Herring Investigations at Plymouth. IV. The Growth of Young Herrings in the Neighbourhood of Plymouth.

By

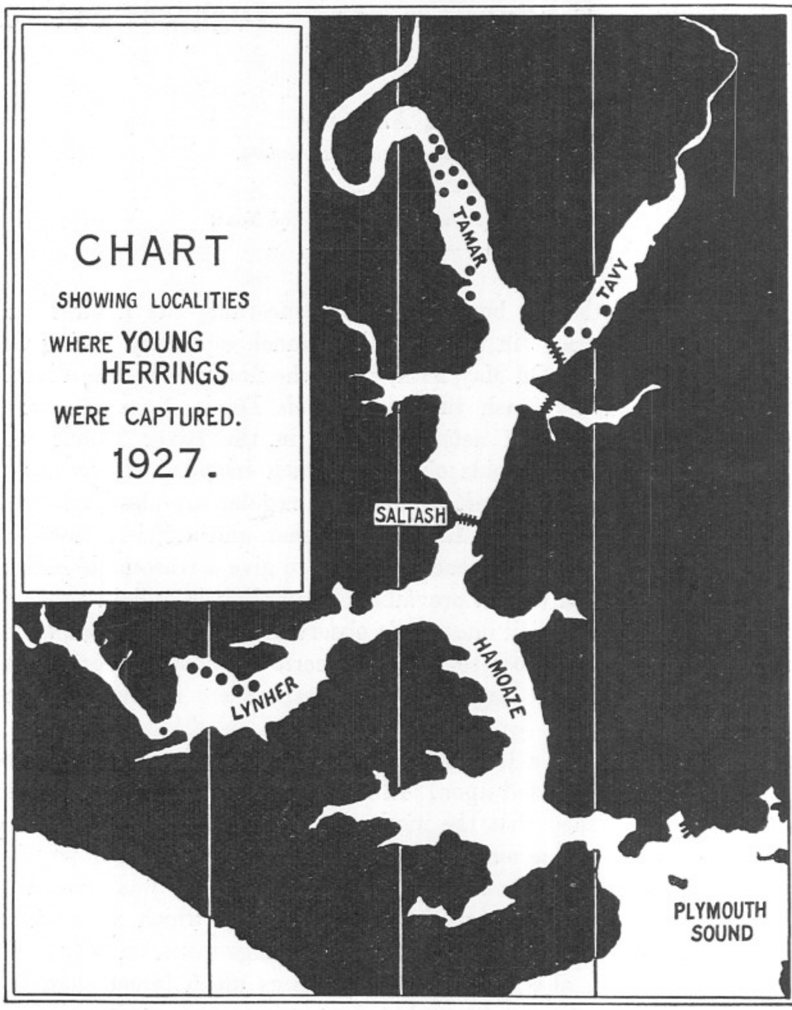
E. Ford, A.R.C.Sc.

Naturalist at the Plymouth Laboratory.

With 1 Chart and 4 Figures in the Text.

COMPARATIVELY little has been published concerning the habitat and growth of young herrings in the English Channel, especially during the first year of their life. On May 26th, 1927, the first of a series of hauls with a small-meshed Saltash tuck seine (*vide* Davis, **1**, p. 70, for a description of this type of net) was made in the River Tamar and a fine haul of young clupeoids obtained, which included the young of the herring, sprat and pilchard. Since then, regular samples have been taken from the rivers Tamar, Tavy and Lynher, and sufficient numbers of young herrings collected on each occasion to give a reasonable indication of the length-distribution prevailing. Sampling is still in progress and will be continued until one year's observation has been completed, but sufficient data are now to hand to merit an initial report. The localities from which the samples were obtained are indicated in the accompanying chart.

