Woods Hole Laboratory
Manuscript Report Number

42 - 4 THE LENGTH-WEIGHT RELATIONSHIP OF REDFISH

AS LANDED AT GLOUCESTER JUNE 15 TO JULY 17, 1942

METHODS OF MEASUREMENT

Lengths were measured on an accurate measuring board graduated in two place logarithms of the length in decimeters. The board was graduated with a maximum error in the graduations of not more than 1/100 of a centimeter so essentially the only source of error would be the personal one of the way in which the fish is slid against the end of the board.

Weights were taken on two spring balances graduated in two place logarithms of the weight in 0.1 pounds. The smaller of the two balances with a capacity of 1.1 pounds never indicated a deviation of more than 1% from the true weight (in the range of weights used) in extensive tests conducted before every sample of fish was weighed. The bias of this scale which would show up in an average was probably not more than ½%. The other scale which was used for all fish over 1.1 pounds had a capacity of 40 pounds and the sector of the dial used was small (between 1 and 2 pounds). Careful checks revealed no error in weighing check weights of more than 2.5% in the range used. However, it was found that the observed weights of test weights were distributed on both sides of the true value so it is considered likely that any bias which would affect an average would not be greater than 1%. Thus in examining the length-weight measurements taken for sources of variation, any variation of less than 1% may possibly be caused by errors in measurement and differences of more than 1% must be explained by reason of some other source of variation.

GATHERING THE DATA

Table 1 itemizes the source of the samples from which the length-weight measurements were obtained. In all of these samples the fish were measured and weighed "as landed" before washing, cleaning, or scaling.

The data were gathered primarily to establish the regression of weight on length for the redfish and secondarily to discover sources of variation in the length-weight relationship. To establish a representative length-weight curve the samples were distributed among as many of the areas fished as possible. Ideally the size of the samples should have been in proportion to the catch from each area but the fishing areas change from week-to-week and data was not available on the expected distribution of the catch for the period in which the samples were taken. The next best bet is to distribute the samples equally among the areas. This was done as far as possible but only one sample of 50 fish was obtained from each of four of the areas which were being lightly fished at the time (Table 1.). From six other areas two samples each were obtained.

The actual length-weight measurements were taken during ten days but because of the necessity of selecting trips for sampling and the pressure of other work the ten days were spread out over 33 days. The females during this time lost much of their spawn, particularly those caught in the more southern areas. The two samples from the same area were taken an average of 16 days apart. This was not planned but by using this information it is possible to obtain an estimate of the change in weight over this period of time.

Table 1.

The source of the samples for the length-weight measurements on redfish. (50 fish per sample).

Area	Dates the Samples were landed.		Days between first and second samples.
Channel	7/15		
Off Gloucester	7/3	7/13	10
Jeffrey's Ledge	7/17		
Off Portland	7/16		
Sequin	6/19	7/ 3	14
Matinicus	6/16	7/13	27
Mt. Desert	7/2	7/14	12
Platts	6/15	7/ 2	17
Cashes	7/16		
Cape Shore (Off Shelbourne)	6/15	7/ 2	17

The samples were taken as nearly at random as was possible under the conditions existing. Usually this meant picking about five to ten fish from each 500 pound box unloaded until the required 50 were obtained. However, some fish companies use 300 pound wheelbarrows and some a 150 pound basket for weighing the fish instead of the 500 pound box. No strict dispersion of the sample was attempted but not more than two fish were taken per 100 pounds unloaded. Neither was any attempt made to spread the sample systematically throughout the whole trip or any definite part of it. Taking the few fish from each container resulted in spreading the sample through several thousand pounds of the boat's catch.

To avoid personal bias in selecting the fish they were picked from the container in as objective a manner as possible. The three, five, or eight fish or whatever the number picked up were taken from those nearest a corner or some other definite point. It is probably impossible to completely avoid personal bias in picking up fish in this way but with care it may be reduced to a minimum.

No restriction was placed on proportion of the sexes in the samples. A significant preponderance (by the Chi^2 test) of females were encountered. Of the 800 fish measured 461 were females. The number in the samples of 50 varied from 18 to 39. (The sex was easy to determine from the exterior for the adult redfish at this time of year, and fairly easy in the case of the immatures but if there was any doubt about the sex the specimen was opened with a knife and the determination made from the gonads).

ANALYSIS OF THE DATA

Covariance analysis was used to determine the sources of variation and the significance of differences. Table 2 presents the results of the analysis for the differences between sexes and among areas. The differences between sexes is slight, the value of F being between the 5% and the 1% levels. The difference among areas is highly significant being well beyond the 0.1% level. However, this difference among areas is confounded with differences in the time at which the samples were taken both in respect to calendar time and to the period in the spawning cycle which is not the same at the same date in the different areas represented. Hence a further examination is necessary before it can be stated that the different areas produce redfish with a different length-weight relationship.

The significance of the time factor was tested by a covariance analysis of the difference between the first and second samples taken from the six areas which were sampled twice (Table 3.). The difference is highly significant when both sexes are considered together or when the females are considered separately but there is no difference in the males between the first and second samples. Change in weight at this season of the year is associated chiefly with the females. Furthermore it would seem appropriate to test the significance of the differences among areas by using the measurements of the males only.

The covariance analysis of the difference among areas was repeated for the males only. The F test reveals a difference well beyond the 1% level. The analysis was also completed for the females only and as is now to be expected an even more significant difference was found among areas; well beyond the 0.1% level (Table 4).

TABLE 2.--REDFISH LENGTH-WEIGHT COVARIANCE ANALYSIS OF THE DIFFERENCES BETWEEN SEXES AND AMONG AREAS

Source of variation	Degrees of freedom	Sums of squares and products			Errors of estimate			
		S_x^2	S_{xy}	S_y^2	Sum of squares	Degrees of freedom	Mean square	
Total	799	2.0966	6.2240	19.4636	.9869	798	.001237	(S = .03417) (C = 8.19%) ($\pm 2S_{y.x}$ = $\pm$17.04%)
Areas	9	.1665	.5139	1.6444				
Sexes	1	.6698	1.9344	5.5873				
Error	789	1.2603	3.7757	12.2319	.9204	788	.00117	
Area + Error	798	1.4268	4.2896	13.8763	.9798	797	.001229	
Difference for test of areas					.0594	9	.00660	
Sexes + Error	790	1.9301	5.7101	17.8192	.9262	789	.00117	
Difference for test of sexes					.0058	1	.0058	

F Test

Difference between Sexes F = .0058/.00117 = 4.96* (5% = 3.85; 1% = 6.66)

Difference among areas F = .00660/.00117 5.64**(5% = 1.89 1% = 2.43) (0.1% = 3.4)

TABLE 3.--REDFISH LENGTH-WEIGHT COVARIANCE ANALYSIS DIFFERENCE BETWEEN FIRST AND SECOND SAMPLES

Source of variation	Degrees of freedom	Sums of squares and products			Errors of estimate		
		Sx^2	Sxy	Sy^2	Sum of squares	Degrees of freedom	Mean square
Both Sexes Together							
Total	599	1.5749	4.6972	14.7464	.7368	598	.00123
Sample	1	.0006	-.0007	.0009			
Error	598	1.5743	4.6979	14.7455	.7264	597	.00122
Difference for Test of Sample					.0104	1	.0104 **
F = .0104/.00122 = 8.52** (1% value 6.68) Highly Significant Difference							
Males Only							
Total	267	.3882	1.1686	3.7863	.2685	266	
Sample	1	.0061	.0174	.0493			
Error	266	.3821	1.1512	3.7370	.2686	265	.00101
Difference for Test of Sample					-.0001	1	-
F = 0 No Difference							
Females Only							
Total	331	.7349	2.2115	7.1202	.4652	330	.00141
Sample	1	.0007	-.0012	.0021			
Error	330	.7342	2.2127	7.1181	.4496	329	.00137
Difference for Test of Sample					.0156	1	.0156 **
F = 11.39** (0.1% value about 11.00) Highly Significant Difference							

TABLE 4.--REDFISH LENGTH-WEIGHT COVARIANCE ANALYSIS OF THE DIFFERENCES AMONG AREAS

Source of variation	Degrees of freedom	Sums of squares and products			Errors of estimate		
		Sx^2	Sxy	Sy^2	Sum of squares	Degrees of freedom	Mean square
Males Only							
Total	338	.4975	1.5056	4.8763	.3199	33	
Areas	9	.0436	.1369	.4540			
Error	329	.4539	1.3687	4.4223	.2951	328	.00090
Difference for Testing Areas					.0248	9	.00276
	F = .00276/.00090 = 3.07 (1% level - 2.48)						
Females Only							
Total	460	.9293	2.7840	9.0000	.6597	459	
Areas	9	.0969	.2889	.9174			
Error	451	.8324	2.4951	8.0826	.6036	450	.00134
Difference for Testing Areas					.0561	9	.00623
	F = .00623/.00134 = 4.65 (1% point = 2.46 0.1% point = app.3.25)						

In summary it appears that there is a relatively large difference in the length-weight relationship among areas and a lesser difference between sexes but both relationships are confounded by a continuing loss of weight by the females during the period of the sampling. Let us examine the magnitude of these differences by means of the regression formulae now that their significance has been determined.

The various regression formulae are presented in Table 5. From these formulae values of the weight have been calculated from assigned values of the length. Several calculated values are listed for the major regression formulae and only the value nearest the mean for the individual area regressions. This single value is best for comparisons among areas. Since very few redfish were less than .40 in length the calculated values of the weight for a length of .30 are subject to irregular and non-significant variations caused by differences in slope.

Comparison of these calculated values of the weight for a given length should properly be made among the males only for differences among areas. It appears that the fish from Platts bank were significantly lighter in weight and those from Off Gloucester, Sequin, Matinicus, Mt. Desert, and Cape Shore ran much the same. Unfortunately insufficient material was obtained from the other four areas for a comparison of areas by the males alone. We may tentatively make a comparison among these areas with both sexes lumped together. This comparison indicates significantly lighter fish from Cashes and significantly heavier fish from the Channel area. Reference to a chart of the area indicates the redfish from the periphery of the Gulf of Maine from Gloucester to Cape Sable had much the same length-weight

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Table 5.

REDFISH LENGTH-WEIGHT
REGRESSION FORMULA

X = Log. of length in decimeters Y = Log. of Weight in 0.1 pounds

Source of Regression formula	N	Regression E of Y =	Y when X = .30	.40	.45	.50	.55
Both Sexes							
All measurements	800	2.96862X-.44093	.4497	.7465	.8949	1.0434	1.1918
By Area							
Off Gloucester	100	2.7084 X-.3205			.8983)		
Seguin	100	3.1015 X-.4867			.9090)		
Matinicus	100	2.8450 X-.3773			.9030)(L.S.D.(1% level)		
Mt. Desert	100	2.8467 X-.3852			.8958)	=.0127)	
Platts	100	3.1274 X-.5210			.8863)		
Cape Shore	100	3.0405 X-.4719			.8963)		
Cashes	50	2.7823 X-.3728			.8792**)		
Portland	50	2.9464 X-.4386			.8873)L.S.D (1% level)		
Channel	50	2.7795 X-.3400			.9108**) =.0183)		
Jeffries	50	2.9472 X-.4355			.8907)		
By time of sampling							
Sample 1	300	3.0836 X-.4876			.9000		
Sample 2	300	2.8598 X-.3926			.8943		
Males Only							
Total	339	3.0263 X-.4630	.4449	.7475	.8988	1.0502	
By Area							
Off Gloucester	48	2.9194 X-.4110			.9027)		
Sequin	39	3.0082 X-.4451			.9086)		
Matinicus	50	2.9351 X-.4156			.9052)L.S.D.(1% level)		
Mt..Desert	39	2.7012 X-.3222			.8933) =.0181)		
Platts	46	3.1079 X-.5152			.8834**)		
Cape Shore	46	3.0336 X-.4665			.8986)		
Cashes	18	Data					
Portland	22						
Channel	11	Inadequate					
Jeffries	20						
By time of sampling							
Sample 1	123	3.1059 X-.4948			.9028		
Sample 2	145	2.9114 X-.4131			.8970		
Females Only							
Total	461	2.9958 X-.4562	.4425	.7421	.8919	1.0417	1.1915
By Area							
Off Gloucester	52	2.7628 X-.3512				1.0302)	
Sequin	61	3.2384 X-.5555				1.0637**)	
Matinicus	50	2.7875 X-.3503				1.0434)L.S.D.	
Mt. Desert	61	2.8896 X-.4063				1.0385)1% level	
Platts	54	3.1004 X-.5061				1.0441) =.0196)	
Cape Shore	54	3.0722 X-.4887				1.0474)	
Cashes	32	Data					
Portland	28						
Channel	39	Inadequate					
Jeffries	30						
By time of sampling							
Sample 1	177	3.1129 X-.5035	.4304	.7417	.8973	1.0530	1.2086
Sample 2	155	2.8793 X-.4040	.4598	.7441	.8917	1.0356	1.1796

relationship while those from Platts and Cashes banks in the center of the Gulf of Maine were thinner and those from the South Channel area were heavier. However, this comparison of the areas should be considered tentative until data is obtained at some time other than the spawning season.

Comparison of the differences among sexes and among samples 1 and 2 may be made by calculated values given in Table 5, or perhaps more easily by the graphs (Figures 1 and 2). The lumped data on sex indicates that the females were very slightly (but significantly) lighter than the males. This similarity is probably accidental since the females decreased markedly in weight between the first and second samples, while the males stayed much the same (Figure 2).

For quick reference the length-weight curve in millimeters and pounds is presented in Figure 3 and the calculated values of the weight for each half centimeter length group are listed in Table 6. These data are most nearly representative of the length-weight relationship of the redfish from the periphery of the Gulf of Maine from Gloucester to Cape Sable for the months of June and July. The redfish from the Central Gulf of Maine and the South Channel area appear to be lighter and heavier, respectively, and no data is available on the variation associated with different seasons. For weighing length-frequency curves it is not likely that any great error will be caused by using this curve for all areas and seasons since even if the fish do run lighter or heavier, the relationship among the weighing factors will change but little. But for converting poundage to numbers, more representative figures would be desirable.

Figure 1

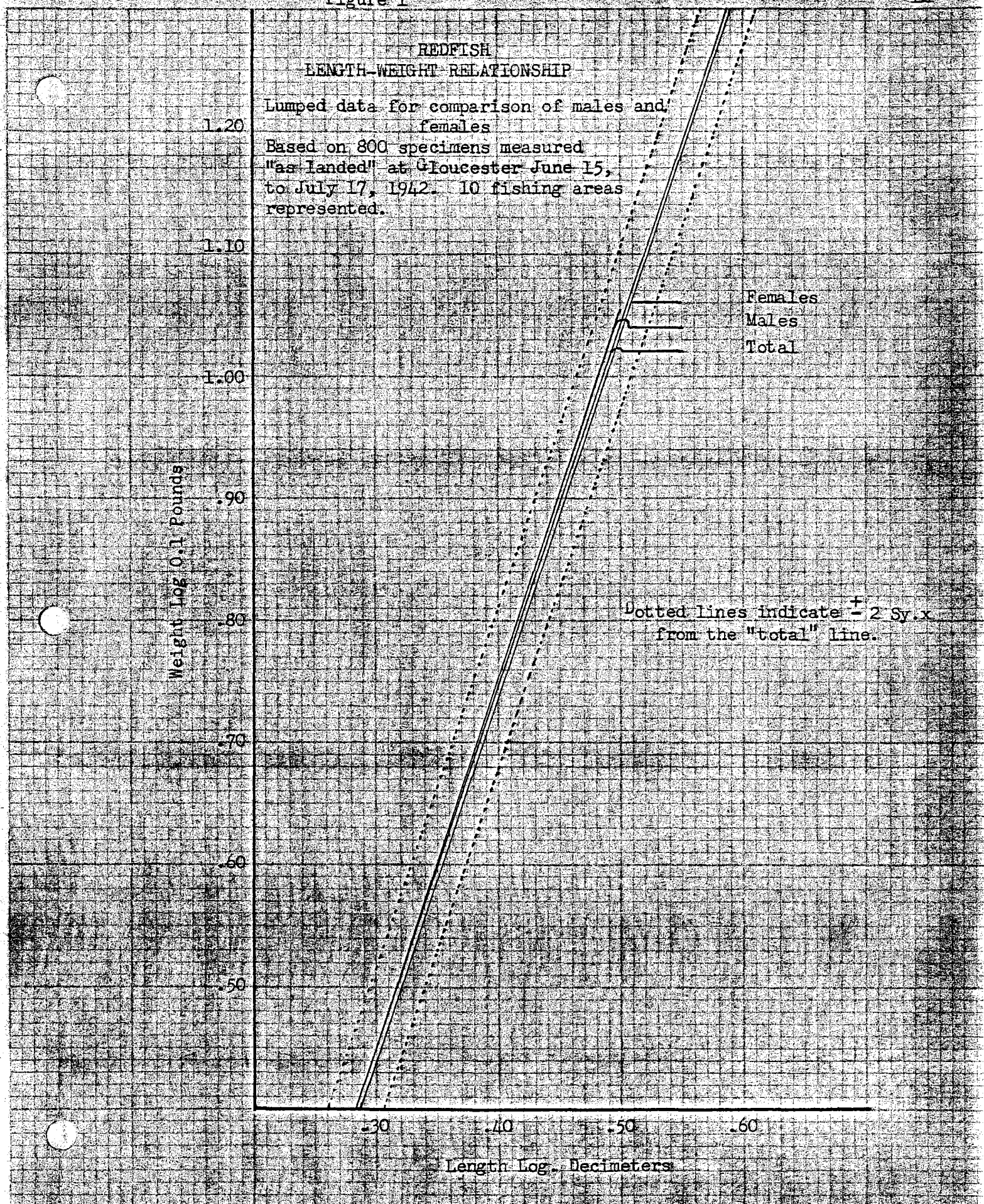

REDFISH
LENGTH-WEIGHT RELATIONSHIP
Lumped data for comparison of males and females
Based on 800 specimens measured "as landed" at Gloucester June 15, to July 17, 1942. 10 fishing areas represented.
Females
Males
Total
Dotted lines indicate ± 2 Sy.x from the "total" line.
Weight Log 0.1 Pounds
1.20
1.10
1.00
.90
.80
.70
.60
.50
.30
.40
.50
.60
Length Log. Decimeters

FIGURE 2

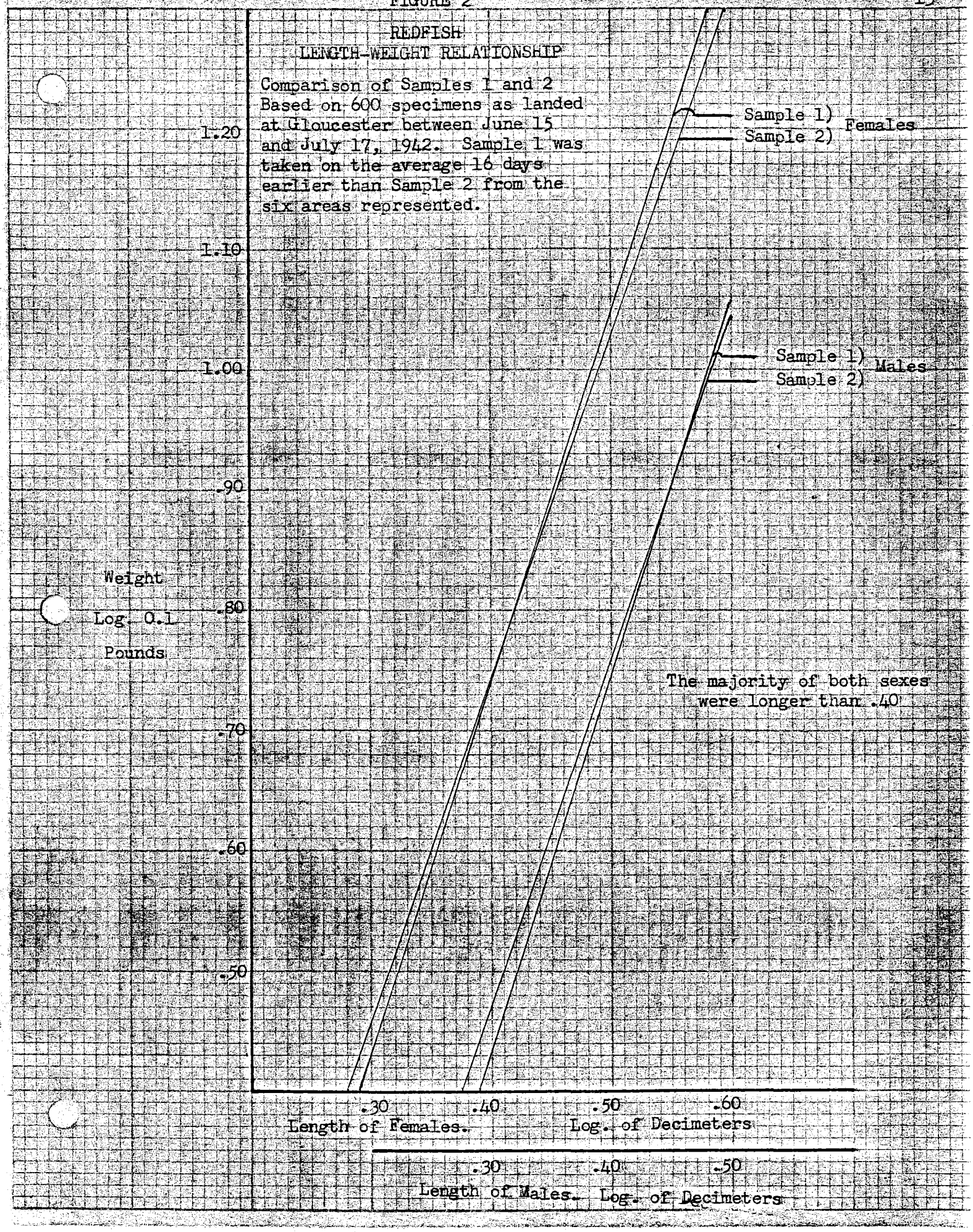

REDFISH
LENGTH-WEIGHT RELATIONSHIP
Comparison of Samples 1 and 2
Based on 600 specimens as landed
at Gloucester between June 15
and July 17, 1942. Sample 1 was
taken on the average 16 days
earlier than Sample 2 from the
six areas represented.
Sample 1)
Sample 2)
Females
Sample 1)
Sample 2)
Males
1.20
1.10
1.00
.90
.80
.70
.60
.50
Weight
Log. O.L
Pounds
The majority of both sexes
were longer than .40
.30
.40
.50
.60
Length of Females.
Log. of Decimeters
.30
.40
.50
Length of Males.
Log. of Decimeters

Table 6.

Redfish - Calculated Weights

Based on measurements of 800 redfish as landed at Gloucester between June 15 and July 17, 1942. Measurements were distributed in random samples from ten fishing areas.

