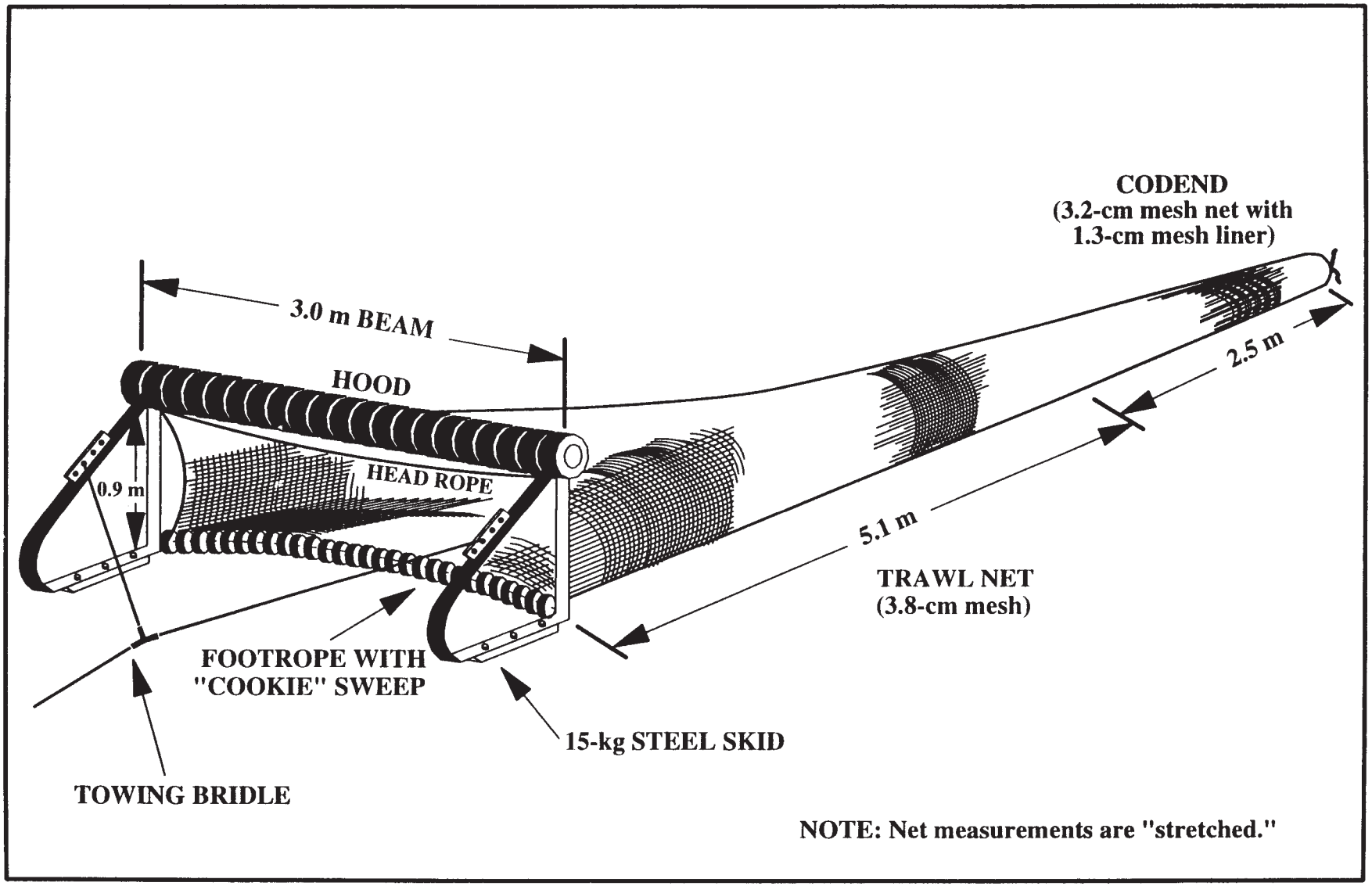


Figure 2-8. Design and dimensions of the 3.0-m beam trawl.

Table 2-1 Strata Sampled within the 13 Geographic Regions of the Hudson River Estuary During 2014

Region	Abbreviation	River Miles	River Kilometers	2014 Surveys Shore	Shoal	Channel	Bottom
Battery	BT	1-11	1-19	--	--	X	X
Yonkers	YK	12-23	19-39	X	X	X	X
Tappan Zee	TZ	24-33	39-55	X	X	X	X
Croton-Haverstraw	CH	34-38	55-63	X	X	X	X
Indian Point	IP	39-46	63-76	X	X	X	X
West Point	WP	47-55	76-90	X	--	X	X
Cornwall	CW	56-61	90-100	X	X	X	X
Poughkeepsie	PK	62-76	100-124	X	--	X	X
Hyde Park	HP	77-85	124-138	X	--	X	X
Kingston	KG	86-93	138-151	X	--	X	X
Saugerties	SG	94-106	151-172	X	--	X	X
Catskill	CS	107-124	172-201	X	--	X	X
Albany	AL	125-152	201-246	X	--	X	X

NOTE: Dashes (--) indicate no sampling scheduled.

Table 2-2 Summary of 2014 Hudson River Surveys

Program Phase	Sampling Schedule: Start Week	Sampling Schedule: End Week	Number of River Runs	Sampling Frequency	Strata Sampled	Sample Number: Collection: Projected	Sample Number: Collection: Actual	Sample Number: Lab Analysis	Sampling Gear
Longitudinal River Ichthyoplankton Survey	10 MAR	5 OCT	23	Weekly/ Biweekly	Shoal	588	518	486	1.0-m^2 net on epibenthic sled, or 1.0-m^2 Tucker trawl
					Channel	1,545	1,430	883	1.0-m^2 Tucker trawl
					Bottom	1,389	1,240	841	1.0-m^2 net on epibenthic sled
Fall Juvenile Survey	30 JUN	23 NOV	11	Biweekly	Shoal	427	427		3.0-m beam trawl, or 1.0-m^2 Tucker trawl
					Channel	648	647		1.0-m^2 Tucker trawl
					Bottom	1,055	1,052		3.0-m beam trawl
Beach Seine Survey	9 JUN	19 OCT	10	Biweekly	Shore	1,000	1,000		30.5-m beach seine

Table 2-3 Number of Samples Not Collected in Order to Comply with Permit to Take Protected Species for Scientific Purposes During the 2014 Hudson River Surveys

Survey	Week of	Region	Number of Samples Not Collected
LRS	22-Jul	Croton-Haverstraw	3
LRS	22-Jul	Indian Point	4
LRS	5-Aug	Tappan Zee	3
FJS	30-Jun	Yonkers	4
		Total	14

Table 2-4 Summary of 2014 Sample Collection Information by River Region and Stratum for the Longitudinal River Ichthyoplankton Survey

	3-Week Period from 10 MAR to 30 MAR					3-Week Period from 31 MAR to 20 APR					3-Week Period from 21 APR to 11 MAY				
	Shoal		Bottom	Channel		Shoal		Bottom	Channel		Shoal		Bottom	Channel	
Region	Sled	Trawl	Sled	Trawl	Total	Sled	Trawl	Sled	Trawl	Total	Sled	Trawl	Sled	Trawl	Total
Battery	--	--	0	0	0	--	--	24	18	42	--	--	18	18	36
Yonkers	0	0	0	0	0	6	6	21	15	48	6	6	21	15	48
Tappan Zee	0	0	0	0	0	18	12	12	12	54	18	12	12	12	54
Croton-Haverstraw	0	0	0	0	0	12	9	12	12	45	12	9	12	12	45
Indian Point	0	0	0	0	0	6	6	12	12	36	6	6	18	30	60
West Point	--	--	0	0	0	--	--	15	15	30	--	--	18	45	63
Cornwall	0	0	0	0	0	9	6	9	9	33	9	6	24	15	54
Poughkeepsie	--	--	--	--	--	--	--	9	9	18	--	--	30	30	60
Hyde Park	--	--	--	--	--	--	--	9	21	30	--	--	27	33	60
Kingston	--	--	--	--	--	--	--	24	18	42	--	--	18	21	39
Saugerties	--	--	--	--	--	--	--	24	18	42	--	--	9	15	24
Catskill	--	--	--	--	--	--	--	39	21	60	--	--	9	15	24
Albany	--	--	--	--	--	--	--	40	30	70	--	--	15	15	30
Total	0	0	0	0	0	51	39	250	210	550	51	39	231	276	597

	3-Week Period from 12 MAY to 1 JUN					4-Week Period from 2 JUN to 29 JUN					14-Week Period from 30 JUN to 5 OCT				
	Shoal		Bottom	Channel		Shoal		Bottom	Channel		Shoal		Bottom	Channel	
Region	Sled	Trawl	Sled	Trawl	Total	Sled	Trawl	Sled	Trawl	Total	Sled	Trawl	Sled	Trawl	Total
Battery	--	--	24	12	36	--	--	24	16	40	--	--	42	41	83
Yonkers	6	3	18	12	39	8	8	24	28	68	14	14	42	28	98
Tappan Zee	12	6	12	12	42	8	8	20	20	56	21	21	25	28	95
Croton-Haverstraw	12	6	12	12	42	12	8	24	24	68	19	21	27	28	95
Indian Point	6	6	18	36	66	12	8	20	64	104	19	21	26	28	94
West Point	--	--	21	45	66	--	--	32	96	128	--	--	28	28	56
Cornwall	9	6	24	15	54	8	8	48	48	112	14	14	21	21	70
Poughkeepsie	--	--	36	54	90	--	--	28	60	88	--	--	21	21	42
Hyde Park	--	--	21	30	51	--	--	20	36	56	--	--	--	--	--
Kingston	--	--	12	18	30	--	--	16	24	40	--	--	--	--	--
Saugerties	--	--	15	9	24	--	--	16	8	24	--	--	--	--	--
Catskill	--	--	9	9	18	--	--	12	12	24	--	--	--	--	--
Albany	--	--	9	9	18	--	--	12	12	24	--	--	--	--	--
Total	45	27	231	273	576	48	40	296	448	832	87	91	232	223	633

NOTE: Dashes (--) indicate no sampling scheduled.

