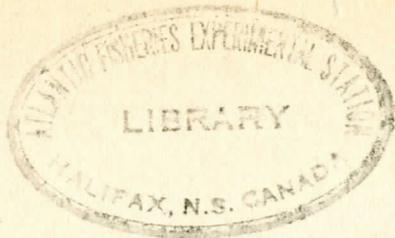


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No.

Title
A report on the clam investigations carried out
on the Sissiboo river.

Author
R. A. Ingalls.

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During the summers of 1941 and 1942 a number of experimental plots were set up at Weymouth North on the Sissiboo river under the joint auspices of the Nova Scotia Economic Council and the Fisheries Research Board of Canada. The purpose of the investigation was to make a study of the factors influencing the growth and distribution of clams.

The work was conducted by R. A. Ingalls of Mount Allison University and A. W. H. Needler of the Fisheries Research Board. The project was financed by the Nova Scotia Government through the Economic Survey Committee of the Economic Council. The flats used were reserved by the Department of Fisheries, Ottawa, which also supplied a guardian for the experimental area.

The following is an outline of the experiments performed with comments on the results obtained:

1. An experiment on the growth and survival of clams as affected by stunting and crowding.

For this experiment a plot seventy feet square was chosen in an area which appeared to be one of the best clam-producing areas of the flat. It was then cleared of all clams and divided into five rows of plots, each being fifteen feet square. Within each square there was then marked off four five-foot squares in a, b, c and d as shown in figure 1. Plots 1, 2, 3, 4 and 5 were given different positions in each of the five rows in order that they be distributed as evenly as possible on the various types of bottom within the experimental area. For convenience of reference the plots were further numbered consecutively from one to twenty-five. Each plot was planted with clams which had been carefully measured and this necessitated the digging, measuring and planting of approximately fifty thousand small clams ($1\frac{1}{4}$ " x $1\frac{3}{8}$ "). Each plot was divided into four smaller areas in order to give an experimental area in each for sampling over a period of four years. The contents of each of the four plots in each row is shown in table 1.

Square (a) in each of the twenty-five plots was dug during the summer of 1942, one year after planting. The clams were measured to determine the difference in the rate of growth, if any, between normal and stunted types. A study was also made of the effect of stunting and crowding on survival. The results obtained are recorded in table 2, summarized in table 3, and the growth curves represented graphically in figure 2.

The mortality was considerable in all experimental plots, being as high as 37.1 per cent in one case. There was no evidence, however, that the plots with the highest concentration, namely forth per square foot, gave any higher mortality than those with

the lowest concentration, which was ten per square foot. The results do seem to indicate that the stunted clams survived better than the normal.

The growth of stunted clams still lagged behind that of normal clams, but is considerably greater than in previous years as shown by the growth rings. It remains to be seen whether, after the stunted clams have become acclimatized to their new type of bottom, they might show a growth equal to that of normal clams with which they are being compared.

Some rather isolated experiments of a similar nature were conducted in boxes sunken in the flat. Three boxes, P, Q, and R, each with two compartments, one foot square, were planted in 1941 with one-inch, one-and-one-quarter-inch and one-and-one-half-inch clams respectively. The concentrations used in the various boxes are shown in table 1 and the results obtained at the end of one year are given in table 4. The growth curves are very similar to those in the previously described experiment with the greatest number of clams showing a maximum growth of approximately one quarter of an inch. The growth of clams of different sizes did not appear markedly different. The experiment did differ from that previously described in that a higher mortality occurred in the compartments where there was greatest concentration of clams.

In order to obtain additional information on the effect of crowding on survival, a number of plots were set up in 1942 in which a concentration of eighty clams per square foot was employed. This set-up is shown in figure 3 and the details of the individual plots are given in table 1. Results will not be available before the summer of 1943.

2. The effect of digging on small clams.

For this experiment forty-foot plots were employed. Each plot was divided into ten-foot areas and alternate ten-foot areas were dug as if digging for commercial purposes. After allowing these to stand for three weeks, sufficient time to allow any clams adversely affected by the digging to die, a five-foot area out of every ten-foot area was dug, screened and a record kept of everything taken from each area. The results are shown in 5-12. This experiment was carried out at two different levels on the flat, one near the channel and the other nearer high tide level. It was further repeated at four different seasons of the year in order to determine whether the season influences the results.

In all of the plots, both dug and undug, there was rather a high mortality of small clams. This was evident from

the large number of new shells from clams recently dead. In the undug plots it varied between 3.1 per cent and 49.2 per cent of all the small shells recorded while in the dug plots it varied between 33.6 and 67.4 per cent. This indicates that there were definitely more newly dead clams in the dug plots than in the undug. If the results from single plots are contrasted it will be noted that any undug plot always shows less newly dead clams than the corresponding dug plots.

In the upper undug plots there were between 36.8 and 64.7 per cent more small live clams than in the corresponding dug plots. Nearer the channel similar results were obtained, although the percentage was somewhat less, ranging between 23 and 34.7 per cent.

These results show that there is an increased mortality of small clams as a result of digging. This is further emphasized when one considers that between 3.5 per cent and 8.8 per cent of the small clams obtained were injured when the plots were hand-picked, while as high as 15.2 per cent were injured in some instances when the plots were screened.

It must be emphasized, however, that during ^{the} course of the experiment it became very evident that not all of the newly dead clams died from injury. Apparently some were buried too deeply as a result of the digging and were unable to regain their normal position. To further bear this out a series of experiments were set up using small, medium and large clams. These were planted at three depths, namely two, four and six inches, some in a normal upright position, others on their sides and still others upside down. The results given in the tables 13, 14, 15, 16, and 17, definitely show that abnormal positions may result in a high mortality.

A survey of the flats which were dug for commercial purposes showed that it is possible for clams to be buried in such positions while digging and that they die because they are unable to orient themselves. In many cases where clams had been planted upside down it was observed that they pushed themselves to the surface. Some buried themselves again in a normal position, while others died as a result of the exposure or were carried from the experimental area by the tide.

3. Experiments to determine the rate at which clams bury themselves.

Considerable interest has been displayed recently in the possibility of clam farming. In this connection it is important to know whether clams scattered on the surface will bury themselves or whether some other means of planting must be employed. During the summer of 1941 a number of preliminary experiments of this nature were performed. It was found on the Sissiboo river flats that clams do not bury themselves readily. The results varied with the size of the clams. With clams over two inches it was found that from eighty to ninety per cent

remained on the surface at the end of the experimental period which was sufficiently long to enable them either to bury themselves or to be killed by exposure. With clams less than one inch in length only twenty-five to thirty per cent remained on the surface at the close of the experimental period.

The results obtained in the Sissiboo area are not applicable, however, to all localities since it was observed at Port La Bebert during the course of the surveys conducted later in the summer that practically all of the clams, left on the surface while digging, were able to bury themselves in the course of the next tide.

In view of the high percentage of clams remaining on the surface in this experiment it was suggested that the clams be scattered either on a surface that had been scratched or placed in furrows. Both of these methods appeared to be highly successful in the early experimental stages. In the latter case where the results were somewhat better anywhere from eighty to one hundred per cent of the clams apparently buried themselves within a week. The results shown in tables 18, 19 and 20 were based on the absence of clams on the surface together with an estimate of siphon holes appearing in the experimental area. Additional results obtained in 1942 based on the actual recovery of the clams which had buried themselves, appear in connection with the next experiment. The results support the contention that spreading in furrows is the best method of planting young clams to avoid excessive loss.

Some experiments of this nature were started during October of 1941, but the gulls consumed all of the clams before they could bury themselves. This difficulty was not encountered during the early part of the season, perhaps because they were securing sufficient food from a nearby fishing plant which was in operation at that time. The gulls became so numerous during the fall months that clams left on the surface did not have a chance for survival.

With the aid of binoculars it was observed that one gull consumed more than ten clams within a minute. During the cold months clams apparently lose some control over their shells since the gulls were able to force them apart with their beaks whereas during the warmer months it was necessary for them to crack the shells in many cases by flying high and dropping the clams on the rocks.

4. Experiment to determine the length of exposure which clams will stand and to study the effect of exposure on their ability to bury themselves.

In the event of clam farming it might be necessary to transport clams for some distance or to hold them over for a short time. Consequently, it was important to determine the method of exposure which would give the minimum degree of injury. For this experiment small, medium and large clams were used. Some of each size were dug and kept in wet sacks in a cold place for varying periods of time. Similar quantities of the three sizes

of clams were placed in sacks and scattered on the flat where they would be covered by the tide for the greater part of the twenty-four-hour daily period. After exposures of three, four and five days during the early phase of the experiment and later extended to two, four and six, the clams were planted in a normal position and allowed to remain for at least three weeks, sufficient time to determine whether or not they had survived the exposure. The results given in tables 21, 22, 23 and 24, show that the clams exposed on the flats survived even a six-day period without mortality. On the other hand, an exposure in the air even for two or four days resulted in such a high mortality as to eliminate the method as a means of keeping clams for planting purposes.

It was of further importance to learn whether clams, which had been exposed for varying periods and under different conditions, could bury themselves when scattered on scratched and furrowed surfaces. Since large clams would hardly be used for planting purposes in actual farming procedures, only small- and medium-sized clams were used. Furthermore, since clams exposed for six days in air showed such a high mortality when planted, it was considered useless to experiment with clams of such long exposures in this work. The experiment was then confined to exposures of two and four days. The results shown in tables 25, 26, 27 and 28, do show that it is possible for a high percentage of the clams exposed under either condition to bury themselves. Later, however, a higher mortality was observed among the clams which had been exposed in air.

5. In addition to the above-mentioned experiments, plots of two-, three- and four-year-old clams were planted at three levels on the flat. This was done to observe the growth of older clams and thus be able to compute a complete growth curve in a shorter time. These plots have hardly been planted a year, therefore results are not available at this time.

