

RESTRICTED

INTERNATIONAL COMMISSION FOR



THE NORTHWEST ATLANTIC FISHERIES

Serial No. 1679  
(D. c. 2)

ICNAF Res. Doc. 66-63

ANNUAL MEETING - JUNE 1966

Length-weight relationships for

Hippoglossoides platessoides, Glyptocephalus cynoglossus and Limanda ferruginea

by P. M. Powles

### Introduction

Surprisingly few length-weight relationships have been published for groundfish species in Subarea 4 though the need for such data arises frequently in fisheries work. Brown (1963) has shown that differences in the length-weight relationship for redfish occur by area and season. McCracken, Jean, and Martin (1962) reported lengths, weights, and girth measurements for 4T and 4V cod and 4W haddock. For 4X, Kohler (1960) gave the length-weight relationship for haddock and Craigie (1927) for hake and pollock. With respect to flounders, McCracken (1958) presented length-weight data for halibut in 4T and 4W, and Craigie presented some data for winter flounder in 4X. Royce's report (1959) covers yellowtail in Division 5Z, but there appear to be no published data on length-weight relationships for American plaice, witch, and yellowtail in Subarea 4. This document presents available data on the latter three species.

### Methods

Lengths were recorded from the snout to the distal end of the longest caudal finray along the midline to the nearest centimetre. During shore sampling, weights were recorded in pounds and ounces for individual fish, and then converted to decimal fractions of pounds. Weighing at sea was carried out on calm days using spring scales. All fish were weighed in the round fresh condition immediately after being caught. The sex and condition of gonads were determined after weighing by gross internal examination.

The data for American plaice compiled ashore have been broken down by sex. For yellowtail and witch measured at sea sexes have been combined. The appropriate data, including area and date of capture, were then transferred to punch cards.

The length-weight relations presented in this document were computed by the method of Swingle (1964).

This is a computer program which calculates the parameters for the standard length-weight equations

$$\log (W) = \log (a) + b \log (L) \quad (1)$$

$$\text{and} \quad W = aL^b \quad (2)$$

It also computes a third degree polynomial equation by least-squares procedures (not included in this report).

Data are presented in the form of straight-line regressions on logarithmic scale, and tables.

### Results

#### American plaice

For 4T plaice, with sexes combined, the length-weight relationship was somewhat greater than cubic (Fig. 1). Females were heavier than males at corresponding lengths (Fig. 2). At this time of year (October) the females are in early stages of ripening (Powles, 1965), but the gonads are not large. It seems reasonable to assume that the greater weight-at-length of females is not completely due to differences in gonadal weight between sexes. However, additional samples for other seasons will be required to test the validity of this assumption.

#### Witch

There appears to be little difference between the length-weight relationship of witch from 4Vs and 4W (Fig. 3 and 4). The value of b for witch in the equation  $W = aL^b$  is greater than that obtained for American plaice. Witch appear to weigh less than plaice at corresponding lengths. At extremely large sizes, however, the differences become small.

#### Yellowtail

Surprisingly, yellowtail appear to outweigh both American plaice and witch at any given length (Fig. 5). Data from 4Vs and 4W have not been processed. However,

Royce, Buller, and Premetz (1959) calculated for 5Z yellowtail that an individual fish of 35.87 cm weighed 0.93 lb on the average. The corresponding weight for 4T yellowtails was 0.89 lb. Yellowtail from 5Z are somewhat heavier at corresponding lengths than 4T fish but Royce et al. found considerable seasonal fluctuations in weight.

Royce et al. also found significant differences in length-weight relationships between sexes in each quarter except that immediately following spawning. Further studies in length-weight for other areas and seasons should be made.

#### References

- Brown, B. E., 1963. Length-weight relationship of redfish collected from U.S. landings in 1951. ICNAF Annual Meeting 1963, Doc. 68.
- Craigie, E. H. 1927. Notes on the total weights of squirrel hake, the pollock, the winter flounder, and the smelt, and on the weights of the liver and gonads in the hake and in the pollock. Studies from the Stations of the Biological Board of Canada, No. 54.
- Kohler, A. C. 1960. The growth, length-weight relationship, and maturity of haddock (Melanogrammus aeglefinus L.) from the region of Lockeport, N. S. J. Fish. Res. Bd. Canada, 17(1): 41-60.
- McCracken, F. D. 1958. On the biology and fishery of the Canadian Atlantic halibut, Hippoglossus hippoglossus L. J. Fish. Res. Bd. Canada, 15(6): 1269-1311.
- McCracken, F. D., Y. Jean, and W. R. Martin. 1962. Girth, length and weight measurements of cod and haddock from Subarea 4. ICNAF Annual Meeting 1962, Doc. 13.
- Powles, P. M. 1965. Life history and ecology of American plaice (Hippoglossoides platessoides F.) in the Magdalen Shallows. J. Fish. Res. Bd. Canada, 22(2): 565-598.