Before proceeding to a discussion of the data obtained, one or two facts need to be commented upon. In the first place it may be accepted as definitely established that the mesh of the seine used was of such a size that no question of serious selectivity among the " O " group populations during the period of sampling can arise. The net was proved to be capable of capturing young sprats in quantity which were much smaller than the great bulk of the smallest herrings taken on May 26th, 1927, while it could also capture older herrings much larger than the largest of the " O " group. Probably, however, in the coming months of, say, March and April and even early in May, 1928, the selective action of the net will need to be taken into account. The second fact, apart from its explanation, is of immediate interest because of its effect on the choice of a standard measurement of length. A regular experience throughout the sampling has been to find that a large proportion of the young herrings had an incomplete caudal fin. The condition of the tail in such specimens presented an appearance which suggested that it had been "nibbled." Slightly affected cases had only a small portion of one fluke missing, but in the more severe cases the caudal peduncle alone remained. This tail affection obviously made it impossible



to determine the total length from the tip of the snout to the end of the dorsal fluke of the tail. To have discarded all affected specimens would have meant the sacrifice of the major portion of every haul, and rather than do this it was thought better to adopt some other standard of length. It was therefore decided to use the *body* length from the tip of the snout to the end of the *caudal peduncle*, instead of the *total* length to the end of the *caudal fin*. This standard of length, although perfectly satisfactory in practice, has the disadvantage that it is not in common use, so that the data on growth are expressed in terms unfamiliar to other workers. To meet this objection so far as is possible, both the body length and the total length have been determined for each of a large number of normal-tailed specimens covering the whole range in size, and a correlation table drawn up from which it is possible to read off the total lengths corresponding with given body lengths (see p. 309).

As a rule hauls of the seine were kept separate, and a sufficient number of hauls taken on each occasion to give as good a representation as possible of the stock present. It was found that hauls taken at the same place during the same visit differed to some extent in their size composition, due, one believes, to the tendency on the part of the fish to segregate into shoals according to size. By increasing the number of hauls and adding together the data for the day, the effects of this segregation were probably fairly well overcome. The actual measurements of length were made to the "nearest 5 mm. below," and the data grouped into 5 mm. classes. For example, all fishes from 65 mm. to 69 mm. were included in the 65 mm. class. Particulars and data for each sample are given in the tables at the end of this paper.

It became evident at an early stage that there was an appreciable difference in size distribution between the normal-tailed and the abnormal-tailed specimens of the same sample, the proportion of the smaller sizes being greater among the latter. There was also an indication that among the abnormal-tailed specimens themselves, size distribution was dependent upon the degree to which the tail was affected. This may be illustrated by an analysis of a sample taken on October 20th, 1927, in which the abnormal-tailed specimens were grouped into two classes, according to a rough standard of severity in tail affection as shown in the photographs in Fig. 1 :—

		Body Length. 12 length groups. mm.													Median Q_2.
	Types	80	85	90	95	100	105	110	115	120	125	130	135	Totals	mm.
Abnormal-tailed specimens.	1–3	5	14	25	30	21	23	14	11	5	–	1	–	149	100·2
	4–7	–	–	3	14	33	34	25	18	14	7	4	1	153	109·0

The Saltash fishermen assert that a big flow of fresh water down the rivers, as the result of heavy rains, drives fish downstream into the lower reaches of the estuary. Now if, as seems possible, the bigger fishes are more susceptible to a marked freshening of the water than are the smaller ones, then samples taken during the periods of such freshening would show a resultant lower average size. When the fresh water " dried up," as the fishermen would say, the bigger fish would return to their usual haunts upstream, with the result that the sample average would rise again. Such a phenomenon would tend to cause some irregularity in the general upward trend of the average size as calculated from sample data.

As the immediate purpose of this paper is to describe the broad features of the growth of the general stock of young herrings in

