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by

D. G. Wilder

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FISHERIES RESEARCH BOARD OF CANADA

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(a) Variation in mean size of lobsters.

There is considerable variation in the mean size of lobsters caught throughout the gulf of St. Lawrence area. The mean size may be less than 7" in some localities, while elsewhere it may be over 10". In general, the mean size is a characteristic of the lobster population at any one locality although it may vary slightly from year to year, or within a single season's fishing, or even in relation to the depth of water fished.

(b) Variation in lobster traps.

For many years fishermen have been modifying their lobster traps in an attempt to find the most efficient traps for their particular locality. As a result a wide variety of traps are now in use. Traps have been measured recently at various localities throughout the southern gulf area where they show the following variation: overall length - 28 to 48 inches, inside width - 15 to 21 inches, inside height - 10 to 15 inches, diameter of fishing rings - $3\frac{1}{2}$ to 6 inches, and spaces between the laths - $\frac{1}{2}$ to $1\frac{1}{2}$ inches. The smaller traps with small rings and narrow spaces between the laths are usually fished where the mean size of lobsters caught is small. Prior to the introduction of a $6\frac{1}{2}$-inch size limit in 1940 throughout the gulf of St. Lawrence and its extension in 1942 to 7 inches, these traps with small rings and narrow spaces between the laths were undoubtedly more efficient in the small-lobster areas. At present, however, in such areas lobsters under 7 inches ("shorts") may constitute more than 50

percent of the total catch by count. Liberating these numerous shorts is time-consuming and consequently annoying to the fisherman. In many areas the enforcement of the size limit is very difficult. Further, even in areas where the size limit is rigidly observed the short lobsters suffer considerable damage from handling, exposure to sunlight, etc., before being returned to the water. It was felt that if a trap could be designed which would automatically liberate the short lobsters without reducing the catch of legal-sized lobsters it would be of considerable benefit both to the fishermen and to the law enforcement officers.

(c) Experiments conducted.

With this in mind, preliminary experiments with two different types of traps were carried out in the spring of 1943 at North Rustico, P. E. I. where the mean size of lobsters caught is small (about 7") and at Pinette, P. E. I. where the mean size of lobsters is considerably larger ($8\frac{3}{4}$"). The traps generally fished at North Rustico are smaller with smaller fishing rings and narrower spaces between the laths than those fished at Pinette. A transfer of traps was made so that at both North Rustico and Pinette the catch from 20 Pinette traps could be compared with the catch from 20 North Rustico traps. At North Rustico the two kinds of traps were fished alternately in strings of ten, while at Pinette two traps (one of each kind) were fished from a single buoy. The catches from each kind of trap were kept separate each day, all the lobsters were measured and then weighed as "shorts," "canners" and "markets." The measurements of the two kinds of traps are given in Table I. Both of these traps were the "standard"

three-bow, two-side-ring traps, with a single "kitchen" and one "parlour." They differed somewhat in size and design but for the liberation of shorts and for the capture of legal-sized lobsters the differences in ring size and lath spacing would seem to be the most important.

Further experiments were conducted during the fall season of 1943 at Shediac, N. B., where the lobsters are an intermediate mean size (7½"). Three kinds of traps (20 of each kind), varying only in ring size and lath space, were fished here. Three traps (one of each kind) were fished from a single buoy. The measurements of these traps are given in Table I. A comparison of the catches from types 3 and 4 indicates the effect of differences in ring size, while a comparison of the catches from 4 and 5 indicates the effect of differences in lath space.

Table I. Measurements (in inches) of traps fished at Rustico, Pinette and Shediac (means in brackets).

Type of trap	Length	Width	Height	Size of ring	Lath space
1 - North Rustico	30-31	17-19	10½-11½	3⅞-4(4)	⅝-⅞(¾)
2 - Pinette	36	19-20	13-14	4⅝-5¼(4⅞)	1¼
3 - Shediac	36	18	13	4-4⅜(4 3/16)	¾-1(⅞)
4 - "	36	18	13	4½-5⅜(4¾)	¾-1(⅞)
5 - "	36	18	13	4¾-5⅜(4 15/16)	1¼-1⅜(1 5/16)

(d) Numbers and size of lobsters caught.

The numbers and size of lobsters caught in each type of trap at each of the three places is indicated in Table II. The same data are presented in graphic form in figures 1 - 4.

Table II. Number and size of lobsters caught in each type of trap.