Length of Fish		
Cm./2	Mm.	Pounds
25	120-124	.065
6	125-129	.074
7	130-134	.083
8	135-139	.092
9	140-144	.103
30	145-149	.114
1	150-154	.126
2	155-159	.138
3	160-164	.152
4	165-169	.166
5	170-174	.181
6	175-179	.197
7	180-184	.214
8	185-189	.232
9	190-194	.251
40	195-199	.271
1	200-204	.292
2	205-209	.314
3	210-214	.337
4	215-219	.361
5	220-224	.387
6	225-229	.413

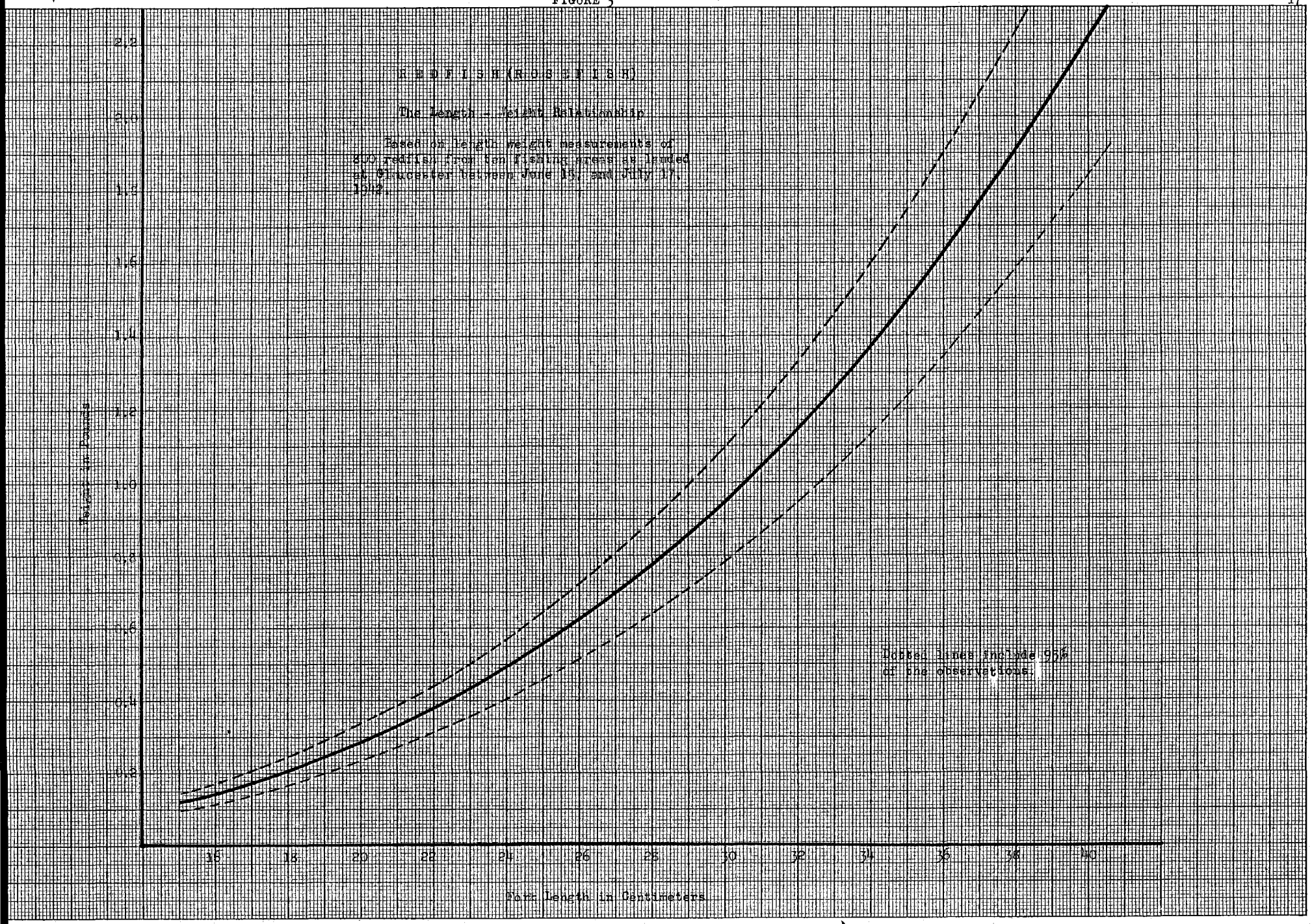
Length of Fish

Cm./2	Mm.	Pounds
7	230-234	.441
8	235-239	.469
9	240-244	.499
50	245-249	.531
1	250-254	.563
2	255-259	.597
3	260-264	.632
4	265-269	.668
5	270-274	.707
6	275-279	.746
7	280-284	.786
8	285-289	.829
9	290-294	.872
60	295-299	.918
1	300-304	.964
2	305-309	1.01
3	310-314	1.06
4	315-319	1.11
5	320-324	1.17
6	325-329	1.22
7	330-334	1.28
8	335-339	1.34
9	340-344	1.39
70	345-349	1.46
1	350-354	1.52

Length of Fish

Cm./2	Mm.	Pounds
2	355-359	1.58
3	360-364	1.65
4	365-369	1.72
5	370-374	1.79
6	375-379	1.86
7	380-384	1.94

FIGURE 3


REDFISH (ROSIFISH)
The Length - Weight Relationship
Based on length weight measurements of 200 redfish from ten fishing areas as landed at Gloucester between June 15, and July 17, 1942.
Dotted lines include 95% of the observations.
Weight in Pounds
2.2
2.0
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
16
18
20
22
24
26
28
30
32
34
36
38
40
Fork Length in Centimeters

Transformations to 2 place Logs.

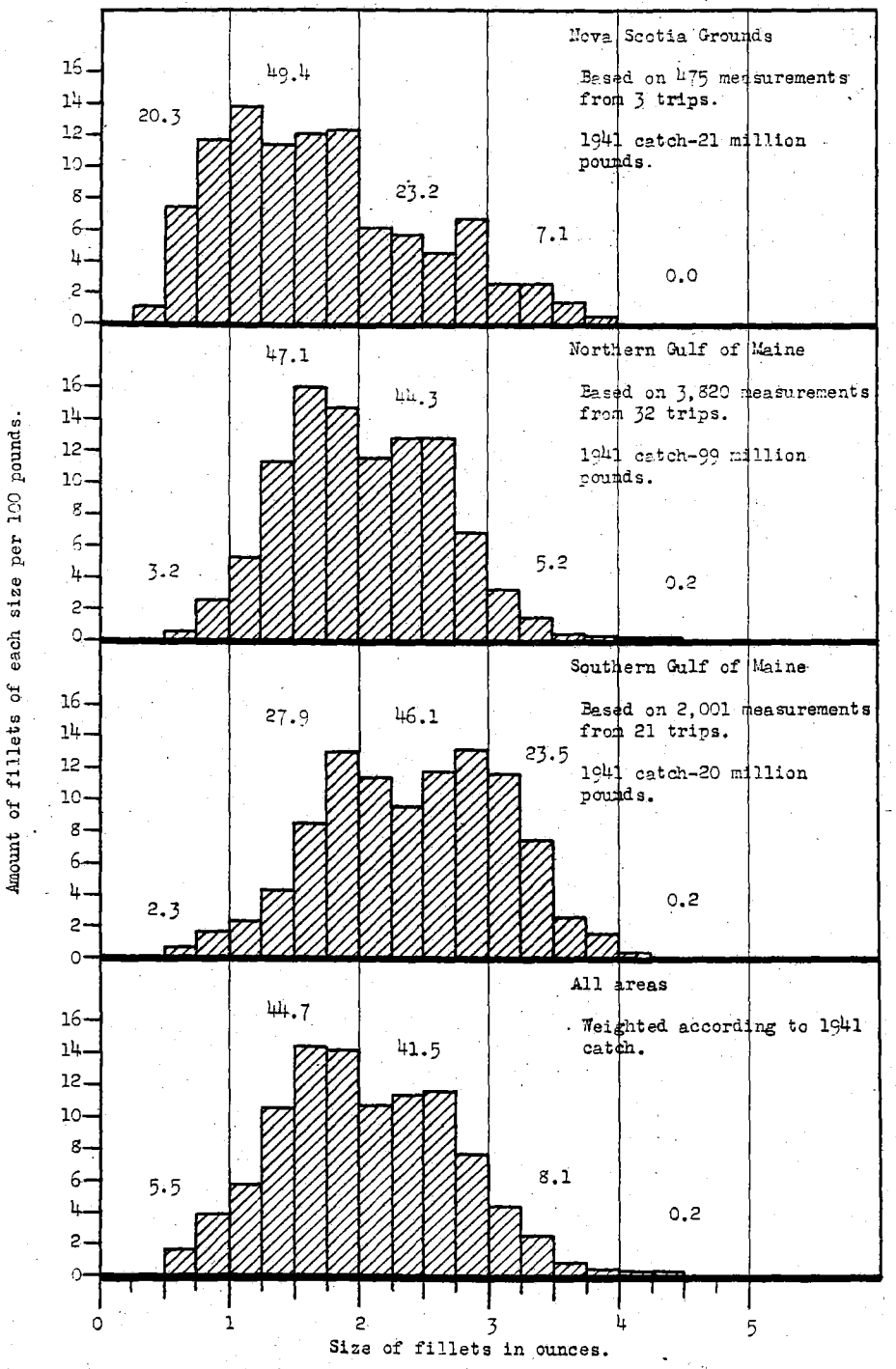
	Antilog	Log
	197-201	30
20	202-206	31
	207-211	32
	212-216	33
	217-221	34
	222-226	35
	227-231	36
	232-237	37
	238-242	38
	243-248	39
	249-254	40
	255-260	41
	261-266	42
	267-272	43
	273-278	44
	279-285	45
	286-291	46
	292-298	47
30	299-305	48
	306-312	49
	313-319	50
	320-327	51
	328-335	52
	336-342	53
	343-350	54
	351-358	55
	359-367	56
	368-375	57
	376-384	58
	385-393	59
40	394-402	60
	403-412	61
	413-421	62
	422-431	63
	432-441	64
	442-451	65
	452-462	66
	463-473	67
	474-484	68
	485-495	69
50	496-507	70
	508-518	71
	519-530	72
	531-543	73
	544-555	74
	556-568	75
	569-582	76
	583-595	77
60	596-609	78
	610-623	79

	Antilog	Log
	624-638	80
	639-653	81
	654-668	82
	669-683	83
	684-699	84
70	700-716	85
	717-732	86
	733-749	87
	750-767	88
	768-785	89
80	786-803	90

#1

R E D F I S H (R O S E F I S H)

DISTRIBUTION OF FILLET WEIGHTS AS LANDED AT GLOUCESTER
DURING APRIL AND MAY, 1942

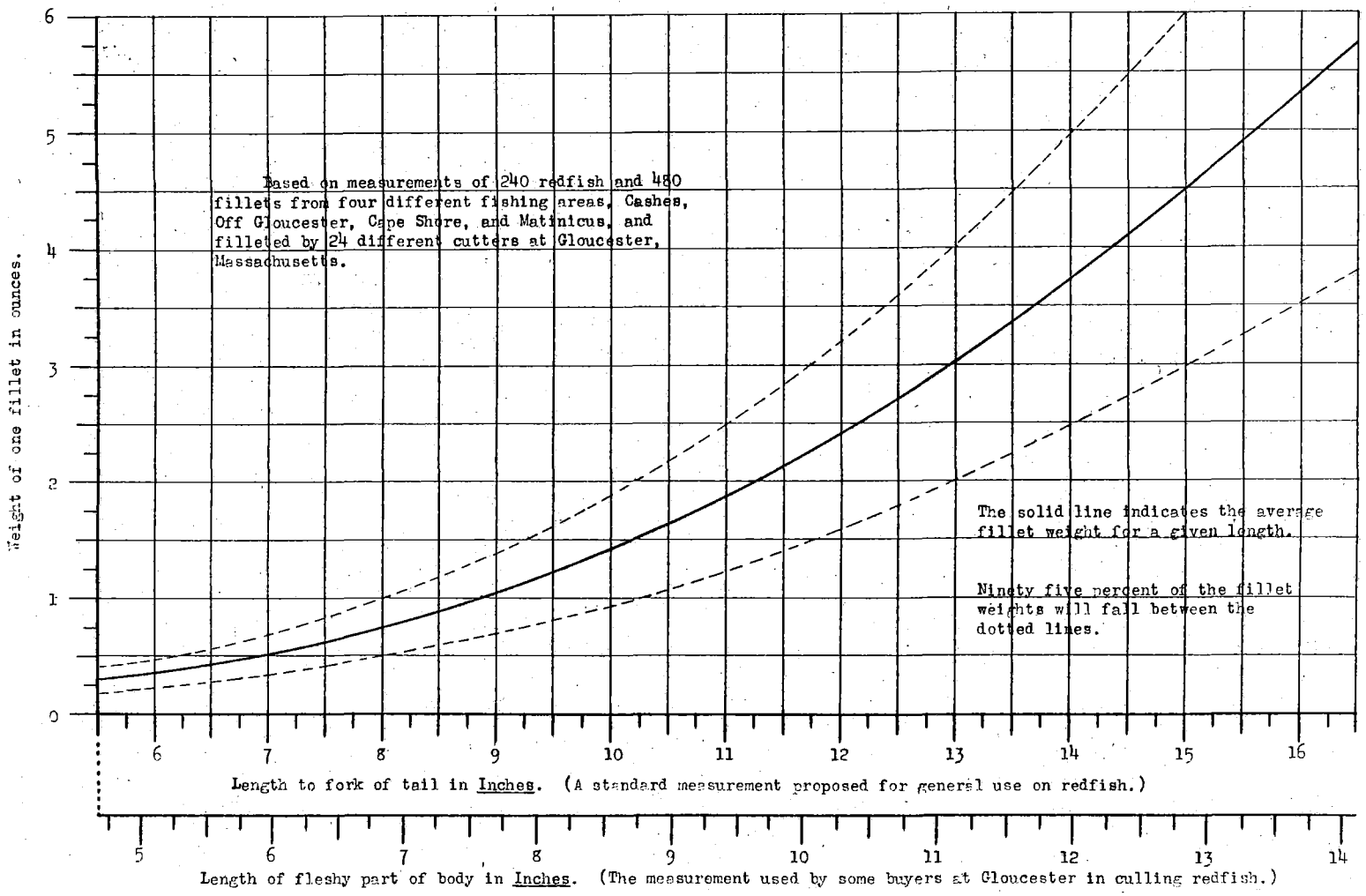


Enclosed figures indicate the amount in each one ounce group.

#2

REDFISH (ROSEFISH)

THE LENGTH-FILLET WEIGHT RELATIONSHIP. MAY, 1942



The Length-Weight Relationship of Redfish

The Length-Weight Relationship of Redfish.

Gathering the data

Measurements

Accuracy -

Analysis -

Covariance -

Differences among areas, time, sexes, ~~areas~~

Each sex from the different areas.

Regression -

~~Standard~~ Curve of Estimate

Results -

Conversion Formulae, Table for L.F. Groups.

Graphs - Tags. and normal figures.

Sex Ratio in Redfish.

Gathering the data -

Analysis -

X^2 applied to sex ratios in L.W. Samples.

Conclusions -

Mates and Spawning Habits.

List of mates and immaturity, development of gonads - proportions of spent, larvals, eggs, etc in the females at different times.

Suggestions for further work

The Length - Fillet Weight Relationships of Redfish.

Gathering the data
- Methods of measuring and weighing -
- Accuracy -

Analysis of data -
- Transformation to logs -
- Regression lines -
- ~~Standard~~ Error of Estimate
- Analysis of Covariance - Sources of Variation

Results
- Conversion formulae
- The length fillet weight relationship -
  - Graphs of combined data
  - Graph of logarithmic curves of areas.
  - " " " " " scales.
  - Table of conversions for L.F. groups.

Total Length -

~~The~~ Fork Length - Standard Length Relationships of Redfish.

Gathering the data -

Analysis —
- Regression -
- Standard Error of Estimates

Results -
- Conversion formulae
- Graphs

O. Mass.

Custom House
New Bedford, Mass.

June 16, 1947

Mr. Sidney C. Hsiao

Marine Biological Laboratory

Woods Hole, Mass.

Dear Mr. Hsiao:

Redfish are landed almost entirely in Gloucester and if you are interested in obtaining fresh specimens, I suggest you contact Dr. Alfred Perlmutter, Post Office Building, Gloucester, Mass. who is our biologist there. If you go up there, you should be able to obtain fish less than two days out of the water from the fishing vessels as they land. If you need them immediately as they come out of the water, you will have to go to sea to get them. Dr. Perlmutter will advise you.

Very truly yours,

William F. Royce,
Aquatic Biologist.

WFR:mco
cc: Dr. Perlmutter

YALE UNIVERSITY
OSBORN ZOOLOGICAL LABORATORY
NEW HAVEN, CONNECTICUT

M. B. L. Woods Hole, Mass.
June 14, 1947

Dear Mr. Royce:

Dr. Merriman of the Bingham Oceanographic Laboratory suggests that I write to you and ask for your help on how to get hold of fresh ovaries from redfish, (Sebastes marinus) for immediate use in my experiments this summer at Woods Hole. I am interested in finding out the chemical changes of the lipids and nitrogenous compounds of the ova & embryos of this fish during development. I need freshly caught fish which I can open up for the ovaries, put them on dry ice & rush them to Woods Hole for examination and chemical analysis. As enzymatic action will change the state and proportion of different nitrogenous compounds, it is necessary to use fresh fish. Would you please advise me as to where I should go for such material? Could you put me in touch with fisherman who can take me out to the fishing grounds or ask some able fisherman to help get the material I need?

Please send your reply to the Marine Biological Laboratory where I am working this summer. Any help you could give me will be highly appreciated,

Yours sincerely

Sidney C. Hsiao

GLOUCESTER REDFISH DEALERS

July 1942

1 - Cape Cann Fisheries
John Del Torchio
Gordon Moure

2 - Marriners Fish Co
Mike Bloom
Mr. Kincaide

3 - Progressive Fish Wharf Inc.
Leo Linquata
Frank Favalaro

4 - General Sea Foods Corp

5 - Gorton-Pew Fresh Fish
Mr. Lenhart

6 - Colonial Fish Co
Scotty Craig
Mr. Raffe

7 - Empire Fillet Co
James Bordano

8 - American Fillet Co
Mr. Cadina

9 - Atlantic Coast Fisheries
Dave Taylor
Mr. Lufkin

10 - Baxter & Kerr
Scotty Baxter
Stevens

11 - Gloucester Seafoods, Inc
Bill Brady

12 - Frank Bertolmo & Son
Frank Bertolino
Started 5/6/42

13 - Gorton Pew - Slade Branch
Mr. Burns

Copied from a list prepared by F.E. Fitch
Accuracy of titles and spelling not
guaranteed W.A.R.

Redfish — Calculated Weights

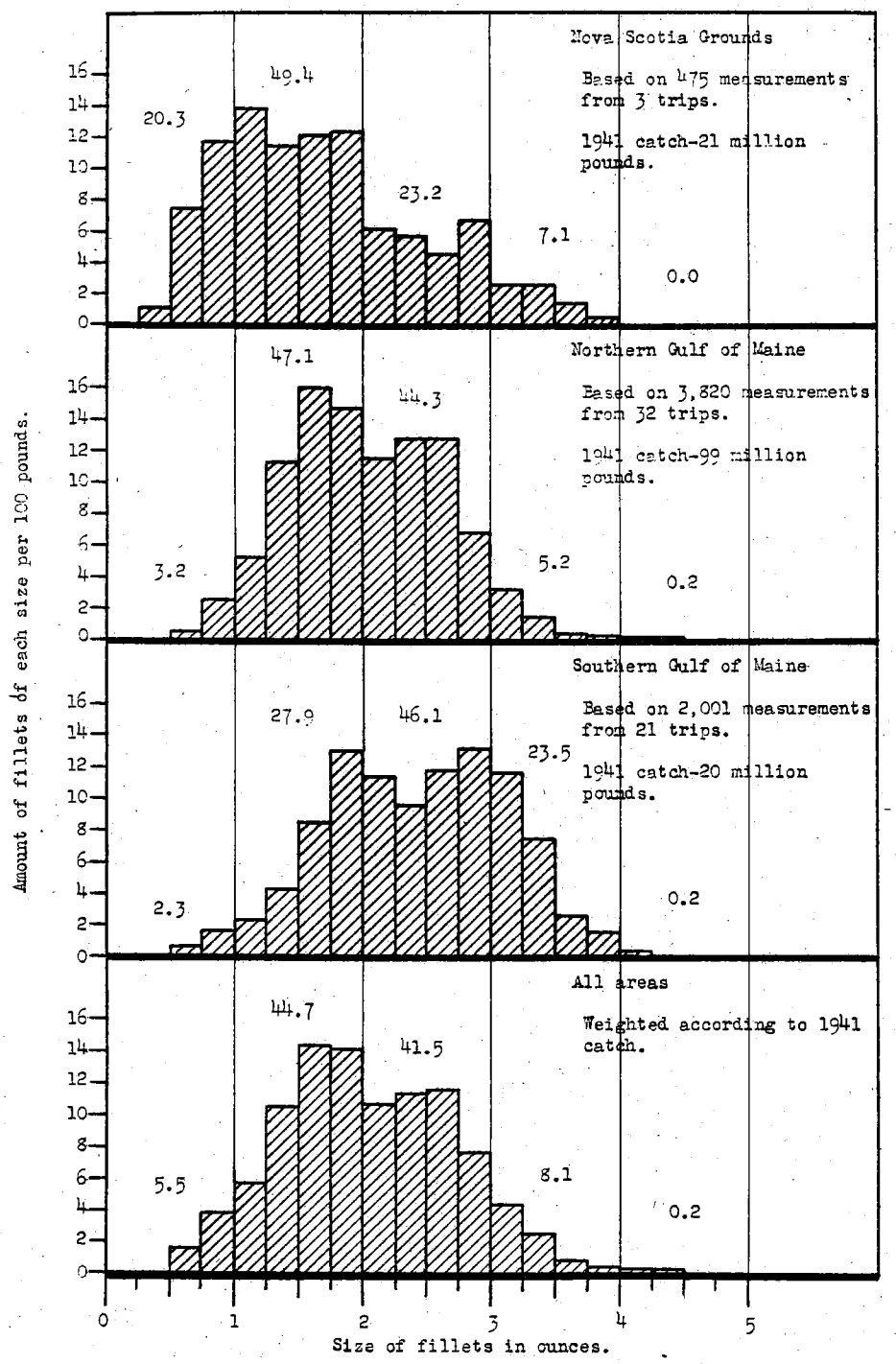
Based on measurements of 800 redfish as landed at Gloucester between June 15 and July 17, 1942. Measurements were distributed in ~~two~~ random samples from ten fishing areas.

