

MAX
MATTESONNATURAL HISTORY OF ELIPTIO COMPLANATUS

Eliptio complanatus is a fresh-water clam found in ^{many} certain lakes in Northeastern United States, the Great Lakes Region, and ~~perhaps~~ adjoining parts of Canada. The most accurate account on the distribution and description of this clam to date may be found in "Fresh-water Mollusca of Wisconsin", Volume II, by F.C. Baker.

The aims to be accomplished by my current research are twofold:

- (1) To complete the life history of the clam, Eliptio complanatus.
- (2) To observe and verify any ecological adaptations which Eliptio complanatus may complete under altered environmental conditions.

A satisfactory source for experimental stock had to be located before any extensive experimentation was begun. To date I have located two areas in Michigan where the clam is present in numbers: Upper Teguahmemon Falls (below falls) in Luce County, and Ocqueoc Lake, in Presque Isle County.

Ocqueoc Lake has been a very satisfactory source for the clams. It is reasonably close to the experimental lakes. What is more important the environmental conditions are such that the lake has an immense population of Eliptio complanatus, as well as smaller numbers of other varieties of clams.

Materials used for collecting were minnow buckets, small tubs, boats, and the trunk of my car. A glass-bottom bucket was somewhat useful for locating the general area inhabited by the clams but a more representative population was obtained by searching the bottom with the bare hands. In this way the small clams could be located as well as the large ones. The clams were transported in the trunk of a car.

Upon arriving at the Biological Station the clams were placed in stone tanks in which fresh lake water was entering slowly through a tap. They were kept in the tanks for various intervals of time (1 day to 4 weeks) until they could be used. Some clams were placed in tubs with no supply of fresh water in order that various phases of hardness might be studied.

During the summer enough clams were marked by a 3-cornered file with a code symbol to form four colonies of two-hundred clams each in each of four lakes: Bar Lake, Manistee County (two separate colonies); Lancaster Lake, Cheboygan County; and Douglas Lake, Cheboygan County.

Before measuring each clam was scraped. This removed any incrustation which might have adhered to the shell. The variation in the amount of material was considerable and would have caused a serious error in weight.

The clams were weighed to the nearest gram, and measured, in centimeters, for length, height, and width. Each one was allowed to dry for several minutes so that the amount of free water in each would be at the minimum. They were weighed individually on a torsion balance. Length was determined by the use of a sliding gauge (Fig. 1) which contacted the anterior and posterior extremities. Height and width also were gotten by the gauge by the widest and highest points of contact. As the edges of the shell were frail care was taken not to damage it by contact with the gauge.

After measurements were taken the clams were placed in a tub of water and transported to the selected lake. At the site chosen the clams were placed in any position on the bottom, and also at various depths so that observations might be made. Observations on the colonies were made at various intervals during the summer.

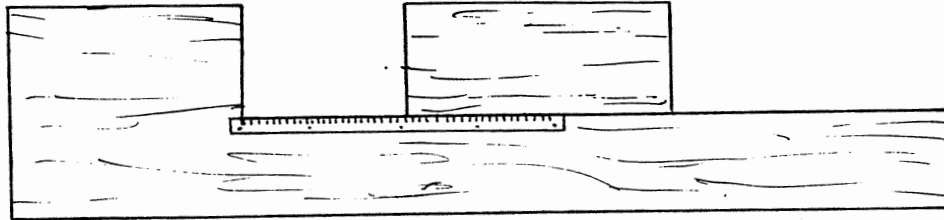


Fig. 1. Clam Measurer

The purpose for having a code was so that each clam could be studied individually. The marks were placed on the shell with a file. Seemingly the clam suffered no discomfort. Many devices might have been used but the above method seems to be most satisfactory, although erosion may destroy the marks in time. In an accompanying illustration the positions for marks may be seen (Fig. 2). As many combinations of letters as possible were placed on the shell, keeping each symbol as simple as possible.

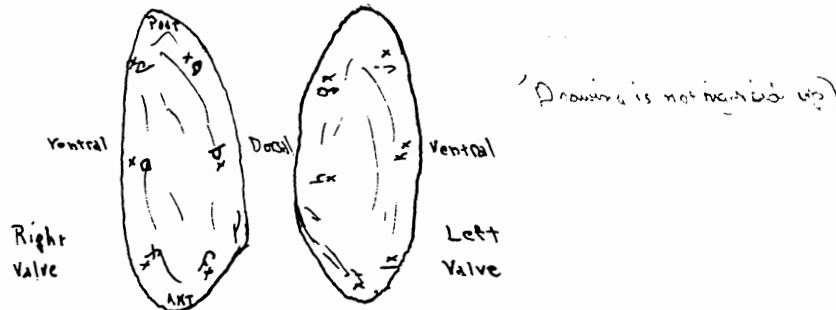


Fig. 2. Left and Right Valves of *Eliptio complanatus* showing position of symbols.

Ocqueoc Lake possesses an enormous population of Eliptio

complanatus. While it is rich also in other varieties such as Lampsilis siliquoidea, Anadonta grandis, and Ligumia nasuta they together do not equal the population of Eliptio complanatus.

Factors which may tend to make the lake productive are: (1) The amount of dissolved oxygen in the water is above that found in many lakes. (2) Aquatic plants grow profusely, probably supplying the oxygen and food for the clams. (3) The periphery of the lake possesses a flat shelf which extends lakeward for distances ranging from ten to fifty feet. Invariably there is a steep declivity at the edge of the shelf in from two to three and one-half feet of water. The summit of the sharper incline seems to be the most preferable location for the clam (Fig. 3).