6. The vertical distribution of small clams is important as a background for the distribution of larger clams and also as a means of knowing what to expect in the production of seed stock. This was explored by screening out patches one foot square at intervals from high tide level down to the channel. The results are shown in tables.

Table I. Contents of the Plots which were planted for the Purpose of Studying Growth and Survival as affected by Stunting and Crowding.

Plot	Time Planted	Contents	
1 a	July 16/41	250 (10 per sq.ft.)	1 1/2" normal
b	July 29/41	250 "	1 5/16 normal
c	July 22/41	250 "	1 1/2 normal
d	July 18/41	250 "	1 1/2 (1 3/8) normal
2 a	July 16/41	250 "	1 1/2 stunted
b	July 19/41	250 "	1 1/2 (1 3/16) stunted
c	July 22/41	250 "	1 1/2 stunted
d	July 18/41	250 "	1 1/2 (1 3/8) stunted
3 a	July 23/41	500 (20 per sq.ft.)	1 1/2 normal
b	Aug. 12/41	500 "	1 3/16 normal
c	Aug. 12/41	500 "	1 1/2 normal
d	Aug. 1/41	500 "	1 3/8 normal
4 a	Aug. 14/41	500 "	1 1/2 stunted
b	Aug. 5/41	500 "	1 3/16 stunted
c	Aug. 14/41	500 "	1 1/2 stunted
d	Aug. 1/41	500 "	1 3/8 stunted
5 a	Sept. 15/41	360 (40 per sq.ft.)	1 1/2 normal
b	Aug. 22/41	360 "	1 3/16 normal
c	Sept. 15/41	360 "	1 1/2 normal
d	Aug. 22/41	360 "	1 3/8 normal
6 a	Aug. 1/41	500 (20 per sq.ft.)	1 1/2 normal
b	Aug. 12/41	500 "	1 3/16 normal
c	Aug. 12/41	500 "	1 1/2 normal
d	Aug. 12/41	500 "	1 3/8 normal
7 a	Sept. 16/41	360 (40 per sq.ft.)	1 1/2 normal
b	Aug. 23/41	360 "	1 3/16 normal
c	Sept. 16/41	360 "	1 1/2 normal
d	Aug. 23/41	360 "	1 3/8 normal
8 a	July 18/41	250 (10 per sq.ft.)	1 3/8 normal
b	July 23/41	250 "	1 3/16 normal
c	July 29/41	250 "	1 1/2 normal
d	July 30/41	250 "	1 1/2 normal
9 a	July 18/41	250 (10 per sq.ft.)	1 3/8 stunted
b	July 25/41	250 "	1 5/16 stunted
c	July 25/41	250 "	1 1/2 stunted
d	July 30/41	250 "	1 1/2 stunted
10 a	Aug. 29/41	500 (20 per sq.ft.)	1 1/2 stunted
b	Aug. 14/41	500 "	1 5/16 stunted
c	Aug. 29/41	500 "	1 1/4 stunted
d	Aug. 5/41	500 "	1 3/8 stunted
11 a	July 29/41	250 (10 per sq.ft.)	1 1/2 stunted
b	July 29/41	250 "	1 5/16 stunted
c	Aug. 2/41	250 "	1 1/2 stunted
d	July 25/41	250 "	1 3/8 stunted
12 a	Aug. 15/41	500 (20 per sq.ft.)	1 1/4 normal
b	Aug. 15/41	500 "	1 5/16 normal
c	Aug. 19/41	500 "	1 1/2 normal
d	Aug. 15/41	500 "	1 3/8 normal

Plot	Time Planted	Contents
13 a	Aug. 27/41	500 (20 per sq.ft.) $1\frac{1}{2}$ stunted
b	Aug. 20/41	500 " $1\frac{5}{16}$ stunted
c	Aug. 27/41	500 " $1\frac{1}{2}$ stunted
d	Aug. 14/41	500 " $1\frac{3}{8}$ stunted
14 a	Sept. 10/41	360 (40 per sq.ft.) $1\frac{1}{2}$ normal
b	Sept. 3/41	360 " $1\frac{5}{16}$ normal
c	Sept. 10/41	360 " $1\frac{1}{2}$ normal
d	Sept. 10/41	360 " $1\frac{3}{8}$ normal
15 a	July 31/41	250 (10 per sq.ft.) $1\frac{1}{2}$ normal
b	July 30/41	250 " $1\frac{5}{16}$ normal
c	Aug. 1/41	250 " $1\frac{1}{2}$ normal
d	July 23/41	250 " $1\frac{3}{8}$ normal
16 a	Sept. 12/41	360 (40 per sq.ft.) $1\frac{1}{2}$ normal
b	Aug. 25/41	360 " $1\frac{5}{16}$ stunted
c	Sept. 13/41	360 " $1\frac{1}{2}$ normal
d	Sept. 12/41	360 " $1\frac{3}{8}$ normal
17 a	Aug. 20/41	250 (10 per sq.ft.) $1\frac{1}{2}$ normal
b	Aug. 1/41	250 " $1\frac{5}{16}$ normal
c	Aug. 20/41	250 " $1\frac{1}{2}$ normal
d	July 29/41	250 " $1\frac{3}{8}$ normal
18 a	Aug. 5/41	250 " $1\frac{1}{2}$ stunted
b	July 30/41	250 " $1\frac{5}{16}$ stunted
c	Aug. 13/41	250 " $1\frac{1}{2}$ stunted
d	July 29/41	250 " $1\frac{3}{8}$ stunted
19 a	Aug. 20/41	500 (20 per sq.ft.) $1\frac{1}{2}$ normal
b	Aug. 19/41	500 " $1\frac{5}{16}$ normal
c	Aug. 20/41	500 " $1\frac{1}{2}$ normal
d	Aug. 19/41	500 " $1\frac{3}{8}$ normal
20 a	Aug. 29/41	500 " $1\frac{1}{2}$ stunted
b	Aug. 18/41	500 " $1\frac{5}{16}$ stunted
c	Aug. 30/41	500 " $1\frac{1}{2}$ stunted
d	Aug. 13/41	500 " $1\frac{3}{8}$ stunted
21 a	Aug. 25/41	500 " $1\frac{1}{2}$ stunted
b	Aug. 26/41	500 " $1\frac{5}{16}$ stunted
c	Aug. 29/41	500 " $1\frac{1}{2}$ stunted
d	Aug. 19/41	500 " $1\frac{3}{8}$ stunted
22 a	Sept. 2/41	500 " $1\frac{1}{2}$ normal
b	Aug. 17/41	500 " $1\frac{5}{16}$ normal
c	Aug. 23/41	500 " $1\frac{1}{2}$ normal
d	Aug. 20/41	500 " $1\frac{3}{8}$ normal
23 a	Sept. 3/41	360 (40 per sq.ft.) $1\frac{1}{2}$ normal
b	Sept. 3/41	360 " $1\frac{5}{16}$ normal
c	Sept. 3/41	360 " $1\frac{1}{2}$ normal
d	Sept. 2/41	360 " $1\frac{3}{8}$ normal
24 a	Aug. 30/41	250 (10 per sq.ft.) $1\frac{1}{2}$ normal
b	Aug. 23/41	250 " $1\frac{5}{16}$ normal
c	Aug. 30/41	250 " $1\frac{1}{2}$ normal
d	July 30/41	250 " $1\frac{3}{8}$ normal
25 a	Aug. 30/41	250 " $1\frac{1}{2}$ stunted
b	Aug. 2/41	250 " $1\frac{5}{16}$ stunted
c	Aug. 30/41	250 " $1\frac{1}{2}$ stunted
d	July 30/41	250 " $1\frac{3}{8}$ stunted

PLOT A

Plot	Time Planted	Contents
6 a	July 31/42	80 (per sq.ft.) 1 3/8" normal
b	Aug. 3/42	80 " 1 3/8" normal
c	July 31/42	" 1 3/8" normal
d	July 30/42	" 1 3/8" normal
7 a	Aug. 3/42	" 1 5/16" normal
b	Aug. 3/42	" 1 5/16" normal
c	July 31/42	" 1 5/16" normal
d	July 30/42	" 1 5/16" normal
8 a	July 31/42	" 1 1/4" normal
b	Aug. 31/42	" 1 1/4" normal
c	July 31/42	" 1 1/4" normal
d	July 30/42	" 1 1/4" normal
10 a	July 10 & 11/42	" 1 3/8" normal
b	July 11/42	" 1 3/8" normal
c	July 10/42	" 1 3/8" normal
d	July 10/42	" 1 3/8" normal
11 a	July 11/42	" 1 5/16" normal
b	July 11/42	" 1 5/16" normal
c	July 10/42	" 1 5/16" normal
d	July 10/42	" 1 5/16" normal
12 a	July 10/42	" 1 1/4" normal
b	July 10/42	" 1 1/4" normal
c	July 10/42	" 1 1/4" normal
d	July 10/42	" 1 1/4" normal
14 a	July 13/42	" 1 3/8" normal
b	July 14/42	" 1 3/8" normal
c	July 13/42	" 1 3/8" normal
d	July 13/42	" 1 3/8" normal
15 a	July 13/42	" 1 5/16" normal
b	July 13/42	" 1 5/16" normal
c	July 13/42	" 1 5/16" normal
d	July 14/42	" 1 5/16" normal
16 a	July 11/42	" 1 1/4" normal
b	July 11/42	" 1 1/4" normal
c	July 11/42	" 1 1/4" normal
d	July 11/42	" 1 1/4" normal

Box	Time Planted 1941	Contents
P upper half	July 14	200 - 1" clams normal
lower half	July 14	50 - 1" clams normal
Q upper half	July 15	150 - 1 1/2" clams normal
lower half	July 15	38 - 1 1/2" clams normal
R upper half	July 21	100 - 1 1/2" clams normal
lower half	July 21	25 - 1 1/2" clams normal

Table 3: Summary of Table 2.