Table 2-5 Specifications of Sampling Gear Used During the 2014 Longitudinal River Ichthyoplankton Survey

1.0-m^2 Tucker Trawl	
Length	8.0 m
Mouth (width)	1.0 m
Mouth (height)	1.4 m
Mesh size	500 μm
Net material	Nytex (monofilament nylon)
Collection cup	
Length	30 cm
Length with net-retaining ring	37 cm
Mesh size	500 μm
Net material	Nytex (monofilament nylon)

1.0-m^2 Net Mounted on Epibenthic Sled	
Length	8.0 m
Mouth (width)	1.0 m
Mouth (height)	1.4 m
Mesh size	500 μm
Net material	Nytex (monofilament nylon)
Collection cup	
Length	30 cm
Length with net-retaining ring	37 cm
Mesh size	500 μm
Net material	Nytex (monofilament nylon)

Table 2-6 Water Quality Sampling Locations During the 2014 Longitudinal River Ichthyoplankton and Fall Juvenile Surveys

River Region	Scheduled Sampling Locations (RM)		Number of Water Quality Samples Scheduled Per Region Per River Run			
	Shoals[1]	Channel	LRS River Runs 1-3	LRS River Runs 4-16	LRS River Runs 17-23	FJS River Runs 1-11
Battery	--	1, 3, 6, 9	12	12	12	12
Yonkers	19	12, 14, 17, 19, 22	19	19	19	19
Tappan Zee	29	25, 27, 29, 32	16	16	16	16
Croton-Haverstraw	36	35, 36, 37, 38	16	16	16	16
Indian Point	43	40, 42, 43, 46	16	16	16	16
West Point	--	49, 51, 53, 55	12	12	12	12
Cornwall	59	56, 57, 59, 61	16	16	16	16
Poughkeepsie	--	63, 67, 71, 75	--	12	12	12
Hyde Park	--	78, 80, 82, 84	--	12	--	12
Kingston	--	87, 89, 91, 93	--	12	--	12
Saugerties	--	96, 99, 102, 105	--	12	--	12
Catskill	--	109, 114, 118, 122	--	12	--	12
Albany	--	126, 131, 135, 138, 142	--	15	--	15
Total per River Run			107	182	119	182

NOTE: Dashes (--) indicate no sampling scheduled.
[1] Sample collected from east and west shoals at designated river mile.

Table 2-7 Summary of 2014 Sample Analysis Information by River Region and Stratum for the Longitudinal River Ichthyoplankton Survey

	3-Week Period from 10 MAR to 30 MAR					3-Week Period from 31 MAR to 20 APR					3-Week Period from 21 APR to 11 MAY				
	Shoal		Bottom	Channel		Shoal		Bottom	Channel		Shoal		Bottom	Channel	
Region	Sled	Trawl	Sled	Trawl	Total	Sled	Trawl	Sled	Trawl	Total	Sled	Trawl	Sled	Trawl	Total
Battery	--	--	0	0	0	--	--	12	9	21	--	--	9	9	18
Yonkers	0	0	0	0	0	6	6	12	15	39	6	6	12	15	39
Tappan Zee	0	0	0	0	0	9	12	12	12	45	9	12	12	12	45
Croton-Haverstraw	0	0	0	0	0	12	9	12	12	45	12	9	12	12	45
Indian Point	0	0	0	0	0	6	6	12	12	36	6	6	9	15	36
West Point	--	--	0	0	0	--	--	15	15	30	--	--	9	9	18
Cornwall	0	0	0	0	0	9	6	9	9	33	9	6	12	15	42
Poughkeepsie	--	--	--	--	--	--	--	9	9	18	--	--	15	15	30
Hyde Park	--	--	--	--	--	--	--	9	12	21	--	--	15	18	33
Kingston	--	--	--	--	--	--	--	12	9	21	--	--	9	12	21
Saugerties	--	--	--	--	--	--	--	12	9	21	--	--	9	15	24
Catskill	--	--	--	--	--	--	--	9	12	21	--	--	9	15	24
Albany	--	--	--	--	--	--	--	8	15	27	--	--	15	15	30
Total	0	0	0	0	0	42	39	143	154	378	42	39	147	177	405

	3-Week Period from 12 MAY to 1 JUN					4-Week Period from 2 JUN to 29 JUN					13-Week Period from 30 JUN to 5 OCT				
	Shoal		Bottom	Channel		Shoal		Bottom	Channel		Shoal		Bottom	Channel	
Region	Sled	Trawl	Sled	Trawl	Total	Sled	Trawl	Sled	Trawl	Total	Sled	Trawl	Sled	Trawl	Total
Battery	--	--	12	12	24	--	--	12	16	28	--	--	21	21	42
Yonkers	6	3	9	12	30	8	7	12	16	43	14	14	21	28	77
Tappan Zee	12	6	12	12	42	8	8	20	20	56	14	21	25	28	88
Croton-Haverstraw	12	6	12	12	42	12	8	12	12	44	19	21	27	28	95
Indian Point	6	6	9	18	39	12	8	20	12	52	13	21	26	28	88
West Point	--	--	12	9	21	--	--	16	20	36	--	--	28	28	56
Cornwall	9	6	12	15	42	8	8	24	24	64	14	14	21	21	70
Poughkeepsie	--	--	18	12	30	--	--	16	12	28	--	--	21	21	42
Hyde Park	--	--	12	15	27	--	--	20	20	40	--	--	--	--	--
Kingston	--	--	12	9	21	--	--	16	12	28	--	--	--	--	--
Saugerties	--	--	15	9	24	--	--	16	8	24	--	--	--	--	--
Catskill	--	--	9	9	18	--	--	12	12	24	--	--	--	--	--
Albany	--	--	9	9	18	--	--	12	12	24	--	--	--	--	--
Total	45	27	153	153	378	48	39	208	196	491	74	91	190	203	558

NOTE: Dashes (--) indicate no sampling scheduled.

Table 2-8 Summary of 2014 Sample Collection by River Region and Stratum for the Fall Juvenile Survey

	15-Week Period from 30 JUN to 12 OCT					6-Week Period from 13 OCT to 23 NOV				
	Shoal		Bottom	Channel		Shoal		Bottom	Channel	
Region	Beam	Tucker	Beam	Tucker	Total	Beam	Tucker	Beam	Tucker	Total
Battery	--	--	64	48	112	--	--	36	--	36
Yonkers	16	16	61	47	140	15	--	34	--	49
Tappan Zee	48	47	48	48	191	15	--	24	--	39
Croton-Haverstraw	40	41	48	48	177	15	--	18	--	33
Indian Point	32	32	56	56	176	15	--	30	--	45
West Point	--	--	80	96	176	--	--	36	--	36
Cornwall	40	40	48	48	176	15	--	30	--	45
Poughkeepsie	--	--	88	88	176	--	--	30	--	30
Hyde Park	--	--	64	48	112	--	--	30	--	30
Kingston	--	--	32	48	80	--	--	24	--	24
Saugerties	--	--	32	16	48	--	--	30	--	30
Catskill	--	--	24	24	48	--	--	29	--	29
Albany	--	--	32	32	64	--	--	24	--	24
Total	176	176	677	647	1676	75	--	375	--	450

NOTE: Dashes (--) indicate no sampling scheduled.

Table 2-9 Specifications of Sampling Gear Used During the 2014 Fall Juvenile Survey

1.0-m^2 Tucker Trawl	
Length	8.0 m
Mouth (width)	1.0 m
Mesh size	3.0 mm
Collection cage (codend)	
Length	81 cm
Diameter	41 cm
Mesh size	3.0 mm

3.0-m Beam Trawl	
Length	7.6 m
Beam width	3.0 m
Net body	3.8-cm mesh (stretch)
Codend	3.2-cm mesh (stretch) net with 1.3-cm mesh (stretch) liner
Hood	3.8-cm mesh (stretch)
Footrope	Equipped with 5.1-cm rollers
Headrope	Equipped with three floats
Mouth area	2.7 m^2

Table 2-10 Specifications of Sampling Gear Used During the 2014 Beach Seine Survey

	30.5-m Beach Seine
Number of wings	2
Length of wings	12.0 m
Depth of wings	2.4 m
Wing mesh (bar)	1.0 cm
Length of bag	6.1 m
Depth of bag	3.0 m
Bag mesh (bar)	0.5 cm
Sampling area	450 m^2

Table 2-11 Summary of 2014 Sample Collection by River Region for the Beach Seine Survey

Region	5-Week Period from 9 JUN to 13 JUL	14-Week Period from 14 JUL to 19 OCT	Total
Yonkers	9	35	44
Tappan Zee	33	168	201
Croton-Haverstraw	21	98	119
Indian Point	9	35	44
West Point	9	35	44
Cornwall	9	42	51
Poughkeepsie	24	35	59
Hyde Park	24	35	59
Kingston	24	35	59
Saugerties	45	63	108
Catskill	57	70	127
Albany	36	49	85
Total	300	700	1000

Table 2-12 Stratum and Region Volumes (m^3) and Surface Areas (m^2) Used in Analysis of 2014 Hudson River Estuary Data

Geographic Region	Channel Volume	Bottom Volume	Shoal Volume	Region Volume	Shorezone Surface Area
Battery	141,809,822	48,455,129	18,747,833	209,012,784	(a)
Yonkers	143,452,543	59,312,978	26,654,767	229,420,288	3,389,000
Tappan Zee	138,000,768	62,125,705	121,684,992	321,811,465	20,446,000
Croton-Haverstraw	61,309,016	32,517,633	53,910,105	147,736,754	12,101,000
Indian Point	162,269,471	33,418,632	12,648,163	208,336,266	4,147,000
West Point	178,830,022	25,977,862	2,647,885	207,455,769	1,186,000
Cornwall	94,882,267	36,768,629	8,140,123	139,791,019	4,793,000
Poughkeepsie	228,975,052	63,168,132	5,990,260	298,133,444	3,193,000
Hyde Park	131,165,041	32,012,000	2,307,625	165,484,666	558,000
Kingston	93,657,021	35,479,990	12,332,868	141,469,879	3,874,000
Saugerties	113,143,296	42,845,077	20,307,338	176,295,711	7,900,000
Catskill	83,924,081	42,281,206	34,526,456	160,731,743	8,854,000
Albany	32,025,080	13,517,183	25,606,842	71,149,105	6,114,000
Total	1,603,443,480	527,880,156	345,505,257	2,476,828,893	76,555,000

a. Shorezone surface area is unknown and not used in data analysis as no beach seine sampling is performed in the Battery region.