Royce, W. F., R. J. Buller, and E. D. Premetz. 1959. Decline of the yellowtail flounder (Limanda ferruginea) off New England. U.S. Fish Wildlife Serv., Fish. Bull., No. 146.

Swingle, W. E. 1964. Instructions for length-weight programs for IBM 1620 in fortran-format (fortran 1). Agricultural Experiment Station, Auburn University, Zoology-Entomology Department Series, Fisheries, No. 1.

Table I. Lengths and weights of American plaice from Division 4T, October 1958 (292 fish) and May 1960 (137 fish); sexes combined. (see text for methods of measurement)

Length cm	Computed mean weight		
	lb	g	
15	.059	26.762	
16	.072	32.659	
17	.087	39.463	
18	.104	47.174	No. fish = 429
19	.124	56.246	
20	.145	65.772	b = 3.13944
21	.170	77.112	
22	.196	88.906	a = .00001201
23	.226	102.514	
24	.258	117.029	Std. error = .07270124
25	.294	133.358	
26	.332	150.595	
27	.374	169.646	
28	.419	190.058	
29	.468	212.285	
30	.521	236.326	
31	.577	261.727	
32	.638	289.397	
33	.703	318.881	
34	.772	350.179	
35	.845	383.292	
36	.923	418.673	
37	1.006	456.321	
38	1.094	496.238	
39	1.187	538.423	
40	1.286	583.330	
41	1.389	630.050	
42	1.499	679.946	
43	1.614	732.110	
44	1.734	786.542	
45	1.861	844.150	
46	1.994	904.478	
47	2.133	967.529	
48	2.279	1033.754	
49	2.432	1103.155	
50	2.591	1175.278	
51	2.757	1250.575	
52	2.931	1329.502	
53	3.111	1411.150	
54	3.299	1496.426	
55	3.495	1585.332	
56	3.698	1677.413	
57	3.910	1773.576	
58	4.129	1872.914	
59	4.357	1976.335	
60	4.593	2083.385	

Table I (continued)

Length cm	Computed mean weight	
	lb	g
61	4.838	2194.517
62	5.091	2309.278
63	5.353	2428.121
64	5.625	2551.500
65	5.905	2678.508
66	6.195	2810.052
67	6.495	2946.132
68	6.804	3086.294
69	7.123	3230.993
70	7.452	3380.227

Table II. Lengths and weights of American plaice (males), Division 4T, October 1958. (see text for methods of measurement).

Length cm	Computed mean weight	
	lb	g
15	.069	31.298
16	.083	37.649
17	.099	44.906
18	.116	52.618
19	.135	61.236
20	.156	70.762
21	.179	81.194
22	.204	92.534
23	.232	105.235
24	.261	118.390
25	.293	132.905
26	.327	148.327
27	.364	165.110
28	.404	183.254
29	.445	201.852
30	.490	222.264
31	.538	244.037
32	.588	266.717
33	.641	290.758
34	.697	316.159
35	.757	343.375
36	.819	371.498
37	.885	401.436
38	.954	432.734
39	1.026	465.394
40	1.102	499.867
41	1.181	535.702
42	1.264	573.350
43	1.351	612.814
44	1.441	653.638
45	1.535	696.276
46	1.633	740.729
47	1.735	786.996
48	1.841	835.078
49	1.951	884.974
50	2.065	936.684
51	2.184	990.662
52	2.306	1046.002
53	2.433	1103.609
54	2.565	1163.484
55	2.701	1225.174
56	2.841	1288.678
57	2.986	1354.450
58	3.136	1422.490
59	3.291	1492.798
60	3.450	1564.920

No. fish = 156

b = 2.81432

a = .00003416

Std. error = .08087118

continued

Table II (continued)

Length cm	Computed mean weight	
	lb	g
61	3.614	1639.310
62	3.784	1716.422
63	3.958	1795.349
64	4.137	1876.543
65	4.322	1960.459
66	4.512	2046.643
67	4.707	2135.095
68	4.907	2225.815
69	5.113	2319.257
70	5.324	2414.966

Table III. Lengths and weights of American plaice (females), Division 4T, October 1958. (see text for methods of measurement).