Length of Fish. Cm/2	Mm.	Weight ~~of Fish~~ Log. 0/1 ~~Pounds~~	Pounds.
25	120-124	9.8156	.065
6	125-129	9.8672	.074
7	130-134	9.9171	.083
8	135-139	9.9649	.092
9	140-144	.0112	.103
30	145-149	.0557	.114
1	150-154	.0988	.126
2	155-159	.1406	.138
3	160-164	.1810	.152
4	165-169	.2202	.166
5	170-174	.2582	.181
6	175-179	.2953	.197
7	180-184	.3312	.214
8	185-189	.3660	.232
9	190-194	.4001	.251
40	195-199	.4334	.271
1	200-204	.4657	.292
2	205-209	.4972	.314
3	210-214	.5278	.337
4	215-219	.5580	.361
5	220-224	.5874	.387
6	225-229	.6159	.413
7	230-234	.6441	.441
8	235-239	.6714	.469
9	240-244	.6984	.499
50	245-249	.7249	.531
1	250-254	.7507	.563
2	255-259	.7759	.597
3	260-264	.8009	.632
4	265-269	.8252	.668
5	270-274	.8493	.707
6	275-279	.8727	.746
7	280-284	.8956	.786
8	285-289	.9184	.829
9	290-294	.9407	.872
60	295-299	.9627	.918
1	300-304	.9840	.964
2	305-309	1.0051	1.01
3	310-314	1.0262	1.06
4	315-319	1.0467	1.11
5	320-324	1.0669	1.17
6	325-329	1.0864	1.22
7	330-334	1.1060	1.28
8	335-339	1.1253	1.34
9	340-344	1.1443	1.39
70	345-349	1.1630	1.46
1	350-354	1.1814	1.52
2	355-359	1.1998	1.58
3	360-364	1.2177	1.65
4	365-369	1.2353	1.72
5	370-374	1.2527	1.79
6	375-379	1.2699	1.86
7	380-384	1.2871	1.94

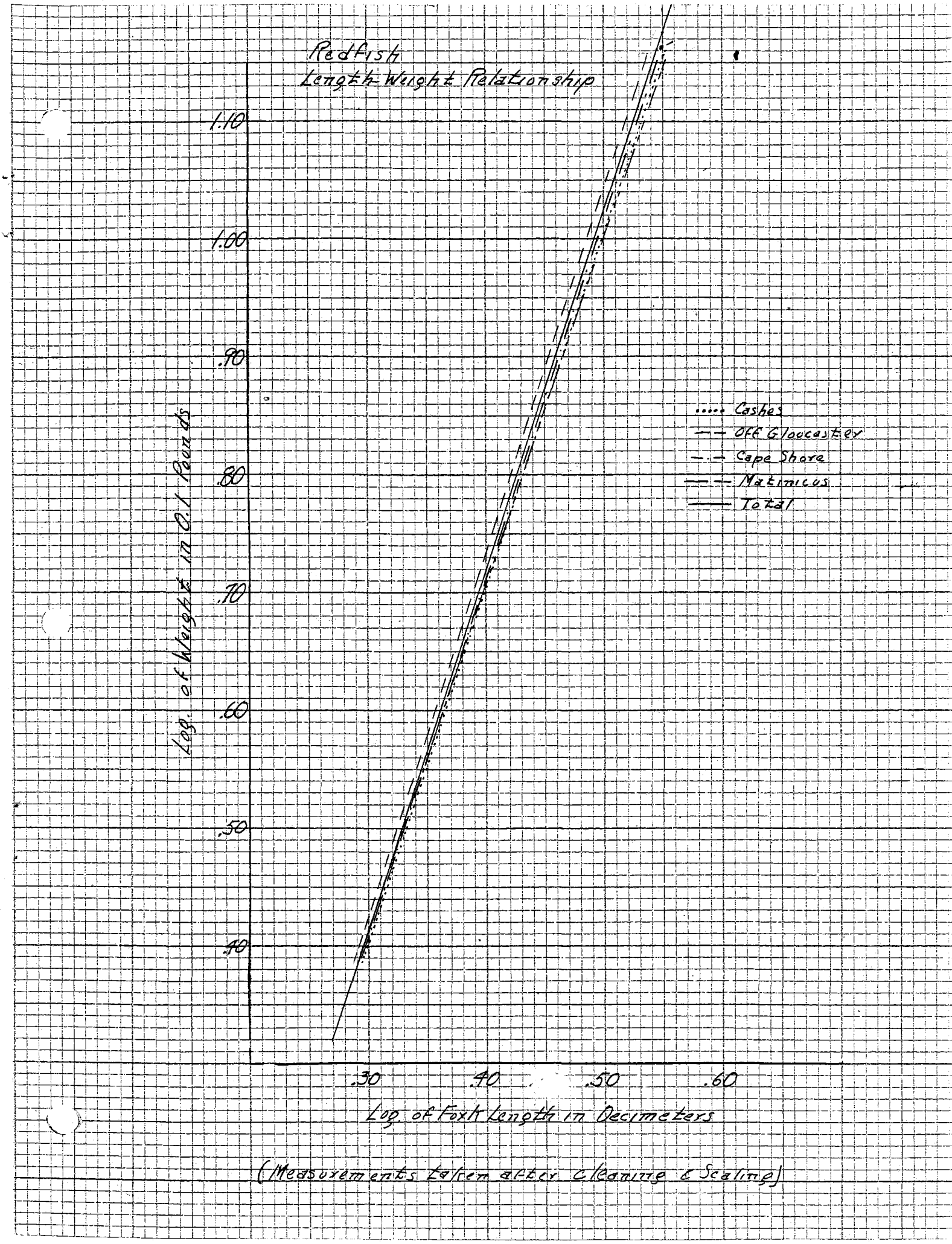
Original — 2 carbons.

REDFISH (ROSEFISH)

DISTRIBUTION OF FILLET WEIGHTS AS LANDED AT GLOUCESTER
DURING APRIL AND MAY, 1942



Enclosed figures indicate the amount in each one ounce group.


Redfish
Length-Weight Relationship
1.10
1.00
.90
.80
.70
.60
.50
.40
Log. of Weight in O.1 Pounds
.30
.40
.50
.60
Log. of Fork Length in Decimeters
..... Cashes
— — Off Gloucester
— — Cape Shore
— — Matinicus
—— Total
(Measurements taken after cleaning & Scaling)

Length-Fillet Weight and Standard Length-Fork Length Relationship

WEIGHING REDFISH FILLETS

GLOUCESTER, MAY 27, 1942

ARRIVED AT CAPE ANN FISH COMPANY AT 7 AM. FOUND THE GOVERNOR AL. SMITH IN WITH A HAIL OF 83,000 REDFISH TAKEN JUST EAST OF CASHES. THE MEN AT THE FISH COMPANY WERE EXCEEDINGLY COOPERATIVE AND SET UP BOXES IN A CORNER OF THE CUTTING ROOM ON WHICH TO MEASURE THE FISH. THIS PROVIDED IDEAL WORKING CONDITIONS.

SELECTION OF SPECIMENS

IT WAS NECESSARY TO TAKE FISH IN THE CUTTING ROOM AFTER THEY HAD BEEN THROUGH THE ROTARY SCALING MACHING BECAUSE IF THEY WERE TAKEN AS THEY COME FROM THE BOAT THEY WOULD HAVE TO BE WASHED, SCALED, AND CARRIED INTO THE PLANT BEFORE FILLETING. AS IT IS, TAKING THEM INSIDE THE PLANT FROM THE CONVEYOR PROVIDED VERY CLEAN FISH ON WHICH TO WORK AND THE CUTTERS WERE AVAILABLE TO FILLET THE FISH WITHOUT LOSS OF TIME. THE FISH HAD TO BE SELECTED TO AVOID MUTILATED SPECIMENS WHICH WERE COMMON AFTER THE RIGORS OF THE SCALING MACHINE. THE MUTILATIONS WHICH WERE AVOIDED WERE CRUSHED HEADS AND LACK OF EYES. OF COURSE WEIGHTS TAKEN UNDER THESE CONDITIONS ARE NOT COMPARABLE TO THE WEIGHOUT FROM THE BOAT AND THE DIFFERENCES BETWEEN THE ROUND WEIGHT AND THE CLEAN WEIGHT WILL HAVE TO BE DETERMINED LATER. THE SPECIMENS WERE SELECTED 10 AT A TIME FROM THE CONVEYOR BELT IN AS NEARLY A RANDOM MANNER AS POSSIBLE AFTER DISCARDING THE MUTILATED SPECIMENS.

MEASURING THE SPECIMENS

THE 10 FISH WERE MEASURED AND THE CLEAN WEIGHT TAKEN AND THEN THEY WERE LAID OUT IN ORDER ON THE TABLE. A CUTTER WAS ASKED TO FILLET THEM. THE FILLETS WERE WEIGHED AND THE SEX AND CONDITION OF THE GONADS NOTED. UNDER THESE CONDITIONS IT WAS POSSIBLE FOR ONE MAN TO COMPLETE THE DATA ON 10 FISH IN ABOUT ONE HALF HOUR. THIS TIME AMY PROBABLY BE REDUCED AFTER PRACTICE.

CONDITION OF THE GONADS

MOST OF THE MALES EXAMINED SEEMED TO BE MATURE. THE TESTES IN THE LARGER FISH WERE SOFTER AND FLABBIER THAN IN THE SMALLER ONES BUT THERE SEEMED TO BE NO SHARP SEPARATION BETWEEN THE TWO GROUPS. ALSO THE SMALLER FISH HAD RELATIVELY LARGE TESTES AND IT SEEMS THAT THEY MUST HAVE BEEN MATURE. THE TESTES IN THIS CASE WERE ABOUT ONE FOURTH INCH IN DIAMETER. A SINGLE SMALL MALE WAS

CLASSIFIED AS IMMATURE BECAUSE THE GONADS WERE ONLY ABOUT ONE SIXTEENTH INCH IN DIAMETER. MORE WORK NEEDS TO BE CONE ON THE SIZE OF THE GONADS AND THE RELATION OF WIDTH OF THE GONAD TO THE LENGTH OF THE FISH BEFORE AND ACCURATE CLASSIFICATION OF MATURITY CAN BE MADE.

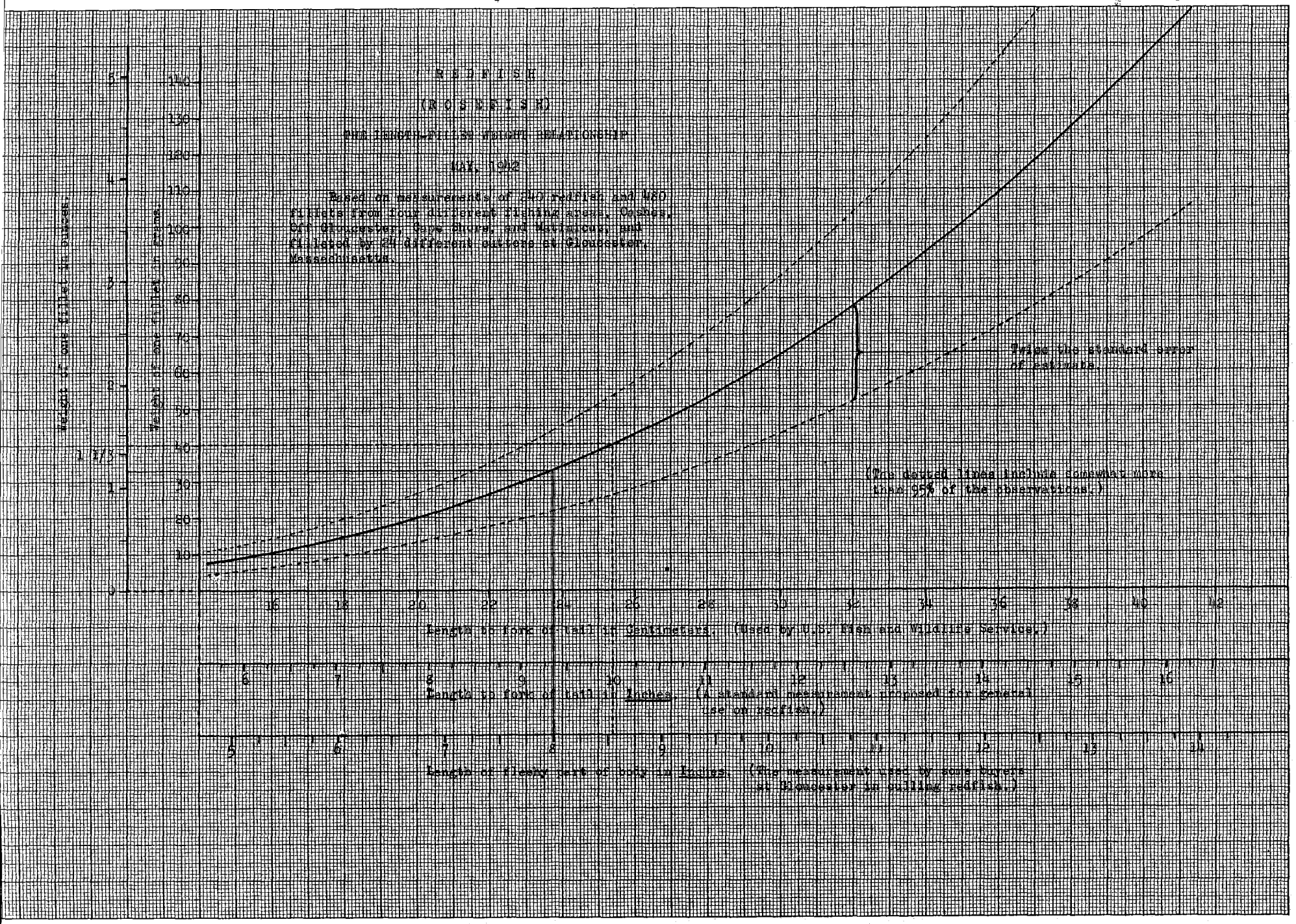
THE FEMALES WERE EASY TO CLASSIFY. THE OVARY IN THE MATURE FISH IS MUCH ENLARGED AT THIS TIME OF YEAR. IMMATATURES POSSESSED AN OVARY ABOUT THREE SIXTEENTHS INCH IN DIAMETER, FIRM IN CONSISTENCY, CONTAINING PIN POINT SIZE YELLOWISH OR ORANGE OVA. NO INTERGRADES WERE FOUND. CAUTION WAS EXERCISED IN SEPARATING SPENT FISH FROM FISH CONTAINING OVA OR LARVA SINCE THE ROUGH HANDLING MAY EXPRESS NEARLY ALL THE OVA OR LARVAE AND THE FISH MIGHT BE CLASSIFIED AS SPENT. IN EACH A CAREFUL SEARCH WAS MADE FOR ORA OR LARVAE AND SEVERAL SPENT APPEARING FISH WERE FOUND TO CONTAIN PRE-EYED OVA. ONLY WHEN NO OVA OR LARVAE COULD BE FOUND WAS THE FISH CLASSIFID AS SPENT.

Redfish- Gov. Al Smith 5/27/42

Length-Fillet Weight Relationship Cashes 42/68 B1

Filleted by Cape Ann Fish Co.

Sample	Sex	Total Length Log.	Fork Length X_1	Log.	St. Length X_2	Log.	Wt. Y_1 Log.	Left Fillet	Right Fillet	Both Fillets Y_2	Log.
Cutter #1 Right Handed	♀♀	314	303	.48	257	.41	.93	50	56	106	1.03
		317	309	.49	262	.42	.95	60	60	120	1.08
		307	297	.47	254	.40	.92	58	60	118	1.07
		285	275	.44	235	.37	.79	42	50	92	.96
		340	331	.52	285	.45	1.05	85	81	166	1.22
		305	295	.47	252	.40	.90	63	59	122	1.09
		337	325	.51	280	.45	1.03	81	88	169	1.23
				3.38							7.68
				1.6364		1					
	♂♂	244	238	.38	202	.31	.62	29	31	60	.78
		262	254	.40	217	.34	.68	35	42	77	.89
		310	300	.48	257	.41	.98	76	77	153	1.18
				1.26							2.85
				.5348							
				464							10.53
Cutter #2 Right Handed	♀♀	235	229	.36	198	.30	.56	26	28	54	.73
		212	205	.31	176	.25	.42	21	21	42	.62
		205	198	.30	169	.23	.40	21	21	42	.62
		246	237	.37	204	.31	.62	36	32	68	.83
		324	315	.50	269	.43	.99	62	64	126	1.10
		303	292	.47	248	.39	.87	54	54	108	1.03
		300	291	.46	248	.39	.92	64	68	132	1.12
				2.77							6.05
				1.1351							
	♂♂	233	225	.35	189	.28	.54	27	28	55	.74
		245	236	.37	202	.31	.65	33	34	67	.83
		296	286	.46	244	.39	.82	48	50	98	.99
				1.18							2.56
				.4710							
				395							8.61


REDFISH
(ROSEFISH)
THE LENGTH-FILLET WEIGHT RELATIONSHIP
MAY, 1942
Based on measurements of 240 redfish and 480 fillets from four different fishing areas, Cashes, Off Gloucester, Cape Shore, and Matinicus, and filleted by 24 different cutters at Gloucester, Massachusetts.
Twice the standard error of estimate.
(The dotted lines include somewhat more than 95% of the observations.)
Weight of one fillet in pounds.
Weight in grams
Length to fork of tail in Centimeters. (Used by U.S. Fish and Wildlife Service.)
Length to fork of tail in Inches. (A standard measurement proposed for general use on redfish.)
Length of fleshy part of body in Inches. (The measurement used by some buyers at Gloucester in culling redfish.)

Redfish – Gov. Al. Smith. 5/27/42 cont.

Sample	Sex	Total Length	Log	Fork Length	Log	St. Length	Log	Wt.	Log	Left Fillet	Right Fillet	Both Fillets	Log
Cutter #3 Right Handed	♀♀	305	.48	294	.47	251	.40	.91		56	56	112	1.05
		325	.51	316	.50	272	.43	1.01		63	77	140	1.15
		250		248	.39	205	.31	.76		42	28	70	.85
		221		217	.34	183	.26	.52		28	25	53	.72
		278		270	.43	233	.37	.77		46	42	88	.94
		305	.48	295	.47	256	.41	.93		61	64	125	1.10
					2.60								5.81
					1.1444								
	♂♂	249		241	.38	205	.31	.72		40	36	76	.88
		269		261	.42	222	.35	.77		46	39	85	.93
		276		266	.42	228	.36	.78		46	44	90	.95
		—		264	.42	222	.35	.78		49	44	93	.97
					1.64								3.73
					.6736								
					424								9.54
Cutter #4 Right Handed	♀♀	331	.52	322	.51	275	.44	1.06		78	84	162	1.21
		324	.51	314	.50	266	.42	.99		64	76	140	1.15
		324	.51	315	.50	269	.43	.98		79	75	154	1.19
		310	.49	298	.47	253	.40	.90		65	57	122	1.09
		290		279	.45	238	.36	.86		59	57	116	1.06
		226		220	.34	187	.27	.49		26	21	47	.67
					2.77								6.37
					1.2991								
	♂♂	277		269	.43	231	.36	.81		49	50	99	1.00
		250		241	.38	206	.31	.65		38	40	78	.89
		269		260	.41	222	.35	.73		44	42	86	.93
		250		241	.38	206	.31	.69		42	39	81	.91
					1.60								3.73
					.6418								
					437								10.10

Redfish- Gov. Al Smith 5/27/42 Cont.

Sample	Sex	Total Length	Log	Fork Length	Log	St. Length	Log	Wt. Log	Left Fillet	Right Fillet	Both Fillets	Log
Cutter #5 Left Handed	♀♀	312		303	.48	255	.41	.92	57	61	118	1.07
		331		321	.51	276	.44	1.04	77	85	162	1.21
		287		279	.45	238	.38	.88	62	61	123	1.09
		241		233	.37	198	.30	.60	25	28	53	.72
					1.81							4.09
					.8299							
	♂♂	209		204	.31	173	.24	.40	17	19	36	.56
		226		220	.34	190	.28	.53	25	24	49	.69
		263		254	.40	215	.33	.73	43	44	87	.94
		265		256	.41	216	.33	.72	38	42	80	.90
		273		261	.42	225	.35	.74	41	42	83	.92
		275		266	.42	227	.36	.81	47	52	99	1.00
					2.30							5.01
					.8926							
					411							9.10
Cutter #6 Right Handed	♀♀	279		269	.43	230	.36	.81	46	45	91	.96
		—		311	.49	266	.42	.99	73	73	146	1.16
		286		275	.44	235	.37	.83	53	48	101	1.00
		264		254	.40	218	.34	.72	39	41	80	.90
		303		295	.47	251	.40	.91	57	60	117	1.07
		259		249	.40	213	.33	.67	36	35	71	.85
		338		330	.52	283	.45	1.08	74	71	145	1.16
					3.15							7.10
					1.4299							
	♂♂	278		268	.43	229	.36	.80	41	43	84	.92
		277		270	.43	233	.37	.85	47	45	92	.96
		259		249	.40	214	.33	.71	39	35	74	.87
					1.26							2.75
					.5298							
					441							9.75

Redfish — Saint Joseph — May 28, 1942

Length-Fillet Weight Relationship. — off Gloucester 42/69 A2

Filleted by Maryiner's Fish Co.

Sample	Sex	Total Length	Log	Fork Length	Log	St. Length	Log	Wt.	Log	Left Fillet	Right Fillet	Both Fillets	Log
Cutter #1	♀♀	345		334	.52	284	.45	1.17		92	103	195	1.29
		365		353	.55	303	.48	1.18		115	111	226	1.35
Right-handed.		313		304	.48	264	.42	1.02		78	74	152	1.18
		315		305	.48	258	.41	1.10		83	88	171	1.23
		262		252	.40	214	.33	.75		41	42	83	.92
♀♀ Sum					2.43		2.09						5.97
Sum of Prod.													
	♂♂	230		223	.35	189	.28	.55		28	29	57	.76
		271		262	.42	223	.35	.80		44	40	84	.92
		301		290	.46	248	.39	.95		73	58	131	1.12
		295		284	.45	240	.38	.93		64	63	127	1.10
		313		305	.48	263	.42	.95		64	65	129	1.11
♂♂ Sum					2.16		1.82						5.01
Squares Prod.													
					4.59								
Cutter Sum													10.98
Squares Prod.													
Cutter #2	♀♀	351		342	.53	291	.46	1.10		88	89	177	1.25
		311		301	.48	260	.41	.98		70	73	143	1.16
Right Handed		264		256	.41	219	.34	.78		46	46	92	.96
		272		264	.42	225	.35	.81		56	51	107	1.03
		286		269	.43	228	.36	.84		53	55	108	1.03
		346		330	.52	282	.45	1.14		98	101	199	1.30
		328		319	.50	272	.43	1.02		80	81	161	1.21
♀♀ Sum					3.29		2.80						7.94
Squares Prod.													
	♂♂	283		274	.44	237	.37	.86		57	57	114	1.06
		243		234	.37	202	.31	.64		34	37	71	.85
		264		258	.41	223	.35	.76		49	50	99	1.00
♂♂ Sum					1.22		1.03						2.91
Squares Prod.													
					451								10.85
Cutter Sum													
Squares Prod.													

Redfish Saint Joseph May 28, 1942 Cont.

Sample	Sex	Total Length	Log.	Fork Length	Log	St. Length	Log.	Wt.	Log.	Left Fillet	Right Fillet	Both Fillets	Log.
Cutter #3	♀♀	395		385	.59	334	.52	1.28		142	121	263	1.42
		342		329	.52	281	.45	1.10		89	54	143	1.16
Right Handed		237		236	.36	196	.29	.59		29	20	49	.69
		225		219	.34	185	.27	.54		27	19	46	.66
		294		285	.45	245	.39	.82		45	36	81	.91
		322		311	.49	264	.42	1.01		74	64	138	1.14
		322		312	.49	268	.43	1.02		73	60	133	1.12
♀♀ Sums					3.24		2.77						7.10
Squares													
Prod.													
	♂♂	291		282	.45	242	.38	.90		49	54	103	1.01
		276		268	.43	227	.36	.83		56	42	98	.99
		299		289	.46	247	.39	.90		53	47	100	1.00
♂♂ Sums					1.34		1.13						3.00
Squares													
Prod.													
					458								
Cutter Sums													10.10
Squares													
Prod.													
Cutter #4	♀♀	262		253	.40	215	.33	.76		41	38	79	.90
		305		297	.47	256	.41	.94		59	46	105	1.02
Right-Handed		279		271	.43	233	.37	.81		50	43	93	.97
		334		325	.51	286	.45	1.07		94	79	173	1.24
♀♀ Sums					1.81		1.56						4.13
Squares													
Prod.													
	♂♂	290		282	.45	241	.38	.92		53	43	96	.98
		266		256	.41	219	.34	.77		43	38	81	.91
		254		245	.39	212	.33	.72		42	37	79	.90
		270		264	.42	226	.35	.81		41	31	72	.86
		282		275	.44	236	.37	.85		48	46	94	.97
		284		275	.44	236	.37	.82		51	46	97	.99
♂♂ Sums					2.55		2.14						5.61
Squares													
Prod.													
					436								9.74

Redfish Saint Joseph May 28, 1942 Cont.