Table 2-13 Parameters for Indices of Annual Abundance Based on Data from the Beach Seine Survey (BSS), Fall Juvenile Survey (FJS), and Longitudinal River Survey (LRS)

		Weeks Used in Sampling Program		
Species	Life Stage	BSS	FJS	LRS
Striped bass	Egg, YSL, and PYSL			Variable[1]
Striped bass	Juvenile	33-40		
White perch	Egg, YSL, and PYSL			Variable[1]
White perch	Juvenile and Yearling	33-40		
Atlantic tomcod	PYSL and Juvenile combined			19-22
Bay anchovy	Juvenile		33-40 (Channel)	
American shad	Egg, YSL, and PYSL			Variable[1]
American shad	Juvenile	33-40		
Alewife	Juvenile	33-40	33-40 (Channel)	
Blueback herring	Juvenile	33-40	33-40 (Channel)	
Rainbow smelt	Juvenile		33-40 (Channel)	20-27
Hogchoker	Juvenile		40-43 (Bottom)	
Spottail shiner	Juvenile	33-40		
White catfish	Yearling and older	33-40		
Weakfish	Juvenile		33-40 (Channel)	
Bluefish	Juvenile	33-40		

[1] 7 weeks beginning with the first week in which 5% of annual total is achieved

CHAPTER 3
PHYSICAL/CHEMICAL PARAMETERS

This chapter provides graphs on the parameters of temperature, salinity, and dissolved oxygen as measured during the 2014 surveys. In addition, freshwater flow data obtained from the U.S. Geological Survey (USGS) for the Green Island Dam near Troy, New York, and daily water temperature data from Poughkeepsie's Water Treatment Facility and the near-by USGS gaging site are also graphed. Supporting tables are presented in Appendix B.

3.1 GREEN ISLAND DAM FLOWS

During 2014, daily freshwater flow for Green Island, New York was estimated from discharge data provided by the USGS for the Hudson River above Lock 1, the Mohawk River at Cohoes, and the Mohawk River diversion at Crescent Dam. At the time of publication, the data from October through December 2014 were provisional.

Links to Graphs	Figure	Supporting Appendix Table
Daily freshwater flow rates for 2014	3-1	B-1
Monthly freshwater flow rates for 2014	3-1	B-2
Monthly average freshwater flow rates for 1974 to 2014	3-1	B-3
Average annual freshwater flow for 1947 to 2014	3-2	B-4

3.2 HUDSON RIVER WATER TEMPERATURES NEAR POUGHKEEPSIE

Long-term (since 1951) daily temperature records are available from Poughkeepsie's Water Treatment Facility, located just north of the City of Poughkeepsie, New York, at RM 77. In addition, water temperature records dating back to 1993 are available from the USGS gaging site (#01372058) on the Hudson River 2.3 miles below Poughkeepsie, New York, at RM 72. Because of the consistency and verification of the USGS records, they were substituted for the Water Treatment Facility records beginning with 1993 and continuing to 2014. Temperature records from the Water Treatment Facility were retained for 1951 through 1992.

Links to Graphs	Figure	Supporting Appendix Table
Daily water temperatures for 2014	3-3	B-5
Average, minimum, and maximum temperatures for 1951 to 2013	3-3	B-5
Average annual water temperature for 1951 to 2014	3-4	B-6

3.3 HUDSON RIVER SURVEYS

In situ measurements of water temperature (°C), dissolved oxygen (mg/L), and specific conductance (microsieman/cm at 25°C) were taken with calibrated meters at fixed river mile and strata stations in conjunction with biological sampling for the 2014 LRS and FJS. These three parameters were also measured with each sample of the 2014 BSS. Salinity data were computed from conductivity data as detailed in Chapter 2.

Links to Graphs	Figure	Supporting Appendix Table
Weekly temperatures for LRS/FJS for 2014	3-5	B-7
Weekly average, minimum, and maximum temperatures for LRS/FJS for 1974 to 2013	3-5	---
Average annual temperature for LRS/FJS for 1974 to 2014	3-5	B-8
Weekly temperatures for BSS for 2014	3-6	B-9
Weekly average, minimum, and maximum temperatures for BSS for 1974 to 2013	3-6	---
Average annual temperature for BSS for 1974 to 2014	3-6	B-10
Weekly salinity for LRS/FJS for 2014	3-7	B-11
Weekly dissolved oxygen for LRS/FJS for 2014	3-8	B-13
Weekly average, minimum, and maximum dissolved oxygen for LRS/FJS for 1974 to 2013	3-8	---
Average annual dissolved oxygen for LRS/FJS for 1974 to 2014	3-8	B-14
Weekly dissolved oxygen for BSS for 2014	3-9	B-15
Weekly average, minimum, and maximum dissolved oxygen for BSS for 1974 to 2013	3-9	---
Average annual dissolved oxygen for BSS for 1974 to 2014	3-9	B-16

Link to Chapter 4

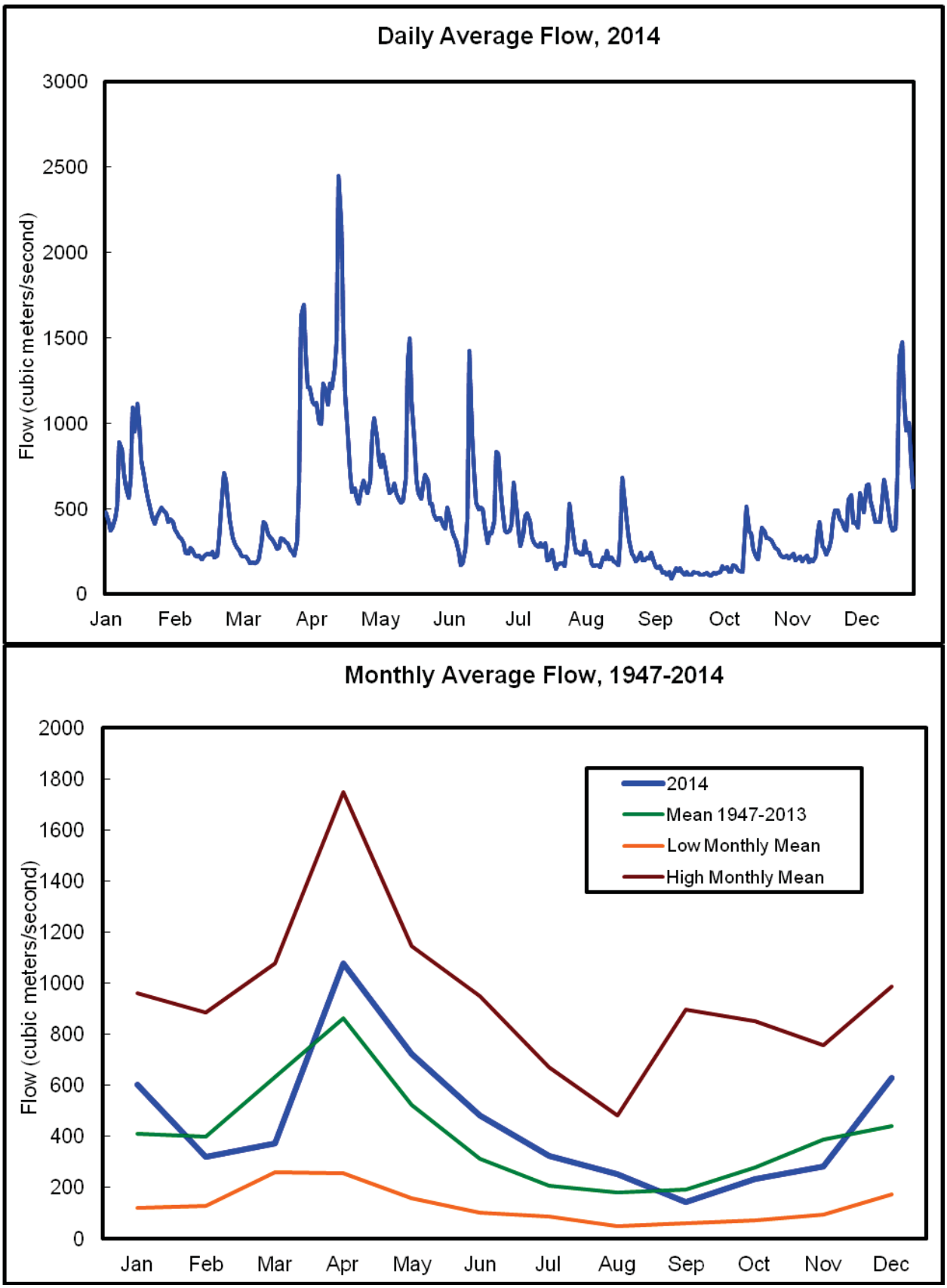


Figure 3-1. Hudson River daily average flow rate in 2014 and monthly average flow rates from 1947 to 2014, Green Island, New York. (Note: Data for October through December 2014 are provisional.)