No. of Plot	Orig. size type, and number.	Type	Concentration	$\frac{1}{4}$	$\frac{9}{32}$	$\frac{5}{16}$	$\frac{11}{32}$	$\frac{3}{8}$	$\frac{13}{32}$	$\frac{7}{16}$	$\frac{15}{32}$	$\frac{1}{2}$	$\frac{17}{32}$	$\frac{9}{16}$	$\frac{19}{32}$	$\frac{5}{8}$	$\frac{21}{32}$	$\frac{11}{16}$	$\frac{23}{32}$	$\frac{3}{4}$	$\frac{25}{32}$	$\frac{13}{16}$	$\frac{27}{32}$	$\frac{7}{8}$	$\frac{29}{32}$	$\frac{15}{16}$	2	Total No. of clams	Dead	% Dead
				16	6	20	23	44	29	48	52	80	55	55	47	44	21	19	6	4	0	1	0	0	1	1	936			
1a, 15a, 17a, 24a.	250	normal	10 per sq.ft.	16	6	20	23	44	29	48	52	80	55	55	47	44	21	19	6	4	0	1	0	0	1	1	936	348	37.1	
2a, 11a, 18a, 25a.	250	stunted	10 " " "	69	45	67	66	93	55	79	38	56	22	16	7	6	0	3	1	1	2	1	2	1	0	964	304	31.5		
3a, 6a, 12a, 19a, 22a.	500	normal	20 " " "	43	32	35	44	90	74	114	128	211	134	165	121	101	54	26	12	13	4	6	2	2	1	2053	590	28.7		
4a, 10a, 13a, 20a, 21a.	500	stunted	20 " " "	95	89	184	186	309	295	278	173	154	57	44	13	14	2	2	0	0	1	2				2254	466	20.6		
5a, 7a, 14a, 16a, 23a.	360	normal	40 " " "	50	13	38	18	57	43	74	114	126	133	105	83	78	37	35	11	16	4	5				1576	507	32.1		

Table 5: Effect of Digging on Small Clams.

Numbers in Dug Plots.

Upper 40' Plot A	<u>Small</u>				<u>Large</u>				Date finally dug.			
	Living	shells new	shells old	Injured	Living	Newly dead	shells old	mud- filled		Injured		
<u>Sub-Plot</u>												
<u>1</u>	1016	(June 12: 80)	(June 12: 72)	380 dug - 109	- - 50	injured	311	8	184	543	63	July 7
<u>2</u>	758	(June 12: 162)	(June 12: 143)	415 dug - 93	- - 76	injured	42	6	136	46	24	"10
<u>6</u>	547	(June 13: 138)	(June 13: 176)	600 dug - 53	- - 32	injured	168	7	262	168	16	"11
<u>8</u>	920	(June 13: 320)	(June 13: 162)	690 dug - 84	- - 85	injured	45	9	184	35	84	"12
<u>9</u>	1612	(June 14: 416)	(June 14: 240)	620 dug - 75	- - 85	injured	112	5	308	61	32	"18
<u>11</u>	1996	(June 16: 608)	(June 16: 274)	457 dug - 273	- - 32	injured	52	6	78	59	11	"24
<u>14</u>	874	(June 14: 252)	(June 14: 206)	398 dug - 170	- - 45	injured	58	12	95	66	8	"21
<u>16</u>	873	(June 16: 210)	(June 16: 308)	475 dug - 152	- - 30	injured	81	12	110	50	32	"28
Totals	8596	2186	1581	1009	869	65	1357	1028	270			
	58	Small			Large							
	Total of: 4035 dug - - 385 injured											

Table 5a: Effect of Digging on Small Clams.

Upper 40' Plot A	Numbers in Undug Plots.										Remarks
	Living	Small shells			Living	injured	Large mud	shells old		newly dead	
Sub-Plot		1/2 new	1/2 shells Old	injured	Living	injured		1/2 shells old	newly dead	Date finally dug.	
<u>2</u>	1990	22	202	182	346	101	211	42		July 10	
<u>4</u>	2320	62	322	167	309	62	116	112	2	" 12	
<u>5</u>	1071	18	122	93	145	57	102	62	1	" 10	
<u>7</u>	1535	24	160	123	219	60	84	96	2	" 11	
<u>10</u>	1913	66	212	156	262	34	17	86	2	" 24	
<u>12</u>	3396	398	716							" 25 no large clams	
<u>13</u>	2130	68	216	174	327	46	122	57	1	" 21 much shell (Plot 14	
<u>15</u>	1664	120	224	158	236	55	44	86		" 25	
Totals	16019	778	2174	1053	1844	415	696	541	8		
		26.3	Small				Large				

Table 6: Effect of Digging on Small Clams.

Numbers in Dug Plots.

Upper 40' Plot B	<u>Small</u>				<u>Large</u>				Date finally dug.
	Living	$\frac{1}{2}$ -shells new	$\frac{1}{2}$ -shells old	injured	living	newly dead	mud-filled	injured	
<u>1</u>	249	30	762	14	802 dug	- -	22 injured	25	Sep. 16
<u>2</u>	270	161	361	24	676 dug	- -	37 injured	12	" 22
<u>6</u>	696	140	235	20	454 dug	- -	3 injured	24	" 25
<u>8</u>	518	190	236	46	901 dug	- -	33 injured	11	" 29
<u>9</u>	647	260	244	46	1036 dug	- -	13 injured	8	" 30
<u>11</u>	618	224	268	38	735 dug	- -	41 injured	3	
<u>14</u>	366	220	128	30	462 dug	- -	26 injured	12	Oct. 8
<u>16</u>	252	116	84	28	520 dug	- -	35 injured	7	" 11

3616	1341	2318	246	1114	412	927	102
Small				Large			
36.6							

Total of: 5586 dug - -, 210 injured

Table 6a: Effect of Digging on Small Clams.

Numbers in Undug Plots.

Upper 40' Plot B	<u>Small</u>				<u>Large</u>					Date finally dug.	Remarks						
	living	½-shells new	½-shells old	injured	living	injured	mud-filled	newly dead									
<u>2</u>	258	55	529	35	322	34	69	23	Sep. 18								
<u>4</u>	616	35	365	60	737	49	92	22	" 23								
<u>5</u>	513	26	352	42	324	36	93	23	" 24								
<u>7</u>	1140	90	244	46	390	22	106	15	" 26	Small 1" or less in the square.							
<u>10</u>	1018	162	148	160	219	17	63	10	Oct. 2	All small 1" or less							
<u>12</u>	1165	26	198	68	298	16	75	18	" 6								
<u>13</u>	4120	780	1560	130	68	7	12	9	" 7	Small all or less; different from rest; to screen.							
<u>15</u>	1433	161	246	42	270	24	84	35	" 10								
10263				1335		3642		483		2628		205		594		155	
Small								Large									

Table 7: Effect of Digging on Small Clams.

Numbers in Dug Plots.

Upper 40' Plot C	<u>Small</u>				<u>Large</u>				date finally dug.
	living	shells new	shells old	injured	living	mud-filled	newly dead	injured	
<u>Sub-Plot</u>									1941
<u>1</u>	% Dug Oct. 25: Total:- 867--				693	79	36	59	
	# 547	356	210	18	36	31	27	4	Nov. 15
<u>2</u>	% Dug Oct. 27: Total:- 929--				745	105	25	54	
	# 730	452	142	39	67	52	53	0	Nov. 17
<u>6</u>	% Dug Oct. 29: Total:- 530--				427	32	24	47	
	# 475	142	66	42	108	30	75	16	" 20
<u>8</u>	% Dug Oct. 29: Total:- 673--				526	47	34	66	
	# 1325	510	304	163	49	168	32	18	" 18
<u>9</u>	% Dug Oct. 30: Total:- 525--				416	41	19	49	
	# 413	314	357	42	110	42	72	9	" 25
<u>11</u>	% Dug Oct. 30: Total:- 783--				670	82	18	13	
	# 872	432	108	112	58	41	38	8	" 29
<u>14</u>	% Dug Oct. 31: Total:- 609--				462	86	26	35	
	# 721	968	336	65	55	108	5	34	Dec. 2
<u>16</u>	% Dug Nov. 1: Total:- 680--				553	47	26	54	
	# 690	784	386	28	85	69	96	7	" 13

Totals # 5773 3958 1909 509 | 568 539 398 96

Small
67.4

Large

1 5596: 4492 519 208 377

1 When first dug only marketable size taken.

Table 7a: Effect of Digging on Small Clams.

Numbers in Undug Plots.

<u>Upper 40'</u> <u>Plot C</u>	<u>Small</u>				<u>Living</u>	<u>mud-filled</u>	<u>newly dead</u>	<u>Large</u>		<u>Date finally dug.</u>
	<u>Living</u>	<u>shells new</u>	<u>shells old</u>	<u>Injured</u>				<u>Injured</u>		
<u>Sub-Plot</u>										1941
<u>2</u>	1051	104	428	53	321	15	54	23		Nov. 15
<u>4</u>	1199	68	302	71	421	70	15	25		" 18
<u>5</u>	912	78	280	45	439	64	15	22		" 19
<u>7</u>	978	98	242	114	350	76	14	12		" 27
<u>10</u>	1038	108	636	106	318	59	22	18		" 28
<u>12</u>	1875	430	618	246	312	78	34	36		" 25
<u>13</u>	672	265	355	44	328	155	17	28		" 26
<u>15</u>	1758	213	488	148	357	61	38	28		Dec. 3
	9483	1364	3349	827	2846	578	209	192		
		Small				Large				

Table 8: Effect of Digging on Small Clams.