Although this is a river-lake the current is probably so nominal that there is little silting. The bottom ranges from sandy clay to pure blue clay. The clams seem to prefer a mixture dominated by clay.

The lake is relatively deep in proportion to its surface area which tends to be a cooling influence.

As the hydrogen ion concentration is around 8.1 one can see that this factor is favorable. Also the carbonates and bicarbonates are present in satisfactory amounts.

In Lancaster Lake the clams were placed on a more gradual declivity. The accompanying chart (Fig. 5) shows any physico-chemical variations between the lakes chosen for the experiment.

The declivity in Douglas Lake is very steep. The bottom is composed of sand intermixed with silt.

In Bar Lake Station One is located on a steep sandy declivity highly exposed to the sun and protected enough to become quite warm. Station Two is located on a point which is exposed, the bottom being slightly silt-covered and Chara is present in considerable amounts.

At Station One, Bar Lake the clams descended until almost out of sight. On taking careful temperature readings it was noticed that the temperature there was very similar to that from which they came. The common rule seems to be that the species of clam ascend or descend in order that they may be inclosed in water at their optimum temperature (about 25 degrees Centigrade).

About one-hundred clams were kept without food for six weeks without any casualties. They were piled one on top of the other for a week at a time in stagnant water without any deaths. As long as the temperature was reasonably



Fig. 3. Shelf in Ocqueoc Lake

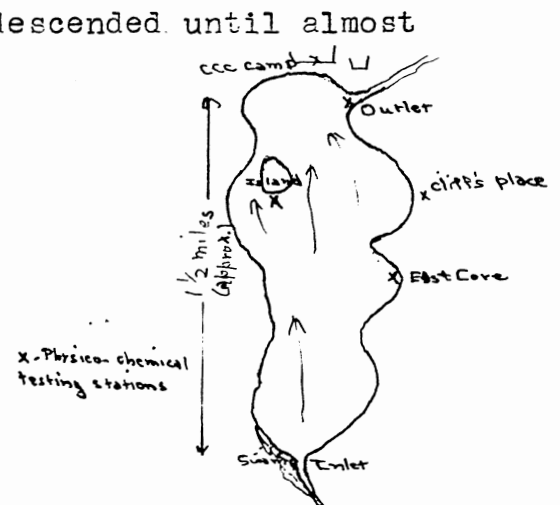


Fig. 4. Rough sketch of Ocqueoc Lake

Lake	Dissolved Oxygen cc. per l.	pH	Temp. C.	CO ₃ ppm	HCO ₃ ppm	Free CO ₂	Depth m.
Ocqueoc Lake							
East Cove (top)	6.32	8.0	26.2	13.86	.8	0.0	0
" " (bottom)	6.18	8.1	24.9	13.6	.8	0.0	1/3
(Bottom: sand, clay, and silt. Nuphar and Scirpus present)							
South end of (top)	5.99	8.0	25.6	13.8	.6	0.0	0
island (bottom)	5.92	8.1	26.2	13.8	.6	0.0	2/3
(Bottom: pure blue clay)							
Outlet (top)	5.85	8.1	24.4	13.8	.6	0.0	1/3
Bar Lake							
Station 1 (top)	6.92	8.1	27.7	15.7	.5	0.0	0
" (bottom)	5.79	8.1	25.6	15.7	.5	0.0	1
Station 2 (top)	6.12	8.1	27.0	16.0	.4	0.0	0
" (bottom)	5.99	8.1	25.5	16.0	.4	0.0	2/3
Lancaster Lake (top)							
" (bottom)	4.86	8.1	25.1	14.8	.4	0.0	0
	4.46	8.1	24.8	14.8	.4	0.0	2/3

Fig. 5. Physico-chemical Record of Lakes

dissolved oxygen content could also be low. At temperatures above 27°C. there had to be an increase in oxygen, or if the water remained stagnant the clams died immediately.

One interesting observation made was that the depth of penetration into the substratum by Eliptio complanatus is highly variable. Some entered the bottom until buried to the siphon. Others barely penetrated the bottom. The reason for this is probably a physiological difference between the clams.

The variation in body proportions is considerable. Even among members of the same sex there are marked differences. All of these differences may become magnified when placed in new environments until a new species seemingly may develop.

Several conclusions may be drawn from the observations taken on Eliptio complanatus. Probably all of these must be conditional as much more time must be spent before they become final. A few of them might be as follows:

- (1) They are able to withstand considerable punishment.
- (2) Temperature is the most important factor in governing vertical distribution.
- (3) One, a few, or a combination of several factors are necessary in order to have an abundance of the species. Some factors are ample oxygen supply, correct slope at the right depth on a declivity, correct combination of bottom materials, lack of silting, a pH of about 8.1.
- (4) Other factors probably influencing the abundance probably would be color of water, type of vegetation, water movements, abundance of fish host.