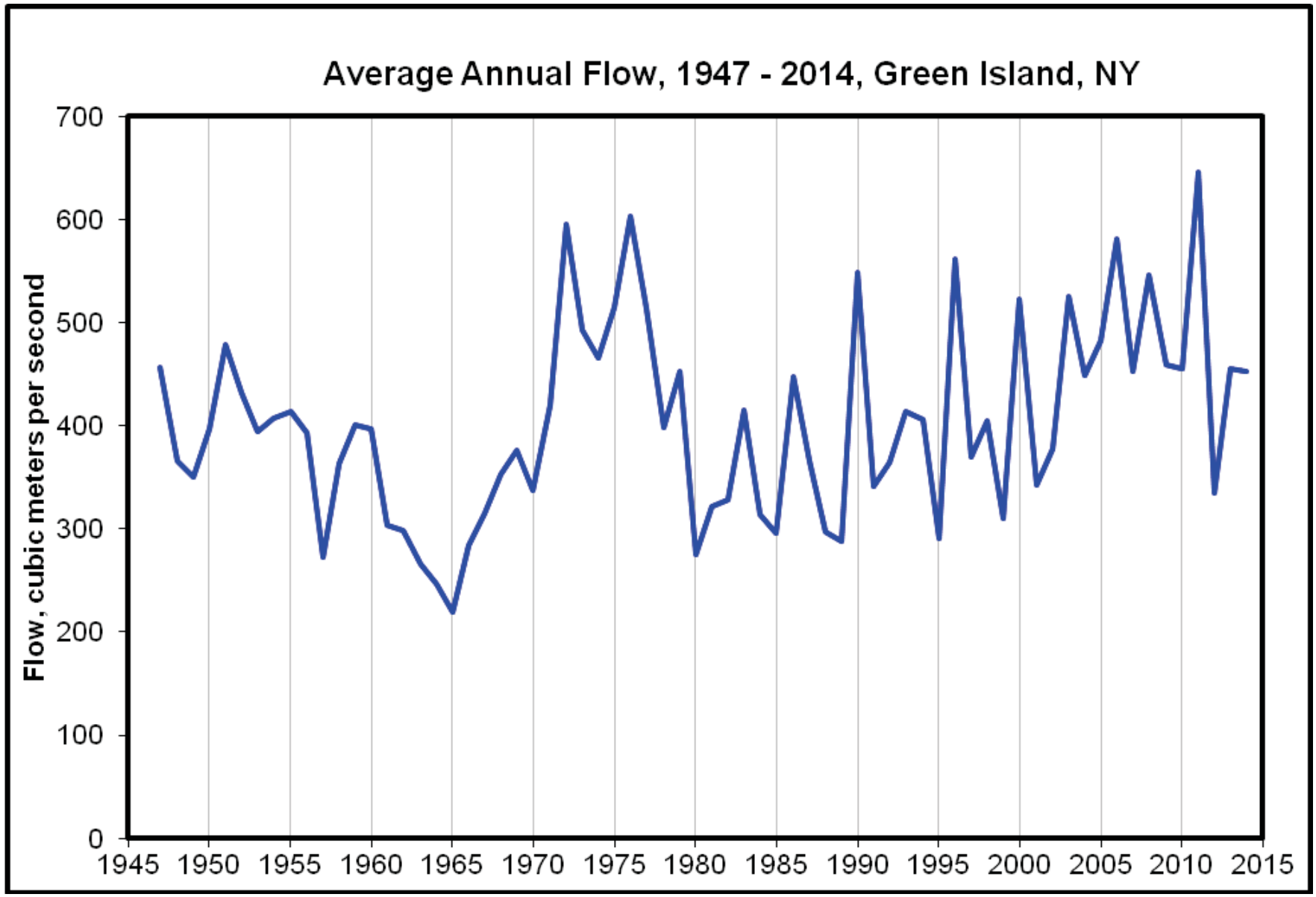


Figure 3-2. Average annual Hudson River flow from 1947 to 2014, Green Island, New York. (Note: Data for 2014 are provisional.)

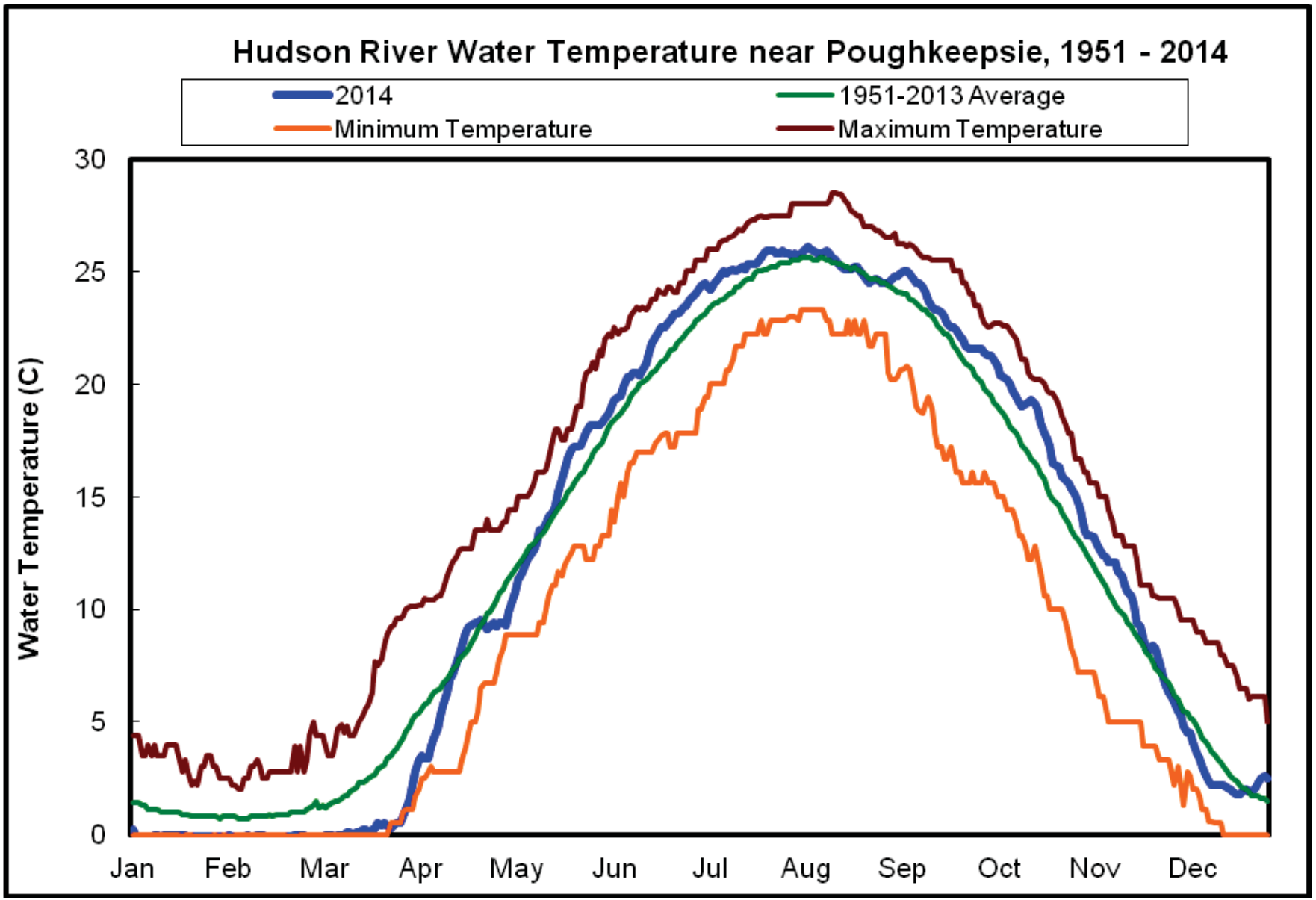


Figure 3-3. Seasonal variations in water temperature from 1951 to 2014 from Hudson River near Poughkeepsie. (Data from 1951 through 1992 from Poughkeepsie's Water Treatment Facility. Data from 1993 through 2014 from USGS gaging site 01372058 Hudson River below Poughkeepsie, NY.)