Length cm.	North Rustico		Pinette		Shediac		
	Type 1	Type 2	Type 1	Type 2	Type 3	Type 4	Type 5
13	1						
14	57					2	
15	110	8			10	14	
16	215	41	7	1	54	49	4
17	233	147	8	9	101	116	70
18	262	246	27	54	131	147	148
19	199	208	47	72	133	142	160
20	107	149	66	93	126	142	157
21	37	60	59	103	95	65	85
22	32	51	66	89	40	44	47
23	10	16	44	96	19	20	23
24	9	9	28	68	12	6	22
25	4	4	29	35	7	6	17
26		2	36	29	4	5	7
27		1	21	24	2	1	8
28		2	19	25	1	1	1
29			7	13		1	2
30	2		6	10	1		
31			4	4			
32		1	1	3			
33				2			
34				1			
35				1			
36				2			
	1278	945	475	734	736	761	751

(e) Width-total length relationship.

Lobsters are deeper through the body than they are wide so it is to be expected that the narrowest space through which a lobster may pass is determined by the greatest width of its carapace. To determine the carapace width-total length relationship, over 200 lobsters were measured at North Rustico. Total length was measured in cm. to the nearest cm. so that a lobster in the 20-cm. class might be from 19.5 - 20.5 cm. long. Carapace width was measured to the nearest mm. with vernier calipers closed tightly on the carapace. In the case of hard-shelled lobsters little compression of the carapace is possible so that such lobsters are not likely to squeeze through

spaces narrower than their greatest width. The data are presented in Table III. The males tend to be somewhat wider through the carapace but the difference is slight and for practical purposes the combined data may be used.

Table III. Carapace width (mm.) - total length (cm.). No. of specimens in brackets.

Total length (cm.)	Male		Female		Combined	
	range	mean	range	mean	range	mean
14	27-29	27.7 (6)	26-28	27.0 (3)	26-29	27.4 (9)
15	28-31	29.5 (12)	28-30	29.2 (12)	28-31	29.4 (24)
16	31-34	31.9 (13)	29-33	31.0 (12)	29-34	31.4 (25)
17	32-37	34.6 (13)	32-35	33.9 (14)	32-37	34.2 (27)
18	35-39	37.0 (13)	34-39	36.5 (14)	34-39	36.8 (27)
19	37-41	39.0 (13)	36-40	38.3 (14)	36-41	38.6 (27)
20	39-43	40.6 (12)	38-43	41.2 (14)	38-43	40.9 (26)
21	41-46	43.2 (8)	40-46	42.7 (14)	40-46	42.8 (22)
22	44-48	46.1 (8)	43-48	45.1 (7)	43-48	45.6 (15)
23	46-48	47.3 (3)	45-47	46.3 (3)	45-48	46.8 (6)
24	48-53	50.4 (5)	48-50	49.0 (2)	48-53	50.0 (7)

(f) Percentages of lobsters expected to escape.

On the basis of these measurements Table IV has been drawn up to indicate the percentage of lobsters in each cm. size class that might be expected to escape through spaces of various widths. At present the size limit for lobsters in the gulf of St. Lawrence area is 7" (17.8 cm.). The 18 cm. class includes lobsters from 17.5 - 18.5 cm. so that 30 percent of this class are below the size limit.

Table IV. Percentages of lobsters of each cm. size class expected to escape through spaces of various widths.

Total length (cm.)	Width of space in inches and millimeters. 1" (25.4 mm)	1⅛" (28.6 mm)	1¼" (31.8 mm)	1 5/16" (33.4 mm)	1⅜" (34.9 mm)	1 7/16" (36.5 mm)
14	0	89	100	100	100	100
15	0	8	100	100	100	100
16	0	0	96	100	100	100
17	0	0	7	18	89	93
18	0	0	0	0	11	44
19	0	0	0	0	0	4
20	0	0	0	0	0	0
21	0	0	0	0	0	0
22	0	0	0	0	0	0
23	0	0	0	0	0	0
24	0	0	0	0	0	0

These figures indicate that 1⅜" is the widest that laths may be spaced without making it possible for legal-sized lobsters to escape. With spaces this wide 11 percent of the 18 cm. class might escape but these are in all probability shorts as 30 percent of this class are under 7" in length. With 1¼" spaces most of the 16 cm. class but only a small fraction of the 17 cm. class would be expected to escape. This latter class comprises a high percentage of the shorts in the small-lobster areas.

(g) Percentages of lobsters that actually escaped.