Numbers in Dug Plots

<u>Upper 40'</u> <u>Plot D</u>	<u>Small</u>				<u>Large</u>				Date finally dug.
	living	$\frac{1}{2}$ -shells new	$\frac{1}{2}$ -shells old	injured	living	mud-filled	newly dead	injured	
<u>Sub-Plot</u>									1942
<u>1</u>	Dug Apr. 21/42: 675	298	Total 702	1194 78	956 46	133 162	28 45	77 14	May 20.
<u>3</u>	Dug Apr. 23/42: 1216	628	Total 76	1307 176	1020 268	113 358	72 272	102 24	May 29.
<u>6</u>	Dug Apr. 24: 924	592	Total 1318	1342 144	1048 186	169 234	46 126	79 16	May 23.
<u>8</u>	Dug April 25: 1104	500	Total 1680	148 148	879 324	138 436	48 320	83 32	May 30.
<u>9</u>	Dug April 27: 1308	662	Total 2188	1067 234	856 276	127 190	28 188	56 20	May 25.
<u>11</u>	Dug April 28: 1136	448	Total 880	1169 106	896 82	146 404	58 58	69 12	May 28.
<u>14</u>	Dug April 29: 1556	1070	Total 924	1142 322	912 78	126 188	58 44	46 0	May 26.
<u>16</u>	Dug April 30: 1208	248	Total 1016	1224 182	960 72	133 238	79 54	52 8	June 2.
				9127	4446	8784	1390	9593	
					1332	2210	1107	126	
					7527	1085	417	564	

33.6

Table 8a: Effect of Digging on Small Clams.

Numbers in Undug Plots.

<u>Upper 40'</u> <u>Plot D</u>	<u>Small</u>				<u>Large</u>				Date finally dug.
	living	shells new	shells old	injured	living	mud- filled	newly dead	injured	
<u>Sub-Plot</u>									1942
<u>2</u>	1029	68	1074	291	614	204	21	80	May 21
<u>4</u>	1386	124	1092	258	464	308	64	48	" 29
<u>5</u>	2370	108	772	428	322	230	8	90	" 22
<u>7</u>	1462	32	1188	246	410	370	8	72	" 23
<u>10</u>	1648	56	1284	284	448	328	8	122	" 25
<u>12</u>	1788	44	724	116	528	314	14	60	June 16
<u>13</u>	2244	48	1864	372	302	364	18	118	May 26
<u>15</u>	2520	48	1792	168	356	392	2	68	" 28
	14447	528	9790	2163	3444	2510	143	658	

Table 9: Effect of Digging on Small Clams.

Numbers in Dug Plots.

Lower 40' Plot E	<u>Small</u>				<u>Large</u>					
	living	$\frac{1}{2}$ -shells old	$\frac{1}{2}$ -shells new	injured	living	mud-filled	injured	$\frac{1}{2}$ -shells newly dead	Date finally dug.	
<u>1</u>	2382	278	712	241	8	46	3	46	July 17	
		(June 17: 96 dug - - 16 injured)								
		(416 on surface; 139 $\frac{1}{2}$ shells)								
<u>3</u>	2362	342	1010	297	16	20	5	66	2 " 14	
		(June 17: 65 dug - - 12 injured)								
		(743 on surface; 332 $\frac{1}{2}$ shells)								
<u>6</u>	2854	780	1824	386	15	4	7	36	8 " 28	
		(June 18: 123 dug - - 11 injured)								
		(342 on surface; 167 $\frac{1}{2}$ shells)								
<u>8</u>	1930	238	564	119	11	14	42	41	4 " 29	
		(June 17: 71 dug - - 9 injured)								
		(705 on surface; 250 $\frac{1}{2}$ shells)								
<u>9</u>	3156	944	1100	340	5	19	3	30	" 30	
		(June 18: 40 dug - - 5 injured)								
		(460 on surface; 220 $\frac{1}{2}$ shells)								
<u>11</u>	3412	564	780	592	8	21	4	30	" 30	
		(June 18: 26 dug - - 4 injured)								
		(562 on surface; 281 half shells)								
<u>14</u>	2860	753	829	368	3	3	5		Sep. 2	
		(June 19: 53 dug - - 6 injured)								
		(314 on surface; 172 half shells)								
<u>16</u>	2464	314	872	464	16	12	6	12	2 July 31	
		(June 19: 12 dug - - 1 injured)								
		(802 on surface; 285 $\frac{1}{2}$ shells)								
	21420	4213	7691	2807	182	141	75	261	16	
	Small	486 dug - - 64 injured						Large		
		4344 on surface; 1846 $\frac{1}{2}$ shells								

Table 9a: Effect of Digging on Small Clams.

Numbers in Undug Plots.

<u>Lower 40'</u> <u>Plot E</u>	<u>Small</u>				<u>Large</u>				Date finally dug.	Remarks
	living	$\frac{1}{2}$ -shells old	$\frac{1}{2}$ -shells new	injured	living	mud-filled	injured	$\frac{1}{2}$ shells		
<u>Sub-Plot</u>										
<u>2</u>	7783	364	298	383	28	30	13		July 14	
<u>4</u>	3430	416	374	453	23	22	9	42	" 15	
<u>5</u>	4134	862	298	209	34	27	18	35	" 22	
<u>7</u>	2506	440	236	280	19	25	7	34	" 28	
<u>10</u>	2855	956	496	253	14	31	12	24	" 29	Much broken shell (plot 9)
<u>12</u>	2220	312	348	238	36	32	11	23	" 30	Lots of new broken shell (plot 11).
<u>13</u>	1601	879	300	351	3	4			Sept. 2	
<u>15</u>	4191	252	616	516	10	50	2	70	July 31	
	28720	4481	2866	2683	167	221	72	228		
	Small					Large				

Table 10: Effect of Digging on Small Clams.

Numbers in Dug Plots.

<u>Lower 40'</u> <u>Plot F</u>	<u>Small</u>				<u>Large</u>				Date finally dug.
	living	shells new	shells old	injured	living	mud-filled	injured	newly dead	
<u>1</u>	1364	1555	846	128	18				Sep.17
		(Aug.29: 59 dug - - 3 injured)							
<u>3</u>	1088	320	26	83	3				
		(Aug.30: 74 dug - - 16 injured)							
<u>6</u>	1068	434	176	85		36	24		Geq.29
		(Aug.30: 53 dug - - 4 injured)							
<u>8</u>	1340	718	224	77	5	36	11		Oct. 1
		(Aug.30: 60 dug - - 5 injured)							
<u>9</u>	1416	578	362	82	2	36	34		" 2
		(Aug.29: 49 dug - - 2 injured)							
<u>11</u>	1268	420	248	34	4	33	2	12	" 4
		(Aug.29: 70 dug - - 6 injured)							
<u>14</u>	689	206	125	41	8	33	3	12	" 17
		(Aug.29: 45 dug - - 4 injured)							
<u>16</u>	980	353	365	102	9	58		6	" 20
		(Aug.29: 100 dug - - 10 injured)							
Totals:	9213	4584	2372	632	49	232	5	99	
	65.8								
		Small				Large			
		Total: 510 dug - - 50 injured							

Table 10a: Effect of Digging on Small Clams.

Numbers in Undug Plots.

<u>Lower 40'</u> <u>Plot F</u>	<u>Small</u>				<u>Large</u>				Date finally dug.
	living	shells new	shells old	injured	living	mud-filled	injured	newly dead	
<u>2</u>	3412	1114	1042	170	30	165	9	59	Sep. 20
<u>4</u>	2684	886	582	150	6	35		4	" 23
<u>5</u>	1184	544	393	49	10	46	3	2	" 26
<u>7</u>	1790	488	356	158	32	66		14	" 30
<u>10</u>	1278	232	382	74	14	40	1	12	Oct. 3
<u>12</u>	2161	152	398	87	14	54	6	12	" 9
<u>13</u>	798	92	327	72	24	43	2	4	" 17
<u>15</u>	814	112	244	68	21	32	2	8	" 18
	14121	3620	3724	828	151	481	23	115	
		Small				Large			

Table 11: Effect of Digging on Small Clams.

Numbers in Dug Plots.

Lower 40' Plot G	<u>Small</u>				<u>Large</u>				Date finally dug.
	living	$\frac{1}{2}$ -shells new	$\frac{1}{2}$ -shells old	injured	living	mud-filled	newly dead	injured	
									1941
<u>1</u>	(Dug 1138	Nov.10: 720	Total 300	78 64	48 2	18 31	8 6	4 1	Dec. 5
<u>3</u>	Dug 1406	Nov.11: 671	Total 389	60 89	38 5	16 36	1 6	5 0	" 10
<u>6</u>	Dug 1634	Nov.11: 328	Total 178	44 97	23 16	18 9	1 7	2 0	April 3
<u>8</u>	Dug 1709	Nov.11: 343	Total 221	40 116	19 14	19 34	0 5	2 0	" 4
<u>2</u>	Dug 1690	Nov.13: 716	Total 388	51 94	34 7	15 44	0 24	2 0	" 17
<u>11</u>	Dug 2223	Nov.14: 853	Total 478	39 174	15 9	22 65	0 16	2 0	" 13
<u>14</u>	Dug 1998	Nov.14: 578	Total 392	56 46	23 14	27 22	0 4	6 2	" 23
<u>16</u>	Dug 486	Nov.14: 214	Total 128	57 20	36 14	14 17	3 6	4 0	" 27
<hr/>									
	11284	4423	2474	700	81	258	44	3	
	Small					Large			
	64.1			425	236	149	13	27	

Table 11a: Effect of Digging on Small Clams.