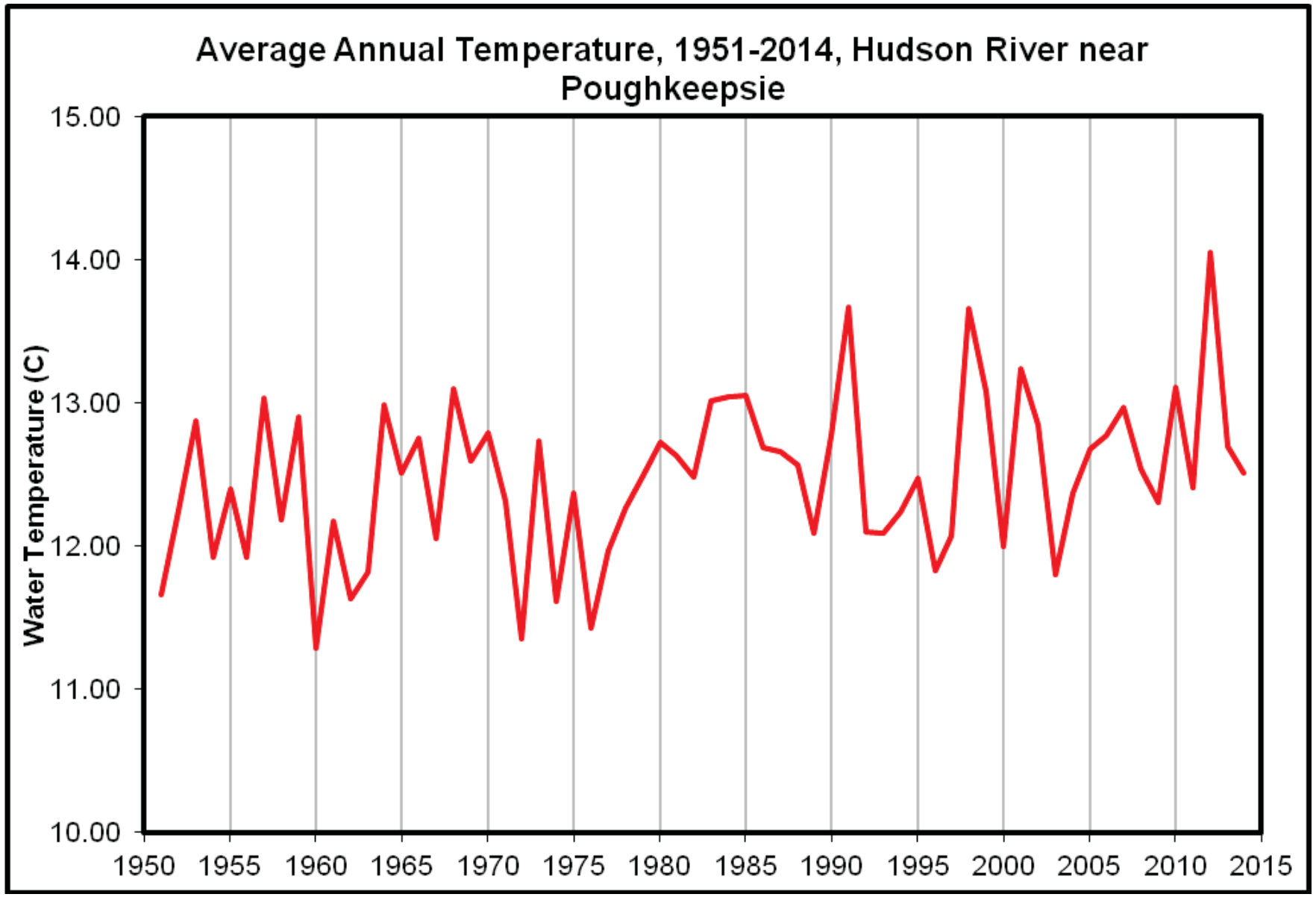
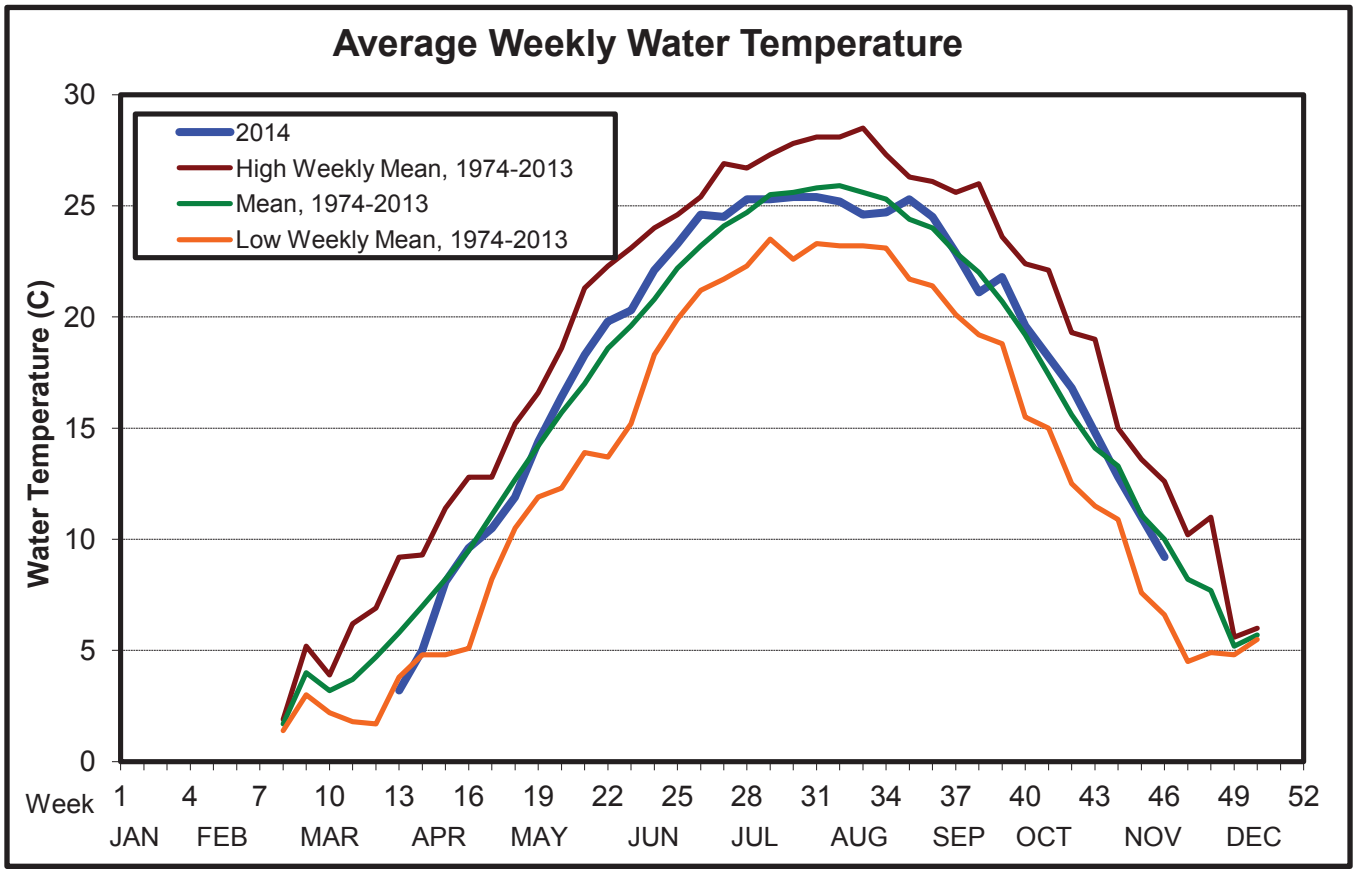


Figure 3-4. Average annual water temperature from 1951 to 2014 from Hudson River near Poughkeepsie. (Data from 1951 through 1992 from Poughkeepsie's Water Treatment Facility. Data from 1993 through 2014 from USGS gaging site 01372058 Hudson River below Poughkeepsie, NY.)

Long River/Fall Juvenile Survey



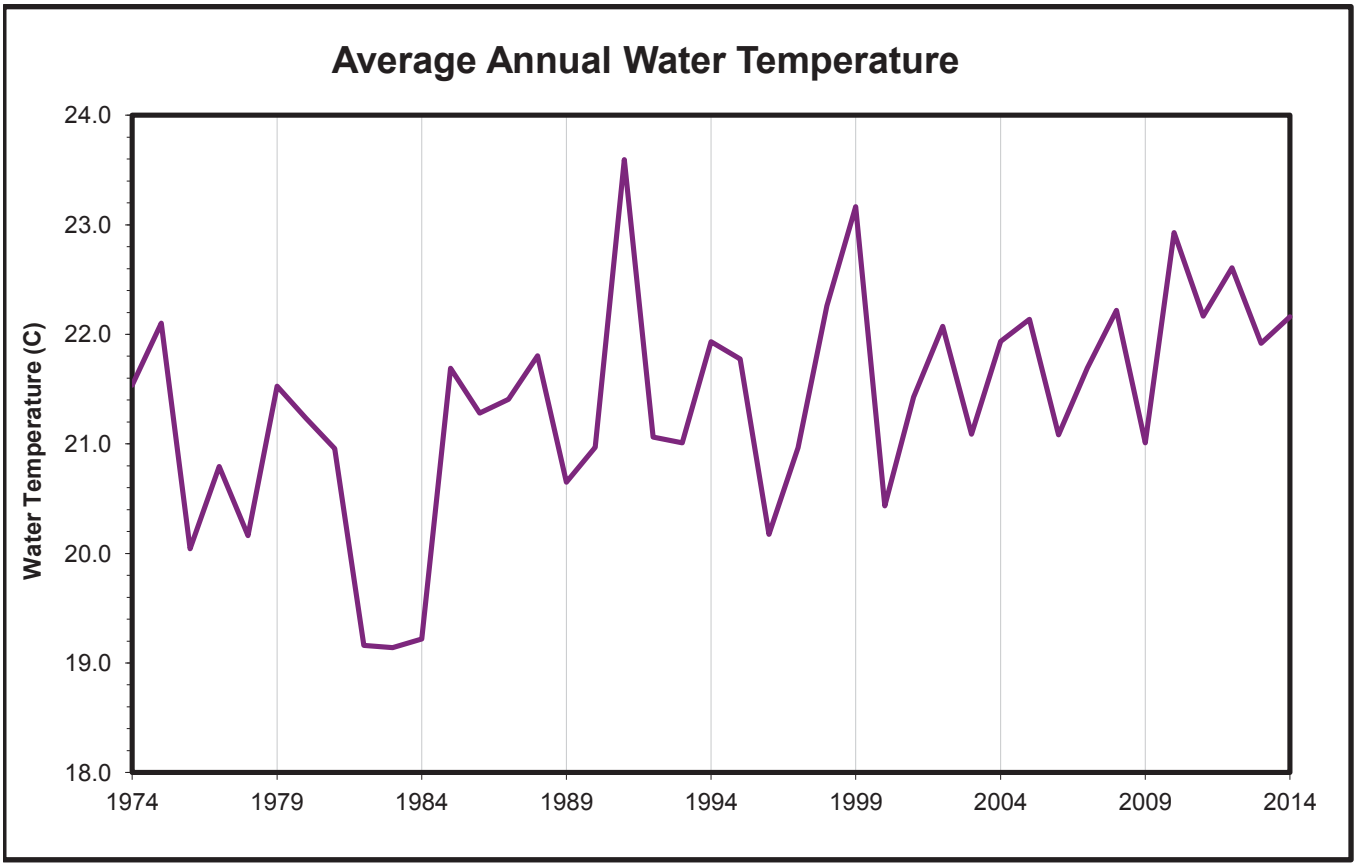
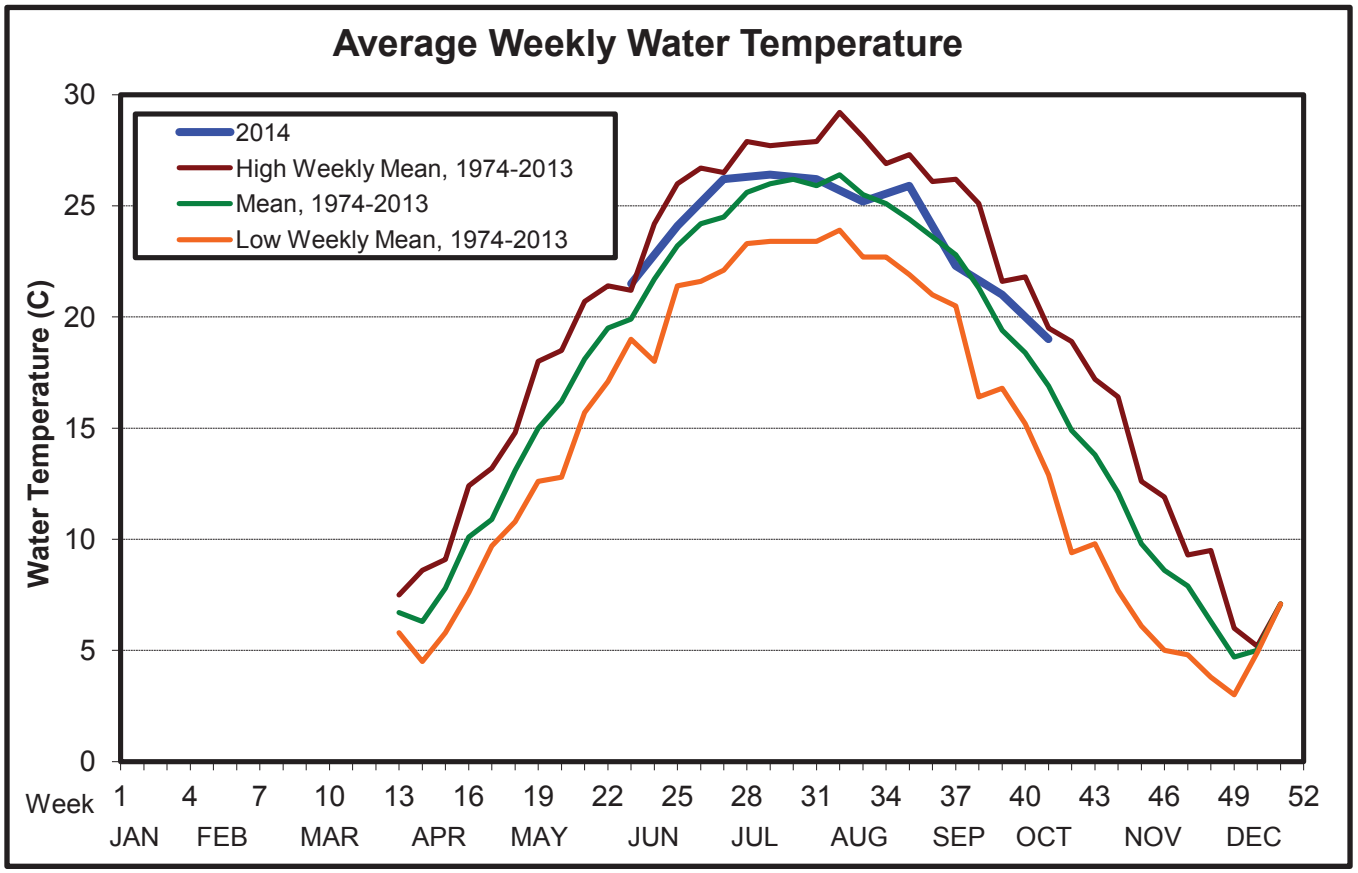