Sample	Sex	Total Length	Log.	Fork Length	Log.	St. Length	Log.	Wt. Log	Left Fillet	Right Fillet	Both Fillets	Log.
Cutter #5	♀♀	321		308	.49	266	.42	.99	68	71	139	1.14
		232		225	.35	191	.28	.56	27	24	51	.71
Right Handed		276		268	.43	227	.36	.79	43	49	92	.96
		343		334	.52	286	.46	1.14	98	94	192	1.28
		346		330	.52	281	.45	1.06	79	68	147	1.17
		286		276	.44	237	.37	.85	49	44	93	.97
		295		286	.46	248	.39	.87	52	44	96	.98
♀♀ Sums					3.21		2.73					7.21
Squares												
Prod.												
	♂♂	305		295	.47	252	.40	.95	63	61	124	1.09
		279		269	.43	230	.36	.87	57	55	112	1.05
		269		260	.41	222	.35	.78	46	41	87	.94
♂♂ Sums					1.31		1.11					3.08
Squares												
Prod.												
					4.52							
Cutter Sums												10.29
Squares												
Prod.												
Cutter #6	♀♀	362		350	.54	300	.48	1.16	88	90	178	1.25
(F.E. Firth)		367		357	.55	306	.49	1.12	82	82	164	1.21
		325		314	.50	272	.43	1.02	67	70	137	1.14
Right Handed.		320		310	.49	263	.42	1.02	71	73	144	1.16
		231		223	.35	192	.28	.54	28	24	52	.72
		192		188	.27	158	.20	.31	14	15	29	.46
		224		218	.34	188	.27	.54	28	23	51	.71
♀♀ Sums					3.04		2.57					6.65
Squares												
Prod.												
		290		279	.45	237	.37	.85	48	49	97	.99
		285		278	.44	237	.37	.91	58	42	100	1.00
		221		215	.33	183	.26	.53	23	24	47	.67
♂♂ Sums					1.22		1.00					2.66
Squares												
Prod.												
					4.26							
Cutter Sums												9.31
Squares												
Prod.												
Trip. Sums					26.82		22.75					61.27
Means												
Squares												
Correction												
Squares.												
Products												
Correction												
Products.												

Redfish. Doris F Amero 5/29/42

Cape Shore
43/64 A 45
43/65 F5

Length - Fillet Weight Relationship

Filleted by Cape Ann Fish Co.

Sample	Sex	Fork Length	Log	St. Length	Log	Wt Log.	Left Fillet	Right Fillets	Both Fillets	Log.
Cutter #1 Right Handed	♀♀	194	.29	161	.21	.35	18	17	35	.54
		229	.36	197	.29	.65	37	35	72	.86
♀♀ Sums Squares Prod.			.65		.50					1.40
	♂♂	281	.45	236	.37	.90	65	62	127	1.10
		232	.37	197	.29	.59	32	32	64	.81
		216	.33	185	.27	.53	26	24	50	.70
		239	.38	204	.31	.64	35	32	67	.83
		255	.41	215	.33	.74	37	40	77	.89
		239	.38	203	.31	.66	38	38	76	.88
		229	.36	196	.29	.61	29	30	59	.77
		229	.36	196	.29	.56	29	29	58	.76
♂♂ Sums Squares Prod.			3.04		2.46					6.74
Cutter Sums Squares Prod.			369							8.14
Cutter #2 Left Handed	♀♀	236	.37	203	.31	.63	34	36	70	.85
		243	.39	208	.32	.66	34	34	68	.83
		366	.56	315	.50	1.24	120	123	243	1.39
		224	.35	192	.28	.54	26	27	53	.72
		228	.36	193	.29	.60	26	30	56	.75
♀♀ Sums Squares Prod.			2.03		1.70					4.54
	♂♂	279	.45	237	.37	.84	52	51	103	1.01
		203	.31	171	.23	.46	19	23	42	.62
		295	.47	252	.40	.88	48	52	100	1.00
		226	.35	193	.29	.52	27	27	54	.73
		253	.40	216	.33	.73	39	39	78	.89
♂♂ Sums Squares Prod.			1.98		1.62					4.25
Cutter Sums Squares Prod.			401							8.79

Redfish - Doris F. Amero 5/29/42 cont.

Sample	Sex	Fork Length	Log	St. Length	Log	Wt. Log.	Left Fillet	Right Fillet	Both Fillets	Log.
Cutter #3 Right Handed	♀♀	201	.30	173	.24	.41	20	17	37	.57
		270	.43	233	.37	.83	56	57	113	1.05
		326	.51	281	.45	1.08	98	84	182	1.26
		265	.42	227	.36	.77	46	43	89	.95
		265	.42	228	.35	.76	42	46	88	.94
		281	.45	242	.38	.79	53	49	102	1.01
		231	.36	199	.30	.59	25	28	53	.72
♀♀ Sums			2.89		2.45					6.50
Squares										
Prod.										
	♂♂	224	.35	192	.28	.52	26	23	49	.69
		223	.35	191	.28	.54	29	28	57	.76
		259	.41	221	.34	.72	42	40	82	.91
♂♂ Sums			1.11		.90					2.36
Squares										
Prod.										
Cutter Sums			4.00							8.86
Squares										
Prod.										
Cutter #4 Right Handed	♀♀	312	.49	268	.43	.91	73	78	151	1.18
		217	.34	184	.26	.48	22	22	44	.64
		237	.37	193	.29	.60	29	32	61	.79
♀♀ Sums			1.20		.98					2.61
Squares										
Prod.										
	♂♂	260	.41	224	.35	.77	44	48	92	.96
		228	.36	195	.29	.59	29	27	56	.75
		289	.46	247	.39	.87	57	62	119	1.08
		242	.38	207	.32	.68	40	36	76	.88
		278	.44	237	.37	.86	57	60	117	1.07
		262	.42	223	.35	.77	40	38	78	.89
		254	.40	218	.34	.71	37	37	74	.87
♂♂ Sums			2.87		2.41					6.50
Squares										
Prod.										
Cutter Sums			4.07							9.11
Squares										
Prod.										

Redfish Doris F Amero 5/29/42 cont

Sample	Sex	Fork Length	Log.	St. Length	Log	Wt.	Left Fillet	Right Fillet	Both Fillets	Log.
Cutter #5 Right Handed	♀♀	345	.54	298	.47	1.10	93	96	189	1.28
		269	.43	231	.36	.79	49	46	95	.98
		282	.45	243	.39	.87	54	58	112	1.05
		257	.41	220	.34	.76	46	45	91	.96
		214	.33	183	.26	.56	29	28	57	.76
		245	.39	209	.32	.67	35	35	70	.85
♀♀ Sums			2.55		2.14					5.88
Squares										
Prod.										
	♂♂	226	.35	194	.29	.56	31	29	60	.78
		231	.36	197	.29	.61	30	28	58	.76
		225	.35	192	.28	.57	28	26	54	.73
		237	.37	203	.31	.63	31	31	62	.79
♂♂ Sums			1.43		1.17					3.06
Squares										
Prod.										
Cutter Sums			398							8.94
Squares										
Prod.										
Cutter #6 Right Handed	♀♀	352	.55	304	.48	1.15	101	112	213	1.33
		234	.37	201	.30	.63	30	35	65	.81
		226	.35	194	.29	.60	29	31	60	.78
		228	.36	195	.29	.62	31	36	67	.83
		303	.48	262	.42	.97	74	80	154	1.19
		258	.41	219	.34	.73	41	40	81	.91
♀♀ Sums			2.52		2.12					5.85
Squares										
Prod.										
	♂♂	200	.30	170	.23	.32	15	16	31	.49
		270	.43	232	.37	.83	48	56	104	1.02
		229	.36	195	.29	.59	27	31	58	.76
		223	.35	191	.28	.54	27	29	56	.75
♂♂ Sums			1.44		1.17					3.02
Squares										
Prod.										
Cutter Sums			396							8.87
Squares										
Prod.										
Trip. Sums			23.71		19.62					52.71
Means										
Squares										
Correction										
Squares										
Products										
Correction										
Products.										

Redfish

Length- Fillet Weight Relationship

Angie & Florence 6/2/42

Matinicus

43/68 AB-34

Filleted by Progressive Fish Wharf Co.

Sample	Sex	Fork Length X_1	Log.	St. Length X_2	Log.	Wt. Y_1 Log.	Left Fillet	Right Fillet	Both Fillets Y_2	Log.
Cutter #1 Left Handed	♀♀	310	.49	265	.42	1.00	57	61	118	1.07
		242	.38	207	.32	.70	23	36	59	.77
		300	.48	257	.41	.96	56	69	125	1.10
			1.35							2.94
	♂♂	259	.41	222	.35	.80	32	37	69	.84
		263	.42	226	.35	.77	42	42	84	.92
		286	.46	246	.39	.90	58	55	113	1.05
		248	.39	212	.33	.73	37	41	78	.89
		248	.39	215	.33	.76	43	37	80	.90
		282	.45	239	.38	.92	55	59	114	1.06
		261	.42	224	.35	.79	39	46	85	.93
			2.94							6.59
			4.29							9.53
Cutter #2 Left Handed Apprentice	♀♀	303	.48	260	.41	.96	68	74	142	1.15
		290	.46	247	.39	.91	58	59	117	1.07
		259	.41	220	.34	.80	42	50	92	.96
		262	.42	226	.35	.78	44	47	91	.96
		315	.50	271	.43	.99	72	74	146	1.16
		298	.47	255	.41	1.02	68	70	138	1.14
			2.74							6.44
	♂♂	279	.45	232	.37	.81	53	53	106	1.03
		251	.40	214	.33	.70	36	35	71	.85
		274	.44	236	.37	.87	59	58	117	1.07
		256	.41	219	.34	.73	42	44	86	.93
			1.70							3.88
			4.44							10.32

Redfish Angie & Florence 6/2/42 Cont.

Sample	Sex	Fork Length	Log.	St. Length	Log.	Wt. Log.	Left Fillet	Right Fillet	Both Fillets	Log.
Cutter #3 Right Handed (cut very close)	♀♀	319	.50	270	.43	1.08	89	86	175	1.24
		305	.48	264	.42	.94	64	66	130	1.11
		224	.35	193	.29	.59	33	29	62	.79
		177	.25	151	.18	.30	15	16	31	.49
			1.58							3.63
	♂♂	264	.42	226	.35	.80	51	50	101	1.00
		246	.39	209	.32	.70	42	43	85	.93
		264	.42	224	.35	.82	52	50	102	1.01
		268	.43	229	.36	.83	44	35	79	.90
		244	.39	208	.32	.72	42	42	84	.92
		283	.45	242	.38	.88	54	60	114	1.06
			2.50							5.82
			4.08							9.45
Cutter #4 Right Handed Apprentice	♀♀	245	.39	213	.33	.66	40	37	77	.89
		315	.50	270	.43	1.00	80	80	160	1.20
		270	.43	233	.37	.78	50	40	90	.95
		265	.42	227	.36	.78	47	38	85	.93
			1.74							3.97
	♂♂	248	.39	212	.33	.66	39	31	70	.85
		259	.41	223	.35	.75	52	47	99	1.00
		273	.44	231	.36	.83	55	51	106	1.03
		266	.42	227	.36	.78	37	37	74	.87
		306	.49	261	.42	.95	72	49	121	1.08
		268	.43	230	.36	.84	59	51	110	1.04
			2.58							5.87
			4.32							9.84

Red Fish Angie & Florence 6/2/42 cont.

Sample	Sex	Fork Length	Log	St. Length	Log	Wt.	Log	Left Fillet	Right Fillet	Both Fillets	Log
Cutter #5 Right Handed	♀♀	280	.45	241	.38	.86		54	51	105	1.02
		221	.34	189	.28	.53		26	25	51	.71
		272	.43	230	.36	.80		54	50	104	1.02
		231	.36	198	.30	.66		38	32	70	.85
			1.58								3.60
	♂♂	259	.41	220	.34	.75		47	47	94	.97
		246	.39	210	.32	.72		43	38	81	.91
		224	.35	192	.28	.60		32	23	55	.74
		216	.33	185	.27	.53		24	20	44	.64
		266	.42	230	.36	.81		51	49	100	1.00
		263	.42	226	.35	.79		50	49	99	1.00
			2.32								5.26
			3.90								8.86
Cutter #6 Right Handed	♀♀	238	.38	204	.31	.62		33	35	68	.83
		209	.32	176	.25	.46		24	23	47	.67
		227	.36	196	.29	.55		30	30	60	.78
		268	.43	229	.36	.78		51	51	102	1.01
		252	.40	214	.33	.71		41	40	81	.91
			1.89								4.20
	♂♂	276	.44	236	.37	.85		56	56	112	1.05
		289	.46	245	.39	.88		59	52	111	1.05
		270	.43	231	.36	.78		44	38	82	.91
		262	.42	224	.35	.78		44	44	88	.94
		253	.40	216	.33	.72		41	41	82	.91
			2.15								4.86
Sums Squares Prod.			4.04								9.06
Cutter Sums Squares Prod.											
Trip Sums.			25.48		21.02						57.06

Redfish — Length-Fillet Weight Relationship.

Summary Sheet — Areas

(log. of Decimeters) (log. of Pounds) (log of Decagram)

X_1 = Fork Length X_2 = St. Length X_3 = Total Length Y_1 = W/t. Y_2 = Fillet W/t.

	Cashes	Off Gloucester	Cape Shore	Matinicus	Total
SX_1	25.72 ✓	26.82 ✓	23.71 ✓	25.07 ✓	101.32
$\bar{X}_1$	.4287	.4470	.3952	.4247	.42217
SX_1^2	11.2184 ✓	12.2220 ✓	9.5807 ✓	10.6089 ✓	43.6300
	11.0253	11.9885	9.3694	10.4751	42.7739
Sx_1^2	.1931	.2335	.2113	.1338	.8561
SX_2	21.61 ✓	22.75 ✓	19.62	21.02	85.00
$\bar{X}_2$	.3602	.3792	.3270	.3503	.35417
SX_2^2	7.9715	8.8655	6.6376	7.4918	30.9664
	7.7832	8.6260	6.4157	7.3640	30.1042
Sx_2^2	.1883	.2395	.2219	.1278	.8622
SX_3					
$\bar{X}_3$					
SX_3^2					
Sx_3^2					
SY_1	47.43 ✓	52.65	41.68 ✓	46.77	188.53
$\bar{Y}_1$	.7905	.8775	.6947	.7795	.78554
SY_1^2	39.2705 ✓	48.4745	30.9482	37.6593	156.3525
	37.4934	46.2004	28.9537	36.4572	148.0982
Sy_1^2	1.7771	2.2741	1.9945	1.2021	7.2543
SY_2	57.73 ✓	61.27 ✓	52.71 ✓	57.06 ✓	228.77
$\bar{Y}_2$	.9622	1.0212	.8785	.9510	.95321
SY_2^2	57.1595	64.6975	48.3865	55.4014	225.6449
	55.5459	62.5669	46.3057	54.2641	218.0655
Sy_2^2	1.6136	2.1306	2.0808	1.1373	7.5794
SX_1X_2	9.4533	10.4051	7.9685	8.9129	36.7398
	9.2635	10.1692	7.7532	8.7829	35.8742
Sx_1x_2	.1898	.2359	.2153	.1300	.8556
SX_1X_3					
Sx_1x_3					
SX_1Y_1	20.9109	24.2530	17.1105	19.9337	82.2081
	20.3317	23.5346	16.4705	19.5421	79.5791
Sx_1y_1	.5792	.7184	.6400	.3916	2.6170
SX_1Y_2	25.2884	28.0661	21.4773	24.2128	99.0446
	24.7469	27.3877	20.8292	23.8416	96.5791
Sx_1y_2	.5415	.6784	.6481	.3712	2.4655
SY_1Y_2					
Sy_1y_2					

Redfish – Length. Fillet Weight.

Summary by Sex.

	Males	Females	Total	For Covariance Analysis
n	111	129	240	
SX	45.10	56.22	101.32	
$\bar{x}$				
SX^2	18.3244	24.5015	42.9739	
Sx^2				.0520
SY	101.11	127.66	228.77	
$\bar{y}$				
SY^2	92.1012	126.3339	217.0655	
Sy^2				.3696
SXY	41.0816	55.6360	96.5791	
S				.1385
Sxy				

Redfish- Length-Fillet Weight

Summary of Cutters For Covariance Analysis.

" " Areas " " "

	Cutters	Areas.
n	240	4
SX^2	42.9262	42.8583
Sx^2	42.7739	42.7739
	.1521	.0844
SY^2	219.3238	218.6826
Sy^2	218.0655	218.0655
	1.2583	.6171
SXY	96.9957	96.8054
Sxy	96.5791	96.5791
	.4166	.2263

Redfish- Length- Fillet Weight
Covariance Analysis
For Differences Among Sexes, Cutters, Areas.

Source of Variation	DF	Sx^2	Sxy	Sy^2	Adjusted Sum of Squares	DF	Mean Square	
Total	239	.8561	2.4655	7.5794				
Sexes	1	.0520	.1385	.3696				
Areas	3	.0844	.2263	.6171				
Cutters	23	.1521	.4166	1.2583				
Error	212	.5676	1.6841	5.3344	.3376	211	.0016	
Cutters + Error	235	.7197	2.1007	6.5927	.4611	234		F = .0054/.0016 = 3.35** Highly Significant (1% point = 1.88)
Significance of Cutter Means					.1235	23	.0054	
Areas + Error	215	.6520	1.9104	5.9515	.3539	214		F = .0054/.0016 = 3.35* Significant - between 5% & 1% points (1% point = 3.87) (5% point = 2.65)
Significance Area means					.0163	3	.0054	
Sexes + Error	213	.6196	1.8226	5.7040	.3427	212		F = .0051/.0016 = 3.19 No ± Significant (5% point = 3.89)
Significance of Sex means.					.0051	1	.0051	

Redfish. Regression—Standard Length on Fork Length

X_1 = Log. Fork Length in Decimeters X_2 = Log. St. Length in Decimeters

Cashes
$E of X_2 = .9829\ X_1 - .0612$

Off Gloucester
$E of X_2 = 1.0103\ X_1 - .0724$

Cape Shore
$E of X_2 = 1.0189\ X_1 - .0757$

Matinicus
$E of X_2 = .9716\ X_1 - .0623$

Total
$E of X_2 = .99942 X_1 - .06776$

Centimeter	X_1 Log.	X_2 Log.	Centimeter
16	.204	.136	13.7
18	.255	.187	15.4
20	.301	.233	17.1
22	.342	.274	18.8
24	.380	.312	20.5
26	.415	.347	22.2
28	.447	.379	23.9
30	.477	.409	25.6
32	.505	.437	27.4
34	.531	.463	29.0
36	.556	.488	30.8
38	.580	.512	32.5
40	.602	.534	34.2
42	.623	.555	35.9

Standard Error of Estimate

$$S_{y.x} = \sqrt{\frac{S_y^2 - \frac{(S_{xy})^2}{S_{x^2}}}{n-2}}$$

$$S_{y.x} = \sqrt{\frac{.0071}{238}} = \sqrt{.0000298}$$

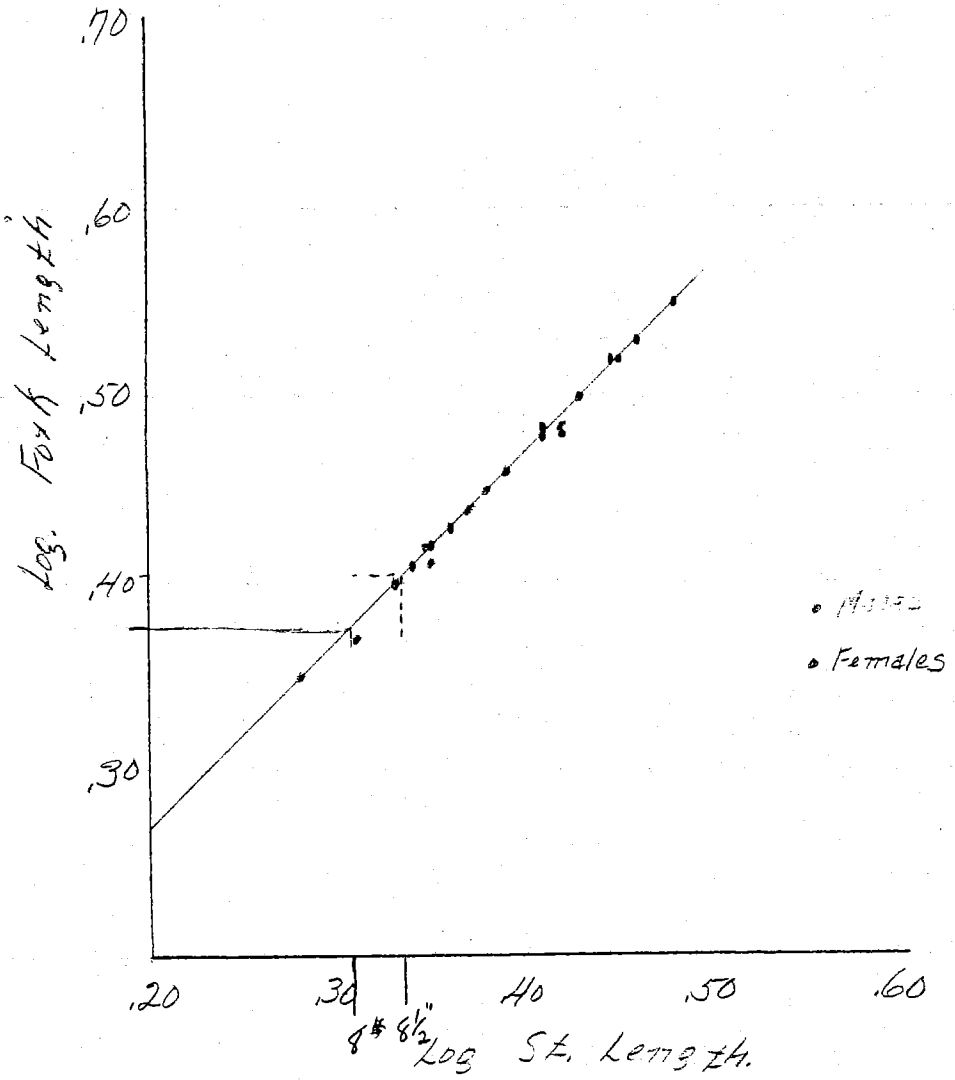
$$S_{y.x} = .00546$$

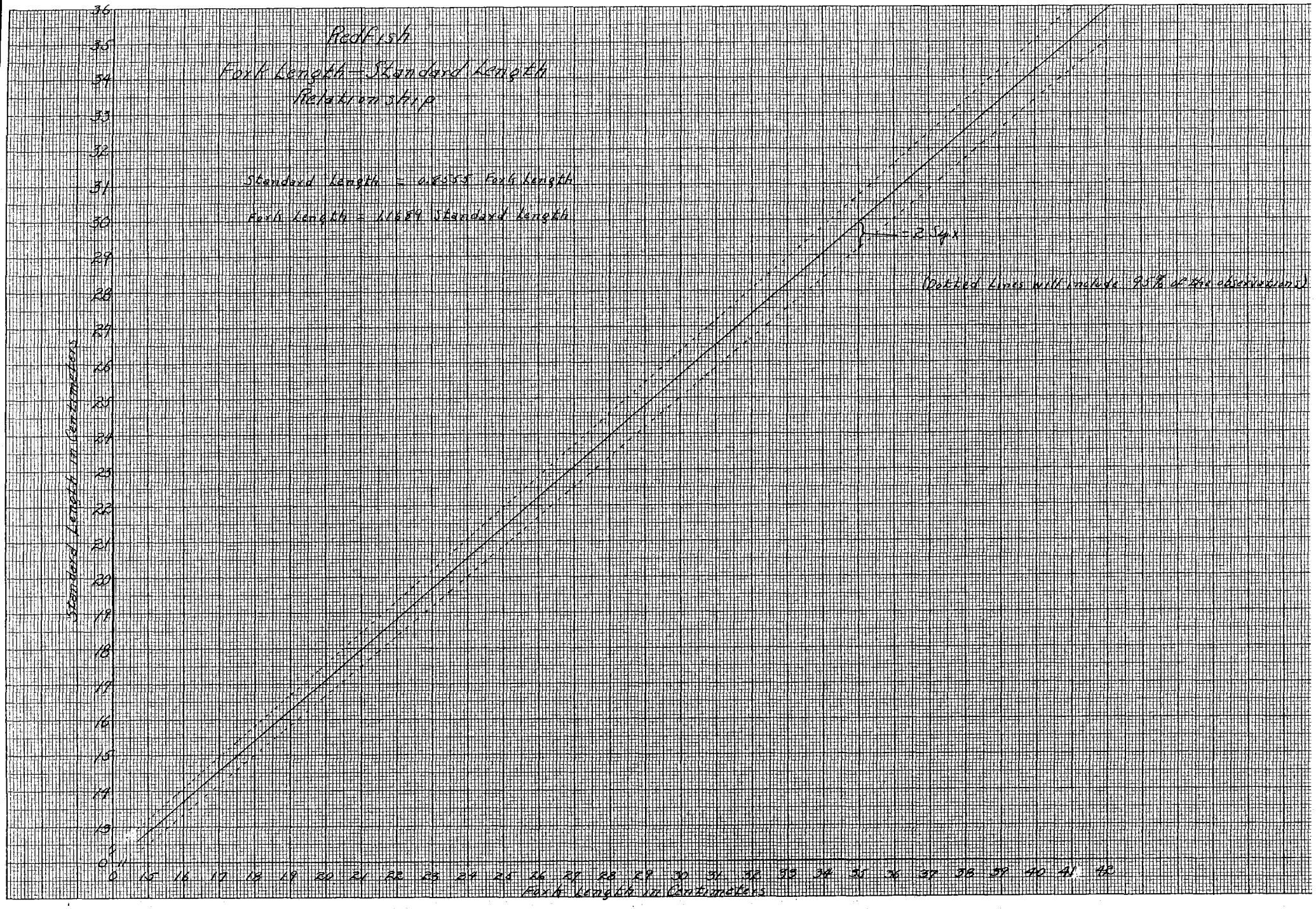
$$C = 1.26\%$$

Redfish - Relationship of Standard Length and Fork Length

Fork Length		Standard Length	
Decimeters	Log	Log	Decimeters
1.63.7	.2140	.1461	1.4
1.87.1	.2721	.2041	1.6
210.5	.3233	.2553	1.8
2.339	.3690	.3010	2.0
2.572	.4104	.3424	2.2
2.807	.4483	.3802	2.4
3.042	.4831	.4150	2.6
3.276	.5153	.4472	2.8
3.510	.5452	.4771	3.0
3.743	.5732	.5051	3.2
3.978	.5997	.5315	3.4
		.5563	3.6