REMOVED FROM OCQUEOC LAKE JULY 2, 1941

MARKED AND RECORDED JULY 4 AND JULY 5, 1941

PLANTED IN BAR LAKE JULY 5, 1941

STATION NO. 1

<u>NUMBER</u>	<u>CODE</u>	<u>LENGTH</u>	<u>HEIGHT</u>	<u>WIDTH</u>	<u>WEIGHT</u>
1	a	120	60	33	169
2	ab	142	75	46	331
3	ac	131	68	45	226
4	ad	125	65	33	159
5	ae	127	70	38	211
6	af	150	76	42	311
7	ag	127	73	35	197
8	ah	127	69	38	202
9	ai	138	75	44	308
10	aj	131	69	34	183
11	ak	110	58	26	87
12	al	120	65	38	190
13	b	122	67	33	175
14	bc	119	57	27	114
15	bd	133	68	35	203
16	be	114	60	29	120
17	bf	135	68	37	198
18	bg	140	72	42	266
19	bh	120	66	37	150
20	bi	121	69	39	222
21	bj	125	74	37	225
22	bk	129	65	35	184
23	bl	114	54	25	73
24	c	129	65	35	171
25	cd	125	68	35	181
26	ce	134	72	39	240
27	cf	122	64	31	146
28	cg	121	60	29	126
29	ch	117	62	32	147
30	ci	130	64	33	165
31	cj	132	74	40	249
32	ck	114	57	26	85
33	cl	112	61	29	119
34	d	131	72	42	266
35	de	144	71	31	218
36	df	123	62	34	163
37	dg	122	62	39	200
38	dh	118	60	34	158
39	di	123	64	31	145
40	dj	124	68	40	226

<u>NUMBER</u>	<u>CODE</u>	<u>LENGTH</u>	<u>HEIGHT</u>	<u>WIDTH</u>	<u>WEIGHT</u>
41	dk	125	69	38	229
42	dl	132	66	40	225
43	e	124	70	35	188
44	ef	114	58	29	115
45	eg	111	64	31	135
46	eh	118	63	29	128
47	ei	116	68	32	158
48	ej	121	61	33	153
49	ek	132	69	34	189
50	el	128	70	40	255
51	f	110	57	30	116
52	fg	128	67	36	203
53	fh	137	69	34	202
54	fi	132	69	41	230
55	fj	123	72	38	210
56	fk	108	53	30	106
57	fl	129	65	34	172
58	g	137	74	40	291
59	gh	129	65	34	185
60	gi	121	64	39	196
61	gj	128	65	34	178
62	gk	130	65	36	170
63	gl	124	70	35	210
64	h	120	65	30	135
65	hi	121	64	32	141
66	hj	118	63	31	137
67	hk	120	63	33	148
68	hl	117	63	33	145
69	i	126	67	34	170
70	ij	119	61	33	146
71	ik	114	58	30	120
72	il	113	57	30	118
73	j	112	56	32	119
74	jk	112	60	30	119
75	jl	115	61	27	106
76	k	97	56	22	67
77	kl	141	75	38	269
78	l	113	60	28	101
79	aa	131	69	44	278
80	aabb	139	74	40	266
81	aacc	134	72	40	264
82	aadd	141	70	41	280
83	aaee	132	69	35	187
84	aaff	125	66	37	187
85	aagg	127	70	38	207

<u>NUMBER</u>	<u>CODE</u>	<u>LENGTH</u>	<u>HEIGHT</u>	<u>WIDTH</u>	<u>WEIGHT</u>
86	aahh	122	66	37	187
87	aa11	132	67	33	174
88	aa1j	134	70	34	204
89	aakk	121	66	34	180
90	aall	113	62	35	138
91	bb	120	66	35	171
92	bbcc	120	62	37	174
93	bbdd	129	65	38	197
94	bbee	129	67	37	194
95	bbff	114	60	27	109
96	bbgg	126	69	39	222
97	bbhh	113	60	33	134
98	bb11	126	67	41	201
99	bbjj	114	63	30	131
100	bbkk	129	70	36	198
101	bbll	131	72	40	286
102	cc	121	66	31	155
103	ccdd	125	66	37	191
104	ccee	128	73	38	250
105	ccff	116	60	34	140
106	ccgg	124	60	34	180
107	cchh	118	64	32	148
108	cc11	126	67	41	239
109	ccjj	122	64	32	149
110	cckk	113	63	34	146
111	cc11	113	57	27	102
112	dd	124	69	37	198
113	ddee	125	68	37	199
114	ddff	121	64	32	155
115	ddgg	117	64	32	159
116	ddhh	115	60	34	151
117	dd11	120	69	33	170
118	ddjj	120	63	32	147
119	ddkk	109	56	30	103
120	ddl1	137	72	39	254
121	ee	122	65	32	157
122	eeff	107	59	30	111
123	ee1j	125	62	37	183
124	eehh	123	60	36	171
125	ee11	124	65	34	159
126	eejj	118	65	28	118
127	eekk	125	67	39	213
128	ee11	111	62	31	126
129	ff	118	59	27	99
130	ffcc	111	56	27	91

<u>NUMBER</u>	<u>CODE</u>	<u>LENGTH</u>	<u>HEIGHT</u>	<u>WIDTH</u>	<u>WEIGHT</u>
131	ffhh	119	65	33	155
132	ffii	105	60	28	105
133	ffjj	115	62	29	127
134	ffkk	123	66	39	189
135	ffll	81	42	19	34
136	gg	120	62	34	151
137	gghh	120	65	35	164
138	ggii	140	75	35	261
139	ggjj	127	71	40	237
140	ggkk	122	61	32	131
141	glll	123	65	34	153
142	hh	119	60	33	130
143	hhii	113	62	33	129
144	hhjj	119	67	34	172
145	hhkk	112	59	34	124
146	hlll	121	62	36	161
147	ii	120	65	34	157
148	iijj	125	63	34	156
149	iikk	108	57	31	111
150	illl	126	66	36	184
151	jj	136	74	39	234
152	jjkk	127	69	39	218
153	jjll	115	56	28	104
154	kk	116	60	33	149
155	kkll	110	60	32	122
156	ll	125	65	34	170
157	abb	114	60	30	127
158	acc	111	62	30	126
159	add	115	59	30	117
160	aee	82	45	22	41