Figure 3-5. Seasonal and annual variations in water temperature from the Long River/Fall Juvenile surveys, 1974 - 2014.

Beach Seine Survey



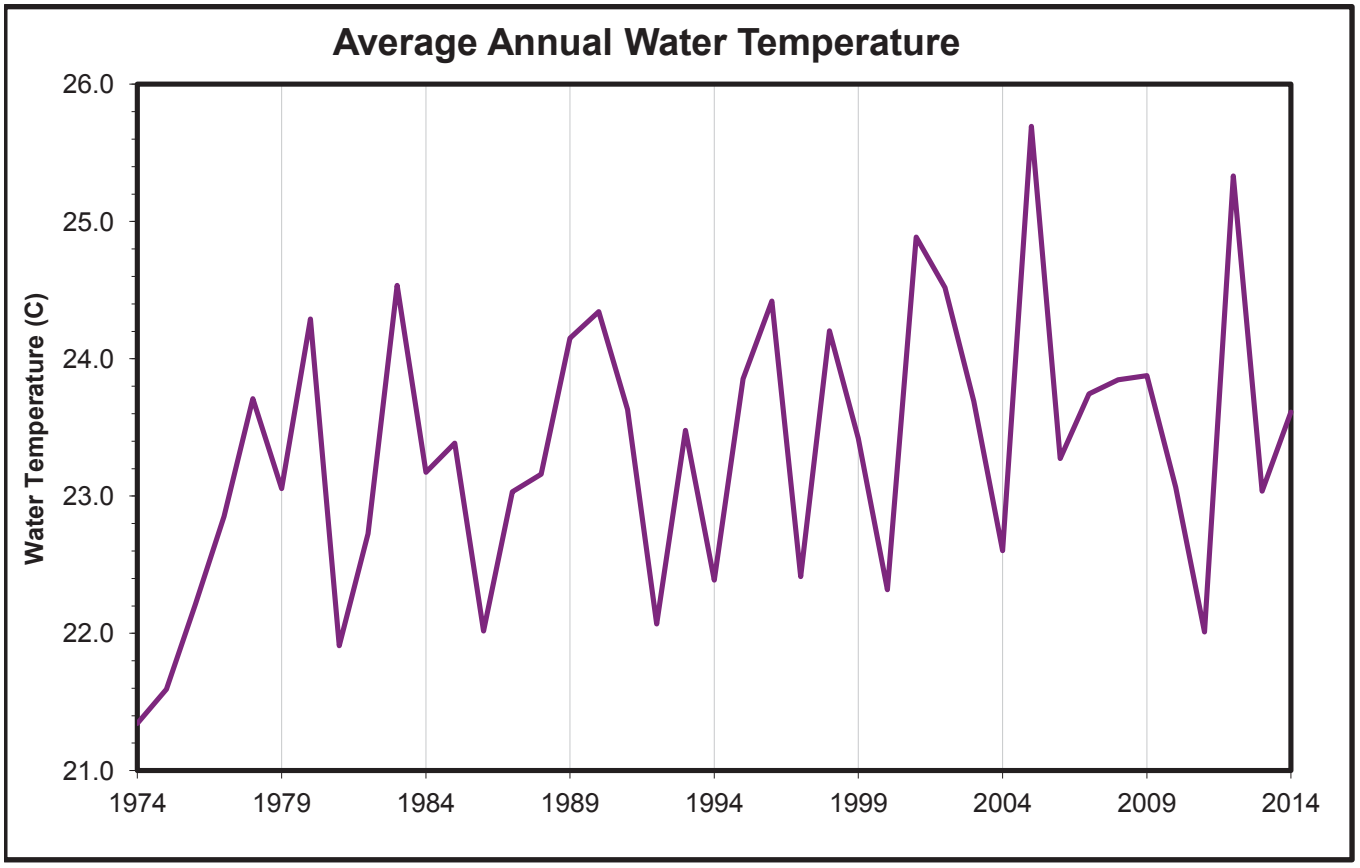


Figure 3-6. Seasonal and annual variations in water temperature from the Beach Seine surveys, 1974 - 2014.