Length cm	Computed mean weight		
	lb	g	
15	.054	24.494	
16	.067	30.391	
17	.081	36.742	No. fish = 136
18	.098	44.453	
19	.116	52.618	b = 3.23414
20	.137	62.143	
21	.161	73.030	a = .00000855
22	.187	84.823	
23	.216	97.978	Std. error = .06961927
24	.248	112.493	
25	.283	128.369	
26	.322	146.059	
27	.364	165.110	
28	.409	185.522	
29	.458	207.749	
30	.511	231.790	
31	.569	258.098	
32	.630	285.768	
33	.696	315.706	
34	.767	347.911	
35	.842	381.931	
36	.923	418.673	
37	1.008	457.229	
38	1.099	498.506	
39	1.195	542.052	
40	1.297	588.319	
41	1.405	637.308	
42	1.519	689.018	
43	1.640	743.904	
44	1.766	801.058	
45	1.899	861.386	
46	2.039	924.890	
47	2.186	991.570	
48	2.340	1061.424	
49	2.502	1134.907	
50	2.671	1211.566	
51	2.847	1291.399	
52	3.032	1375.315	
53	3.225	1462.860	
54	3.426	1554.034	
55	3.635	1648.836	
56	3.853	1747.721	
57	4.080	1850.688	
58	4.316	1957.738	
59	4.562	2069.323	
60	4.816	2184.538	

136  
136  
-----  
292

continued

Table III (continued)

Length cm	Computed mean weight	
	lb	g
61	5.081	2304.742
62	5.355	2429.028
63	5.640	2558.304
64	5.935	2692.116
65	6.240	2830.464
66	6.556	2973.802
67	6.882	3121.675
68	7.220	3274.992
69	7.569	3433.298
70	7.930	3597.048

Table IV. Lengths and weights of witch, Division 4Vs, March 1965; sexes combined. (see text for methods of measurement)

Length cm	Computed mean weight	
	lb	g
15	.025	11.340
16	.031	14.062
17	.039	17.690
18	.049	22.226
19	.059	26.762
20	.072	32.659
21	.086	39.010
22	.102	46.267
23	.120	54.432
24	.140	63.504
25	.162	73.483
26	.187	84.823
27	.215	97.524
28	.246	111.586
29	.279	126.554
30	.316	143.338
31	.356	161.482
32	.400	181.440
33	.448	203.213
34	.499	226.346
35	.555	251.748
36	.615	278.964
37	.680	308.448
38	.749	339.746
39	.824	373.766
40	.904	410.054
41	.989	448.610
42	1.080	489.888
43	1.177	533.887
44	1.280	580.608
45	1.389	630.050
46	1.505	682.668
47	1.628	738.461
48	1.758	797.429
49	1.895	859.572
50	2.040	925.344
51	2.193	994.745
52	2.354	1067.774
53	2.524	1144.886
54	2.702	1225.627
55	2.889	1310.450
56	3.085	1399.356
57	3.291	1492.798
58	3.507	1590.775
59	3.733	1693.289
60	3.969	1800.338

No. fish = 325

b = 3.64864

a = .00000129

Std.

error = .09566964

continued

Table IV (continued)

Length cm	Computed mean weight	
	lb	g
61	4.216	1912.378
62	4.473	2028.953
63	4.742	2150.971
64	5.023	2278.433
65	5.315	2410.884
66	5.620	2549.232
67	5.937	2693.023
68	6.266	2842.258
69	6.609	2997.842
70	6.966	3159.778

Table V. Lengths and weights of witch, Division 4W, October 1960; sexes combined (see text for methods of measurement)

Length cm	Computed mean weight		
	lb	g	
15	.029	13.154	
16	.037	16.783	
17	.046	20.866	No. fish = 162
18	.056	25.402	
19	.068	30.845	b = 3.57559
20	.082	37.195	
21	.098	44.453	a = .00000183
22	.115	52.164	
23	.135	61.236	Std.
24	.158	71.669	error = .07649338
25	.183	83.009	
26	.210	95.256	
27	.241	109.318	
28	.274	124.286	
29	.311	141.070	
30	.351	159.214	
31	.395	179.172	
32	.442	200.491	
33	.494	224.078	
34	.549	249.026	
35	.609	276.242	
36	.674	305.726	
37	.743	337.025	
38	.818	371.045	
39	.897	406.879	
40	.983	445.889	
41	1.073	486.713	
42	1.170	530.712	
43	1.273	577.433	
44	1.382	626.875	
45	1.497	679.039	
46	1.620	734.832	
47	1.749	793.346	
48	1.886	855.490	
49	2.030	920.808	
50	2.183	990.209	
51	2.343	1062.785	
52	2.511	1138.990	
53	2.688	1219.277	
54	2.874	1303.646	
55	3.069	1392.098	
56	3.273	1484.633	
57	3.487	1581.703	
58	3.711	1683.310	
59	3.945	1789.452	
60	4.189	1900.130	

continued

Table V (continued)