REMOVED FROM OCQUEOC LAKE JULY 9, 1941

MARKED AND RECORDED JULY 10, 1941

PLANTED IN BAR LAKE JULY 12, 1941

STATION NO. 1

<u>NUMBER</u>	<u>CODE</u>	<u>LENGTH</u>	<u>HEIGHT</u>	<u>WIDTH</u>	<u>WEIGHT</u>
161	aff	135	68	33	177
162	agg	139	79	42	291
163	ahh	118	60	35	155
164	aii	140	71	35	226
165	ajj	121	63	32	134
166	akk	122	68	36	197
167	all	126	65	32	140
168	baa	126	69	34	182
169	bcc	128	68	37	208
170	bdd	125	66	35	171
171	bee	135	71	35	206
172	bff	136	76	34	183
173	bgg	136	70	32	191
174	bhh	131	70	37	218
175	bii	119	67	39	211
176	bjj	125	61	30	125
177	bkk	135	70	35	204
178	bll	123	65	35	197
179	caa	113	61	31	137
180	cbb	110	62	27	101
181	cdd	136	72	38	224
182	cee	139	74	39	253
183	cff	137	72	37	217
184	cgg	131	68	33	174
185	chh	138	76	36	209
186	cii	135	68	37	195
187	cjj	134	66	37	183
188	ckk	130	73	34	202
189	cll	136	70	35	195
190	daa	138	67	34	169
191	dbb	130	66	34	163
192	dcc	119	66	35	176
193	dee	133	65	32	156
194	dff	120	65	34	168
195	dgg	119	66	31	146
196	dhh	133	70	34	190
197	dii	132	69	36	200
198	djj	125	67	32	168
199	dkk	114	57	28	103
200	dll	119	60	29	126

REMOVED FROM OCQUEEC LAKE JULY 9, 1941

MARKED AND RECORDED JULY 10, 1941

PLANTED IN BAR LAKE JULY 12, 1941

STATION NO. 2

<u>NUMBER</u>	<u>CODE</u>	<u>LENGTH</u>	<u>HEIGHT</u>	<u>WIDTH</u>	<u>WEIGHT</u>
201	ea	125	64	35	164
202	eb	131	66	38	193
203	ec	135	71	37	241
204	ed	119	58	28	110
205	ef	118	64	34	155
206	eg	122	61	28	103
207	eh	120	65	33	159
208	ei	110	61	26	100
209	ej	130	71	36	225
210	ek	121	63	31	152
211	el	120	62	33	148
212	fa	125	73	34	231
213	fb	125	66	38	210
214	fc	130	70	37	222
215	fd	128	68	35	169
216	fe	132	69	35	200
217	fg	125	62	32	147
218	fh	130	68	36	198
219	fi	129	71	35	198
220	fj	126	65	32	166
221	fk	123	67	32	147
222	fl	151	77	41	314
223	ga	130	69	33	183
224	gb	120	66	30	154
225	gc	123	64	33	176
226	gd	107	57	29	101
227	ge	125	65	31	155
228	gf	130	70	35	202
229	gh	124	65	33	154
230	gi	113	62	32	139
231	gj	120	61	33	132
232	gk	116	62	31	135
233	gl	123	63	30	128
234	ha	123	67	36	196
235	hb	128	70	33	174
236	hc	138	70	35	214
237	hd	125	63	37	190
238	he	122	60	33	143
239	hf	146	73	36	248
240	hg	125	65	35	180

<u>NUMBER</u>	<u>CODE</u>	<u>LENGTH</u>	<u>HEIGHT</u>	<u>WIDTH</u>	<u>WEIGHT</u>
241	hii	136	68	37	220
242	hjj	113	60	33	132
243	hkk	133	67	34	172
244	hll	121	59	32	133
245	iaa	125	65	35	165
246	ibb	138	72	34	220
247	icc	131	67	35	284
248	idd	142	73	36	225
249	iee	115	66	33	155
250	iff	110	60	33	131
251	igg	133	66	35	202
252	ihh	125	65	30	139
253	ijj	121	56	28	105
254	ikk	128	68	35	192
255	ill	117	61	31	141
256	jaa	120	65	29	135
257	jbb	119	62	31	137
258	jcc	125	68	35	189
259	jdd	139	73	45	285
260	jee	145	74	39	265
261	jff	116	63	33	155
262	jgg	140	67	40	234
263	jhh	118	68	32	141
264	jii	108	57	29	104
265	jkk	131	69	39	247
266	jll	117	64	31	128
267	kaa	132	68	38	196
268	kbb	127	69	30	169
269	kcc	117	64	35	177
270	kdd	122	62	33	159
271	kee	112	65	32	150
272	kff	121	65	35	172
273	kgg	110	53	26	82
274	khh	128	69	37	201
275	kii	108	57	28	106
276	kjj	133	70	35	198
277	kll	122	67	39	221
278	laa	127	71	33	162
279	lbb	125	62	34	168
280	lcc	130	67	35	177
281	ldd	127	68	32	155
282	lee	134	74	38	221
283	lff	117	63	30	141
284	lgg	122	63	30	143
285	lhh	118	64	29	125