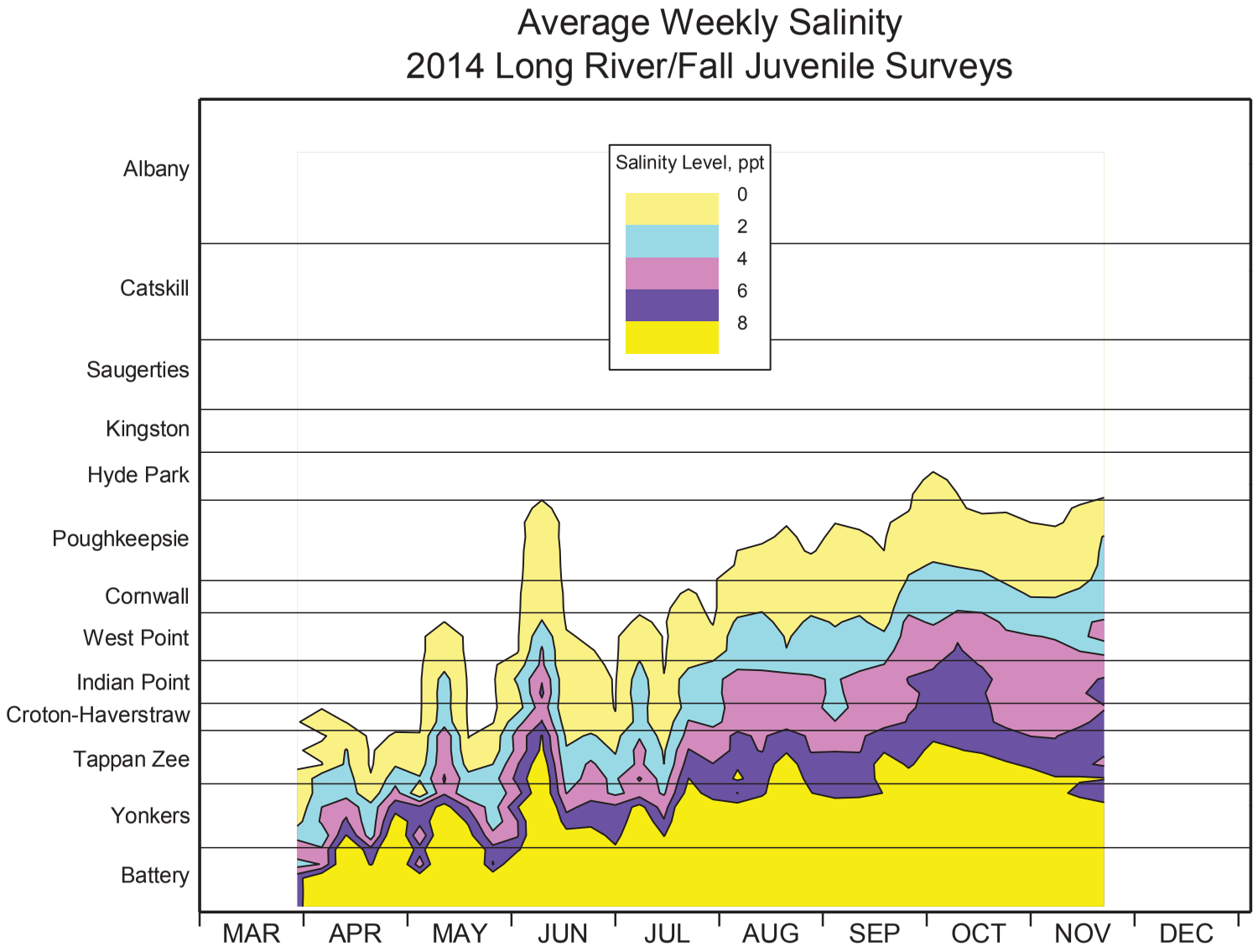
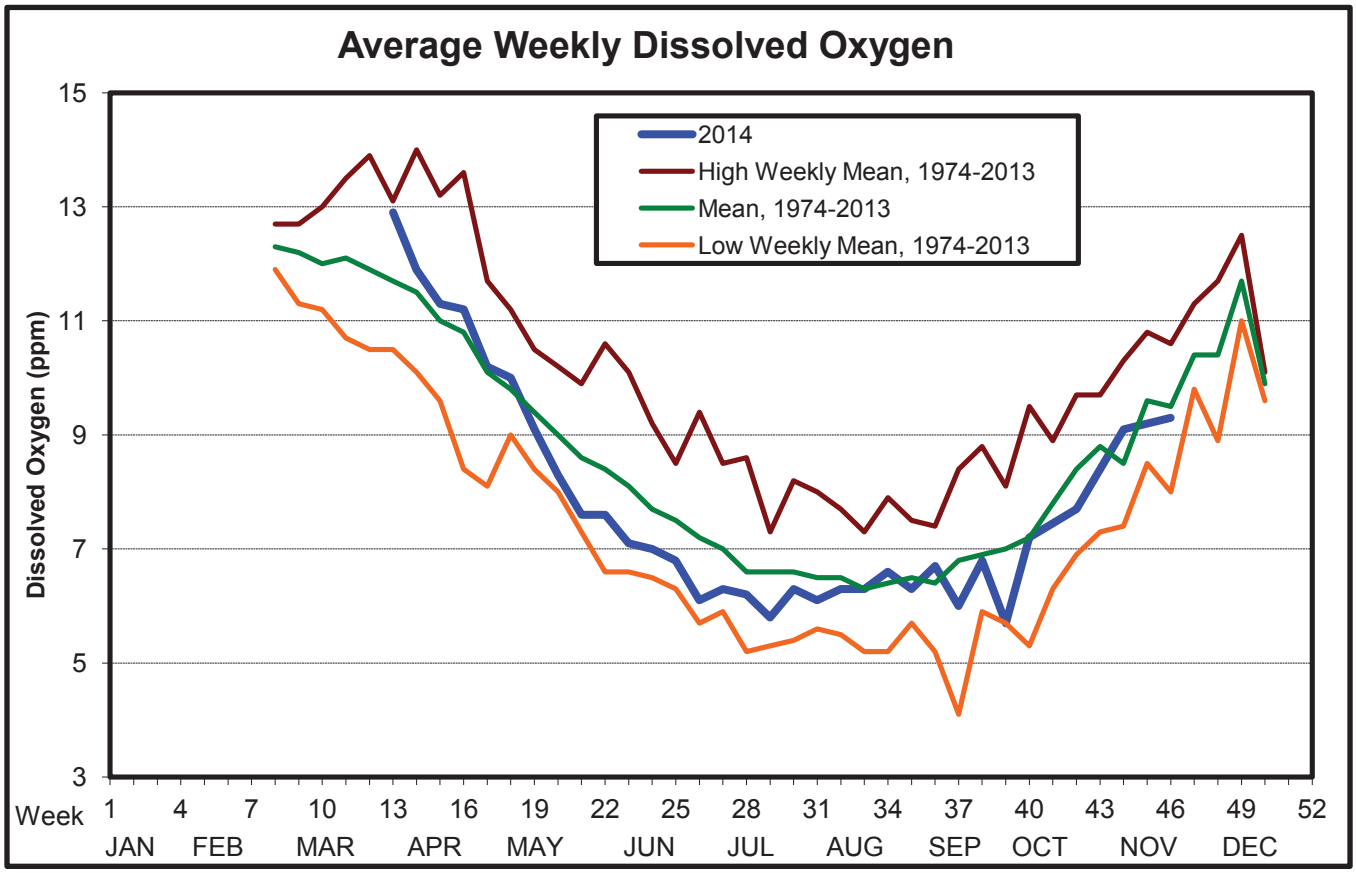


Figure 3-7. Seasonal variations in average weekly salinity from the 2014 Long River/Fall Juvenile surveys.

Long River/Fall Juvenile Survey



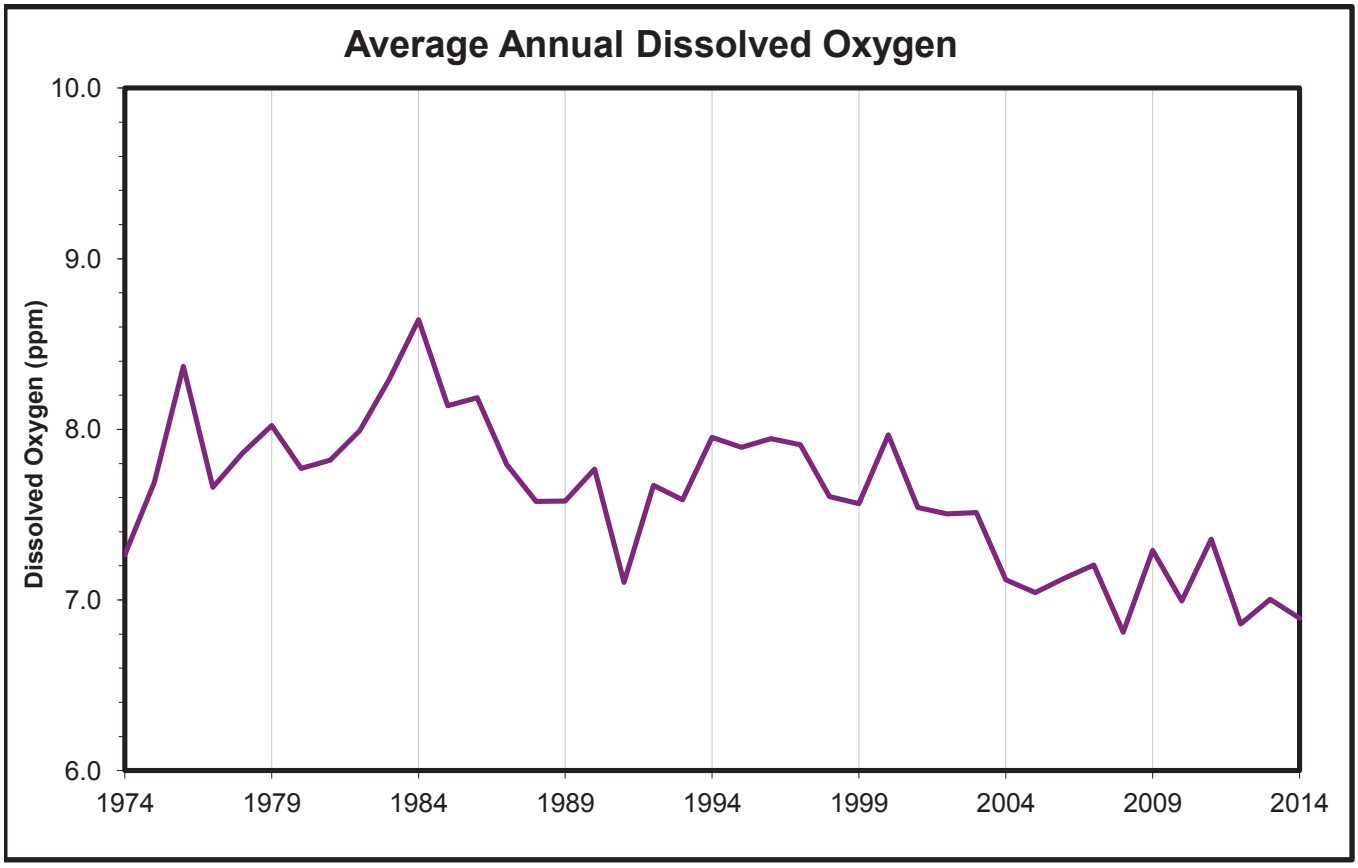
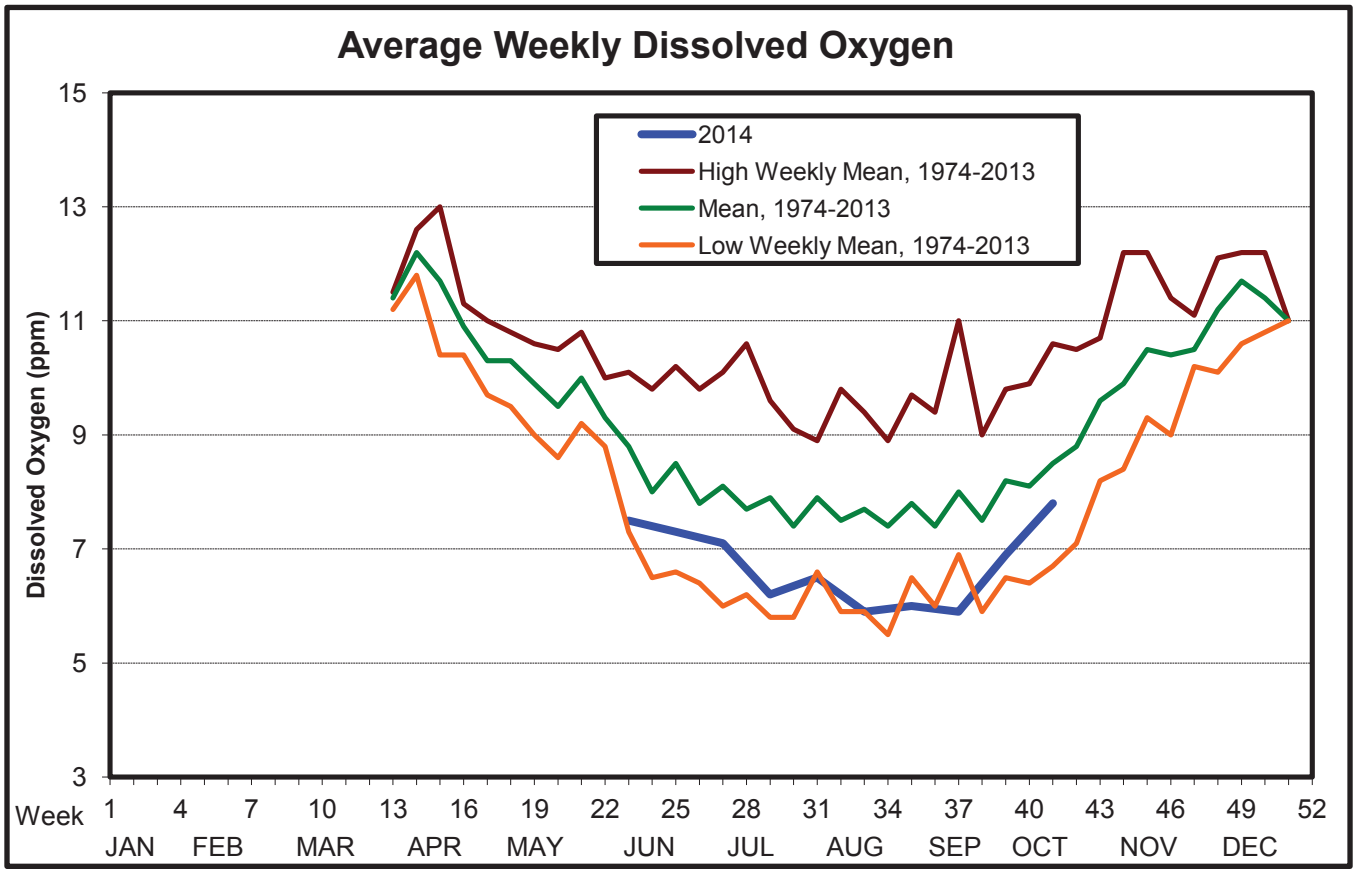