Numbers in Undug Plots.

<u>Lower 40'</u> <u>Plot G</u>	<u>Small</u>				<u>Large</u>				Date finally dug.
	living	$\frac{1}{2}$ -shells new	$\frac{1}{2}$ -shells old	injured	living	mud-filled	newly dead	injured	
<u>2</u>	907	184	220	78	10	36	1	0	Dec. 6
<u>4</u>	3029	752	809	128	17	56	4	4	" 13
<u>5</u>	2809	216	311	104	32	3	66	7	" 16
<u>7</u>	1517	123	353	119	11	35	3	0	April 3
<u>10</u>	2478	479	912	170	18	118	7	1	" 16
<u>12</u>	1518	463	609	107	11	47	9	1	" 10
<u>13</u>	1455	292	534	78	36	54	9	1	" 20
<u>15</u>	1087	307	704	58	21	45	1	0	" 24
	14790	2816	4452	842	156	394	100	14	
		Small				Large			
			38.8						

Table 12: Effect of Digging on Small Clams.

Numbers in Dug Plots.

Lower 40' Plot H.	<u>Small</u>				<u>Large</u>				Date finally dug.	
	living	shells new	shells old	injured	living	mud-filled	newly dead	injured		
<u>Sub-Plot</u>									1942	
<u>1</u>	Dug May 9: 1054	Total 748	466	196 46	126 52	48 38	12 30	10 14	June 17	
<u>3</u>	Dug May 9: 2050	Total 912	1098	132 184	69 72	51 90	7 16	5 0	" 19	
<u>6</u>	Dug May 11: 614	Total 572	296	120 64	63 46	46 64	3 34	8 0	" 23	
<u>8</u>	Dug May 11: 1560	Total 252	792	110 84	81 130	16 116	2 14	11 8	" 24	
<u>2</u>	Dug May 13: 1500	Total 468	232	134 96	73 22	46 78	3 24	12 4	" 27	
<u>11</u>	Dug May 13: 1118	Total 1224	350	164 34	70 20	84 94	0 56	10 134	" 26	
<u>14</u>	Dug May 14: 2558	Total 620	392	94 98	43 250	42 116	4 46	5 6	" 20	
	Dug May 14: 1194	Total 496	504	154 74	64 42	79 182	2 38	9 0	" 24	
11648				680	634				166	
Small				1104	589				70	
56.1					Large					

Table 12a: Effect of Digging on Small Clams.

Numbers in Undug Plots.

<u>Lower 40'</u> <u>Plot H.</u>	<u>Small</u>				<u>Large</u>				
	<u>living</u>	<u>½-shells new</u>	<u>½-shells old</u>	<u>injured</u>	<u>living</u>	<u>mud-filled</u>	<u>newly dead</u>	<u>injured</u>	<u>Date finally dug.</u>
<u>Sub- Plot</u>									
<u>2</u>	2684	324	1350	156	142	116	6	8	June 19
<u>4</u>	936	38	208	50	140	42	12	14	" 26
<u>5</u>	1952	160	368	84	130	90	20	2	" 20
<u>7</u>	1560	232	692	84	130	116	14	8	" 26
<u>10</u>	1756	608	370	2	118	142	4	2	" 27
<u>12</u>	1136	192	496	56	158	72	22	20	" 24
<u>13</u>	670	248	396	138	186	24	14	28	" 22
<u>15</u>	710	300	262	56	318	88	6	18	" 20
	<u>11374</u>	<u>2102</u>	<u>4142</u>	<u>626</u>	<u>1322</u>	<u>690</u>	<u>98</u>	<u>100</u>	
	Small				Large				
	33.6								

Table 13.

Experiment to determine the survival of clams when planted
in abnormal positions.

Number and Size	Position	Date planted 1942	Date checked 1942	Number recovered	Number dead	Per cent dead
200 small	on side	June 29	July 22	184	46	25.0
200 small	upside down	June 29	July 22	174	29	16.6
200 small	on side	June 29	July 27	176	27	15.3
200 small	upside down	June 29	July 27	186	30	16.1
200 medium	on side	June 29	July 22	158	12	7.5
200 medium	upside down	June 29	July 21	174	40	22.9
200 medium	on side	June 29	July 27	185	22	11.8
200 medium	upside down	June 29	July 27	140	20	14.4
100 large	on side	June 29	July 21	88	14	15.9
100 large	upside down	June 29	July 21	87	75	86.2
100 large	on side	June 29	July 27	93	17	18.2
100 large	upside down	June 29	July 27	65	38	58.4
200 medium	on side	July /41 early	July /41 late	184	21	8.2
200 medium	upside down	July /41 early	July /41 late	150	38	25.3
100 large	on side	July /41 early	July /41 late	81	14	17.2
100 large	upside down	July /41 early	July /41 late	74	50	67.5
200 medium	on side	July /41 early	July /41 late	191	22	11.5
200 medium	upside down	July /41 early	July /41 late	173	30	17.3
100 large	on side	July /41 early	July /41 late	92	11	11.9
100 large	upside down	July /41 early	July /41 late	81	50	61.7

Table 14. Experiment to determine the survival of clams when planted in abnormal positions.

Number and size	Position	Date planted	Date checked	Number recovered	Number dead	Per cent dead
200 medium	on side	Aug. /41 early	Aug. /41 late	170	25	14.7
200 medium	upside down	Aug. /41 early	Aug. /41 late	101	46	45.5
100 large	on side	Aug. /41 early	Aug. /41 late	75	4	5.3
100 large	upside down	Aug. /41 early	Aug. /41 late	88	73	82.9
200 medium	on side	Aug. /41 early	Aug. /41 late	184	15	8.1
200 medium	upside down	Aug. /41 early	Aug. /41 late	154	19	12.3
100 large	on side	Aug. /41 early	Aug. /41 late	88	12	13.6
100 large	upside down	Aug. /41 early	Aug. /41 late	90	40	44.4
200 medium	on side	Nov. 5/41	Jan. 3/42	185	12	6.4
200 medium	upside down	Nov. 5/41	Jan. 3/42	165	18	10.9
100 large	on side	Oct. 30/41	Dec. 31/41	25	9	36.0
100 large	upside down	Oct. 30/41	Dec. 31/41	30	21	70.0
200 medium	on side	Nov. 5/41	April 10/42	172	14	8.1
200 medium	upside down	Nov. 5/41	April 10/42	176	8	4.5
100 large	on side	Oct. 30/41	April 8/42	63	9	14.2
100 large	upside down	Oct. 30/41	April 8/42	58	13	22.2

Table 15.

Experiment to determine the survival of clams planted at different depths and in different positions.

Number and size	Depth and position	Date planted 1942	Date checked 1942	Number recovered	Number dead	Per cent dead
100 small	2" deep normal	June 30	July 21	87	12	13.7
100 small	4" deep normal	July 2	July 27	91	39	42.8
100 small	6" deep normal	July 2	July 25	98	88	89.7
100 small	2" deep normal	Aug. 11	Sept. 2	97	10	9.7
100 small	4" deep normal	Aug. 11	Sept. 2	94	25	25.5
100 small	6" deep normal	Aug. 11	Sept. 4	96	82	82.4
100 small	2" deep on side	June 30	July 21	68	10	14.7
100 small	4" deep on side	July 2	July 27	100	78	78.0
100 small	6" deep on side	July 2	July 25	89	89	100.0
100 small	2" deep on side	Aug. 11	Sept. 2	99	20	20.2
100 small	4" deep on side	Aug. 11	Sept. 3	95	41	43.1
100 small	6" deep on side	Aug. 11	Sept. 3	61	48	78.6
100 small	2" deep upside down	June 30	July 21	87	28	72.1
100 small	4" deep upside down	July 2	July 27	92	92	100.0
100 small	6" deep upside down	July 2	July 27	100	100	100
100 small	2" deep upside down	Aug. 11	Sept. 2	100	34	34.0
100 small	4" deep upside down	Aug. 11	Sept. 3	94	73	75.5
100 small	6" deep upside down	Aug. 11	Sept. 4	47	42	89.3

Table.16.

Experiment to determine the survival of clams planted at different depths and in different positions.

Number and size	Depth and position	Date planted 1942	Date checked 1942	Number recovered	Number dead	Per cent dead
100 medium	2" deep normal	June 30	July 25	96	7	7.3
100 medium	4" deep normal	June 30	July 24	84	16	11.1
100 medium	6" deep normal	June 30	July 24	98	45	45.9
100 medium	2" deep normal	Aug. 11	Sept. 4	100	6	6
100 medium	4" deep normal	Aug. 13	Sept. 5	100	57	57
100 medium	6" deep normal	Aug. 13	Sept. 7	98	44	44
100 medium	2" deep on side	June 30	July 25	96	20	20.8
100 medium	4" deep on side	June 30	July 25	94	52	55.3
100 medium	6" deep on side	June 30	July 25	86	75	87.2
100 medium	2" deep on side	Aug. 11	Sept. 5	98	10	10.2
100 medium	4" deep on side	Aug. 13	Sept. 5	96	36	37.5
100 medium	6" deep on side	Aug. 13	Sept. 7	94	46	48.9
100 medium	2" deep upside down	June 30	July 25	90	45	50.0
100 medium	4" deep upside down	June 30	July 25	--	--	--
100 medium	6" deep upside down	June 30	July 25	83	80	96.5
100 medium	2" deep upside down	Aug. 13	Sept. 5	100	59	59
100 medium	4" deep upside down	Aug. 13	Sept. 7	77	52	68.8
100 medium	6" deep upside down	Aug. 14	Sept. 7	71	34	47.8

Table 17.

Experiment to determine the survival of clams planted at different depths and in different positions.