By comparing the catches from the narrow-spaced traps with the catches from the wide-spaced traps (Table II), it is possible to calculate the percentages of each cm. size class that actually escaped through 1¼" and 1 5/16" spaces. This calculation is based on the assumption that the traps were otherwise similar (not strictly the case) and that no lobsters of the sizes considered escaped through the ¾" or ⅞" spaces. This latter assumption seems reasonable as even a 14 cm. lobster is more than an inch wide. The catch from the wide-spaced traps at Shediac has been compared with the mean catch from the

two groups of narrow-spaced traps. The percentages that escaped are indicated in Table V.

Table V. Percentages of lobsters of each cm. size class that escaped through 1¼" and 1 5/16" spaces.

Total length (cm.)	1¼" spaces		1 5/16" spaces
	North Rustico	Pinette	Shediac
13	100	--	--
14	100	--	100
15	93	--	100
16	81	86	92
17	37	0	35
18	6	0	0

From a comparison of Tables IV and V it is apparent that the percentages of lobsters expected to escape on the basis of the width-length relationship agree fairly well with the percentages that actually did escape during the experimental fishing. At Rustico more of the 17 cm. and 18 cm. classes escaped than was to be expected. Possibly their escape was facillitated by the larger rings in the wide-spaced traps. The Shediac data show very good agreement with the exception of the 17 cm. class where again more than the expected number escaped. In general, it may be said that the width-length relationship gives a good indication of the percentages of lobsters of various sizes that will escape through a space of fixed width.

(h) Catch of lobsters by count and by weight.

Lobsters are usually grouped commercially into three size classes, (1) "shorts" - under 7", (2) "canners" - from 7" to about 9" (actually 3⅛" carapace measure), and (3) "markets" - over 9". The catches from the different types of traps at the three places fished have been grouped in this manner and the data both by count and by weight are presented in Tables VI and VII. The weighings

were done with a spring balance and while this method is not particularly accurate the comparative weights are of value since the same balance was used throughout.

Table VI. Catch of lobsters by count.

North Rustico	Total	Shorts	Canners	Markets
Type 1.	1278	659	597	22
" 2.	945	220	698	27
Pinette				
Type 1.	475	18	279	178
" 2.	734	21	441	272
Shediac				
Type 3.	736	199	491	46
" 4.	761	230	484	47
" 5.	751	110	554	87

Table VII. Catch of lobsters in pounds.

North Rustico	Shorts	Canners	Markets	Canners & Markets
Type 1.	220	345	29	374
" 2.	86	421	35	456
Pinette				
Type 1.	5.5	203	274	477
" 2.	6.5	315	400	715
Shediac				
Type 3.	71	284	54	338
" 4.	83	275	54	329
" 5.	43	316	100	416

The number, rather than the weight, of shorts that escape is of primary interest both to the fishermen and to those concerned with the protection of the lobsters, while it is the weight of legal-sized lobsters caught that is of chief interest. At each of the three places the wide-spaced traps caught more canners and more markets both by count and by weight. At North Rustico and at Shediac the wide-spaced traps caught fewer shorts. That the wide-spaced traps at

Pinette caught about the same number of shorts was not entirely unexpected. Shorts are very scarce in this area and are just below the size limit. Lobsters of this size would not be expected to readily escape through 1¼" spaces. The use of wide-spaced traps reduced the number of shorts caught at North Rustico by 67 percent and at Shediac by 52 percent. The percentage increase in weight of legal-sized lobsters caught was as follows: North Rustico 22 percent, Pinette 50 percent, and Shediac 26 percent. Thus, it appears that the use of wide-spaced traps brings about the greatest reduction in shorts where the average size of lobsters caught is small. The greatest increase in catch of legal-sized lobsters occurs where the average size of lobsters is large.

A comparison of the catches at Shediac from trap types 4 and 5 indicate that it is the width of spacing rather than ring size that determines both the number of shorts that escape and the catch of legal-sized lobsters. These two types of traps had fishing rings of approximately the same size but differed by nearly half an inch in lath spacing. The only difference between traps 3 and 4 was a half inch in ring size. The catches from these two types was very similar but the traps with the larger rings actually caught more shorts. In this case the difference in ring size was not great and further experiments are needed to determine more accurately the effect of ring size.

(i) Effect of lath spacing on mean size.

The variation in mean size of lobsters caught throughout the Maritime Provinces has undoubtedly many contributing factors such as depth of water fished, fishing intensity, suitability of area for spawning and rearing, type of traps fished, etc. These experiments

indicate how much of this variation may be brought about by the use of different traps. The mean sizes of lobsters caught in each type of trap at the three places are shown in Table VIII.