<u>NUMBER</u>	<u>CODE</u>	<u>LENGTH</u>	<u>HEIGHT</u>	<u>WIDTH</u>	<u>WEIGHT</u>
286	lji	128	68	37	206
287	ljj	124	68	38	210
288	lkk	128	70	34	163
289	abc	129	71	35	188
290	dbc	128	66	34	182
291	ebc	119	61	33	154
292	fbc	133	70	37	204
293	gbc	141	66	38	205
294	hbc	128	65	35	199
295	ibc	132	72	36	206
296	jbc	137	71	40	261
297	kbc	152	79	44	298
298	lbc	131	69	38	247
299	acd	126	65	36	181
300	ecd	131	66	33	165
301	fed	122	59	35	166
302	gcd	112	61	40	190
303	hcd	118	65	30	131
304	icd	128	70	35	195
305	jcd	117	60	32	146
306	kcd	119	60	32	128
307	ade	135	73	39	228
308	bde	130	66	31	231
309	ede	113	58	32	127
310	ede	142	75	47	358
311	hde	119	63	33	155
312	ide	116	59	28	104
313	jde	122	66	33	178
314	kde	121	60	28	119
315	lde	130	70	38	215
316	aef	138	71	37	223
317	bef	125	66	36	175
318	cef	114	63	30	129
319	gef	112	62	35	160
320	hef	134	78	37	222
321	ief	108	57	30	109
322	jef	113	60	27	101
323	kef	129	65	35	177
324	lef	108	60	31	129
325	afg	111	58	30	114
326	bfg	133	72	35	200
327	cfg	125	64	33	162
328	dfg	114	63	32	125
329	hfg	130	70	34	206
330	ifg	131	65	37	175

<u>NUMBER</u>	<u>CODE</u>	<u>LENGTH</u>	<u>HEIGHT</u>	<u>WIDTH</u>	<u>WEIGHT</u>
331	jfg	124	72	34	202
332	kfg	127	70	39	241
333	lfg	126	68	35	198
334	agh	131	70	34	198
335	bgh	122	62	34	167
336	cgh	120	65	32	166
337	dgh	125	69	32	167
338	egh	118	63	35	152
339	igh	134	67	35	200
340	jgh	120	58	33	139
341	kgh	112	58	30	119
342	lgh	120	68	39	221
343	ahi	128	67	36	190
344	bhi	106	59	28	92
345	chi	133	71	39	242
346	dhi	117	59	29	120
347	ehi	126	69	34	195
348	fhi	133	67	38	215
349	jhi	130	70	38	221
350	khi	131	76	38	244
351	lhi	122	67	33	156
352	aij	127	72	34	182
353	bij	114	63	32	139
354	cij	132	69	38	204
355	dij	129	69	36	210
356	eij	125	67	32	154
357	fi j	119	63	32	153
358	gi j	120	63	36	175
359	ki j	117	64	34	157
360	li j	125	65	38	196
361	ajk	108	59	29	121
362	bjk	128	71	31	193
363	ckj	132	65	38	207
364	djk	108	39	28	97
365	ejk	129	69	31	176
366	fjk	120	64	32	150
367	gjk	129	73	37	217
368	hjk	123	68	35	183
369	ljk	122	66	29	140
370	akl	127	66	34	179
371	bkl	140	68	37	217
372	ckl	109	58	29	115
373	dcl	130	65	33	166
374	ekl	104	60	30	116
375	flk	136	69	38	238

<u>NUMBER</u>	<u>CODE</u>	<u>LENGTH</u>	<u>HEIGHT</u>	<u>WIDTH</u>	<u>WEIGHT</u>
376	gkl	114	61	29	121
377	hkl	133	69	36	154
378	ikl	114	61	32	128
379	abcd	125	65	39	227
380	bbcd	117	62	33	134
381	cbcd	125	66	35	171
382	dbcd	115	63	32	137
383	ebcd	126	63	38	195
384	fbcd	125	66	31	150
385	gbcd	120	65	33	158
386	hbcd	123	66	35	178
387	ibcd	115	60	32	126
388	jbcd	135	70	38	215
389	kbcd	137	70	36	219
390	lbcd	119	64	28	133
391	acde	132	68	37	207
392	ccde	127	66	35	187
393	dcde	140	75	40	274
394	ecde	120	62	30	127
395	fcde	125	72	34	191
396	gcde	127	69	34	184
397	hcde	123	68	34	158
398	icde	135	72	33	197
399	jcde	137	65	32	170
400	kcde	131	76	37	233

REMOVED FROM OCQUEOC LAKE JULY 9, 1941

MARKED AND RECORDED JULY 16, 1941

PLANTED IN LANCASTER LAKE JULY 16, 1941

<u>NUMBER</u>	<u>CODE</u>	<u>LENGTH</u>	<u>HEIGHT</u>	<u>WIDTH</u>	<u>WEIGHT</u>
1	a	126	67	38	205
2	ab	131	67	34	203
3	ac	124	64	32	165
4	ad	124	66	36	190
5	ae	121	62	34	157
6	af	120	63	34	184
7	ag	118	61	33	145
8	ah	116	58	28	124
9	ai	137	68	34	211
10	aj	122	65	33	188
11	ak	130	63	42	241
12	al	115	59	31	138
13	b	121	63	33	152
14	bc	133	66	33	180
15	bd	119	60	31	141
16	be	141	70	38	244
17	bf	113	62	35	164
18	bg	106	54	27	90
19	bh	123	72	32	188
20	bi	140	72	43	298
21	bj	125	65	36	194
22	bk	126	64	30	148
23	bl	116	63	30	135
24	c	123	63	30	137
25	cd	120	64	32	152
26	ce	133	64	41	250
27	cf	133	71	36	231
28	ca	121	63	33	166
29	ch	116	61	32	149
30	ci	128	70	38	228
31	cj	109	60	31	127
32	ck	124	67	43	280
33	cl	130	64	37	215
34	d	119	63	28	136
35	de	121	63	31	144
36	df	132	66	34	190
37	dg	143	73	38	257
38	dh	128	65	30	145
39	di	115	56	33	109
40	dk	124	69	41	255