Length cm	Computed mean weight	
	lb	g
61	4.444	2015.798
62	4.711	2136.910
63	4.988	2262.557
64	5.277	2393.647
65	5.578	2530.181
66	5.891	2672.158
67	6.216	2819.578
68	6.554	2972.894
69	6.906	3132.562
70	7.270	3297.672

Table VI. Lengths and weights of yellowtail, Division 4T, October 1960; sexes combined. (see text for methods of measurement).

Length cm	Computed mean weight	
	lb	g
15	.074	33.566
16	.089	40.370
17	.106	48.082
18	.124	56.246
19	.145	65.772
20	.168	76.205
21	.192	87.091
22	.220	99.792
23	.249	112.946
24	.281	127.462
25	.316	143.338
26	.353	160.121
27	.392	177.811
28	.435	197.316
29	.480	217.728
30	.529	239.954
31	.580	263.088
32	.635	288.036
33	.693	314.345
34	.754	342.014
35	.818	371.045
36	.886	401.890
37	.958	434.549
38	1.033	468.569
39	1.112	504.403
40	1.194	541.598
41	1.281	581.062
42	1.371	621.886
43	1.465	664.524
44	1.564	709.430
45	1.667	756.151
46	1.774	804.686
47	1.885	855.036
48	2.001	907.654
49	2.121	962.086
50	2.246	1018.786
51	2.375	1077.300
52	2.509	1138.082
53	2.648	1201.133
54	2.792	1266.451
55	2.941	1344.038
56	3.095	1403.892
57	3.254	1476.014
58	3.418	1550.405
59	3.587	1627.063
60	3.762	1706.443

No. fish = 116

b = 2.82938

a = .00003502

Std. error = .08389163

continued

Table VI (continued)

Length cm	Computed mean weight	
	lb	g
61	3.942	1788.091
62	4.128	1872.461
63	4.319	1959.098
64	4.516	2048.458
65	4.718	2140.085
66	4.927	2234.887
67	5.141	2331.958
68	5.361	2431.750
69	5.587	2534.263
70	5.819	2639.498