Figure 3-8. Seasonal and annual variations in dissolved oxygen from the Long River/Fall Juvenile surveys, 1974 - 2014.

Beach Seine Survey



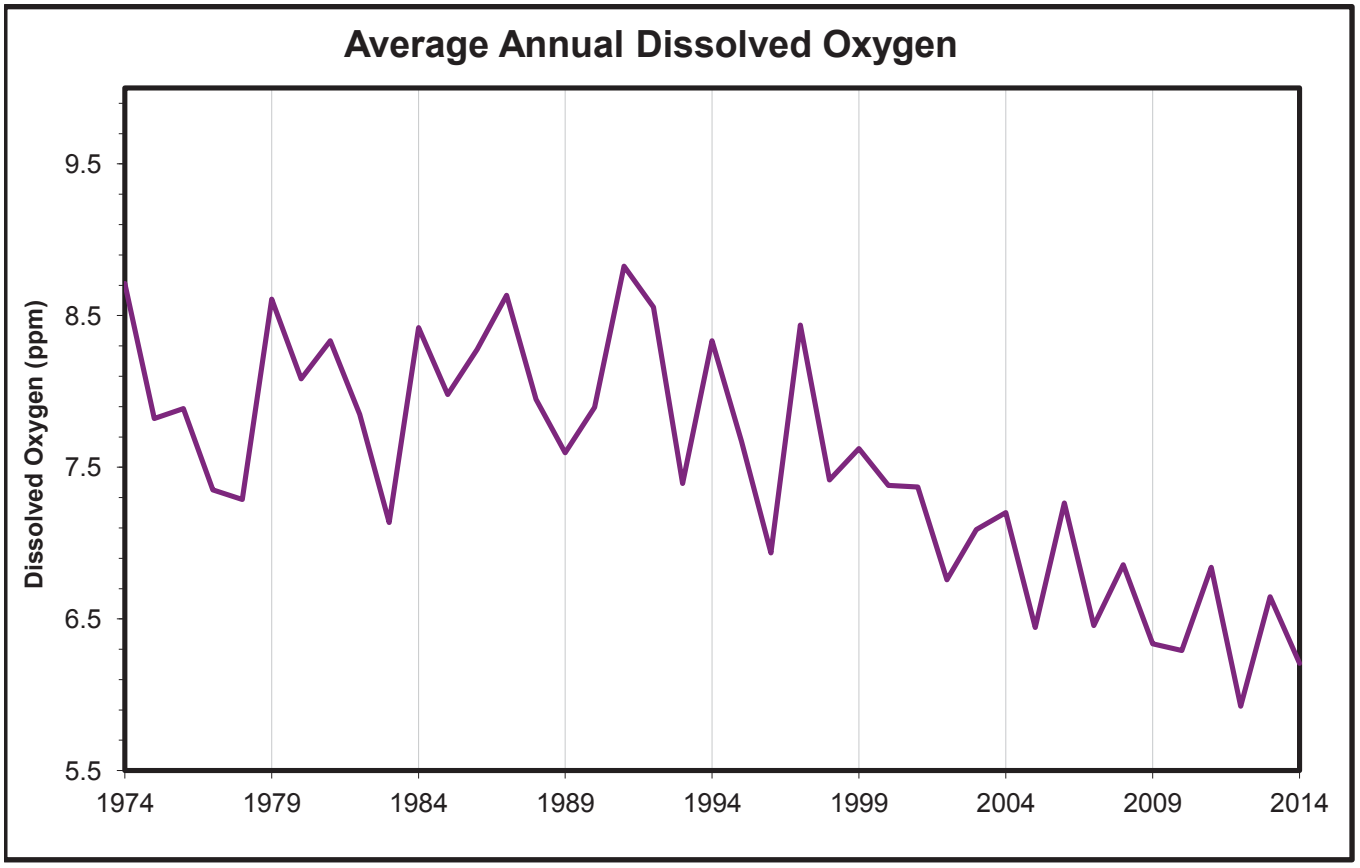
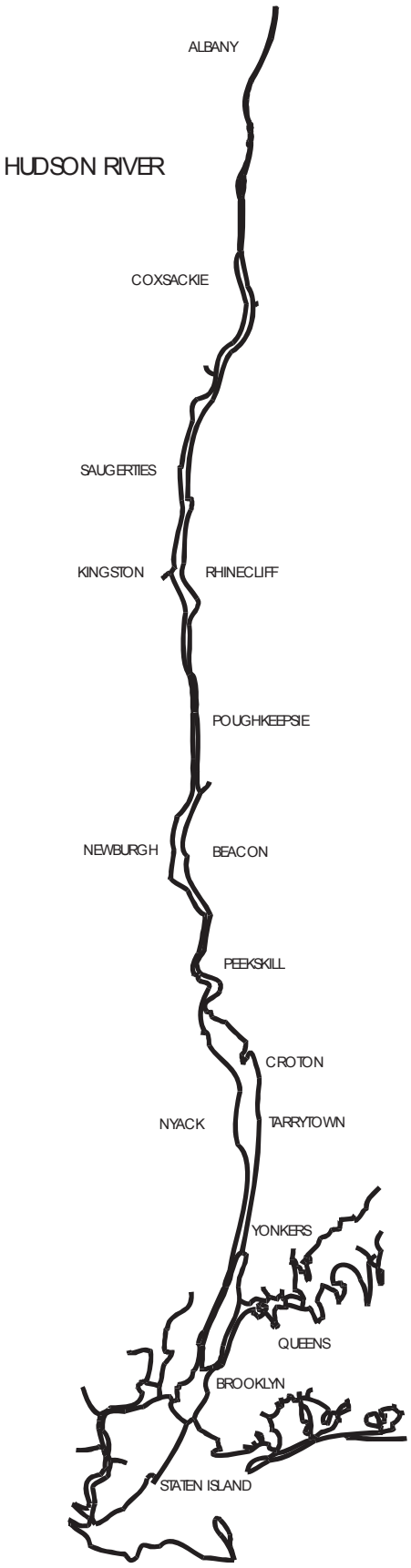


Figure 3-9. Seasonal and annual variations in dissolved oxygen from the Beach Seine surveys, 1974 - 2014.



2014 YEAR CLASS REPORT

for the Hudson River Estuary Monitoring Program

Prepared on behalf of

Entergy Nuclear Indian Point 2 L.L.C.
Entergy Nuclear Indian Point 3 L.L.C.
Entergy Nuclear Operations, Inc.

Prepared by

ASA Analysis & Communication
Solutions through Science

2014 Year Class Report for the Hudson River Estuary Monitoring Program

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