<u>NUMBER</u>	<u>CODE</u>	<u>LENGTH</u>	<u>HEIGHT</u>	<u>WIDTH</u>	<u>WEIGHT</u>
41	ej	127	67	36	207
42	el	134	72	36	229
43	f	126	64	35	179
44	fg	138	71	39	251
45	fh	119	59	30	130
46	fi	114	60	28	119
47	fj	113	60	32	136
48	fk	144	77	42	301
49	fl	123	68	36	212
50	g	125	65	35	191
51	gh	125	67	37	222
52	gi	111	61	27	117
53	gj	108	54	28	103
54	gk	110	58	30	125
55	gl	112	69	35	202
56	h	112	59	28	104
57	hi	120	64	28	130

REMOVED FROM OCQUECC LAKE JULY 9, 1941

MARKED AND RECORDED JULY 30, 1941

PLANTED IN LANCASTER LAKE JULY 30, 1941

NUMBER	CODE	LENGTH	HEIGHT	WIDTH	WEIGHT
58	dj	137	79	45	342
59	dl	137	69	41	265
60	e	137	68	38	215
61	ef	117	58	29	127
62	eg	130	67	38	220
63	eh	138	70	36	239
64	ei	122	66	32	157
65	ek	127	66	39	223
66	hj	95	47	26	62
67	hk	126	70	37	206
68	hl	125	61	30	134
69	i	129	70	32	179
70	ij	90	44	25	53
71	ik	109	54	25	84
72	il	121	68	34	189
73	j	141	74	43	268
74	jk	136	68	42	264
75	jl	106	54	30	109
76	k	126	65	36	163
77	kl	108	65	33	166
78	l	126	71	40	223
79	aa	130	73	38	253
80	aabb	101	51	26	123
81	aacc	143	74	42	293
82	aadd	126	74	33	197
83	aeee	130	69	36	184
84	aaff	126	69	32	169
85	aagg	128	69	35	200
86	aahh	133	66	37	206
87	aaii	125	64	33	175
88	ajjj	130	65	36	194
89	akkk	138	77	45	322
90	aall	115	57	27	105
91	bb	105	55	27	87
92	bbcc	121	63	30	140
93	bbdd	124	64	33	170
94	bbee	135	68	37	212
95	bbff	118	65	31	152

<u>NUMBER</u>	<u>CODE</u>	<u>LENGTH</u>	<u>HEIGHT</u>	<u>WIDTH</u>	<u>WEIGHT</u>
96	bbgg	125	68	34	172
97	bbhh	123	57	28	116
98	bbii	130	68	34	197
99	bbjj	136	66	36	213
100	bbkk	120	68	32	171
101	bbll	140	77	40	262
102	cc	120	63	28	120
103	ccdd	124	67	33	176
104	ccee	133	74	34	227
105	ccff	125	67	32	165
106	ccgg	131	69	33	180
107	cchh	126	59	31	131
108	ccii	108	60	34	128
109	ccjj	125	64	34	154
110	cckk	105	55	26	84
111	ccll	124	67	36	167
112	dd	136	80	39	278
113	ddee	117	62	39	197
114	ddff	133	73	34	200
115	ddgg	119	65	34	158
116	ddhh	95	48	24	57
117	ddii	124	61	35	171
118	ddjj	87	46	22	45
119	ddkk	129	69	35	184
120	ddll	129	73	34	208
121	ee	122	67	36	184
122	eeff	129	64	29	139
123	eegg	134	65	35	179
124	eehh	128	66	33	163
125	eeii	126	68	34	195
126	eejj	129	65	34	186
127	eekk	126	67	35	176
128	eell	117	65	33	154
129	ff	127	67	35	194
130	ffgg	123	62	28	127
131	ffhh	115	62	32	132
132	ffii	129	77	38	241
133	ffjj	127	69	30	153
134	ffkk	128	65	38	192
135	ffll	126	64	33	151
136	gg	128	68	34	189
137	gghh	119	64	33	148
138	ggii	133	66	34	190
139	ggjj	131	71	36	210
140	ggkk	129	64	35	169

<u>NUMBER</u>	<u>CODE</u>	<u>LENGTH</u>	<u>HEIGHT</u>	<u>WIDTH</u>	<u>WEIGHT</u>
141	ggll	135	77	36	255
142	hh	125	61	32	145
143	hhii	122	66	37	202
144	hhjj	126	68	34	179
145	hhkk	135	68	37	208
146	hhll	117	61	32	138
147	ii	118	61	30	138
148	iijj	118	66	32	153
149	iikk	126	71	35	228
150	ii ll	111	56	30	108
151	jj	125	66	38	202
152	jjkk	125	62	30	138
153	jjll	121	64	35	182

REMOVED FROM OCQUEOC LAKE JULY 17, 1941

154	kk	130	72	40	241
155	kkll	115	64	31	137
156	ll	123	66	32	168
157	abb	118	65	37	187
158	acc	128	65	37	198
159	add	128	67	32	183
160	ae	131	71	38	235
161	aff	116	58	33	147
162	agg	128	64	35	176
163	ahh	116	62	33	156
164	aii	114	64	37	175
165	ajj	114	62	31	150
166	akk	130	68	35	190
167	all	123	63	37	175
168	baa	102	57	25	87
169	bcc	122	66	36	183
170	bdd	137	68	41	246
171	bee	131	65	32	176
172	bff	137	70	34	216
173	bgg	113	58	30	107
174	bhh	129	67	37	198
175	bii	129	68	36	199
176	bjj	115	63	35	147
177	bkk	117	64	33	158
178	bll	120	68	36	187
179	caa	114	65	35	173
180	cbb	106	55	30	105