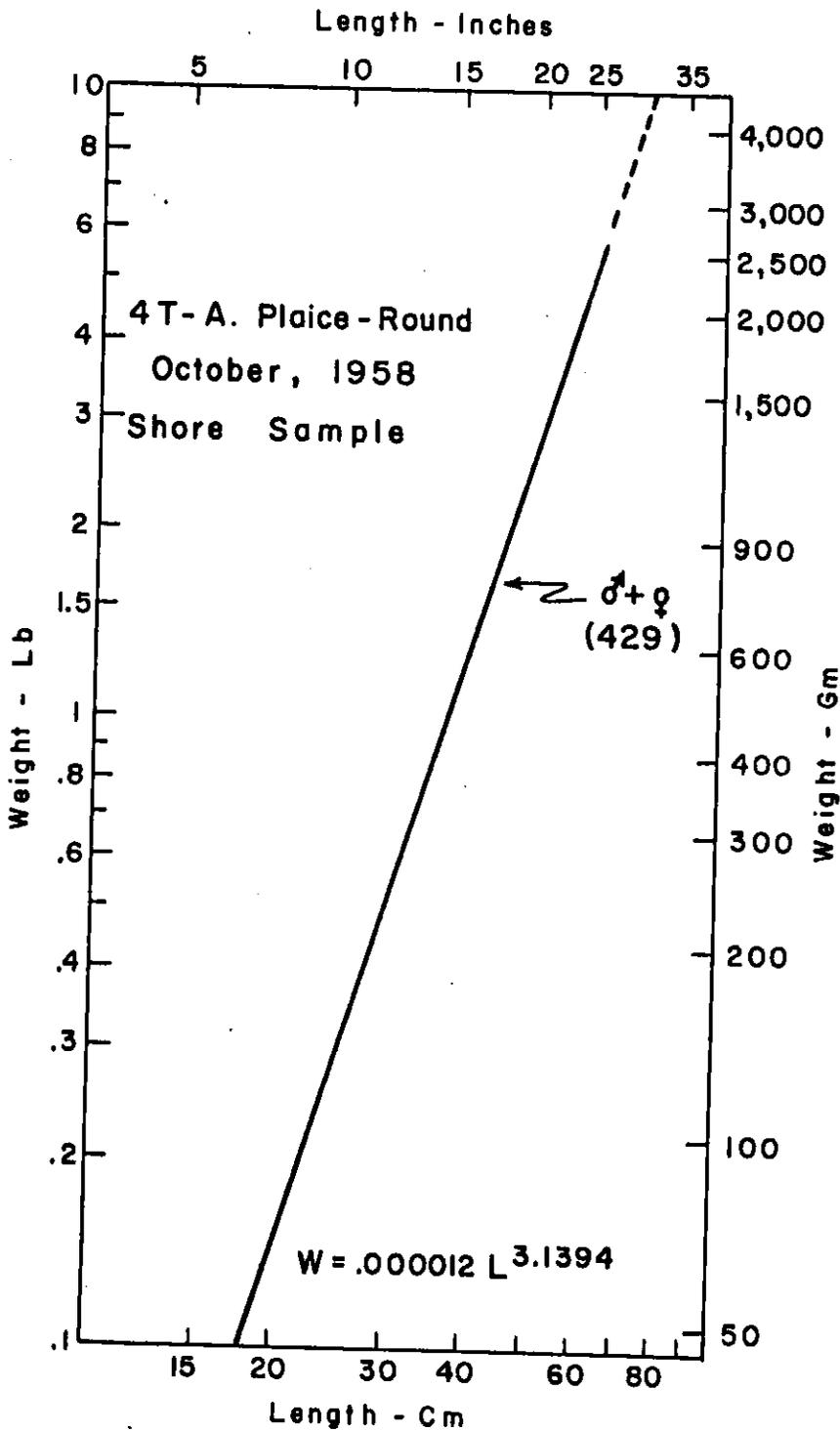


Fig. 1. The length-weight relationship for American plaice in Div. 4T, October 1958. Sexes are combined. The dotted portion of the line is an extension beyond observed mean points. The calculated regression of weight on length is shown also.