Table VIII. Mean sizes (cm.) of lobsters.

	North Rustico	Pinette	Shediac
Type 1.	17.67 ± .06	22.36 ± .15	
" 2.	18.91 ± .06	22.36 ± .12	
" 3.			19.19 ± .08
" 4.			19.03 ± .08
" 5.			19.82 ± .08

The wide-spaced traps caught lobsters of significantly larger mean sizes both at North Rustico and at Shediac. As might be expected the greatest difference in mean sizes was obtained where the lobsters caught are small. There was no difference in the mean sizes caught at Pinette. Here, the wide-spaced traps caught more lobsters but the increase was quite evenly distributed over the various size classes so that no increase in mean size resulted. At Shediac the mean sizes of the catch from the two groups of narrow-spaced traps did not differ significantly.

Thus, part of the variation that occurs in the mean sizes of lobsters is definitely associated with differences in the traps used. Many fishermen state that prior to the introduction of the size limit there had been, over a period of years, a tendency to reduce the width of the lath spacing in order to compensate partially for the gradually decreasing mean size of lobsters. Any reduction in mean size that may have occurred during these years could well be the result of this practice rather than the cause of it. At present, it is only where the mean size of lobsters caught is large that traps are used with spaces as wide as 1¼". Of late years, variations in lath spacing used throughout the small-lobster

areas would have little effect on the mean size of lobsters caught.

(j) Comparative abundance of lobsters.

From the experimental data it is possible to arrive at an estimate of the comparative abundance of lobsters on the different fishing grounds. At North Rustico and at Pinette the same gear was fished at the same time of year. The number of traps hauled each day and the number, size, and weight of lobsters caught is known so that it is possible to calculate the catch per unit effort. This catch per unit effort is a measure of the abundance of lobsters. The data for the Shediac catches are not strictly comparable as the fishing was done during the "fall" season when the water was considerably warmer and the lobsters were probably trapping more readily. The actual number of trap hauls and the number of lobsters caught are indicated in Table IX. In Table X, these data have been reduced to catch per unit effort, using 1000 trap hauls as unit effort. Similarly, the catch in pounds per unit effort is indicated in Table XI. At each place the combined data from the different types of traps are used.

Table IX. Number of trap hauls and number of lobsters caught.

	No. of trap hauls	Number of lobsters caught.			
		Total	Shorts	Canners	Markets
North Rustico	496	2223	879	1295	49
Pinette	1314	1209	39	720	450
Shediac	1044	2248	539	1529	180

Table X. Number of lobsters caught per 1000 trap hauls.

	Number of lobsters caught.			
	Total	Shorts	Canners	Markets
North Rustico	4482	1772	2611	99
Pinette	920	30	548	342
Shediac	2152	516	1464	172

Table XI. Weight of lobsters caught per 1000 trap hauls.

	Weight of lobsters caught				
	Total	Shorts	Canners	Markets	Canners & Markets
North Rustico	2290	617	1544	129	1673
Pinette	916	9	394	513	907
Shediac	1226	189	838	199	1037

From Table X it is seen that lobsters are nearly five times as abundant at North Rustico as at Pinette and over twice as abundant at Shediac as at Pinette. The shorts at North Rustico are, however, about three times as abundant as at Shediac and over fifty times as abundant as at Pinette. Canners at North Rustico are nearly five times as numerous as at Pinette and nearly twice as numerous as at Shediac. Markets, on the other hand, are about three and one-half times as numerous at Pinette as at North Rustico and about twice as numerous at Pinette as at Shediac. In spite of the abundance of shorts at North Rustico, the catch of legal-sized lobsters in pounds per unit effort was about 85 percent greater than at Pinette. The catch of legal-sized lobsters in pounds per unit effort was about the same at Shediac and at Pinette. With canners approximating the value of markets as they are at the present time, the catch per unit effort at North Rustico is worth considerably more than the catch per unit effort at Pinette.