<u>NUMBER</u>	<u>CODE</u>	<u>LENGTH</u>	<u>HEIGHT</u>	<u>WIDTH</u>	<u>WEIGHT</u>
181	cdd	111	56	29	110
182	cee	128	68	38	235
183	cff	109	61	29	119
184	egg	98	53	23	62
185	chh	115	63	33	163
186	cii	122	67	32	155
187	cjj	132	73	33	207
188	ckk	118	65	35	167
189	cll	139	70	38	256
190	daa	120	65	31	140
191	dbb	128	68	35	196
192	dcc	123	67	38	209
193	dee	120	68	32	157
194	dff	123	69	37	214
195	dgg	117	60	33	137
196	dhh	122	66	33	188
197	dii	126	68	35	192
198	djj	87	47	22	52
199	dkk	97	49	24	61
200	dll	121	62	34	176

REMOVED FROM OCQUEOC LAKE JULY 17, 1941

MARKED AND RECORDED AUGUST 8, 1941

PLANTED IN NORTH FISHTAIL BAY, DOUGLAS LAKE AUGUST 8, 1941

<u>NUMBER</u>	<u>CODE</u>	<u>LENGTH</u>	<u>HEIGHT</u>	<u>WIDTH</u>	<u>WEIGHT</u>
1	a	130	68	37	212
2	ab	98	51	24	65
3	ac	115	64	36	181
4	ad	151	77	43	296
5	ae	123	63	30	136
6	af	124	68	29	140
7	ag	131	66	37	211
8	ah	93	45	23	49
9	ai	116	60	30	120
10	aj	132	69	34	196
11	ak	125	65	37	190
12	al	127	68	34	185
13	b	120	64	33	153
14	bc	121	63	33	153
15	bd	134	67	39	231
16	be	120	67	34	179
17	bf	118	64	31	145
18	bg	100	50	24	60
19	bh	114	57	28	109
20	bi	133	74	38	239
21	bj	114	60	29	109
22	bk	103	54	30	111
23	bl	113	57	33	123
24	c	117	63	31	139
25	cd	116	56	30	113
26	ce	122	67	38	225
27	cf	91	48	21	46
28	cg	128	67	38	217
29	ch	115	60	30	118
30	ci	123	65	33	159
31	cj	138	68	36	197
32	ck	129	70	37	203
33	cl	117	62	33	140
34	d	126	65	32	160
35	de	139	71	40	250
36	df	117	64	34	156
37	dg	129	69	33	183
38	dh	123	68	36	196
39	di	113	58	30	111
40	dj	127	68	31	148

<u>NUMBER</u>	<u>CODE</u>	<u>LENGTH</u>	<u>HEIGHT</u>	<u>WIDTH</u>	<u>WEIGHT</u>
41	dk	140	70	38	225
42	dl	126	63	33	161
43	e	112	60	30	113
44	ef	114	60	27	107
45	eg	126	70	34	179
46	eh	128	67	36	191
47	ei	131	70	34	169
48	ej	124	64	35	174
49	ek	120	68	34	171
50	el	126	60	32	146
51	f	107	58	29	126
52	fg	103	57	25	82
53	fh	130	69	38	214
54	fi	138	70	33	187
55	fj	118	60	34	160
56	fk	133	68	37	209
57	fl	117	61	33	141
58	g	121	63	36	173
59	gh	128	68	34	173
60	gi	115	60	28	110
61	gj	83	41	21	34
62	gk	118	61	34	157
63	gl	84	45	21	39
64	h	109	55	27	95
65	hi	141	77	36	244
66	hj	131	68	41	250
67	hk	124	68	36	199
68	hl	114	56	31	109
69	i	100	54	28	83
70	ij	125	62	32	150
71	ik	128	70	37	204
72	il	110	62	31	133
73	j	100	52	24	70
74	jk	110	60	30	122
75	jl	117	62	26	108
76	k	113	61	32	129
77	kl	120	70	30	150
78	l	128	72	37	227

REMOVED FROM OCQUEOC LAKE JULY 17, 1941

MARKED AND RECORDED AUGUST 13, 1941

PLANTED IN NORTH FISHTAIL BAY, DOUGLAS LAKE AUGUST 13, 1941

<u>NUMBER</u>	<u>CODE</u>	<u>LENGTH</u>	<u>HEIGHT</u>	<u>WIDTH</u>	<u>WEIGHT</u>
79	aa	119	58	29	113
80	aabb	125	69	41	272
81	aacc	129	70	33	176
82	aadd	118	66	30	137
83	aeee	135	71	34	183
84	aaff	122	62	36	165
85	aagg	112	58	27	107
86	sahh	120	65	32	171
87	saai	91	47	23	51
88	saaj	119	65	30	141
89	sakk	125	64	29	137
90	sall	135	69	38	236
91	bb	119	60	30	123
92	bbcc	125	62	38	180
93	bbdd	113	61	29	111
94	bbee	117	62	28	127
95	bbff	127	67	35	175
96	bbgg	124	63	31	143
97	bbhh	77	40	18	28
98	bbii	112	63	35	149
99	bbjj	113	64	31	138
100	bbkk	112	61	32	156
101	bbll	117	62	29	127
102	cc	121	65	36	185
103	ccdd	102	51	24	67
104	ccee	87	43	19	38
105	ccff	102	53	28	82
106	ccgg	140	71	31	175
107	cchh	114	58	29	114
108	ccii	97	52	22	59
109	ccjj	131	67	35	181
110	cckk	130	68	33	173
111	ccll	112	62	33	143
112	dd	128	72	31	179
113	ddee	135	73	42	270
114	dfff	123	72	33	197
115	ddgg	131	68	38	226