Redfish Log. Fork Length vs. Log. St. Length.
Test For Curvilinearity 1st 2 Samples from St. Joseph, 5/27/62

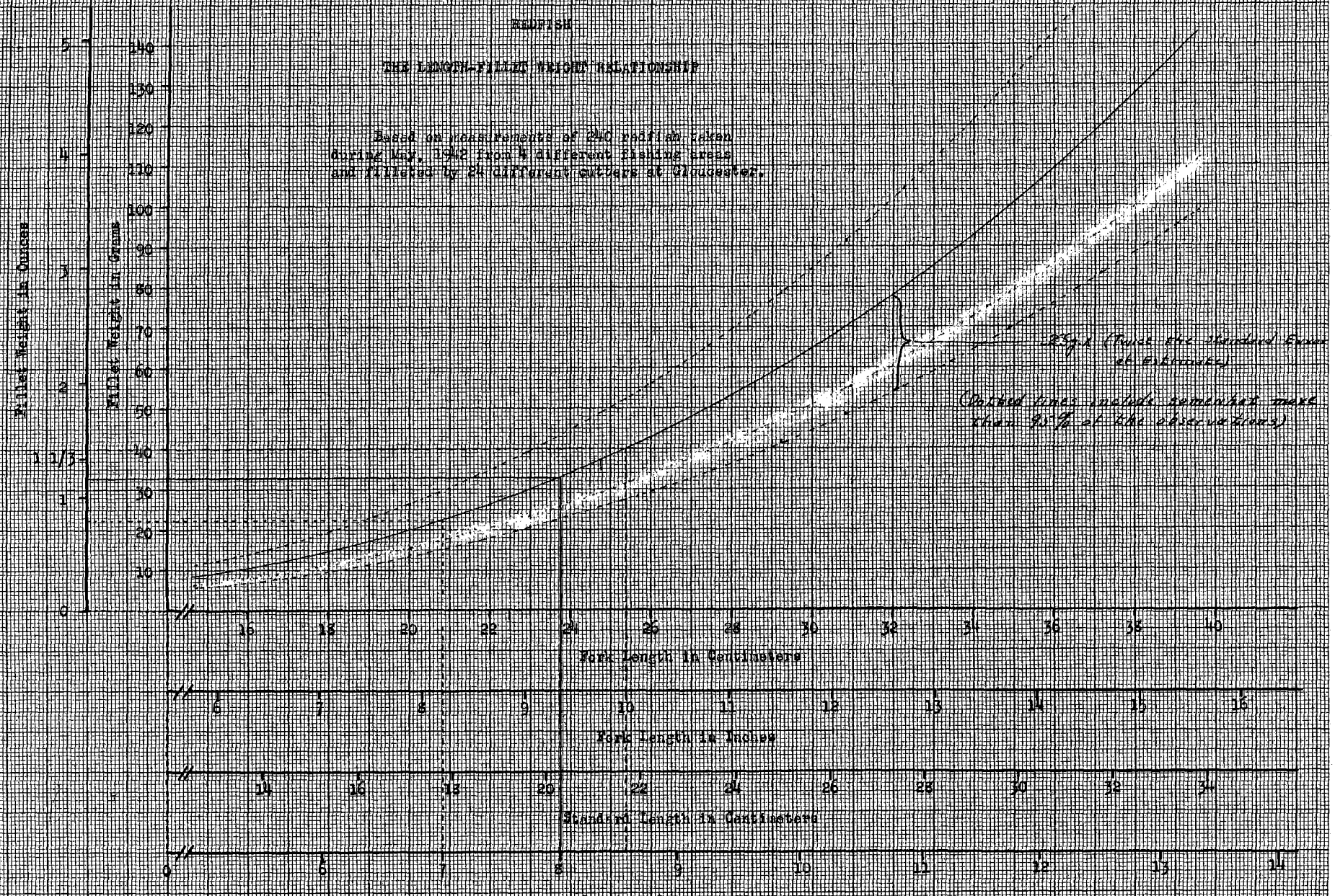



Redfish
Fork Length – Standard Length
Relationship
Standard Length = 0.8555 Fork Length
Fork Length = 1.1689 Standard Length
2 Sy.x
(Dotted lines will include 95% of the observations)
Standard Length in Centimeters
Fork Length in Centimeters
0
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42

REDFISH

THE LENGTH-FILLET WEIGHT RELATIONSHIP

Based on measurements of 240 redfish taken during May, 1942 from 4 different fishing areas and filleted by 24 different cutters at Gloucester.

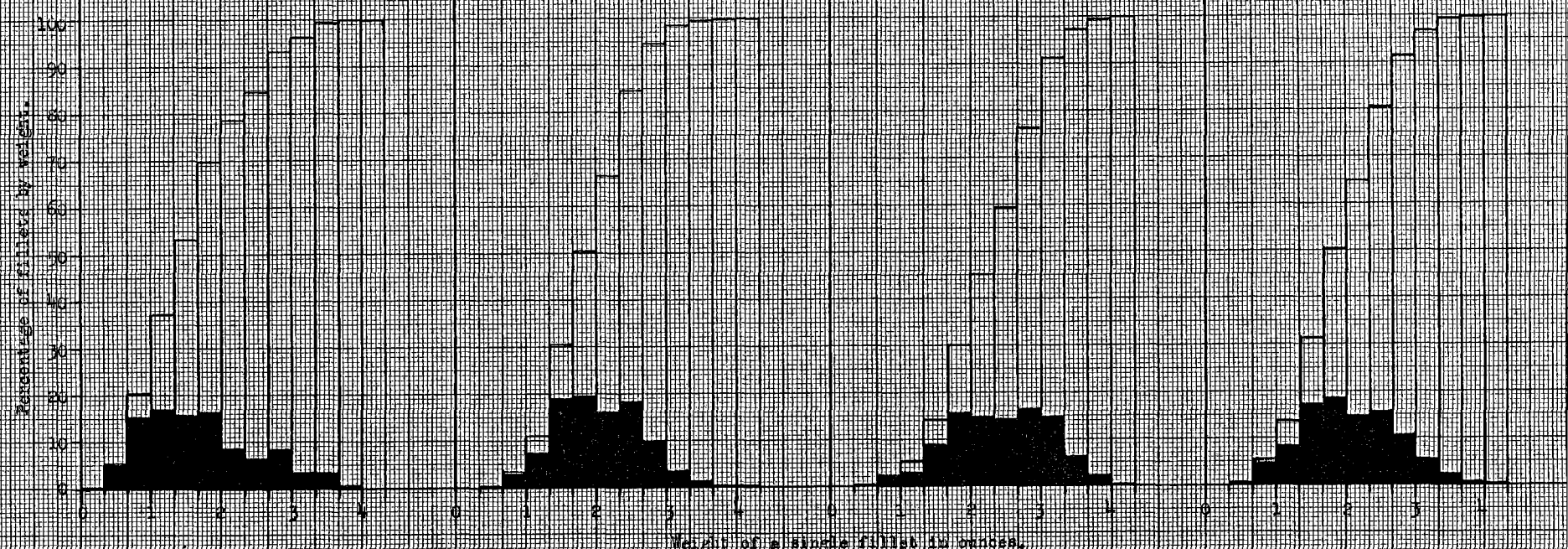


REDFISH

(ROSEFISH)

DISTRIBUTION OF FILLET WEIGHTS AS LANDED AT GLOUCESTER DURING APRIL AND MAY, 1942

Area	Nova Scotia.	Northern Gulf of Maine.	Southern Gulf of Maine.	All areas.
Basis of percentage calculations	475 length measurements from 3 trips.	3520 length measurements from 32 trips.	2001 length measurements from 21 trips.	6296 length measurements from 56 trips. Average of the three principal fishing areas weighed according to the 1941 catch.
Catch in 1941. (Millions of pounds)	22	99	20	140



■ Percentage of fillets between the indicated limits.

□ Cumulative percentage below the upper limit of the group.

Redfish- Fillet Weights

Boat	Place	Average Wt. in Grams Left Fillet	Right Fillet
Gov. Al. Smith	Cashes	48.81	49.23
Saint Joseph	OAF Glo.	59.35	55.33
Doris F. Amero	Cape Shore	41.42	42.07
Angie & Florence	Matinicus	47.42	46.32
Total		11820	11577
Grand Average		49.250	48.238

Redfish Regression of Fillet Weight on Fork Length

X_1 = Log. Fork Length in Decimeters

Y_2 = Log. Weight of Both Fillets in Decagrams

	X_1	Calc Y_2
Cashes Eof Y_2 = 2.8042 X_1 − .2400	.25 .60	.4610 1.4425
Off Gloucester Eof Y_2 = 2.8914 X_1 − .2713	.25 .60	.4516 1.4635
Cape Shore E of Y_2 = 3.0672 X_1 − .3337	.25 .60	.4331 1.5066
Natimicus E of Y_2 = 2.7743 X_1 − .2272	.25 .60	.4664 1.4374
Total E of Y_2 = 2.87992 X_1 − .26261	.25 .60	.4574 1.4653

Standard Error of Estimate (Total)

$$S_{y.x} = \sqrt{\frac{S_{y^2} - \frac{(S_{xy})^2}{S_{x^2}}}{n-2}} = \sqrt{\frac{.4790}{238}} = \sqrt{.002013}$$

$S_{y.x}$ = .04487

C = 10.88%

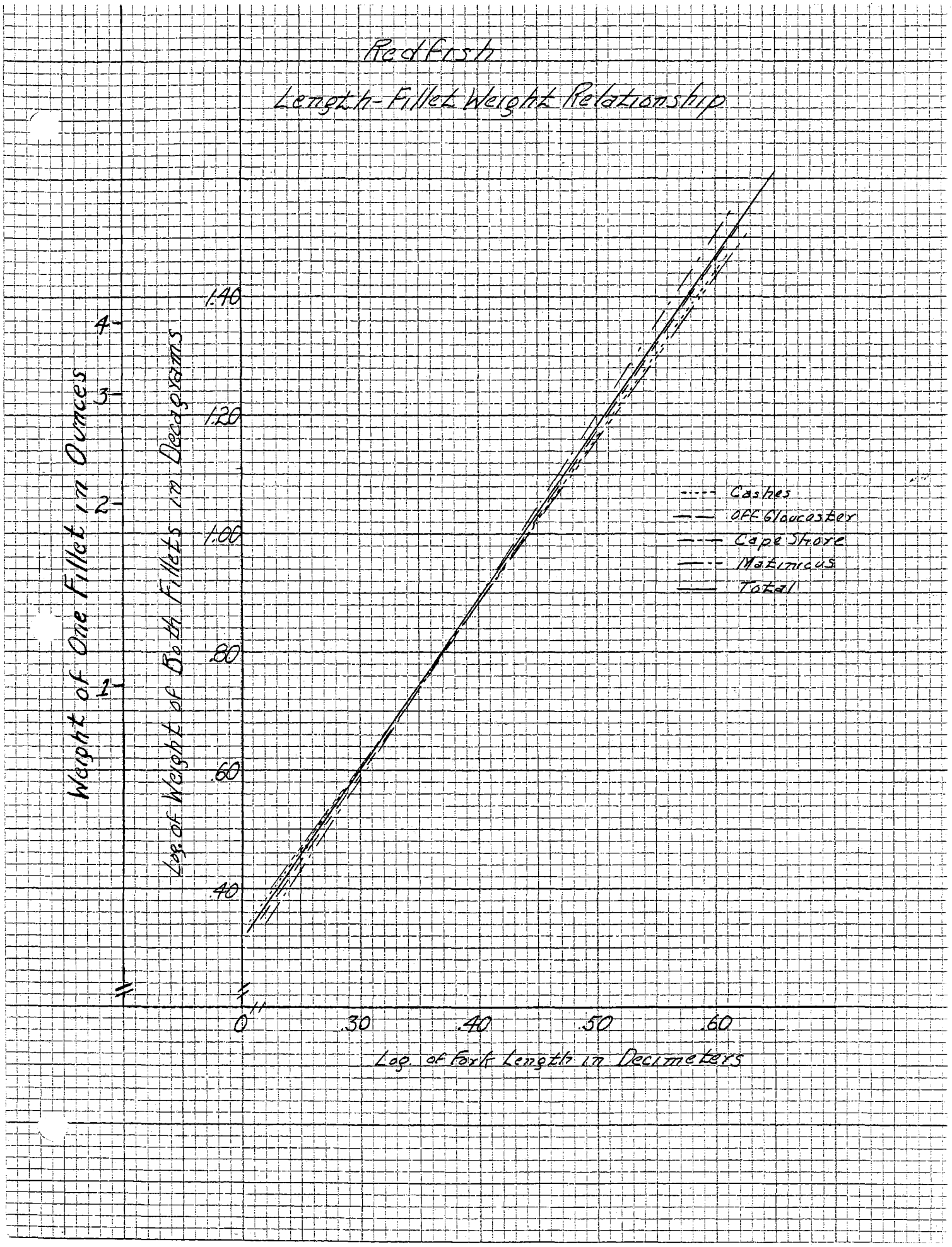
For Single Fillet Weight

$S_{y.x}$ = .04487 ($\sqrt{2}$) = .06345

Note - Because of a non-random distribution of the two fillet weights making up the total weight from one fish used in the analysis, this value is very probably indicative of slightly more variation than actually occurs.

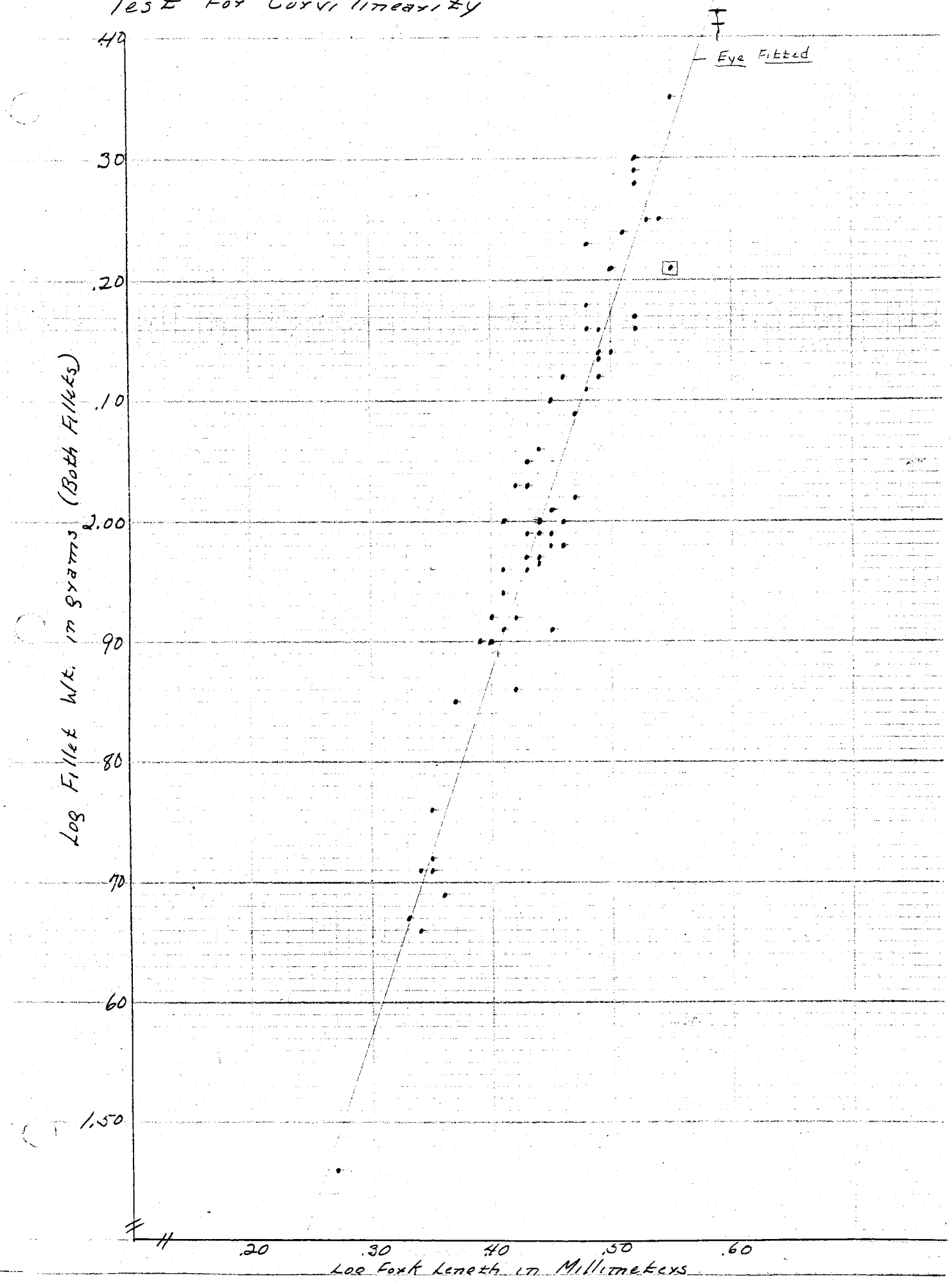
Redfish- Relationship of Fillet Weight to Fork Length
Based on Measurements of 240 Specimens.