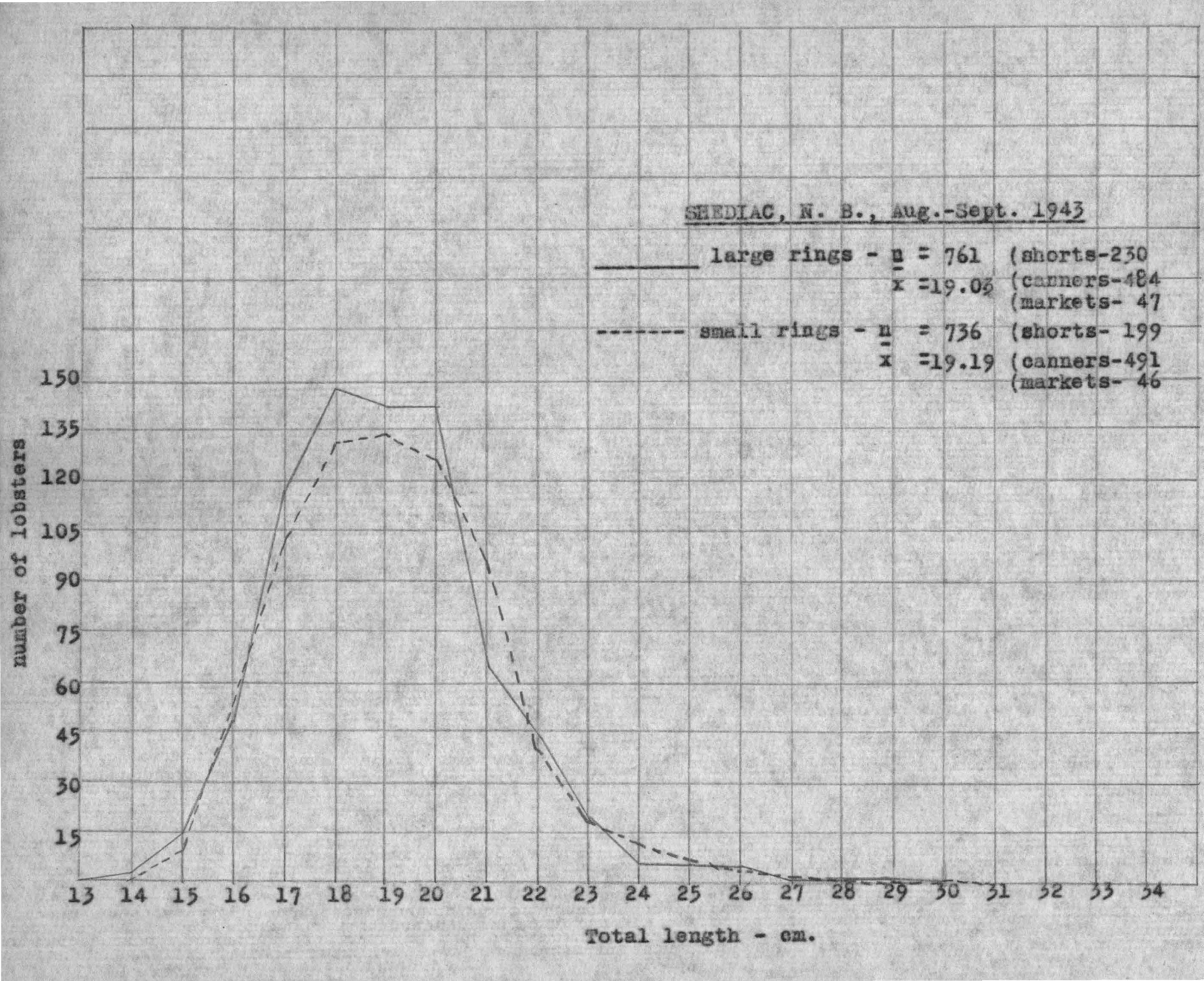
(k) Number of crabs retained.