Number and size	Depth and position	Date planted 1942	Date checked 1942	Number recovered	Number dead	Per cent dead
50 large	2" deep normal	July 1	July 24	50	6	12
50 large	4" deep normal	July 1	July 24	50	19	38
50 large	6" deep normal	July 1	July 24	50	23	46
50 large	2" deep normal	Aug. 14	Sept. 8	47	7	14.8
50 large	4" deep normal	Aug. 20	Sept. 8	50	14	28
50 large	6" deep normal	Aug. 20	Sept. 8	50	23	46
50 large	2" deep on side	July 1	July 24	50	3	6
50 large	4" deep on side	July 1	July 24	50	29	58
50 large	6" deep on side	July 1	July 24	50	35	70
50 large	2" deep on side	Aug. 14	Sept. 8	50	6	12
50 large	4" deep on side	Aug. 20	Sept. 8	50	8	16
50 large	6" deep on side	Aug. 20	Sept. 8	48	32	66.6
50 large	2" deep upside down	July 1	July 25	47	44	93.6
50 large	4" deep upside down	July 1	July 24	48	46	97.9
50 large	6" deep upside down	June 30	July 24	46	46	100
50 large	2" deep upside down	Aug. 14	Sept. 8	50	48	96
50 large	4" deep upside down	Aug. 20	Sept. 8	50	18	36
50 large	6" deep upside down	Aug. 20	Sept. 7	50	46	92

Table 18. Experiment to determine whether clams can bury themselves when scattered on the surface.

Date of scattering	Plot number	Size and number scattered	Number of clams on surface at date of reading.			
			<u>June 17</u>	<u>June 21</u>	<u>June 23</u>	<u>June 28</u>
June 14	1	1400 large		1241		1206
" 14	2	300 "	265	232		
" 14	3	300 "	281	275		
" 16	4	200 small			60	
" 16	5	137 large			104	
" 16	6	400 small			102	

Table 19. Experiment to show the ability of clams to bury themselves on scratched surfaces.

Start of experiment	Plot number	Size and number of clams scattered.	Number of clams on surface at		
			date <u>Aug. 15</u>	of <u>Aug. 19</u>	reading <u>Aug. 26</u>
August 12	1	50 medium	25	12	4
" 12	2	50 small	13	2	none
" 12	3	50 medium	23	13	6
" 12	4	50 small	3	none	none
" 12	5	50 medium	16	8	2
" 12	6	50 small	4	1	none
				<u>Sept. 11</u>	<u>Sept. 18</u>
Sept. 2	1	250 small		30	18
" 2	2	250 "		21	15
" 22	3	250 "		31	23
" 2	4	150 "		18	15

Table 20. Experiment to show the power of clams to bury themselves in furrows.

Start of experiment	Furrow number	Size and number of clams scattered	Number of clams on surface at			
			date	of	reading	
			<u>Aug. 15</u>	<u>Aug. 19</u>	<u>Aug. 26</u>	
August	12	1	50 medium	11	7	4
"	12	2	50 "	15	7	6
"	12	3	50 small	3	none	none
"	12	4	50 "	6	none	none
			<u>Sept. 11</u>	<u>Sept. 18</u>		
Sept.	2	1	50 small	0	0	
"	2	2	50 "	1	0	
"	2	3	50 "	3	1	
"	2	4	50 "	1	0	
"	2	5	50 "	0	0	
"	2	6	50 "	5	3	
"	2	7	50 "	1	0	
"	2	8	50 "	3	1	
"	2	9	50 "	2	0	
"	2	10	50 "	4	2	

Table 21. Experiment to determine the survival of clams when exposed on the flats over periods of varying length.

Number and size	Type and length of exposure	Date planted	Date checked	Number recovered	Number dead	Per cent dead
200 small	3 days on flats	July 41 early	July 41 late	181	4	2.2
200 "	4 " " "	" 41 "	" 41 "	174	8	4.5
200 "	5 " " "	" 41 "	" 41 "	154	12	7.8
200 medium	3 " " "	" 41 "	" 41 "	155	3	1.9
200 "	4 " " "	" 41 "	" 41 "	172	7	4.0
200 "	5 " " "	" 41 "	" 41 "	160	12	7.5
100 large	3 " " "	" 41 "	" 41 "	94	6	6.3
100 "	4 " " "	" 41 "	" 41 "	93	8	8.5
100 "	5 " " "	" 41 "	" 41 "	90	10	11.1
200 small	3 " " "	" 41 "	" 41 "	190	4	2.1
200 "	4 " " "	" 41 "	" 41 "	182	12	6.5
200 "	5 " " "	" 41 "	" 41 "	191	30	15.7
200 medium	3 " " "	" 41 "	" 41 "	184	3	1.6
200 "	4 " " "	" 41 "	" 41 "	191	4	2.0
200 "	5 " " "	" 41 "	" 41 "	182	16	8.7
100 large	3 " " "	" 41 "	" 41 "	90	4	4.4
100 "	4 " " "	" 41 "	" 41 "	88	6	6.8
100 "	5 " " "	" 41 "	" 41 "	82	3	3.6
200 small	3 " " "	Aug. 41 "	Aug. 41 "	152	7	4.6
200 "	4 " " "	" 41 "	" 41 "	--	--	--
200 "	5 " " "	" 41 "	" 41 "	171	9	5.2
200 medium	3 " " "	" 41 "	" 41 "	128	4	3.1
200 "	4 " " "	" 41 "	" 41 "	150	5	3.3
200 "	5 " " "	" 41 "	" 41 "	140	8	4.7
100 large	3 " " "	" 41 "	" 41 "	100	5	5.0
100 "	4 " " "	" 41 "	" 41 "	97	4	4.1
100 "	5 " " "	" 41 "	" 41 "	93	7	7.5

Table 22. Experiment to determine the survival of clams when exposed on the flats over periods of varying length.

Number and size	Type and length of exposure	Date planted	Date checked	Number recovered	Number dead	Per cent dead
200 small	3 days on flats	Aug. 41 early	Aug. 41 late	170	8	4.7
200 "	4 " " "	" 41 "	" 41 "	--	--	--
200 "	5 " " "	" 41 "	" 41 "	182	28	15.3
200 medium	3 " " "	" 41 "	" 41 "	165	5	3.0
200 "	4 " " "	" 41 "	" 41 "	196	9	4.5
200 "	5 " " "	" 41 "	" 41 "	193	25	12.9
100 large	3 " " "	" 41 "	" 41 "	78	2	2.5
100 "	4 " " "	" 41 "	" 41 "	71	4	5.6
100 "	5 " " "	" 41 "	" 41 "	75	1	1.3
200 small	3 " " "	Nov. 6/41	Dec. 27/41	180	11	6.1
200 "	4 " " "	" 7/41	" 27/41	160	12	7.5
200 "	5 " " "	" 8/41	" 27/41	161	23	14.2
200 medium	3 " " "	" 6/41	" 29/41	159	9	5.6
200 "	4 " " "	" 7/41	" 29/41	153	14	9.1
200 "	5 " " "	" 8/41	" 29/41	120	22	10.0
100 large	3 " " "	Oct. 28/41	" 29/41	58	10	17.2
100 "	4 " " "	" 29/41	" 30/41	68	15	22.0
100 "	5 " " "	" 30/41	" 31/41	45	18	40.0
200 small	3 " " "	Nov. 6/41	Feb. 7/42	182	17	9.3
200 "	4 " " "	" 7/41	March 14/42	175	20	11.4
200 "	5 " " "	" 8/41	March 27/42	153	38	24.8
200 medium	3 " " "	" 6/41	Feb. 7/42	176	18	10.0
200 "	4 " " "	" 7/41	March 27/42	186	10	5.3
200 "	5 " " "	" 8/41	April 2/42	169	23	13.6
100 large	3 " " "	Oct. 28/41	April 2/42	71	19	26.7
100 "	4 " " "	" 29/41	" 6/42	78	17	21.7
100 "	5 " " "	" 30/41	" 6/42	69	21	30.0

Table 23.

Experiment to determine the survival of clams when exposed on the flats over periods of varying length.

Number and size	Type and length of exposure	Date planted 1942	Date checked 1942	Number recovered	Number dead	Per cent dead
200 small	2 days on flats	June 27	July 22	200	36	18
200 "	4 " " "	" 29	" 22	186	35	18.8
200 "	6 " " "	July 1	" 22	196	64	32.6
200 "	2 " " "	June 27	" 29	190	34	17.8
200 "	4 " " "	" 29	" 28	164	31	18.2
200 "	6 " " "	July 1	" 29	180	33	18.3
200 "	2 days in water	Aug. 10	Aug. 31	196	30	15.3
200 "	4 " " "	" 12	" 31	196	32	16.3
200 "	6 " " "	" 14	Sept. 1	180	24	13.3
200 medium	2 days on flats	June 27	July 22	179	21	11.7
200 "	4 " " "	" 29	" 23	200	34	17.0
200 "	6 " " "	July 1	July 23	194	23	11.8
200 "	2 " " "	June 27	" 29	193	19	9.8
200 "	4 " " "	" 29	" 30	195	29	14.8
200 "	6 " " "	July 1	" 30	194	40	20.1
200 "	2 " " "	Aug. 10	Aug. 31	200	27	13.5
200 "	4 " " "	" 12	Sept. 1	190	19	10.0
200 "	6 days in water	" 14	" 1	177	25	14.1
100 large	2 days on flats	July 2	July 23	100	6	6
100 large	4 " " "	" 4	" 23	97	6	6
100 "	6 " " "	" 1	" 23	96	4	4
100 "	2 " " "	" 2	" 29	51	51	100
100 "	4 " " "	" 4	" 29	80	80	100
100 "	6 " " "	June 29	" 28	96	6	6
100 "	2 " " "	Aug. 12	Sept. 1	97	4	4
100 "	4 " " "	" 14	" 1	98	6	6
100 "	6 " " "	" 15	" 3	90	27	30

Table 24.