Fork Length		Fillet Weight			
Decimeters	Log.	Both Log.	Fillets Decagrams	Single Fillet Decagrams	Single Fillet Ounces
1.60	.2041	.32518	2.114	1.057	.37
1.80	.2553	.47263	2.969	1.484	.52
2.00	.3010	.60425	4.020	2.010	.71
2.20	.3424	.72347	5.290	2.645	.93
2.40	.3802	.83234	6.797	3.398	1.20
2.60	.4150	.93256	8.562	4.281	1.51
2.80	.4472	1.02529	10.60	5.30	1.87
3.00	.4771	1.11140	12.92	6.46	2.28
3.20	.5051	1.19204	15.56	7.78	2.74
3.40	.5315	1.26807	18.55	9.28	3.27
3.60	.5563	1.33949	21.85	10.92	3.85
3.80	.5798	1.40717	25.54	12.77	4.50


Redfish
Length-Fillet Weight Relationship
Weight of One Fillet in Ounces
Log. of Weight of Both Fillets in Decigrams
1.40
1.20
1.00
.80
.60
.40
4
3
2
1
0
.30
.40
.50
.60
Log. of Fork Length in Decimeters
Cashes
Off Gloucester
Cape Shore
Maximus
Total

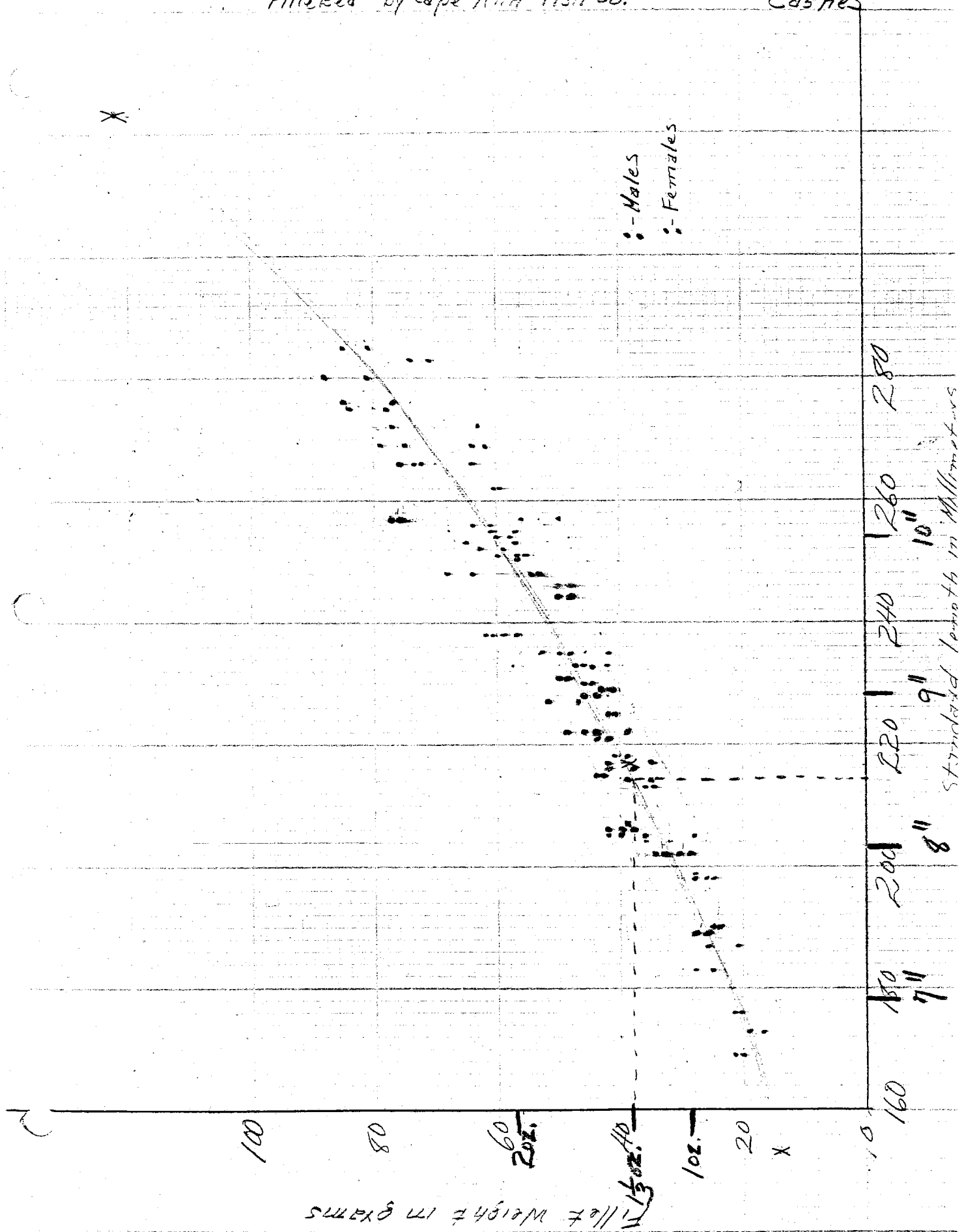
Redfish - Length - Fillet Weight Relationship.
Test for Curvilinearity

St. Joseph.
5/28/42



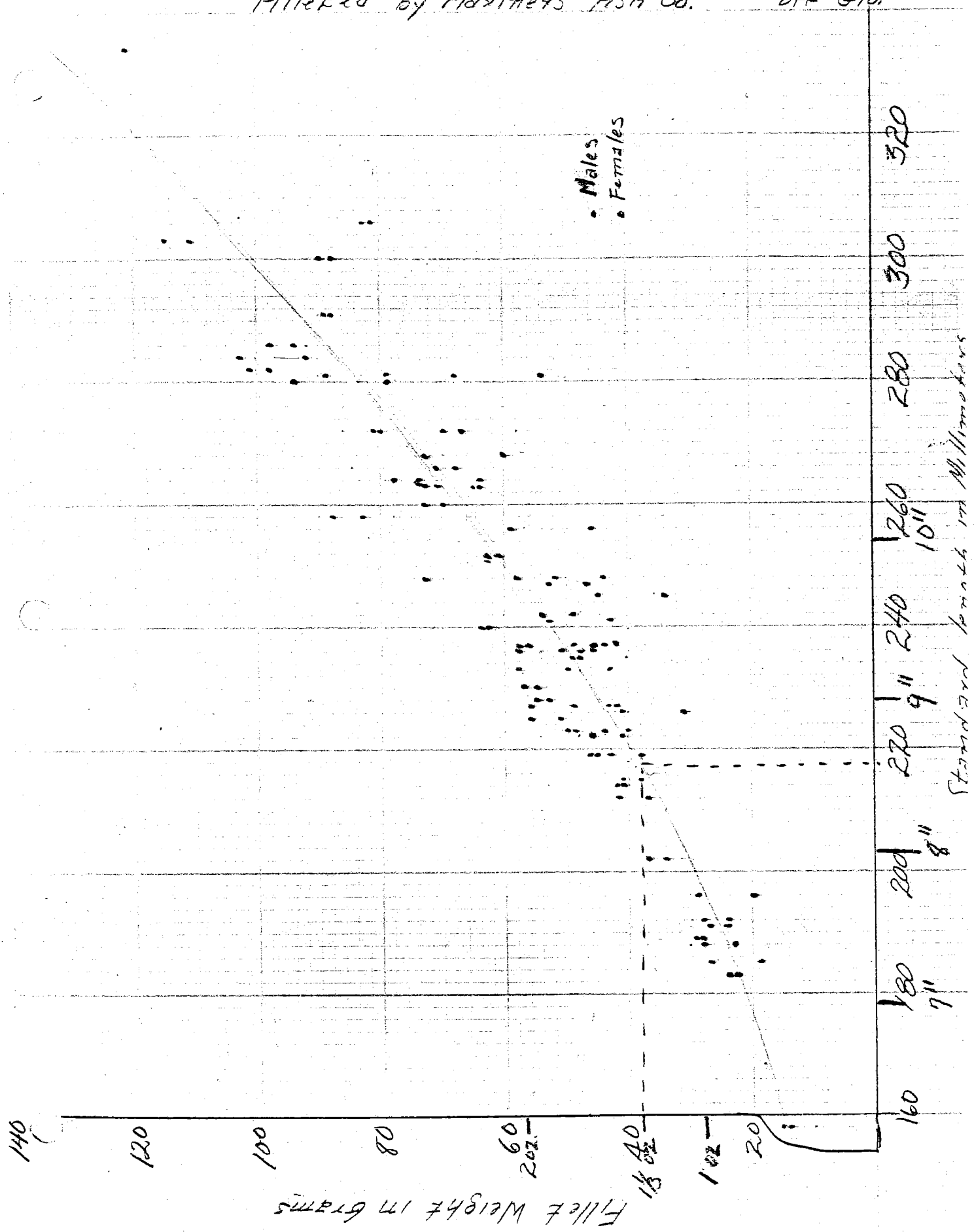
Redfish — Fillet Weight — "Gov. Al Smith" 5/27/42

Filleted by Cape Ann Fish Co. Casines



Redfish - Fillet Weight Saint Joseph 5/28/42 off G/O.

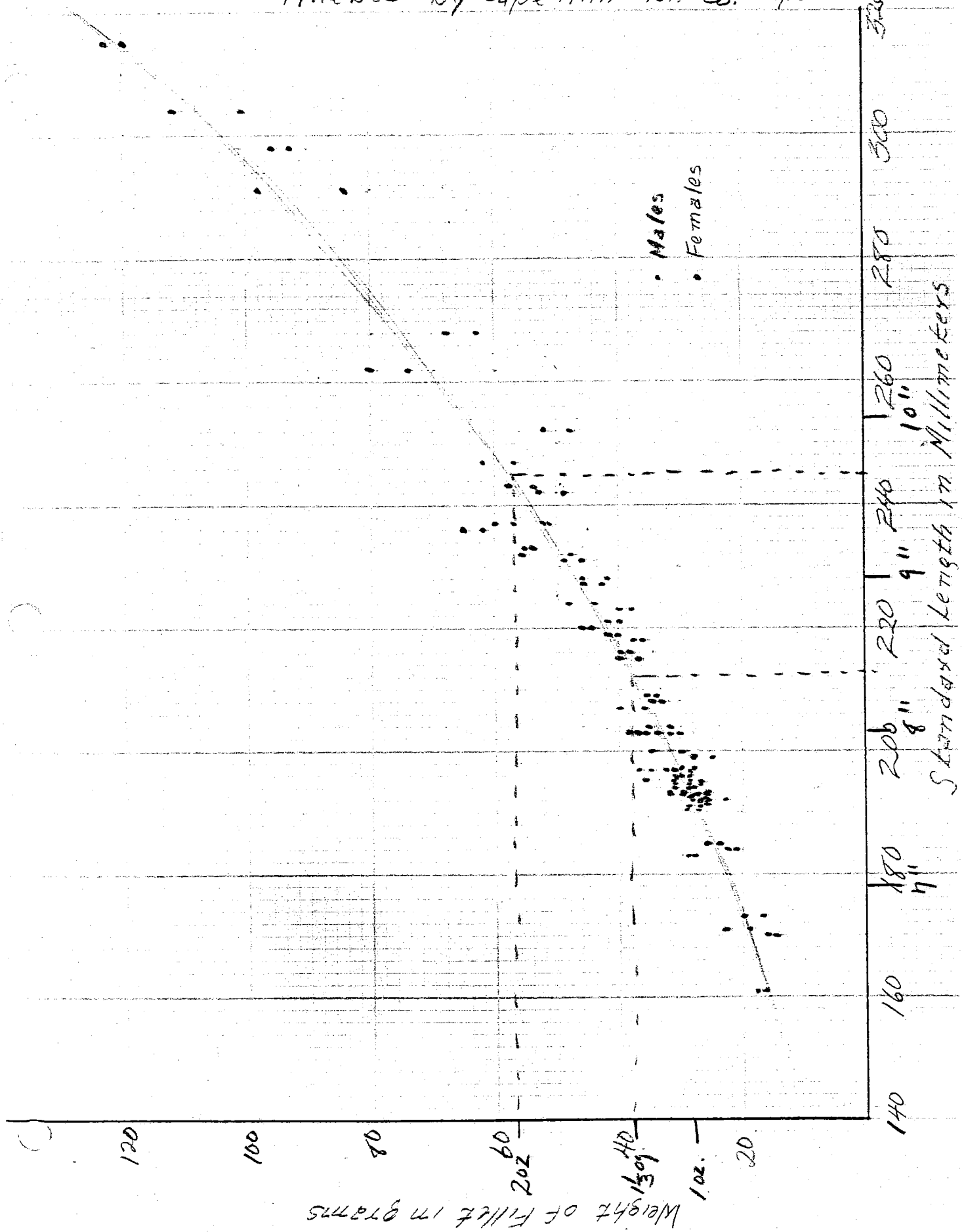
Filleted by Mariners Fish Co.



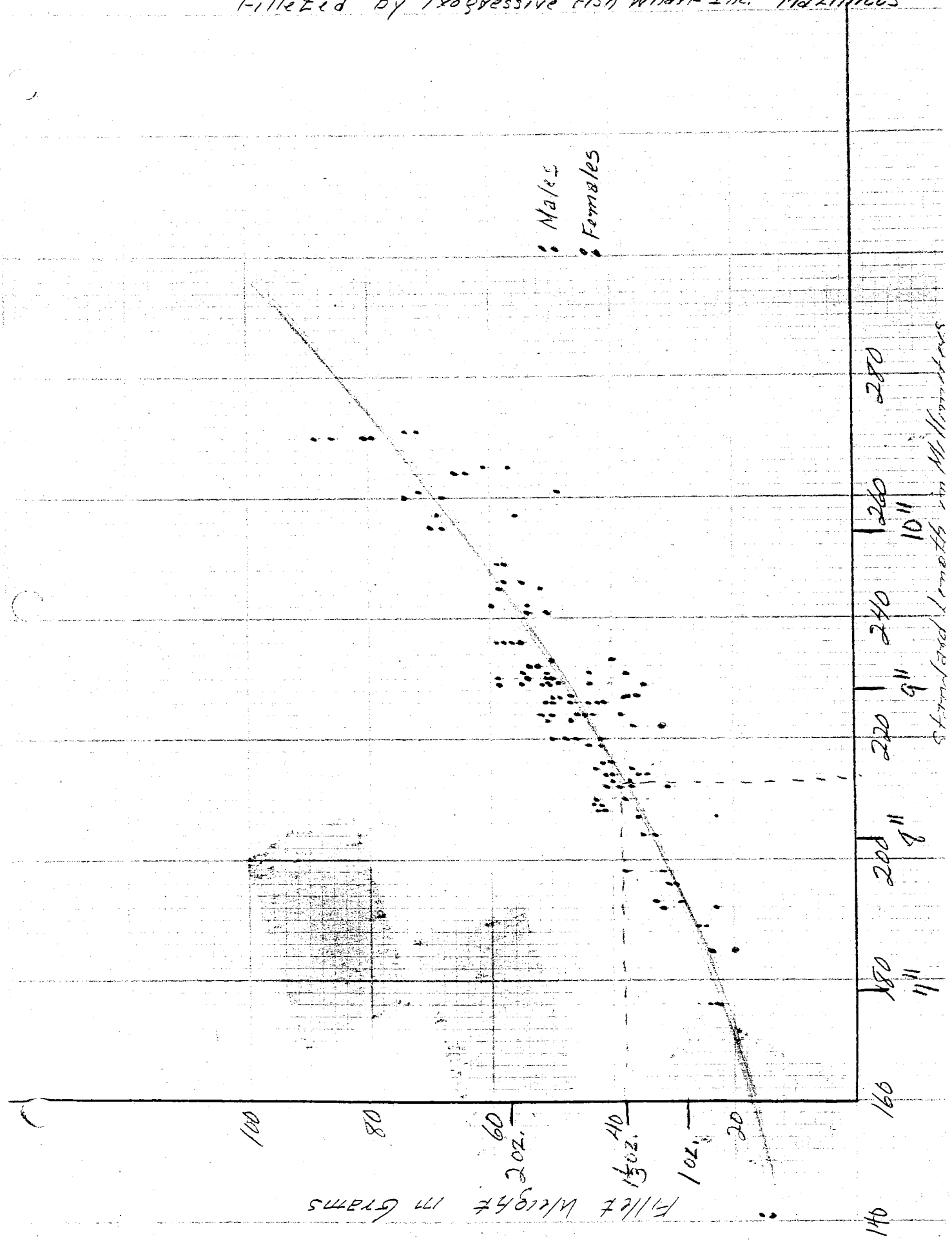
Redfish- Fillet Weight

Filleted by Cape Ann Fish Co. Cape Shore

Doris F. Ames
5/29/42



Red Fish - Fillet Weight - "Angie & Florence" 6/2/42
Filleted by Progressive Fish Wharf Inc. Matinicus



Calculation of the Effect of Cull of Small Redfish.

Area	Length Frequencies from which Fillet Percentages were calculated. Basis of Data for Fillet Percentages	Catch in 1941 in million of Pounds	% by weight of Redfish Fillets Landed: Below 1 oz	1 to 1⅓ oz.	1⅓ to 2 oz	2 oz-3 oz	over 3 oz	Total
Nova Scotia Area XXI	475 measurements from 3 trips	21	20.3	16.8	32.5	23.4	7.1	100.1
Northern Gulf of Maine Subareas XXII B, C, D, F.	3530 measurements from 32 trips	99	3.2	7.8	39.4	44.3	5.4	100.1
Southern Gulf of Maine Subareas XXII E, G, H, I, M, N, O.	2001 measurements from 21 trips	20	2.3	3.0	24.9	46.1	23.7	100.0
Total	6306 measurements Average weighed according to 1941 catch	140	5.6	8.5	36.2	41.4	8.3	100.0

The percentage by weight of the redfish fillets was calculated from measurements on 240 rosefish fillet from 4 different areas and filleted by 24 different cutters.

The length frequency material was gathered during April, May, and early June 1942

Measurements on 423 fish culled at sea under by three different boats indicates that about 99% of the fish so culled would have produced fillets of less than one ounce. On the basis of interviews The fish culled at sea probably represent only from one to three percent of the total catch on the average - Sometimes, in Nova Scotian waters, however as much as thirty or forty percent of the catch may be culled. Apparently such is rare since the fishermen try to avoid the schools of small fish.

Notes on Cull of redfish.

Checker at Cape Cod Inc- June 15th

Cull of redfish was abandoned about may 15 in all the plants as far as he knows. Now they deduct a flat 5% for ice and "buttons" with no sampling or deductions for small fish. Maximum cull used to be about 10% but occasionally up to 25% for cape shore fish which had not been culled at sea.

Mr Bloom Manager at Mariners. June 15th-

Says cull has been as high as 14 to 15% for small fish but perhaps average two or three percent. Hasn't had to cull any in some time because there have been very few small fish brought in.

Frank Favalaro - Manager Progressive Fish Wharf Inc.
June 18, 1942

Maximum cull used to be about 10% - Average was probably less than 3%. Now the only deduction is 5% for ice and "buttons". Hammer cutters, now, discard most fish below seven inches and will cut only one fillet from some small fish. They take the time to pick up the fish and figure they might as well cut one fillet from it.

Redfish Combination of L.F. from April - June 8
Calculation of Fillet Weights

	Cape Shore					Off Gloucester Channel					Northern Gulf of Maine					
M.M.	F.E.F.	W.F.R.	Total	Fillet Wt.	%	F.E.F.	W.F.R.	Total	Fillet Wt.	%	F.E.F.	W.F.R.	Total	Fillet Wt.	%	Av. Weight
125-129											1		1	11	0.0	0
130-134			21				20				1	99	1	12	0.0	0
135-139																
140-	2		2	30.0	0.1						1		1	15	0.0	0
150-						1		1	18	0.0						
	1		1	20.0	0.1											0
160	2		2	43.8	0.1						2		2	44	0.0	0
	4		4	95.6	0.3						1		1	24	0.0	0
170	4		4	104.0	0.3	3		3	78	0.0						
	5		5	141.5	0.4	4		4	112	0.0	4	1	5	142	0.0	0
180	17		17	520.2	1.4	3		3	93	0.0	6		6	184	0.0	0.2
	7		7	231.7	0.6	9		9	297	0.1	6		6	199	0.0	0.1
190	13		13	465.4	1.3	6		6	216	0.1	24	1	25	895	0.2	0.4
	16	1	17	654.5	1.8	13		13	494	0.2	15	2	17	654	0.2	0.4
200	22		22	910.8	2.5	17	1	18	738	0.3	20	1	21	869	0.2	0.6
	19	2	21	932.4	2.6	14		14	616	0.2	34	1	35	1554	0.4	0.7
210	14	3	17	807.5	2.2	9	1	10	480	0.2	38	3	41	1948	0.5	0.7
	20		20	1018.0	2.8	25		25	1275	0.5	48	4	52	2647	0.7	1.0
220	17	5	22	1194.6	3.3	29	2	31	1674	0.7	59	5	64	3475	0.9	1.2
	22	7	29	1679.1	4.6	21		21	1218	0.5	71	2	73	4227	1.1	1.5
230	22	4	26	1604.2	4.4	25	1	26	1612	0.7	77	5	82	5059	1.3	1.6
	14	3	17	1113.5	3.1	19	2	21	1386	0.6	88	2	90	5895	1.5	1.8
240	10	6	16	1113.6	3.1	19		19	1330	0.5	105	5	110	7656	1.9	1.9
	15	1	16	1182.4	3.3	32	1	33	2442	1.0	157	9	160	11824	3.0	2.6
250	12	2	14	1094.8	3.0	40	2	42	3276	1.3	173	8	181	14154	3.6	3.2
	18	2	20	1656.0	4.6	56	2	58	4814	2.0	207	13	220	18216	4.6	4.2
260	13	2	15	1312.5	3.6	59	5	64	5632	2.3	240	19	259	22662	5.7	4.9
	15	1	16	1478.4	4.1	67	2	69	6348	2.6	223	13	236	21806	5.5	4.[illegible]
270	15	6	21	2047.5	5.6	112	9	121	11858	4.8	238	13	251	24472	6.1	5.8
	13	8	21	2163	6.0	104	5	109	11227	4.6	205	13	218	22454	5.6	5.5
280	8	4	12	1296	3.6	114	9	123	13284	5.4	197	17	214	23112	5.8	5.4
	7	4	11	1254	3.4	114	6	120	13680	5.5	176	6	182	20748	5.2	5.0
290	1	4	5	600	1.7	84	3	87	10440	4.2	141	8	149	17880	4.5	4.0
	6	2	8	1008	2.8	88	3	91	11466	4.7	153	5	158	19908	5.0	4.6
300	7	3	10	1320	3.6	76	3	79	10428	4.2	174	10	184	24288	6.1	5.5
		4	4	552	1.5	74	4	78	10764	4.4	165	5	170	23460	5.9	5.0
310	2	3	5	725	2.0	79	4	83	12035	4.9	168	7	175	25375	6.4	5.5
	2	3	5	760	2.1	92	6	98	14896	6.0	131	14	145	22040	5.5	5.1
320	9	3	12	1908	5.3	95	4	99	15741	6.4	105		105	16695	4.2	4.7
	1	3	4	664	1.8	93	7	100	16600	6.7	66	3	69	11454	2.9	3.3
330		4	4	692	1.9	96	3	99	17127	6.9	50	3	53	9169	2.3	2.9
		2	2	362	1.0	75	8	83	15023	6.1	26		26	4706	1.2	1.9
340		2	2	378	1.0	65	4	69	13041	5.3	18	2	20	3780	0.9	1.5
		4	4	784	2.2	27	2	29	5684	2.3	12	3	15	2940	0.7	1.2
350		1	1	205	0.6	19		19	3895	1.6	1		1	205	0.1	0.4
		1	1	213	0.6	16	1	17	3621	1.5	2		2	426	0.1	0.4
360						5		5	1110	0.5	2		2	444	0.1	0.1
						1		1	231	0.1	1		1	231	0.1	0.1
370						1		1	240	0.1						
											1		1	250	0.1	0.1
Total	375	100	475	38,336.0	100.3	1901	100	2001		100.0	3627	203	3830	96,210	100.1	99.9

App. Av Coil Length

8" st.l.

10" F.L.

10" F.L.

Rosefish- Average Length for a given Fillet Weight.