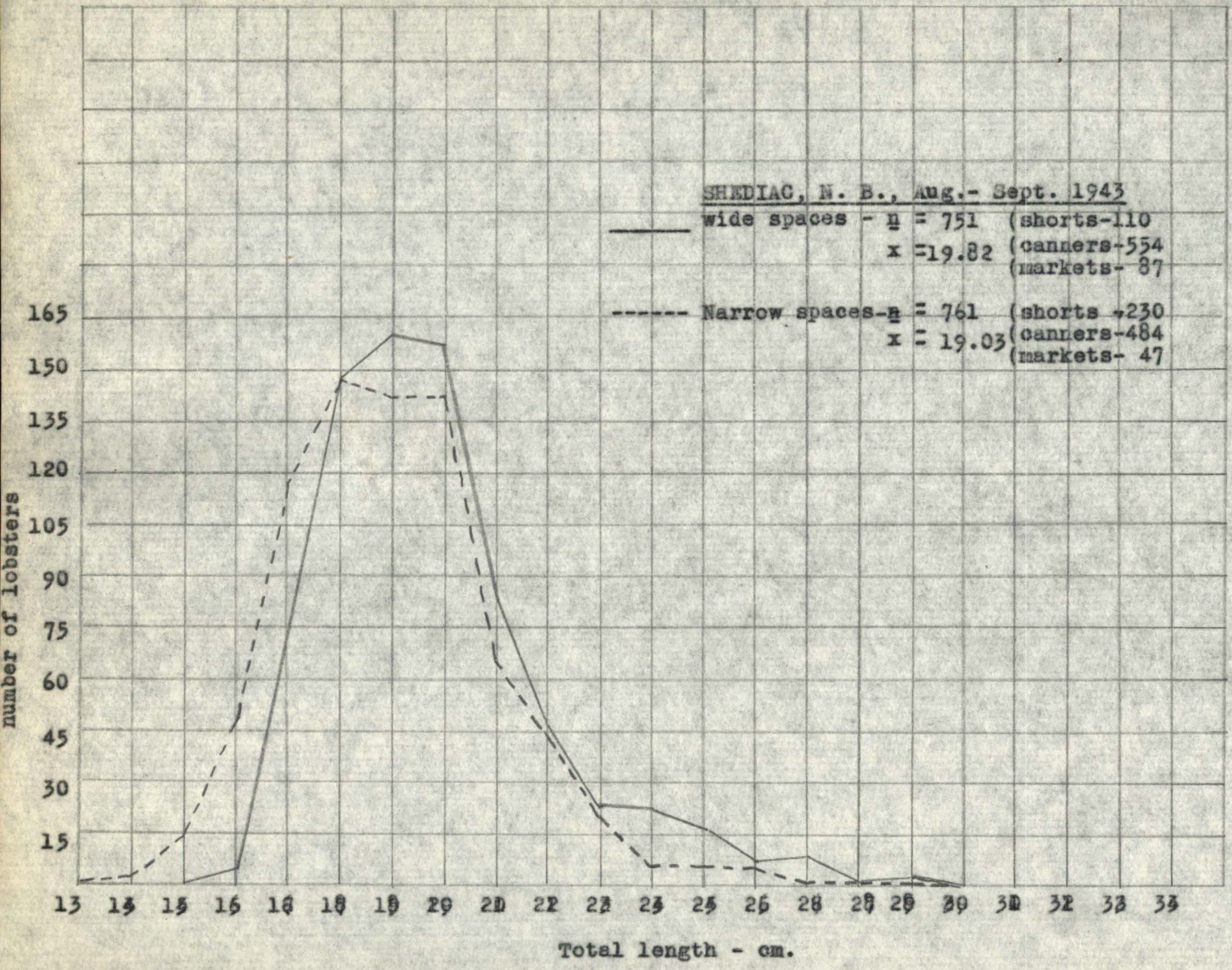
One reason fishermen advance for not fishing wide-spaced traps is that such traps would catch more crabs. Crabs are objectionable in that they eat the bait, thus reducing the catch of lobsters and that they are a nuisance to liberate. Wide lath spacing would not be expected to reduce the number of crabs entering the traps but it might allow them to escape more readily. At Shediac, N. B., the following numbers of crabs were caught in one