Experiment to determine the survival of clams when exposed
in air over periods of varying length.

Number and size	Length of exposure	Date planted 1942	Date checked 1942	Number recovered	Number dead	Per cent dead
200 small	2 days	June 25	July 20	191	58	30.4
200 "	4 "	" 23	" 18	188	99	52.6
200 "	6 "	" 22	" 20	187	118	63.1
200 medium	2 "	" 25	" 20	192	22	11.4
200 "	4 "	" 23	" 18	190	79	41.4
200 "	6 "	" 22	" 20	167	84	44.3
100 large	2 "	" 25	" 20	94	16	17.0
100 "	4 "	" 27	" 20	96	54	56.2
100 "	6 "	" 22	" 17	93	55	59.1
200 small	2 "	Aug. 10	Aug. 31	195	30	15.3
200 "	4 "	" 12	" 31	189	154	81.5
200 "	6 "	Not fit to plant.				
200 medium	2 "	Aug. 10	Aug. 31	194	25	12.8
200 "	4 "	" 10	Sept. 1	173	153	88.4
200 "	6 "	Not fit to plant.				
100 large	2 "	Aug. 12	Sept. 1	94	7	7.4
100 "	4 "	" 14	" 1	89	65	73.0
55 "	6 "	" 15	" 1	48	46	95.8
		Only 55 fit to plant.				

Table 25. Experiment to determine whether clams can bury themselves when scattered on the surface after various degrees of exposure.

Size and number	Nature of surface	Date of spreading 1942	Type and length of exposure	Date checked 1942	Total no. of clams recovered	% Buried	Dead	Per cent dead	Position	Remarks
200 small	Furrowed	July 2	Fresh	July 8	175	87.5	19	10.8	Upper	2 surface
200 "	Scratched	July 2	"	" 9	146	73	3	2.05	"	18 "
200 medium	Furrowed	" 2	"	" 8	185	92.5	6	3.2	"	14 "
200 "	Scratched	" 2	"	" 9	152	76	2	1.3	"	11 "
200 small	Furrowed	June 29	4 days flats	" 7	124	62	11	8.8	lower	
200 "	"	July 1	6 " "	" 8	153	76.5	21	1.3	"	
200 "	Scratched	June 29	4 " "	" 6	94	47	11	11.7	"	
200 "	"	July 1	6 " "	" 7	60	30	8	13.3	"	Washed off.
200 medium	Furrowed	June 29	4 " "	" 7	153	76.5	2	1.3	"	
200 "	"	July 1	6 " "	" 8	139	69.5	10	7.1	"	
200 "	Scratched	June 29	4 " "	" 6	59	29.5	0	0	"	
200 "	"	July 1	6 " "	" 7	42	21	7	16.6	"	
200 small	Furrowed	June 23	4 days air	" 7	107	53.5	40	37.3	"	
200 "	"	" 22	6 " "	" 6	43	21.5			"	
200 "	Scratched	" 23	4 " "	" 7	130	65	38	29.2	"	
200 "	"	" 29	6 " "	" 7	4	2	0	0	"	
200 medium	Furrowed	" 23	4 " "	" 6	124	62	34	27.4	"	
200 "	"	" 30	6 " "	" 6	67	33.5	67	100	"	
200 "	Scratched	" 23	4 " "	" 7	101	50.5	17	16.8	"	
200 "	"	" 27	6 " "	" 7					"	Floated away.
200 small	Normal	" 27	4 " "	" 6	103	50.1	13	12.6	upper	
200 medium	"	" 27	4 " "	" 6	35	17.5	4	11.4	lower	

Table 26. Experiment to determine whether clams can bury themselves when scattered on the surface after various degrees of exposure.

Size and number	Nature of surface	Date of spreading 1942	Type and length of exposure	Date checked 1942.	% buried	Total no. of clams	Dead	Per cent dead	Remarks
200 small	Scratched	Aug. 7	2 days water	Aug. 21	79.5	159	17	10.6	Drifted off
200 "	"	Aug. 8	4 " "	" 25	21.5	53	15	28.1	
200 "	Furrowed	" 7	2 " "	" 22	69	138	21	15.2	
200 "	"	" 8	4 " "	" 26	52.5	105	75	71.4	
200 medium	Scratched	" 7	2 " "	" 22	72	144	15	10.4	
200 "	"	" 8	4 " "	" 26	76.5	153	12	7.8	
200 "	Furrowed	" 7	2 " "	" 22	84.5	169	18	10.6	
200 "	"	" 8	4 " "	" 26	84.5	169	15	8.9	
200 small	Scratched	" 7	2 days air	" 22	88.5	177	25	14.1	
200 "	"	" 8	4 " "	" 25	88.5	176	13	7.3	
200 "	Furrowed	" 7	2 " "	" 22	84	164	26	15.8	
200 "	"	" 8	4 " "	" 26	87.5	175	29	16.5	
200 medium	Scratched	" 7	2 " "	" 26	61	122	4	3.2	
200 "	"	" 8	4 " "	" 25	20.05	41	7	17.7	
200 "	Furrowed	" 7	2 " "	" 24	88.5	177	31	11.8	
200 "	"	" 8	4 " "	" 26	44.5	89	49	55.05	

Table 27. Experiment to determine whether clams can bury themselves when scattered on the surface after various degrees of exposure.

Size and number	Nature of surface	Date of spreading 1942	Type and length of exposure	Date checked 1942	% Buried	Total no. of clams	Dead	Per cent dead	Remarks
200 small	Scratched	Aug. 7	2 days water	Aug. 21					
200 "	"	" 8	4 " "	" 24	73	146	11	7.5	
200 "	Furrowed	" 7	2 " "	" 21	76	153	36	23.5	
200 "	"	" 8	4 " "	" 24	100	200	30	15	
200 medium	Scratched	" 7	2 " "	" 21	91.5	183	39	21.3	
200 "	"	" 8	4 " "	" 24	63	126	16	12.6	
200 "	Furrowed	" 7	2 " "	" 21	31	62	6	9.6	
200 "	"	" 8	4 " "	" 19	86.05	173	25	14.4	Drifted off.
200 small	Scratched	" 7	2 days air	" 21	84.05	169	19	11.2	
200 "	"	" 8	4 " "	" 24	74.05	149	19	12.7	
200 "	Furrowed	" 7	2 " "	" 21	11	22	10	45.4	
200 "	"	" 8	4 " "	" 24	95.5	191	33	16.2	
200 medium	Scratched	" 7	2 " "	" 24	66.5	123	109	88.6	
200 "	"	" 8	4 " "	" 21	52	104	4		
200 "	Furrowed	" 7	2 " "	" 24	4.5	9	2		
200 "	"	" 8	4 " "	" 24	78.5	157	21		
				" 19	58.5	117	79		

Table 28. Experiment to determine whether clams can bury themselves when scattered on the surface.

Size and number.	Position	Date scattered	Date checked	Per cent buried	Number re-covered.	Number dead	Per cent dead	
200 small	surface	July 3	July 9	73	146	3	2	
200 medium	"	" 1	" 8	44	88	2	2.2	
100 large	"	" 2	" 17	51	51	0	washed away and eaten by gulls	
200 small	"	July/41 early	July/41 late	68.5	137	2	1.4	
200 medium	"	" /41 "	" /41 "	60	120	7	5.8	
100 large	"	" /41 "	" /41 "	17	17	2	11.76	
200 small	"	" /41 "	" /41 "	62.5	121	7	5.7	
200 medium	"	" /41 "	" /41 "	56	112	3	2.6	
100 large	"	" /41 "	" /41 "	15	15	2	1.33	
200 small	"	Aug. early	Aug. late	40	80	4	5	
200 medium	"	" "	" "	55	110	2	1.8	
100 large	"	" "	" "	13	26	--	0	
200 small	"	August	" "	70	140	6	4.2	
200 medium	"	"	" "	62	124	4	3.2	
100 large	"	"	" "	10.5	21	--	0	
200 small	"	Nov. 5/41	Consumed by gulls before they could bury themselves.					
200 medium	"	" 5/41	" " " "	" " " "	" " " "	" " " "	"	
100 large	"	" 5/41	" " " "	" " " "	" " " "	" " " "	"	
200 small	"	" 5/41	Consumed by gulls before they could bury themselves.					
200 medium	"	" 5/41	" " " "	" " " "	" " " "	" " " "	"	
100 large	"	" 5/41	" " " "	" " " "	" " " "	" " " "	"	
200 small	"	July 2/42	July 8/42		12	3		
200 medium	"	" 2/42	" 9/42		20	0		
100 large	"	" 2/42	" 9/42		7	0		

Table 29: Clams in one-foot squares dug at 50-foot intervals from the head of the flat to the channel, Dec. 17-19, 1941.