Fillet Weight	Average Fork Length (Millimeters)
1 oz	225
1 1/3 oz	248
2 oz	286
3 oz	330
4 oz	364

Fillet Weight OZ.	Average Fork Length MM.
1/4	139
1/2	177
3/4	204
1	225
1/4	243
1/2	259
3/4	273
2	286
1/4	298
1/2	309
3/4	320
3	330
1/4	339
1/2	348
3/4	356
4	364
1/4	372
1/2	380
3/4	387

Grams	Fillet Weight Ounces	Average Fork Length (Millimeters)
7.1	1/4	139
	1/3 oz.	154
14.2	1/2	177
	2/3	196
21.3	3/4	204
	1	225
35.4	1 1/4	243
	1 1/3	248
42.5	1 1/2	259
	1 2/3	269
49.6	1 3/4	273
	2	286
63.8	2 1/4	298
	2 2/3	302
70.9	2 1/2	309
	2 2/3	317
78.0	2 3/4	320
	3	330
92.1	3 1/4	339
	3 1/3	342
99.2	3 1/2	348
	3 2/3	354
106.3	3 3/4	356
	4	364

(1/3, 2/3, and even ounces calculated -)

(1/4, 3/4, 1/2 read from curve)

Redfish- Distribution of Fillet Weights
1/3 oz. units

Weight of Fillet oz	Area: Nova Scotia %	Nova Scotia Cum.	N. Gulf of Maine %	N. Gulf of Maine Cum.	S. Gulf of Maine %	S. Gulf of Maine Cum	Weighted Average %	Weighted Average Cum.
0 - 1/3	0.1	0.1	0	0	0	0	0	0
1/3 - 2/3	5.0	5.1	.3	.3	.3	.3	.8	.8
2/3 - 1	15.2	20.3	2.9	3.2	2.0	2.3	4.7	5.5
1 - 1 1/3	17.0	37.3	7.8	11.0	3.0	5.3	8.4	13.9
1 1/3 - 1 2/3	15.9	53.2	19.8	30.8	9.0	14.3	17.5	31.4
1 2/3 - 2	16.6	69.8	19.6	50.4	15.9	30.2	18.7	50.1
2 - 2 1/3	8.7	78.5	16.1	66.5	14.9	45.1	14.9	65.0
2 1/3 - 2 2/3	6.3	84.8	18.2	84.7	14.4	59.5	15.8	80.8
2 2/3 - 3	8.4	93.2	10.0	94.7	16.8	76.3	10.8	91.6
3 - 3 1/3	3.2	96.4	3.7	98.4	14.9	91.2	5.3	96.9
3 1/3 - 3 2/3	3.2	99.6	1.2	99.6	6.4	97.6	2.3	99.2
3 2/3 - 4	0.7	100.3	0.2	99.8	2.1	99.7	0.5	99.7
4 - 4 1/3	0		0.1	99.9	0.3	100.0	0.2	99.9

Redfish- Distribution of Fillet Weights
1/4 oz. units

Weight of Fillet oz	Nova Scotia %	Nova Scotia Cum.	N. Gulf of Maine %	N. Gulf of Maine Cum.	S Gulf of Maine %	S Gulf of Maine Cum.	Weighted Average %	Weighted Average Cum
0 - 1/4	0		0		0		0	
1/4 - 1/2	1.1		0		0		0	
1/2 - 3/4	7.5		0.6		0.7		1.6	
3/4 - 1	11.7	20.3	2.6	3.2	1.6	2.3	3.9	5.5
1 - 1 1/4	13.8		5.2		2.2		5.8	
1 1/4 - 1 1/2	11.3		11.2		4.2		10.4	
1 1/2 - 1 3/4	12.1		16.0		8.5		14.3	
1 3/4 - 2	12.3	69.8	14.8	50.4	13.0	30.2	14.1	50.1
2 - 2 1/4	6.1		11.8		11.4		10.7	
2 1/4 - 2 1/2	5.8		12.9		9.6		11.4	
[illegible] - 2 3/4	4.6		12.9		11.9		11.6	
2 3/4 - 3	6.8	93.1	6.9	94.7	13.2	76.3	7.8	91.6
3 - 3 1/4	2.6		3.2		11.7		4.3	
3 1/4 - 3 1/2	2.6		1.5		7.5		2.5	
3 1/2 - 3 3/4	1.4		0.3		2.7		0.9	
3 3/4 - 4	0.5	100.2	0.2	99.9	1.6	99.8	0.4	99.7
4 - 4 1/4			0.1	100.0	0.2	100.0	0.1	99.8
4 1/4 - 4 1/2			0.1	100.1			0.1	99.9

The Effect of The Cull of Small Rosefish on Production

Area	Length Frequencies from which fillet percentages were calculated	Catch in 1941 (Millions of pounds)	Percentage by weight of rosefish fillets landed				
			Below 1 oz.	1 to 1 1/3 oz.	1 1/3 to 2 oz.	2 to 3 oz.	Over 3 oz.
Nova Scotia Area XXI	475 measurements from 3 trips	21	20.3	16.8 37.1	32.5 69.6	23.4 93.0	7.1 100.1
Northern Gulf of Maine. Sub-areas XXII B, C, D, F.	3820 measurements from 32 trips	99	3.2	7.8 11.0	39.4 50.4	44.3 94.7	5.4 100.1
Southern Gulf of Maine. Sub-areas XXII E, G, H, J, M, N, O.	2001 measurements from 21 trips	20	2.3	3.0 5.3	24.9 30.2	46.1 76.3	23.7 100.0
Total and weighed averages.	~~6306~~ 6396 measurements from ~~35~~ 36 trips. Average weighed according to 1941 catch.	140	5.6	8.5 14.1	36.2 50.3	41.4 91.7	8.3 100.0

Basis of above information.

The length frequency material was gathered during April, May, and June, 1942. ~~The percentage by~~ Average weight of the rosefish fillets was calculated from fillet weights on 240 rosefish from 4 different fishing areas and filleted by 24 different cutters.

Effect of the cull on production.

The above table does not give any indication of the cull of fish at sea. No very accurate information on this is available but interviews with boat captains indicate that an average of 1 to 3 percent of the catch is discarded at sea. Sometimes in Nova Scotian waters as much as 30 or 40 percent of the catch may be culled. Apparently this is rare since the fishermen can avoid the schools of small fish to some extent

Measurements on 423 rosefish discarded at sea by three different boats indicates that about 99 pecent of the fish so culled would have produced fillets of less than one ounce. Measurements of 939 rosefish culled in two different plants indicates that about 12 percent of the ~~were~~ culled fish ~~discarded which~~ would have produced fillets of over one ounce but the average of the largest fish culled was of a size that would produce fillets of just about one ounce. Essentially, then the cull limit is very close to the size fish which will produce a one ounce fillet. Some variation is, of course, to be expected; a few larger fish will be discarded and a few smaller ones saved

Because of the present demand for rosefish fillets the cutting plants at Gloucester have abandoned the cull limit and the fisherman is paid for all the fish he brings in regardless of size. The cull was abandoned about May 15, 1942.

Under the conditions existing before the cull was abandoned when fish yielding a fillet of less than one ounce were discarded, raising the minimum size fillet to one and one third ounces would have decreased production by about 9 percent. Now, with no cull, it would necessitate a decrease in production of 14 percent to cull all fish yielding fillets of less than one and one third ounces.

Redfish-Calculated Fillet Weights

Based on measurements of 240 redfish and 480 fillets from four different fishing areas, Cashes, Off Gloucester, Cape Shore, and Matinicus, and filleted by 24 different cutters at Gloucester, Massachusetts.
May 27 - June 2, 1942

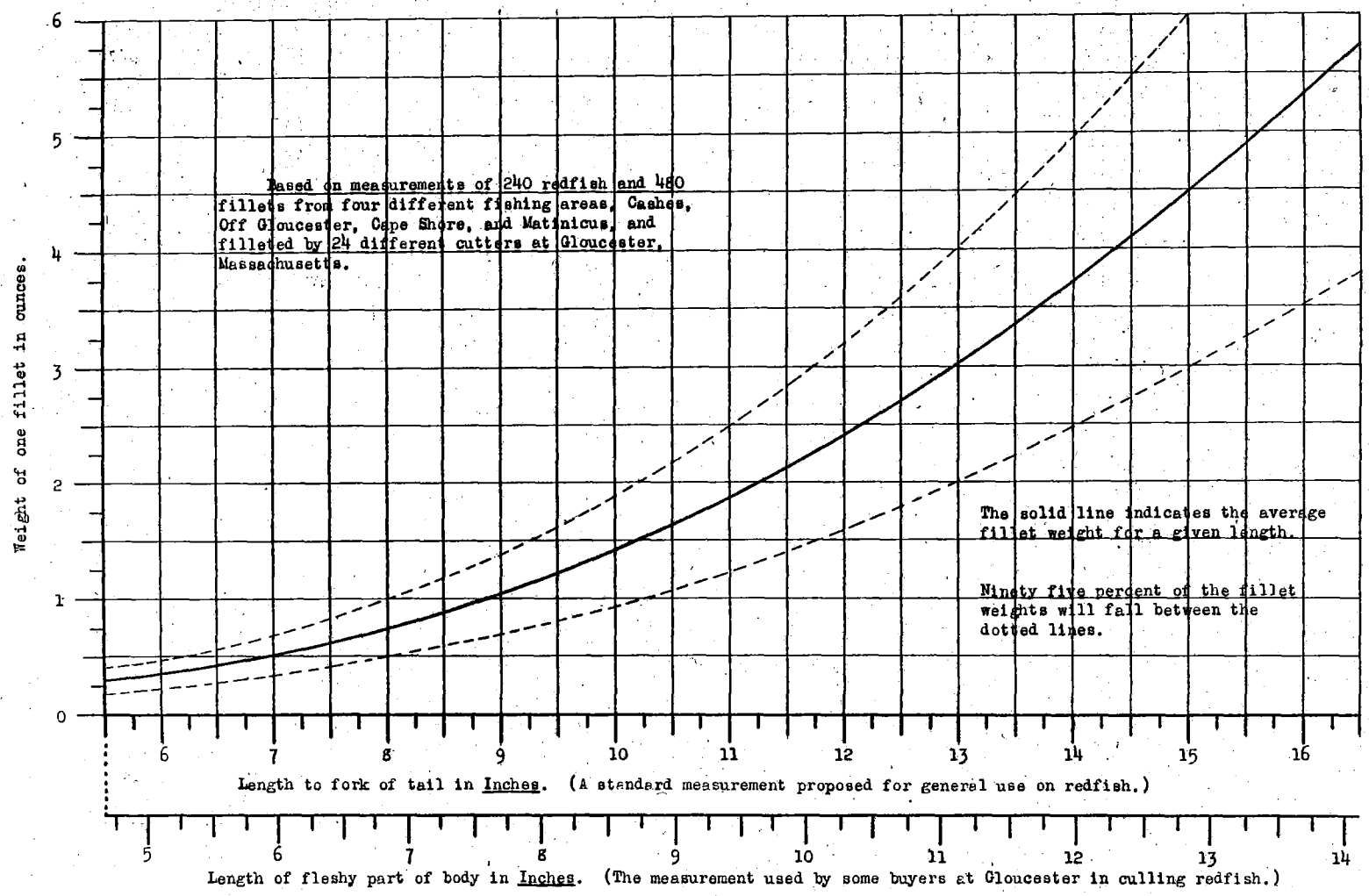
Length of Fish		Weight of Both Fillets	
Cm./2	Mm.	Grams	Ounces
25	120-124	9.69	.3
6	125-129	10.9	.4
7	130-134	12.2	.4
8	135-139	13.5	.5
9	140-144	15.0	.5
30	145-149	16.6	.6
1	150-154	18.2	.6
2	155-159	20.0	.7
3	160-164	21.9	.8
4	165-169	23.9	.8
5	170-174	26.0	.9
6	175-179	28.3	1.0
7	180-184	30.6	1.1
8	185-189	33.1	1.2
9	190-194	35.8	1.3
40	195-199	38.5	1.4
1	200-204	41.4	1.5
2	205-209	44.4	1.6
3	210-214	47.5	1.7
4	215-219	50.9	1.8

Length of Fish		Weight of Both Fillets	
Cm./2	Mm.	Grams	Ounces
45	220-224	54.3	1.9
6	225-229	57.9	2.0
7	230-234	61.7	2.2
8	235-239	65.5	2.3
9	240-244	69.6	2.5
50	245-249	73.9	2.6
1	250-254	78.2	2.8
2	255-259	82.8	2.9
3	260-264	87.5	3.1
4	265-269	92.4	3.3
5	270-274	97.5	3.4
6	275-279	103.	3.6
7	280-284	108.	3.8
8	285-289	114.	4.0
9	290-294	120.	4.2
60	295-299	126.	4.4
1	300-304	132.	4.7
2	305-309	138.	4.9
3	310-314	145.	5.1
4	315-319	152.	5.4

Length of Fish		Weight of Both Fillets	
Cm./2	Mm.	Grams	Ounces
65	320-324	159.	5.6
6	325-329	166.	5.9
7	330-334	173.	6.1
8	335-339	181.	6.4
9	340-344	189.	6.7
70	345-349	196.	6.9
1	350-354	205.	7.2
2	355-359	213.	7.5
3	360-364	222.	7.8
4	365-369	231.	8.1
5	370-374	240.	8.5
6	375-379	250.	8.8
7	380-384	259.	9.1

REDFISH (ROSEFISH)

THE LENGTH-FILLET WEIGHT RELATIONSHIP. MAY, 1942



Red Fish Fillet Weights (Calculated)

omit these 3 calums.

Length of Fish				Log. Fillet Wt. (Both Fillets)	Weight of Both Fillets	
Cm/2	MM.	Midpoint	Log Midpoint		Grams	Ounces
25	120-124	122	.0864	9.9862-10	9.69	.3
6	125-129	127	.1038	.0363	10.9	.4
7	130-134	132	.1206	.0847	12.2	.4
8	135-139	137	.1367	.1311	13.5	.5
9	140-144	142	.1523	.1760	15.0	.5
30	145-149	147	.1673	.2192	16.6	.6
1	150-154	152	.1818	.2610	18.2	.6
2	155-159	157	.1959	.3016	20.0	.7
3	160-164	162	.2095	.3408	21.9	.8
4	165-169	167	.2227	.3788	23.9	.8
5	170-174	172	.2355	.4156	26.0	.9
6	175-179	177	.2480	.4516	28.3	1.0
7	180-184	182	.2601	.4865	30.6	1.1
8	185-189	187	.2718	.5202	33.1	1.2
9	190-194	192	.2833	.5533	35.8	1.3
40	195-199	197	.2945	.5856	38.5	1.4
1	200-204	202	.3054	.6170	41.4	1.5
2	205-209	207	.3160	.6475	44.4	1.6
3	210-214	212	.3263	.6771	47.5	1.7
4	215-219	217	.3365	.7065	50.9	1.8
5	220-224	222	.3464	.7350	54.3	1.9
6	225-229	227	.3560	.7627	57.9	2.0
7	230-234	232	.3655	.7900	61.7	2.2
8	235-239	237	.3747	.8165	65.5	2.3
9	240-244	242	.3838	.8427	69.6	2.5
50	245-249	247	.3927	.8684	73.9	2.6
1	250-254	252	.4014	.8934	78.2	2.8
2	255-259	257	.4099	.9179	82.8	2.9
3	260-264	262	.4183	.9421	87.5	3.1
4	265-269	267	.4265	.9657	92.4	3.3
5	270-274	272	.4346	.9890	97.5	3.4
6	275-279	277	.4425	1.0118	103.	3.6
7	280-284	282	.4502	1.0340	108	3.8
8	285-289	287	.4579	1.0562	114	4.0
9	290-294	292	.4654	1.0778	120	4.2
60	295-299	297	.4728	1.0991	126	4.4
1	300-304	302	.4800	1.1198	132	4.7
2	305-309	307	.4871	1.1402	138	4.9
3	310-314	312	.4942	1.1607	145	5.1
4	315-319	317	.5011	1.1806	152	5.4
5	320-324	322	.5079	1.2002	159	5.6
6	325-329	327	.5145	1.2192	166	5.9
7	330-334	332	.5211	1.2382	173	6.1
8	335-339	337	.5276	1.2569	181	6.4
9	340-344	342	.5340	1.2753	189	6.7
70	345-349	347	.5403	1.2935	196	6.9
1	350-354	352	.5465	1.3113	205	7.2
2	355-359	357	.5527	1.3292	213	7.5
3	360-364	362	.5587	1.3465	222	7.8
4	365-369	367	.5647	1.3637	231	8.1
5	370-374	372	.5705	1.3804	240	8.5
6	375-379	377	.5763	1.3971	250	8.8
7	380-384	382	.5821	1.4138	259	9.1

Landines

Length-Weight Relationship

Redfish- Regression of Weight on Fork Length

X_1 = Log. of Fork Length in Decimeters

Y_1 = Log. of Weight in 0.1 pounds

		X_1	Calc Y_1
Cashes			
	$E \text{ of } Y_1 = 2.9995 X_1 - .4954$	.30	.4044
		.55	1.1543
Off Gloucester			
	$E \text{ of } Y_1 = 3.0767 X_1 - .4977$	.30	.4253
		.55	1.1945
Cape Shore			
	$E \text{ of } Y_1 = 3.0289 X_1 - .5023$	.30	.4064
		.55	1.1636
Matinicus			
	$E \text{ of } Y_1 = 2.9268 X_1 - .4635$	.30	.4145
		.55	1.1462
Total			
	$E \text{ of } Y_1 = 3.05689 X_1 - .50499$	.30	.4121
		.55	1.1763

Measurements taken along with Fillet Weights - after being cleaned and scaled.

The Length-Weight Relationship of Redfish

as landed at Gloucester June 15 to July 17, 1942

Table 1 itemizes the source of the samples from which the length-weight measurements were obtained. In all of these samples the fish were measured and weighed "as landed" before washing, cleaning, or scaling. Methods of Measurement — (Caps)

Insert on 2nd page

Lengths were measured on an accurate measuring board graduated in two place logarithms of the length in decimeters. The board was graduated with a maximum error in the graduations of not more than 1/100 of a centimeter so essentially the only source of error would be the personal one of the way in which the fish is slid against the end of the board

Weights were taken on two spring balances graduated in two place logarithms of the weight in 0.1 pounds. The smaller of the two balances with a capacity of 1.1 pounds never indicated a deviation of more than 1% from the true weight (in the range of weights used) in extensive tests conducted before every sample of fish was weighed. The bias of this scale which would show up in an average was probably not more than ½%. The other scale which was used for all fish over 1.1 pounds had a capacity of 40 pounds and the sector of the dial used was small (between 1 and 2 pounds). Careful checks revealed no error in weighing check weights of more than 2.5% in the range used. However, it was found that the observed weights of test weights were distributed on both sides of the true value so it is considered likely that any bias which would affect an average would not be greater than 1%. Thus in examining the length weight measurements taken for sources of variation, ~~that~~ any

variation of less than 1% may possibly be caused by errors in measurement and differences of more than 1% must be explained by reason of some other source of variation.

Insert 1st paragraph on 1st page here

GATHERING THE DATA

The data were gathered primarily to establish the regression of weight on length for the redfish and secondarily to discover sources of variation in the length weight relationship. To establish a representative length weight curve the samples were distributed among as many of the areas fished as possible. Ideally the size of the samples should have been in proportion to the catch from each area but the fishing areas change from week to week and data was not available on the expected distribution of the catch for the period in which the samples were taken. The next best bet is to distribute the samples equally among the areas. This was done as far as possible but only one sample of 50 fish was obtained from each of four of the areas which were being lightly fished at the time (Table1.). From six other areas two samples each were obtained.

The actual length weight measurements were taken during ten days but because of the necessity of selecting trips for sampling and the pressure of other work the ten days were spread out over 33 days. The females during this time lost much of their spawn ~~although this was much more pronounced in~~ particularly those caught in the more southern areas. The two samples from the same area were taken an average of 16 days apart. This was not planned but by using this ~~part of the data~~ information it is possible to obtain an estimate of the ~~value of the time factor~~ change in weight over this period of time.

Table 1

~~Table~~ . The source of the samples for the length-weight measurements on redfish. (50 fish per sample.)

Area	Date the Samples were Landed.		Days between first and second samples.
Channel	7/15		
Off Gloucester	7/3	7/13	10
Jeffrey's Ledge	7/17		
Off Portland	7/16		
Sequin	6/19	7/3	14
Matinicus	6/16	7/13	27
Mt. Desert	7/2	7/14	12
Platts	6/15	7/2	17
Cashes	7/16		
Cape Shore (Off Shelbourne)	6/15	7/2	17

The samples were taken as nearly at random as was possible under the conditions existing. Usually this meant picking about five to ten fish from each 500 pound box unloaded until the required 50 were obtained. However, some fish companies use 300 pound wheelbarrows and some a 150 pound basket for weighing the fish instead of the 500 pound box. No strict dispersion of the sample was attempted but ~~xxxxxxxx~~ not more than two fish were taken per 100 pounds unloaded. Neither was any attempt made to spread the sample systematically throughout the whole trip or any definite part of it. Taking the few fish from each container resulted in spreading the sample through several thousand pounds of the boats catch.

To avoid personal bias in selecting the fish they were picked from the container in as ~~xx~~ objective a manner as possible. The three, five, or eight fish or whatever the number picked up were taken from those nearest a corner or some other definite point. It is probably impossible to completely avoid personal bias in picking up fish in this way but with care it may be reduced to a minimum.

No restriction was placed on proportion of the sexes in the samples. A significant preponderance (by the Chi^2 test) of females were encountered. Of the 800 fish measured 461 were females. The number in the samples of 50 varied from 18 to 39. (The sex was easy to determine from the exterior for the adult redfish at this time of year and fairly easy in the case of the immatures but if there was any doubt about the sex the specimen was opened with a a knife and the determination made from the gonads.)

ANALYSIS OF THE DATA

Covariance analysis was used to determine the sources of variation and the significance of differences. Table 2 presents the results of the analysis for the differences between sexes and among areas. The differences between sexes is slight, the value of F being between the 5% and the 1% levels. The difference among areas is highly significant being well beyond the 0.1% level. However this difference among areas is confounded with differences in the time at which the samples were taken both in respect to calender time and to the period in the spawning cycle which is not the same at the same date in the different areas represented. Hence a further examination is necessary before it can be stated that the different areas produce redfish with a different length-weight relationship.

The significance of the time factor was tested by a covariance analysis of the difference between the first and second samples taken from the six areas which were sampled twice (Table 3.). The difference is highly significant when both sexes are considered together or when the females are considered separately but there is no difference in the males between the first and second samples. Change in weight at this season of the year is associated chiefly with the females. Furthermore it would seem appropriate to test the significance of the differences among areas by using the measurements of the males only.

Redfish Length-Weight Covariance Analysis of the Table 2

Differences between Sexes and Among Areas

Source of Variation	DF	S_{x^2}	S_{xy}	S_{y^2}	S.S.	D.F.	Mean Square	
Total	799	2.0966	6.2240	19.4636	.9869	.798	.001237	(s = .03417) (C = 8.19%) (± 2 $S_{y.x}$ = ± 17.04%)
Areas	9	.1665	.5139	1.6444				
Sexes	1	.6698	1.9344	5.5873				
Error	789	1.2603	3.7757	12.2319	.9204	788	.00117	
Area + Error	798	1.4268	4.2896	13.8763	.9798	797	.001229	
Difference for test of Areas					.0594	9	.00660	
Sexes + Error	790	1.9301	5.7101	17.8192	.9262	789	.00117	
Difference for test of Sexes					.0058	1	.0058	

F Test

Difference between Sexes

F = .0058 / .00117 = 4.96* (5% = 3.85; 1% = 6.66)

Difference Among Areas

F = .00660 / .00117 5.64** (5% = 1.89 1% = 2.43) (0.1% = 3.4)

Redfish Length-Weight
Covariance Analysis

Table 3

Difference between First and Second Samples

Source of Variation	DF	S_{x^2}	S_{xy}	S_{y^2}	SS	DF	Mean Square	
Males ~~Alone~~ Only								
Total	267	.3882	1.1686	3.7863	.2685	266		
Sample	1	.0061	.0174	.0493				
Error	266	.3821	1.1512	3.7370	.2686	265	.00101	2
Difference for Test of Sample					-.0001	1	—	
		F = 0						
		No difference						
Females ~~Alone~~ Only								
Total	331	.7349	2.2115	7.1202	.4652	330	.00141	
Sample	1	.0007	-.0012	.0021				3
Error	330	.7342	2.2127	7.1181	.4496	329	.00137	
Difference for Test of Sample					.0156	1	.0156 **	
		F = 11.39** (0.1% value about 11.00)						
		Highly Significant Difference						
Both Sexes Together								
Total	599	1.5749	4.6972	14.7464	.7368	598	.00123	
Sample	1	.0006	-.0007	.0009				
Error	598	1.5743	4.6979	14.7455	.7264	597	.00122	1
Difference for Test of Sample					.0104	1	.0104 **	
		F Test F = .0104/.00122 = 8.52** (1% value 6.68)						
		Highly Significant Difference						

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Redfish-Length-Weight Covariance Analysis of the Differences Among Areas - ~~Males Only~~. Table 4

Males Only

Source of Variation	D.F.	S_{x^2}	S_{xy}	S_{y^2}	S.S.	D.F.	M.S.
Total	338	.4975	1.5056	4.8763	.3199	33	
Areas	9	.0436	.1369	.4540			
Error	329	.4539	1.3687	4.4223	.2951	328	.00090
Difference for Testing Areas					.0248	9	.00276

F = .00276/.00090 = 3.07 (1% Level - 2.48)

Remainder of this table on next page

Redfish – Length – Weight –

Differences Among Areas – Females Only Table 4

Source of Variation	DF	S_{x^2}	S_{xy}	S_{y^2}	S.S.	D.F.	M.S.
Total	460	.9293	2.7840	9.0000	.6597	459	
Areas	9	.0969	.2889	.9174			
Error	451	.8324	2.4951	8.0826	.6036	450	.00134
Difference for testing Areas.					.0561	9	.00623

F = .00623/.00134 = 4.65 (1% point = 2.46 0.1% point = app. 3.25)

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The covariance analysis of the difference among areas was repeated for the males only. The F test reveals a difference well beyond the 1% level. The analysis was also completed for the females only and as is now to be expected and even more significant difference was found among areas; well beyond the 0.1% level (Table 4).