<u>NUMBER</u>	<u>CODE</u>	<u>LENGTH</u>	<u>HEIGHT</u>	<u>WIDTH</u>	<u>WEIGHT</u>
116	ddhh	120	67	34	186
117	ddii	128	65	38	153
118	ddjj	125	69	34	195
119	ddkk	119	63	31	137
120	ddl1	113	63	28	120
121	ee	107	60	26	94
122	eeff	67	33	15	15
123	eegg	130	67	31	165
124	eehh	127	64	39	232
125	eeii	120	63	36	168
126	eejj	104	58	30	109
127	eekk	136	67	33	190
128	eell	140	74	40	302
129	ff	135	67	40	244
130	ffgg	138	72	34	206
131	ffhh	121	57	33	136
132	ffii	108	57	25	85
133	ffjj	130	71	35	194
134	ffkk	119	67	38	202
135	ffll	124	66	31	150
136	gg	116	62	30	138
137	gghh	119	62	36	178
138	ggii	115	62	27	111
139	ggjj	119	66	29	119
140	gkkk	112	60	39	194
141	gell	124	63	35	154
142	hh	123	74	35	208
143	hhii	109	55	29	107
144	hhjj	122	66	29	140
145	hhkk	118	59	29	123
146	hhll	122	60	34	146
147	ii	115	62	31	138
148	iijj	138	74	74	249
149	iikk	123	66	33	157
150	iill	120	64	31	151
151	jj	115	61	28	130
152	jjkk	138	69	31	172
153	jjll	132	72	36	228
154	kk	123	65	34	170
155	kkll	128	68	34	188
156	ll	131	66	35	183
157	abb	120	64	32	161
158	acc	132	66	35	192
159	add	117	63	32	141
160	ae	125	64	30	143

<u>NUMBER</u>	<u>CODE</u>	<u>LENGTH</u>	<u>HEIGHT</u>	<u>WIDTH</u>	<u>WEIGHT</u>
161	aff	135	71	37	93
162	agg	119	66	34	177
163	ahh	121	65	31	155
164	aii	110	56	27	94
165	ajj	135	70	39	236
166	akk	118	56	28	108
167	all	105	54	31	105
168	baa	122	66	33	164
169	bcc	125	68	41	237
170	bdd	137	68	41	244
171	bee	121	67	31	158
172	bff	120	69	30	145
173	bgg	124	66	35	176
174	bhh	110	58	27	77
175	bii	102	56	26	84
176	bjj	121	65	33	172
177	bkk	117	61	35	170
178	bll	126	62	29	138
179	caa	98	51	22	59
180	cbb	122	63	31	135
181	cdd	115	61	32	152
182	cee	115	61	30	126
183	cff	128	70	36	229
184	cgg	74	40	18	28
185	chh	127	66	36	187
186	cii	128	66	32	160
187	cjj	105	60	30	111
188	ckk	109	57	32	122
189	cll	118	60	32	144
190	daa	132	69	42	250
191	dbb	98	48	23	60
192	dcc	108	55	28	96
193	dee	127	66	39	224
194	dff	130	65	36	185
195	deg	114	65	30	133
196	dhh	101	50	22	60
197	dii	109	58	27	98
198	djj	92	47	22	53
199	dkk	115	63	29	123
200	dll	121	64	36	183

LENGTH OF SHELL OF ELLIPTIC COMPLANATUS

Length in mm.	Bar Lake Sta. #1	Bar Lake Sta. #2	Lancaster Lake	Douglas Lake	TOTAL
66					
67				1	1
68					1
69					
70					
71					
72					
73					1
74				1	
75					
76					
77				1	
78					1
79					
80					
81	1				
82	1				
83				1	4
84				1	
85					
86					
87			2	1	
88					4
89					
90			1		
91				2	
92				1	
93				1	6
94					
95			2		
96					
97	1		1	1	
98			1	3	10
99					
100				3	
101			1	1	
102			1	3	
103				2	15
104		1		1	
105	1		2	2	
106		1	3		
107	1	1		2	
108	2	6	3	2	42
109	1	1	3	4	
110	4	3	1	4	

Length in mm.	Bar Lake Sta. #1	Bar Lake Sta. #2	LANCASTER Lake	Douglas Lake	TOTAL
111	4	1	3		
112	4	4	2	6	
113	8	4	3	6	93
114	9	5	4	6	
115	5	3	7	9	
116	3	3	5	3	
117	3	8	6	9	
118	7	5	6	7	137
119	9	7	5	8	
120	13	12	8	10	
121	10	5	8	8	
122	8	10	7	6	
123	7	7	9	7	169
124	6	3	8	7	
125	14	20	11	8	
126	7	5	15	5	
127	6	8	4	6	
128	5	11	11	10	148
129	7	5	9	3	
130	4	11	9	6	
131	7	9	5	6	
132	7	6	2	4	
133	3	8	7	2	94
134	4	3	2	1	
135	5	4	3	6	
136	5	2	3	1	
137	4	3	6	1	
138	3	3	3	5	56
139	3	1	1	1	
140	3	3	2	3	
141	2	1	2	1	
142	1	2			
143			2		14
144	1		1		
145		1			
146		1			
147					
148					2
149					
150	1				
151		1		1	
152		1			
153					3
154					
155					