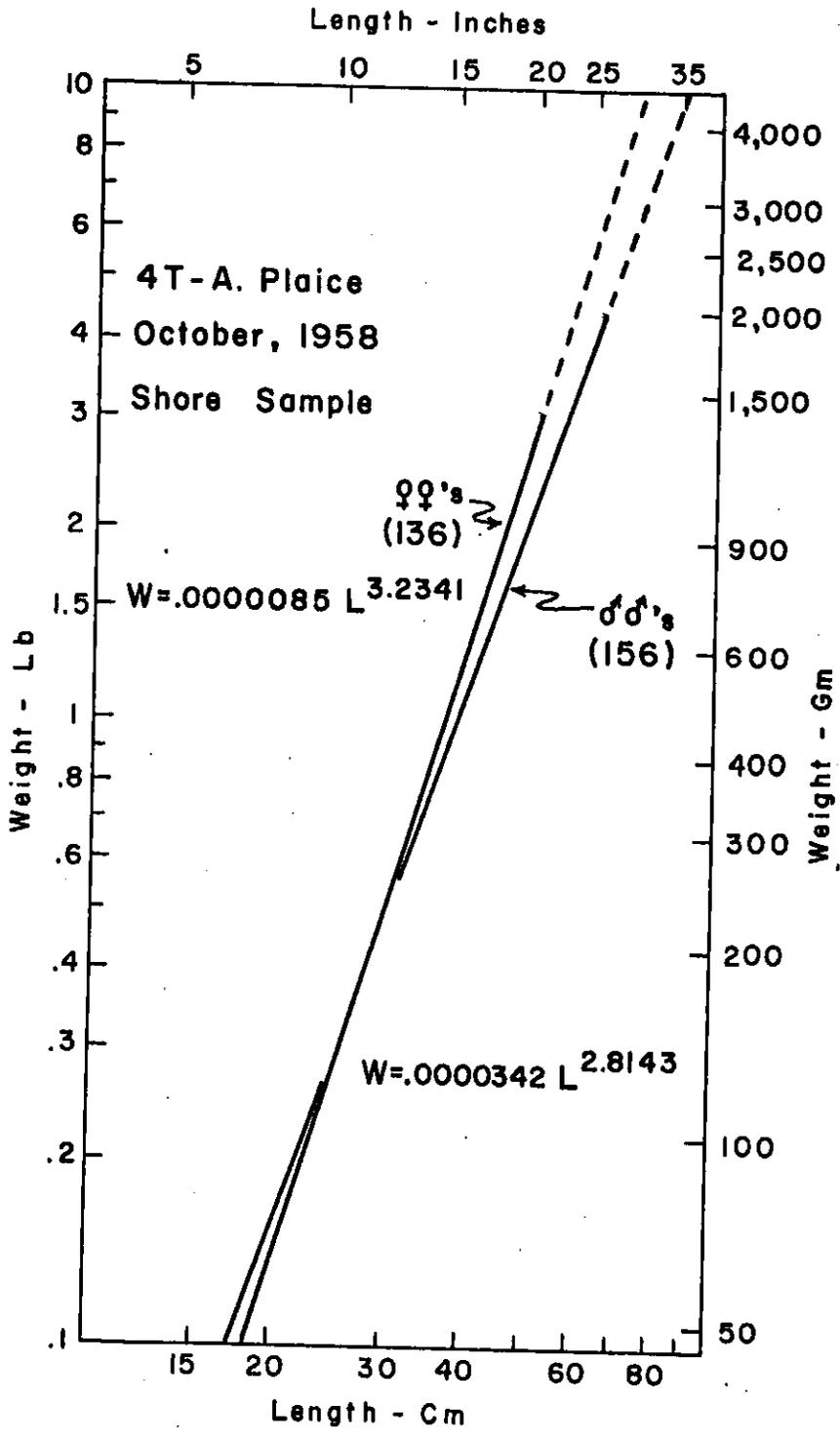


Fig. 2. The length-weight relationship for American plaice in 4T by sex. For other details see Fig. 1.