In summary it appears that there is a relatively large difference in the length weight relationship among areas and a lesser difference between sexes but both relationships are confounded by a continuing loss of weight by the females during the period of the sampling. Let us examine the magnitude of these differences by means of the regression formulae now that their significance has been determined.

The various regression formulae are presented in Table 5. From these formulae values of the weight have been calculated from assigned values of the length. Several calculated values are listed for the major regression formulae and only the value nearest the mean for the individual area regressions. This single value is best for comparisons among areas. Since very few redfish were less than .40 in length the calculated values of the weight for a length of .30 are subject to irregular and non-significant variations caused by differences in slope

Redfish- Length-Weight Regression Formulae

Table 5

X = Log. of length in Decimeters Y = Log. of Weight in 0.1 Pounds

Source of Regression formula	N	Regression Eq of Y =	Y when X = .30	.40	.45	.50	.55
Both Sexes							
All measurements	800	2.96862X − .44093	.4497	.7465	.8949	1.0434	1.1918
By Area							
Off Gloucester	100	2.7084X − .3205			.8983		
Sequin	100	3.1015X − .4867			.9090		
Matinicus	100	2.8450X − .3773			.9030		
Mt Desert	100	2.5467X − .3852			.8958		
Platts	100	3.1274X − .5210			.8863**		
Cape Shore	100	3.0405X − .4719			.8963		
Cashes	50	2.7823X − .3728			.8792**		
Portland	50	2.9464X − .4386			.8873		
Channel	50	2.7795X − .3400			.9108**		
Jeffries	50	2.9472X − .4355			.8907		
By time of Sampling							
Sample 1	300	3.0836X − .4876			.9000		
Sample 2	300	2.8598X − .3926			.8943		
Males Only							
Total	339	3.0263X − .4630	.4449	.7475	.8988	1.0502	
By Area							
Off Gloucester	48	2.9194X − .4110			.9027		
Sequin	39	3.0082X − .4451			.9086		
Matinicus	50	2.9351X − .4156			.9052		
Mt Desert	39	2.7012X − .3222			.8933		
Platts	46	3.1079X − .5152			.8834**		
Cape Shore	46	3.0336X − .4665			.8986		
Cashes	18	Data					
Portland	22						
Channel	11	Inadequate					
Jeffries	20						
By time of Sampling							
Sample 1	123	3.1059X − .4948	~~.4390~~	~~.7476~~	.9028	~~1.0582~~	
Sample 2	145	2.9114X − .4131	~~.4603~~	~~.7544~~	.8970	~~1.0426~~	
Females Only							
Total	461	2.9958X − .4562	.4425	.7421	.8919	1.0417	1.1915
By Area							
Off Gloucester	52	2.7628X − .3512				1.0302	
Sequin	61	3.2384X − .5555				1.0637**	
Matinicus	50	2.7875X − .3503				1.0434	
Mt Desert	61	2.8896X − .4063				1.0385	
Platts	54	3.1604X − .5061				1.0441	
Cape Shore	54	3.0722X − .4887				1.0474	
Cashes	32	Data					
Portland	28						
Channel	39	Inadequate					
Jeffries	30						
By time of Sampling							
Sample 1	177	3.1129X − .5035	.4304	.7417	.8973	1.0530	1.2086
Sample 2	155	2.8793X − .4040	.4598	.7441	.8917	1.0356	1.1796

(L.S.D (1% level = .0127)

L.S.D. (1% level = .0183)

(L.S.D. (1% Level = .0181)

(L.S.D 1% Level = .0196)

Comparison of these calculated values of the weight for a given length should properly be made among the males only for differences among areas. It appears that the fish from Platts Bank were significantly lighter in weight and those from Off Gloucester, Seguin, Matinicus, Mt Desert, and Cape Sable were much the same. Unfortunately insufficient material was obtained from the other four areas for a comparison of areas by the males only. We may tentatively make a comparison among these areas with both sexes lumped together. This comparison indicates significantly lighter fish from Cashes and significantly heavier fish from the Channel area. Reference to a chart of the area indicates the redfish from the periphery of the Gulf of Maine from Gloucester to Cape Sable had much the same length weight relationship while those from Platts and Cashes banks in the centre of the Gulf of Maine were heavier and those from the South Channel area were heavier. This comparison of the areas should be considered tentative until data is obtained at some time other than the spawning season.

Comparison of the differences among sexes and among samples 1 and 2 may be made by calculated value given in Table 5 or perhaps more easily by the graphs (Figures 1 and 2). The lumped data on sex indicates that the females were very slightly (but significantly) lighter than the males. This similarity is probably accidental since the females decreased markedly in weight between the first and second samples while the males stayed much the same (Figure 2.

~~The lumped data is presented in Figure 3 and in Table 6 for use at this season of the year for~~

For quick reference the length weight curve in millimeters and pounds is presented in ~~Table 6~~ Figure 3 and the calculated values of the weight for each half centimeter length group are listed in Table 6. These ~~should~~ data are most nearly representative of the length weight relationship of the redfish from the periphery of the Gulf of Maine from Gloucester to Cape Sable for the months of June and July. The redfish from the central Gulf of Maine and the Fundy Channel area appear to be lighter and heavier, respectively, and no data is available on the variation ~~with~~ associated with different seasons. For weighing length frequency curves it is not likely that any great error will be caused by using this curve for all areas and seasons since even if the fish do run lighter or heavier the relationship among the weighing factors will change but little. But for converting poundage to numbers ~~this~~ more representative figures would be desirable.

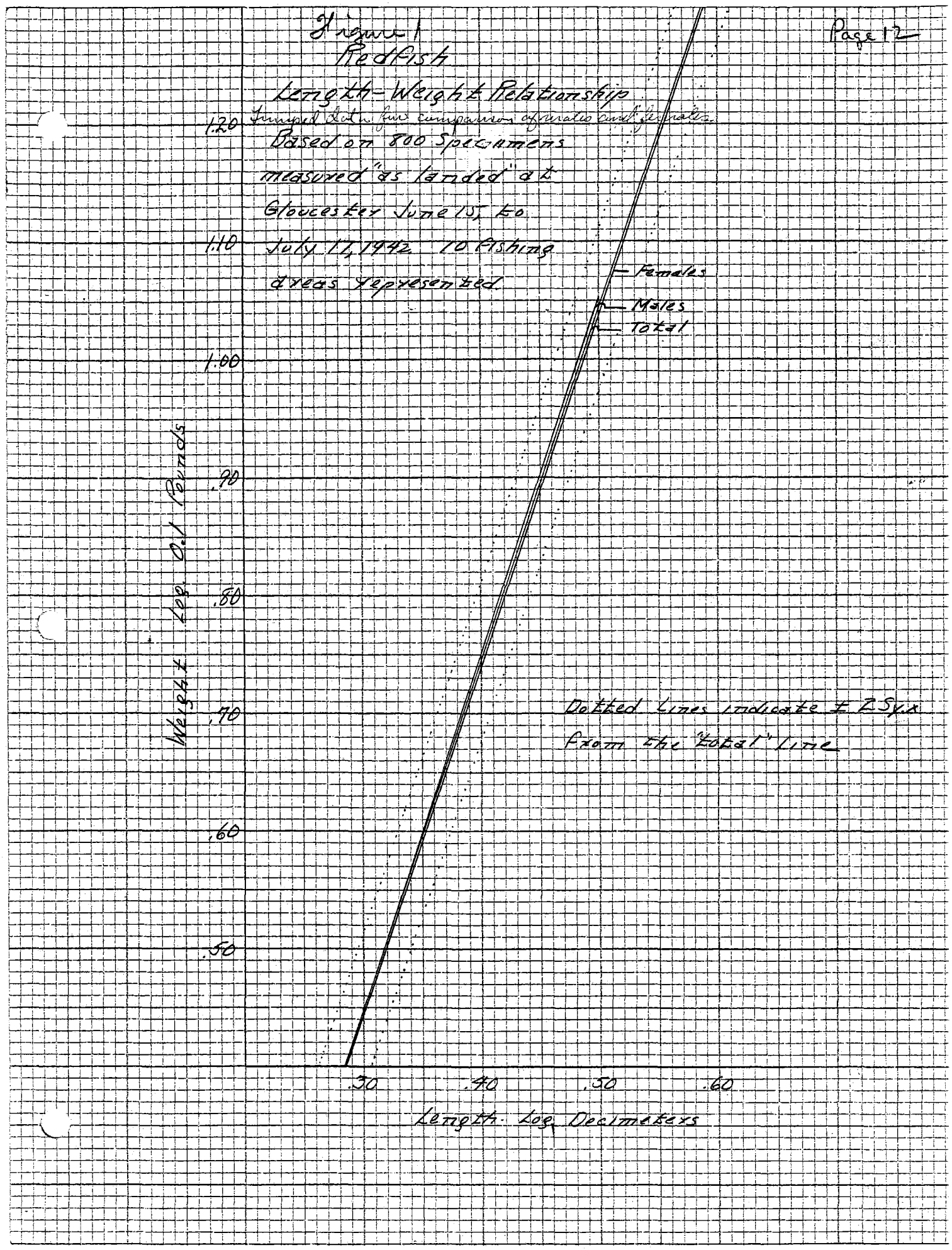


Figure 1
Redfish
Length-Weight Relationship
Jumped data for comparison of males and females.
Based on 800 specimens
measured "as landed" at
Gloucester June 15, to
July 11, 1942. 10 fishing
areas represented.
Females
Males
Total
Dotted Lines indicate ± 2Sy.x
from the "Total" line
1.20
1.10
1.00
.90
.80
.70
.60
.50
Weight Log. O.I Pounds
.30
.40
.50
.60
Length Log. Decimeters

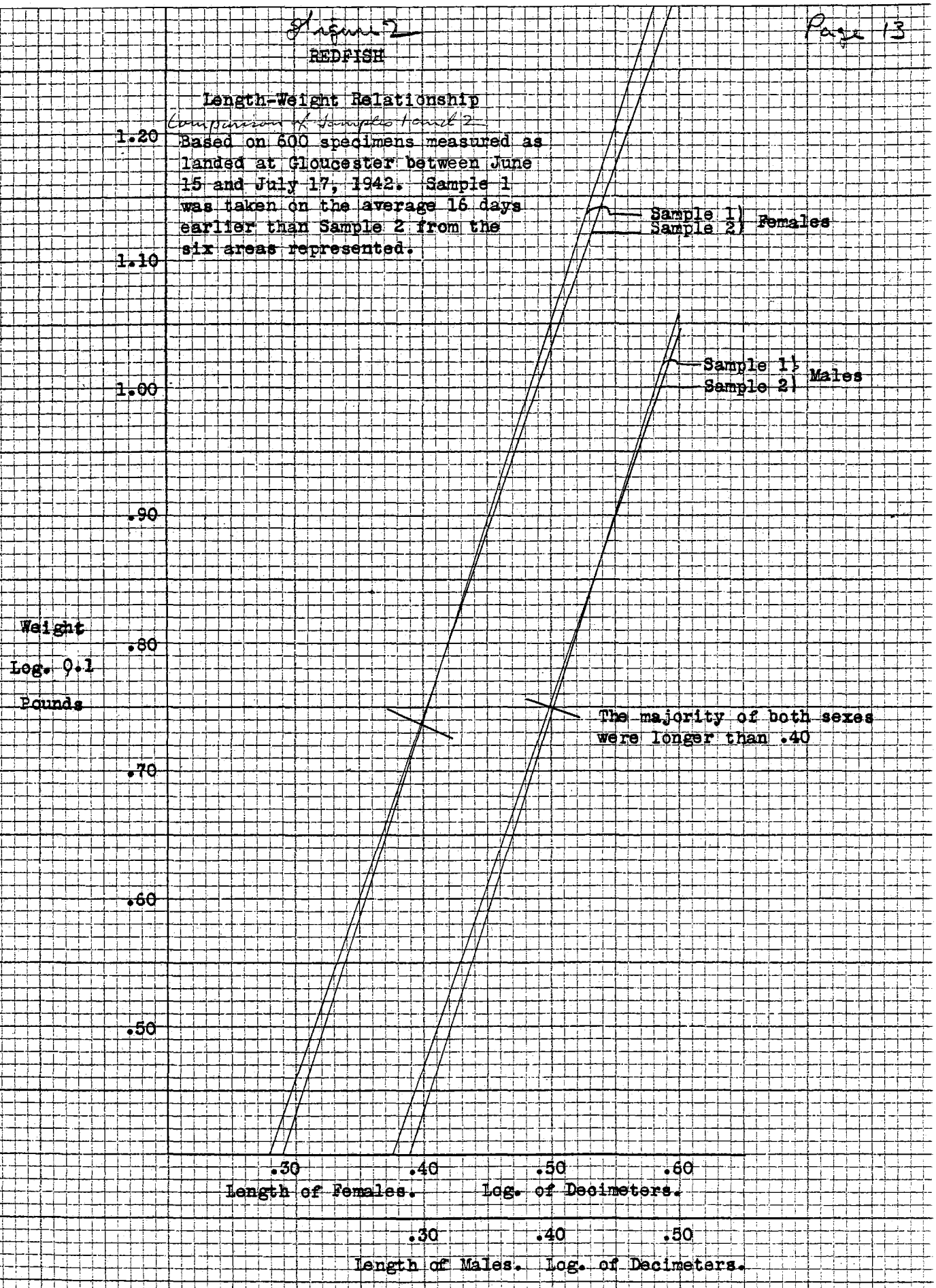
Figure 2

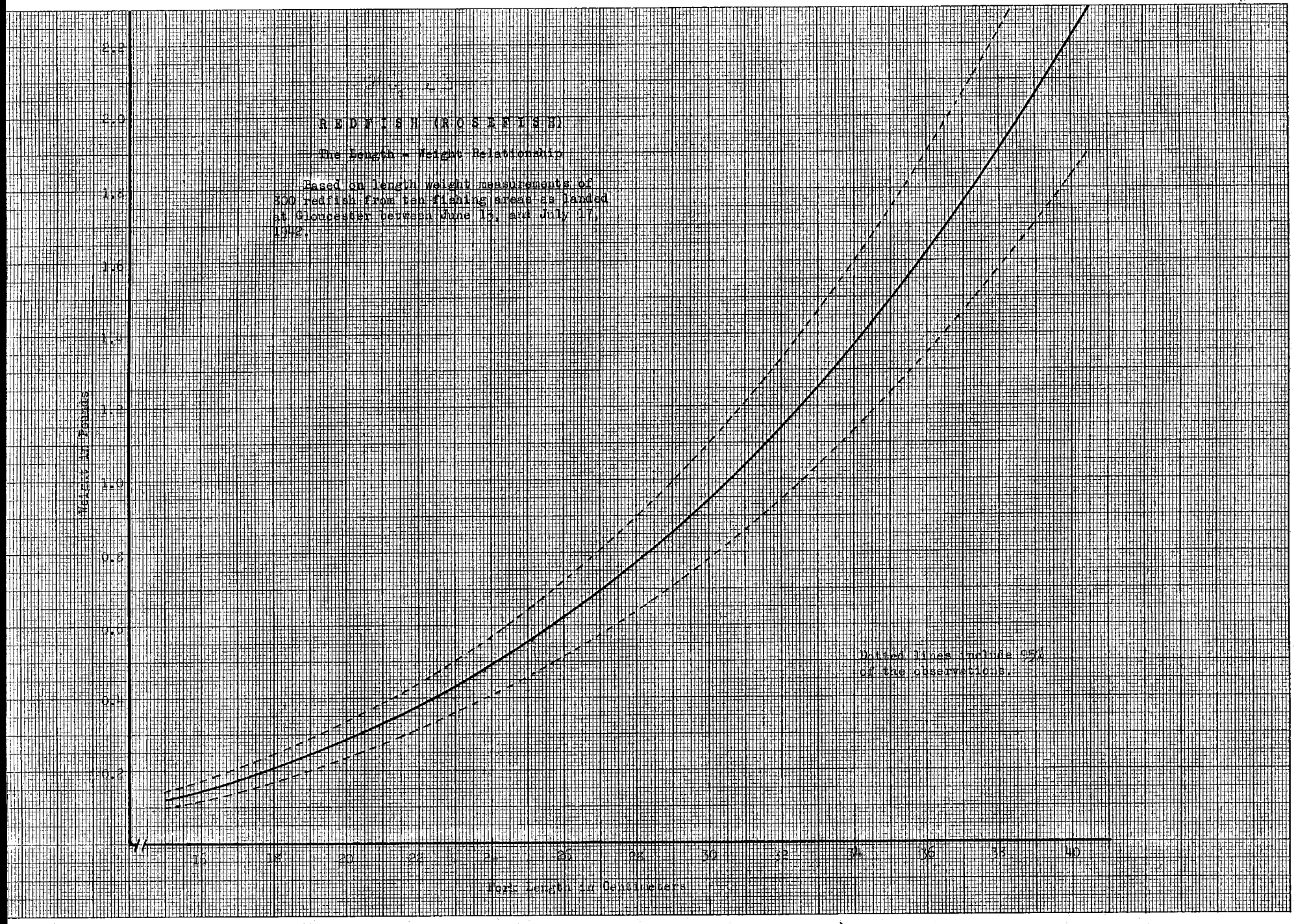
REDFISH

Length-Weight Relationship

Comparison of Samples 1 and 2

Based on 600 specimens measured as landed at Gloucester between June 15 and July 17, 1942. Sample 1 was taken on the average 16 days earlier than Sample 2 from the six areas represented.




REDFISH (ROSEFISH)
The Length - Weight Relationship
Based on length weight measurements of 300 redfish from ten fishing areas as landed at Gloucester between June 15, and July 17, 1942.
Dotted lines include 95% of the observations.
Weight in Pounds
2.2
2.0
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
16
18
20
22
24
26
28
30
32
34
36
38
40
Fork Length in Centimeters

Notes on Sexual Differences & Spawning.

Redfish- Sex Ratio

Area	Number in Samples of 50		
	♂	♀	χ^2
Channel	11	39	15.68 **
Off Gloucester	16	34	6.48 *
	32	18	3.92 *
Jeffreys Ledge	20	30	2.00
Portland	22	28	.72
Sequin	16	34	6.48 *
	23	27	.32
Matinicus	24	26	.08
	26	24	.08
Mt Desert	20	30	2.00
	19	31	2.88
Platts	28	22	.72
	18	32	3.92 *
Cashes	18	32	3.92 *
Cape Shore	19	31	2.88
	27	23	.32
Total	339	461	52.40 (1% point 32.000)

χ^2 for Totals = 7.605 (1% point 6.635)

Redfish- "Gov. Al. Smith" 5/27/41 Coshes 42/68 Bl.

Sex and Condition of Gonads

	♂ Immature	♂ Mature	♀ Immature	♀ Mature Pre-Eyed	♀ Mature Eyed	♀ Mature Larvae	♀ Mature Spent
Fork Length Millimeters	204	238	229	309	303	315 5M.	314
		254	205	297	331	321 6M.	
		300	198	275	315	311 6M.	
		225	237	295	294	254 7M.	
		236	243	325	295	295 5M	
		286	217	292	322	330 5M.	
		241	220	291	298		
		261	303	316	279		
		266	233	270	269		
		264		279			
		269		275			
		241		249			
		260					
		241					
		220					
		254					
		256					
		261					
		266					
		268					
		270					
		249					
Total	204	5626	2085	3473	2706	1826	314
Ave.	204	251.2	231.7	289.4	300.6	304.3	314.
Max		300	(303) 243	325	331	330	
Min		220	198	249	269	254	

Redfish - "Saint Joseph." May 28, 1942

42/69 A 2

Sex and Condition of Gonads Off. Gloucester

	♂ Immature	♂ Mature	♀ Immature	♀ Pre-Eyed	♀ Eyed	♀ Larvae	♀ Spent
Fork Length in Millimeters	215	223	256	305	334	353 5mm	342
		262	264		304	252 4mm	330
		290	230		301	319 6mm	
		284	219		269	385 6mm	
		305	285		330	329 5mm	
		234	253		312	311 6mm	
		258	271		325	297 6mm	
		274	225		334	308 4mm	
		282	268		286	276 4mm	
		268	223		314	350 7mm	
		289	188			357 5mm	
		282	218			310 5mm	
		256					
		245					
		264					
		275					
		275					
		295					
		269					
		260					
		279					
		278					
Total	215			305			
Average							
Min.		223	188		269	252	330
Max.		305	285		334	385	342

Redfish "Doris F. Amero" May 29, 1942

Cape Shore
43/64 A-45
43/65 F5

Sex and Condition of Gonads

	♂ Immature	♂ Mature	♀ Immature	♀ Pre Eyed	♀ Eyed	♀ Larvae	♀ Spent
Fork Length in Millimeters		281	194	326	265	366 4mm.	
		232	229	257	281	270 4mm.	
		216	236		345	312 4mm.	
		239	243		269	352 5mm.	
		255	224		282		
		239	228		303		
		229	201				
		229	265				
		279	231				
		203	217				
		295	237				
		226	214				
		253	245				
		224	234				
		223	226				
		259	228				
		260	258				
		228					
		289					
		242					
		278					
		262					
		254					
		226					
		231					
		225					
		237					
		200					
		270					
		229					
		223					
Total							
Average							
Min.		200	194	257	265	270	
Max.		295	265	326	345	366	

Note - Captain reported culling about 40,000 lbs at sea. Brought in about 150000 reds.

note - the smallest testes in the males was about 3mm in diameter. There seemed to be a steady gradation from this up to about 10mm in the larger fish.

Note: - All Immature females with yellowish eggs just visible to the naked eye have with translucent ovaries. One specimen, 178mm had nearly translucent ovaries with a very few pin point yellow eggs.

Redfish- Angie & Florence June 2, 1942

Sex and Condition of Gonads Matinicus

43/68 AB 34

	♂		♀ Immature			♀ Mature				
	Immature	Mature	Translucent ovary	Pin Point Ova	Pre Eyed	Eyed	Larvae	Spent		
Fork Length Millimeters	222	259	177	224	242	310	290 4mm	265		
	202	263		221	259	300	315 4mm			
	216	286		231	262	303	272 4mm.			
		248		238	319	298	318 5mm			
		248		209	270	305				
		282		227	268	245				
	3	261		252	285	315				
		279		198	303	280				
		251		211	318	271				
		274		196	261	262				
		256		250		288				
		264		283		275				
		246								
		264								
		268								
		244	1	12	10	12	4	1		
		283								
		248								
		259								
		273								
		266								
	262	306								
	261	268								
	265	259								
	234	246								
	262	224								
	257	216								
	269	266								
	254	263								
	252	276								
		289								
	59	270								
		262								
		253								
		262								
		281								
		257								
		264								
		248								
		273								
		247								
		230								
		251								
		192								
		210								
		276								
		235								
		231								
		284								
		257								

Miscellaneous notes on Redfish spawning. 1942

June 15. Redfish from Platts Bank. The females were mostly in the late larval stages. The fish as landed looked muddy or sandy as they were covered thickly with well pigmented eyes of the larvae.

June 16 Redfish from south of Matinicus. The females were mostly in the early larval stages with some still containing pre-eyed eggs. Seven or eight females in the 150 examined were of large size and still had ovaries immature in appearance. One was 325 mm fork length! Whether these are young fish or older fish whose maturity has been delayed is an interesting problem.

July 3, - From off Gloucester - redfish about half spent. half still in the larval stages.

July 3 From off Seguin - Mostly in larval stages - few spent - no eyed eggs seen in 50 fish examined.