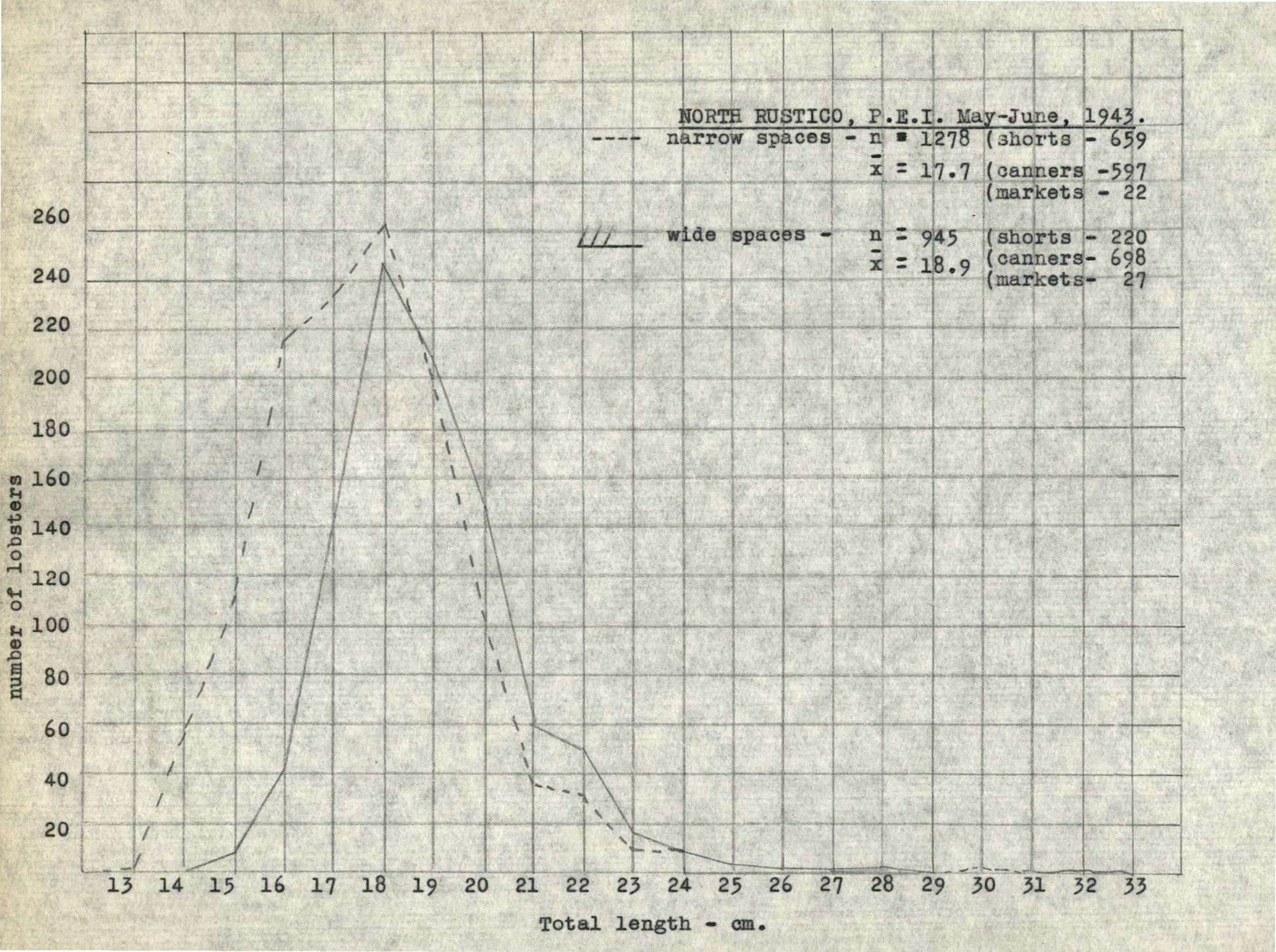
day's fishing by twenty traps of each type; type 3 - 292, type 4 - 242, type 5 - 148. The wide-spaced traps retained fewer crabs than either type of narrow-spaced trap--about half as many as type 3. Of the two types of narrow-spaced traps those with the smaller rings retained more crabs indicating that large rings as well as wide spaces facilitate the escape of crabs.