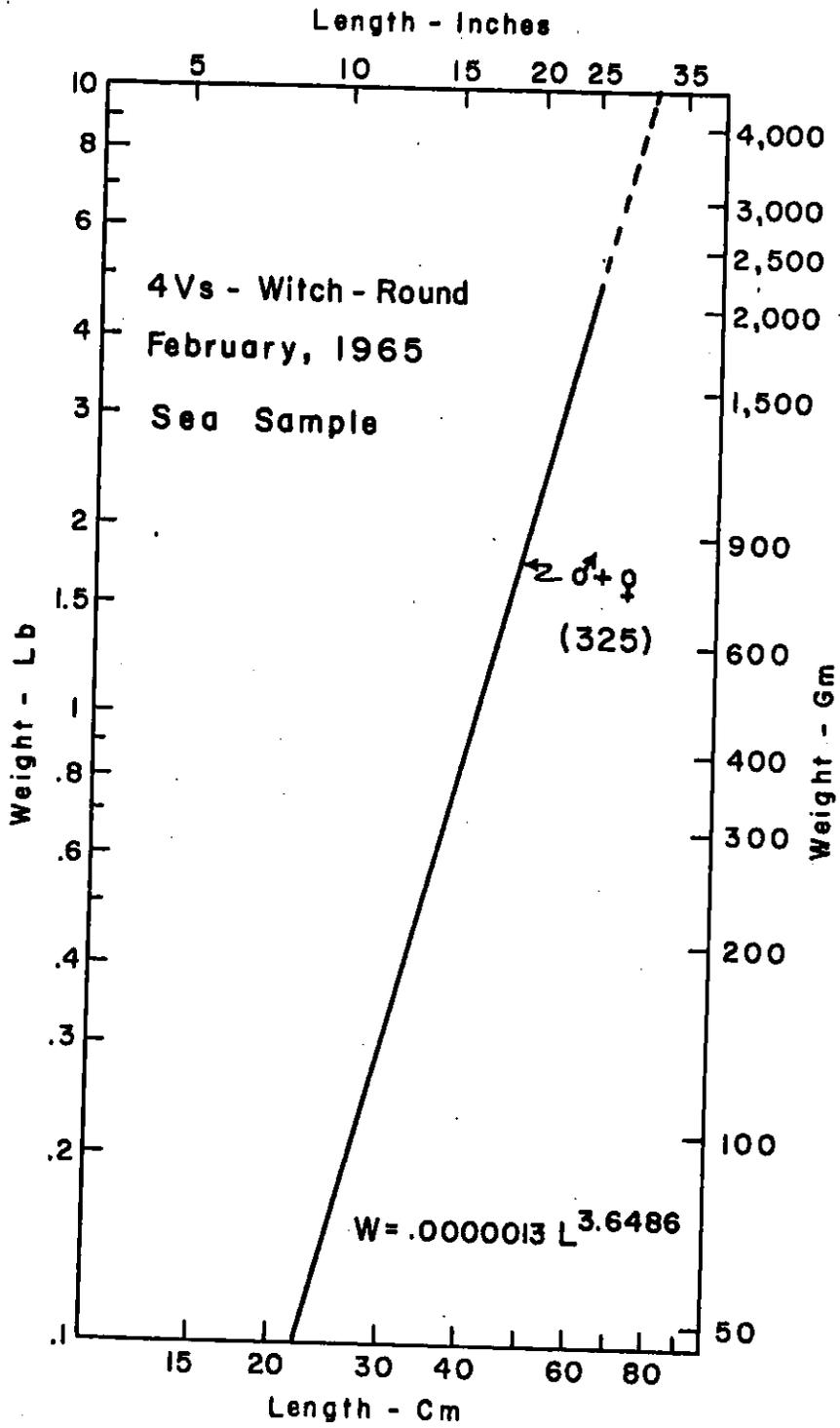


Fig. 3. The length-weight relationship for witch flounder in Division 4Vs. Sexes are combined. For other details see Fig. 1.

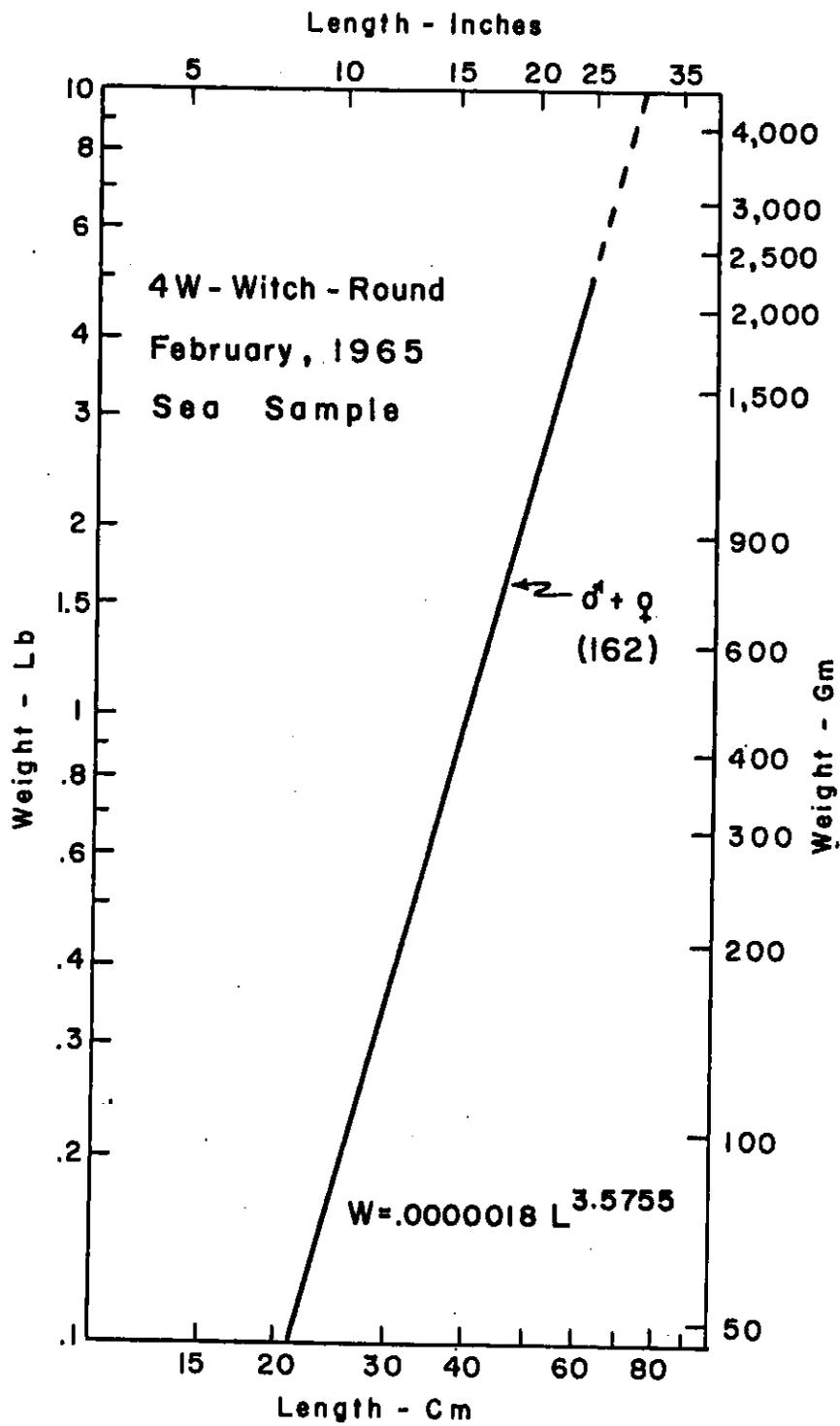


Fig. 4. The length-weight relationship for witch flounder in Division 4W. Sexes are combined. For other details see Fig. 1.