Plot	Age 1 - 2 years	AGE 2 - 3 years	Age 3 - 4 years	Age 4 - 5 years
No.1 100 ft. from channel	18 clams $\frac{3}{4}$ to $1\frac{1}{4}$ in.	42 clams 1 - $1\frac{5}{8}$ in.	18 clams $1\frac{1}{2}$ - $1\frac{3}{4}$ in.	0
No.2 100 ft. from No.1	17 clams $\frac{1}{2}$ to $\frac{3}{4}$ in.	61 clams $\frac{3}{4}$ to $1\frac{3}{8}$ in.	31 clams $1\frac{1}{4}$ to $1\frac{1}{2}$ in.	14 clams 2 to 3 in.
No.3 100 ft. from No.2	11 clams $\frac{7}{16}$ - $\frac{9}{16}$ in.	41 clams $\frac{1}{2}$ - 1 in.	8 clams $\frac{3}{4}$ - $1\frac{1}{8}$ in.	53 clams $1\frac{1}{4}$ - $2\frac{3}{8}$ in.
No.4 100 ft. from No.3	10 clams $\frac{7}{16}$ - $\frac{3}{4}$ in.	6 clams $1\frac{1}{8}$ - $1\frac{3}{4}$ in.	7 clams 1 - $1\frac{1}{8}$ in.	40 clams $1\frac{1}{2}$ - $2\frac{1}{4}$ in.
No.5 100 ft. from No.4	5 clams $\frac{1}{4}$ - $\frac{3}{4}$ in.	5 clams $\frac{3}{4}$ - $\frac{7}{8}$ in.	3 clams 1 - $1\frac{1}{2}$ in.	73 clams $1\frac{1}{4}$ - $2\frac{1}{8}$ in.
No.6 100 ft. from No.5	9 clams $\frac{3}{4}$ - $\frac{9}{16}$ in.	71 clams $\frac{9}{16}$ - 1 in.	14 clams 1 - $1\frac{1}{2}$ in.	20 clams $1\frac{1}{4}$ - $1\frac{3}{4}$ in.

Table 30: Clams in one-foot square dug at 50-foot intervals
 from the head of the flat to the channel, Dec. 17-19, 1941.

Square		1941 sets	2-yr.	3-yr.	4-yr.	5-yr.
1		0	0	0	2	16
"	2	0	12	19	6	6
"	3	1	4	10	31	18
"	4	51	23	76	32	17
"	5	11	13	8	12	26
"	6	11	20	4	7	16
"	7	15	19	14	4	17
"	8	14	84	79	7	5
"	9	18	95	115	11	0
"	10	0	2	5	9	1
"	11	0	0	2	1	1

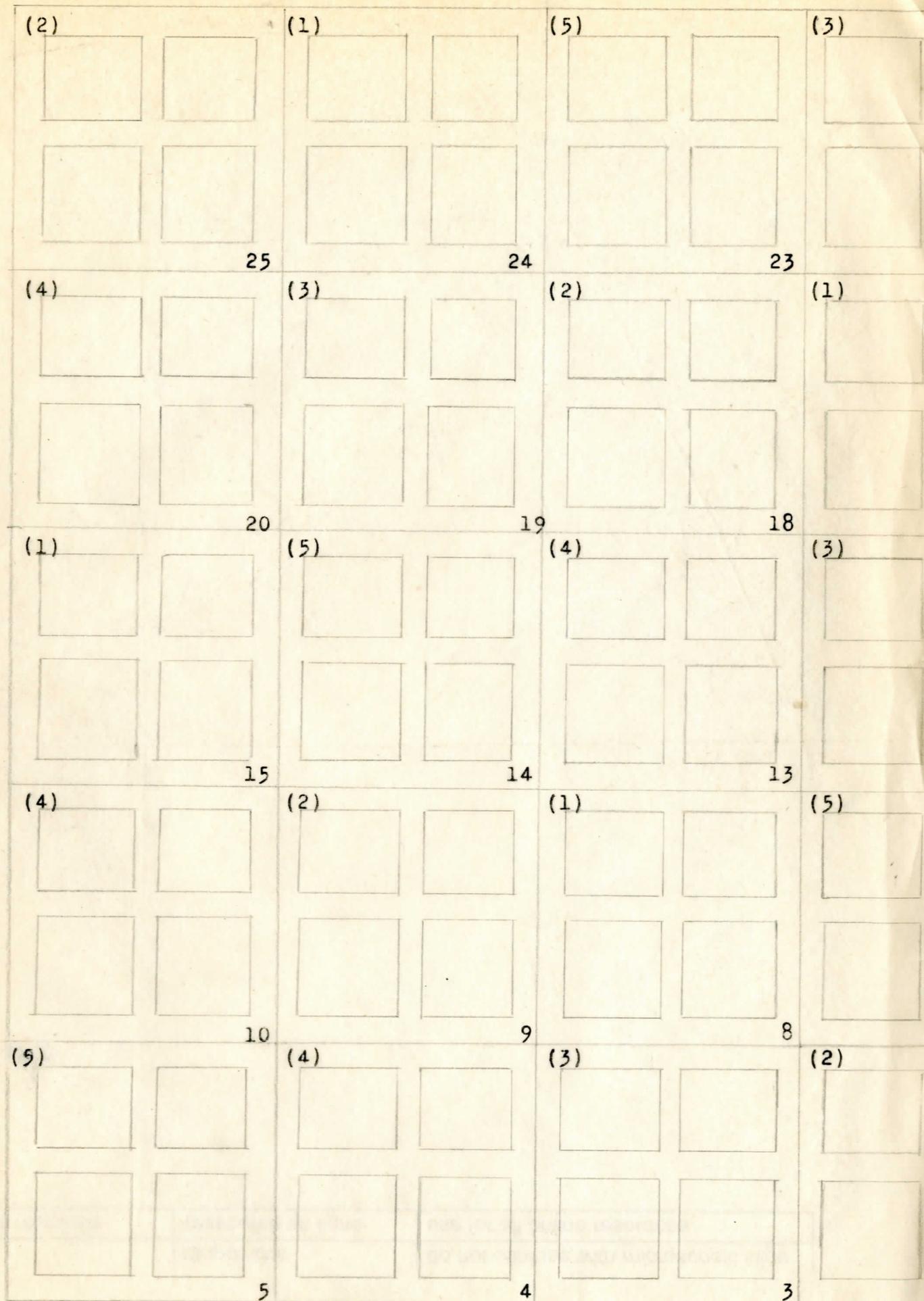


Figure 1. Plan of the 75' x 75' Plot used for the Study of Growth and Stunting and Crowding.

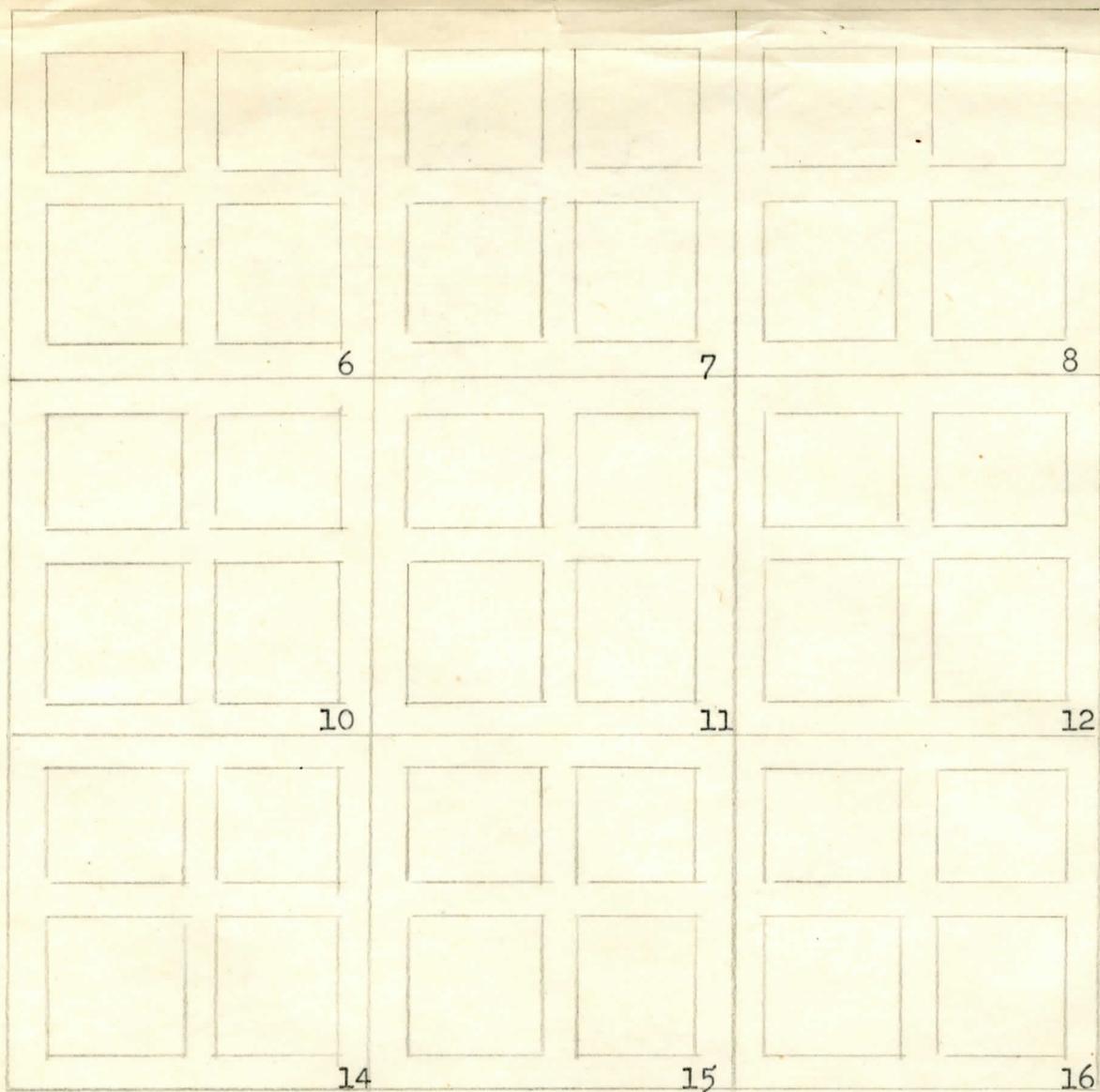


Figure 3. Plan of an additional plot used for the study of growth and survival as affected by stunting and crowding. 80 clams per sq. ft. were used in all these areas.