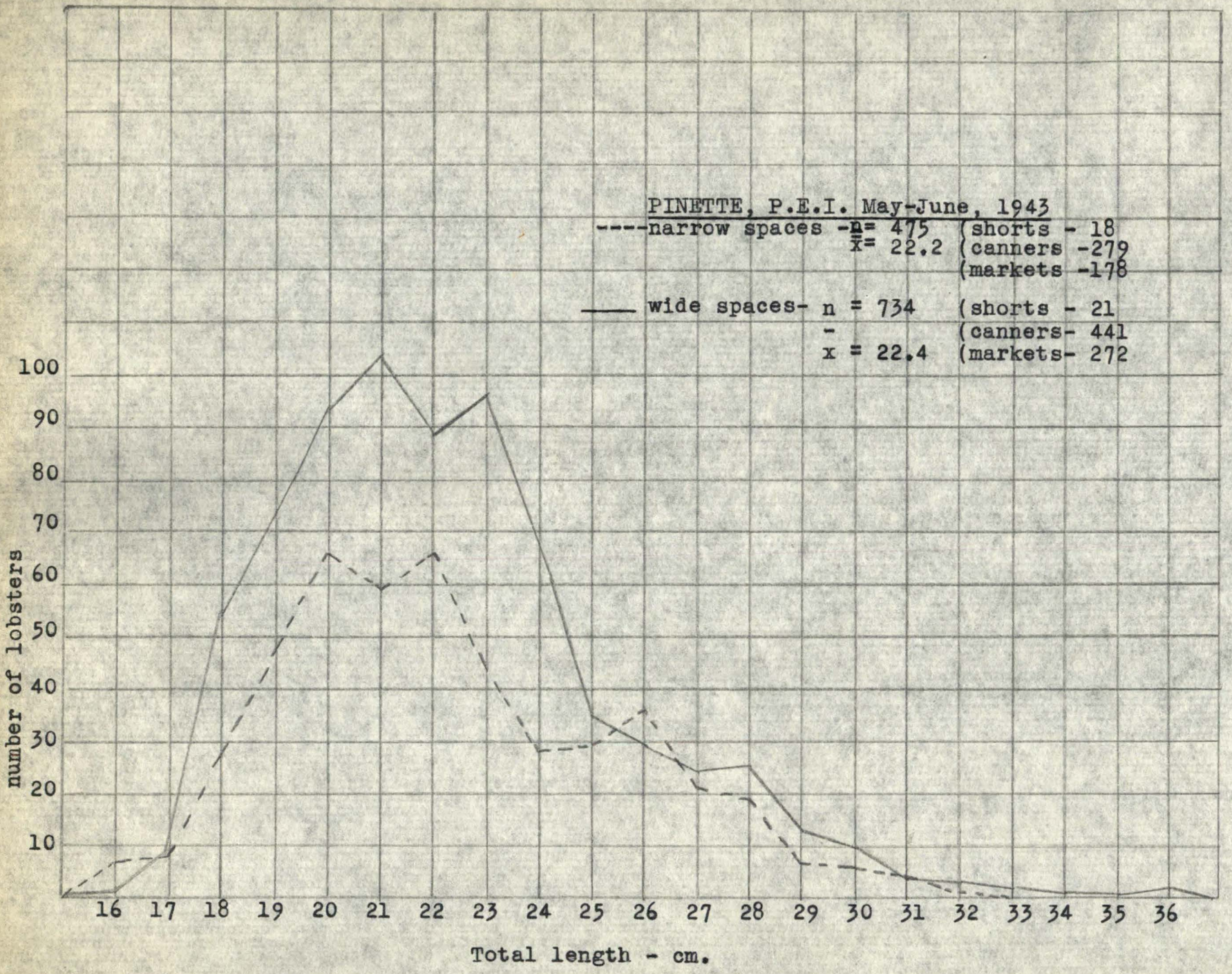
(1.) Number of lobsters caught between the laths.

Many fishermen contend that with wide-spaced traps more lobsters are injured by having their claws caught between the laths. The extent to which this occurs depends both on the size of lobsters caught and on the width of spacing used. As yet, no figures are available on this point but the three fishermen who fished the experimental traps were unanimous in the decision that fewer lobsters were caught between the wide-spaced laths.


SHEDIAC, N. B., Aug.-Sept. 1943
large rings - n = 761 (shorts-230
x̄ = 19.06 (canners-484
(markets- 47
small rings - n = 736 (shorts- 199
x̄ = 19.19 (canners-491
(markets- 46
number of lobsters
150
135
120
105
90
75
60
45
30
15
13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34
Total length - cm.


SHEDIAC, N. B., Aug.- Sept. 1943
wide spaces - n = 751 (shorts-110
x =19.82 (canners-554
(markets- 87
Narrow spaces-n = 761 (shorts -230
x = 19.03 (canners-484
(markets- 47
number of lobsters
165
150
135
120
105
90
75
60
45
30
15
13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34
Total length - cm.


NORTH RUSTICO, P.E.I. May-June, 1943.
---- narrow spaces - n = 1278 (shorts - 659
x̄ = 17.7 (canners -597
(markets - 22
/// wide spaces - n = 945 (shorts - 220
x̄ = 18.9 (canners- 698
(markets- 27
number of lobsters
260
240
220
200
180
160
140
120
100
80
60
40
20
13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33
Total length - cm.


PINETTE, P.E.I. May-June, 1943
----narrow spaces -n= 475 (shorts - 18
x̄= 22.2 (canners -279
(markets -178
—— wide spaces- n = 734 (shorts - 21
- (canners- 441
x = 22.4 (markets- 272
number of lobsters
100
90
80
70
60
50
40
30
20
10
16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36
Total length - cm.