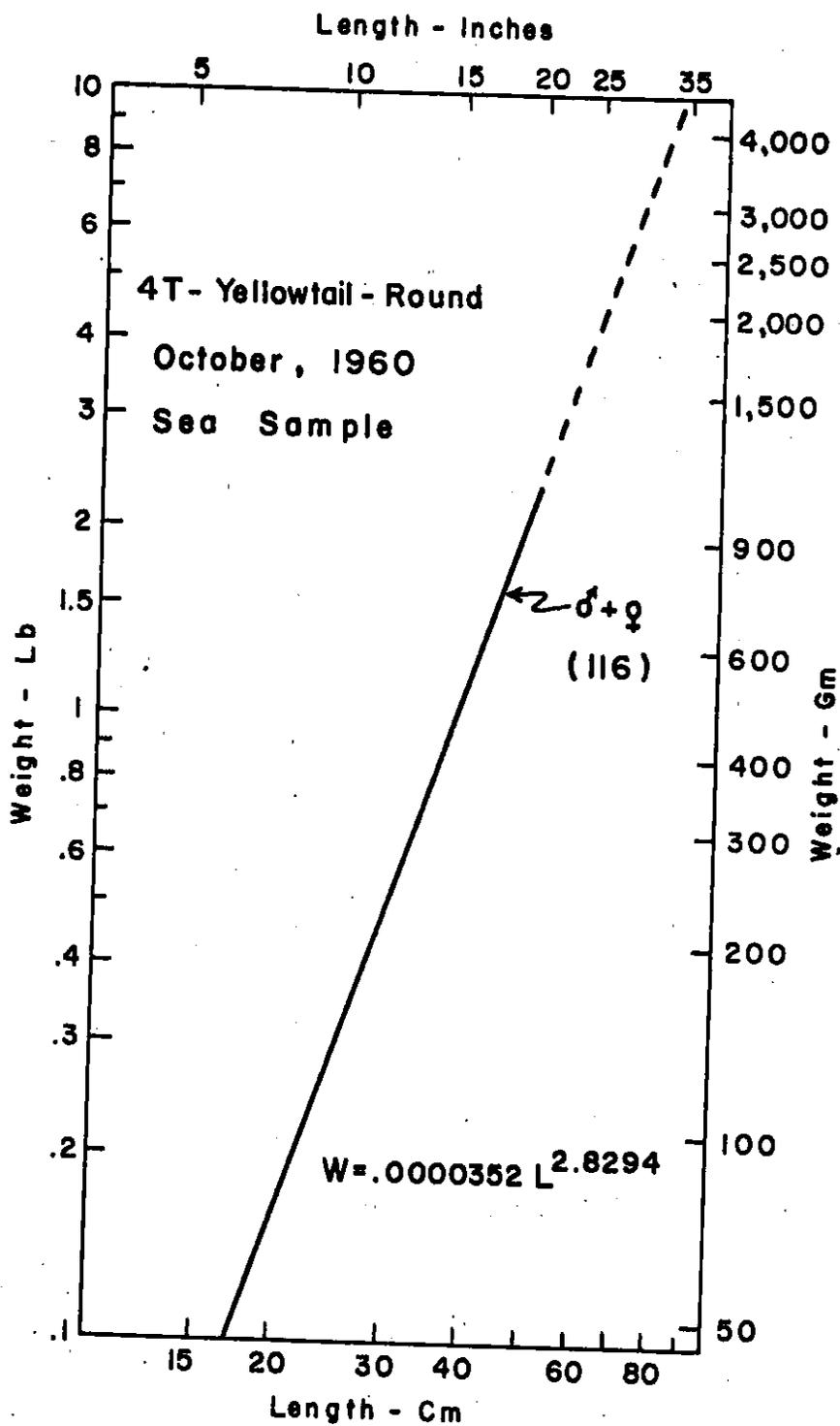


Fig. 5. The length-weight relationship for yellowtail flounder in Division 4T. Sexes are combined. For other details see Fig. 1.