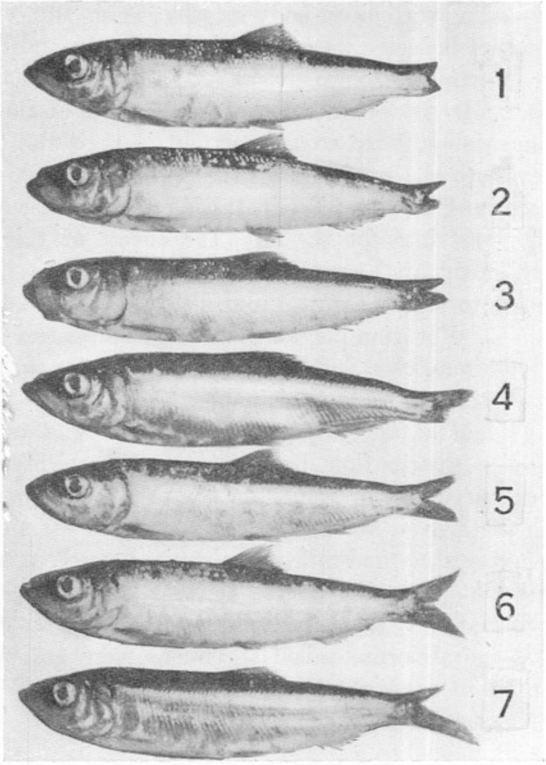


FIG. 1.—Seven examples of young herrings from Tamar with abnormal tails. Body length 95 mm. 1927. (*ca.* $\times \frac{4}{7}$).

the area, the summarised data, as shown in Tables V and VI (p. 319), may be used. It will be realised, however, from what has been said above, that the estimates of growth derived from these summaries are subject to correction for the reasons stated. It is at once seen that throughout the period of sampling there was always a considerable range in size among the individuals of any one sample. The difference in size between the fishes of the first sample (May 26th, 1927) is believed to be due, in the main, to a difference in the time at which the fishes were spawned. Between 200 and 300 of the specimens in this sample had not yet completed their metamorphosis ; these may be regarded as the final contribution from the winter spawning season of 1926–27, which, as was shown in Part III (see p. 284), may have commenced as early as October, 1926, and finished as late as March, 1927. The question of the difference in size directly attributable to a difference in time of birth can only be approached with confidence, however, when samples taken during the early months of the year 1928 become available. The extent of the range in size within the sample showed no tendency to diminish as time went on ; if anything, the later samples showed an even greater range. It is quite feasible that abnormality of the tail reduces the general efficiency for hunting food, with the result that badly affected specimens are less fortunate than their healthier associates and, in consequence, grow less. Certainly, as has already been shown, abnormal-tailed specimens were on average smaller than normal-tailed ones, and the more severe the affection, the less the average size.

Proportionate Length of the Tail.

The *body* length and the *total* length were determined for each of 1305 specimens with unaffected tails, and the data are shown in the form of a correlation table (Table II, on p. 316). There is an almost perfect correlation between the two measurements, and it may be taken that for any value (L_B) of the body length, the corresponding total length (L_T) is approximately $7/6\ L_B$. It is interesting to observe that this proportion holds good to a strikingly close degree for a total of 1075 adult herrings measured at Plymouth by Orton (2). The latter data are given in Table I, p. 315, but the following summary may be used to demonstrate the observation :—

Plymouth "o" Group Fishes.

(mm.) Observed L_B	32·5	37·5	42·5	47·5	52·5	57·5	62·5	67·5	72·5	77·5	82·5
Average L_T	37·5	43·0	49·1	55·3	59·7	66·4	72·3	77·6	82·9	89·1	95·1
$L_T = 7/6\ L_B$	37·9	43·5	49·6	55·4	61·2	67·1	72·9	78·7	84·5	90·4	96·2

87·5	92·5	97·5	102·5	107·5	112·5	117·5	122·5	127·5	132·5	137·5	142·5
100·2	106·8	112·7	119·0	124·2	129·4	135·5	141·5	148·2	153·5	159·0	162·5
102·1	107·8	113·7	119·6	125·4	131·2	137·0	142·9	148·7	154·6	160·4	166·2

Orton's Adult Fishes.

(cm.) L_B*	18·5	19·5	20·5	21·5	22·5	23·5	24·5	25·5	26·5
L_T*	21·9	23·0	24·1	25·2	26·3	27·5	28·5	29·75	31.5
$L_T = 7/6\ L_B$	21·6	22·75	23·9	25·1	26·2	27·4	28·6	29·74	30·9

* L_B is Orton's character 7, and L_T is Orton's character 9.

Tamar Samples

The data for the Tamar samples are given in Tables III and V on pp. 317 and 319, and shown graphically in Fig. 2. If the curve AB be accepted as a reasonable approximation to the general upward trend of

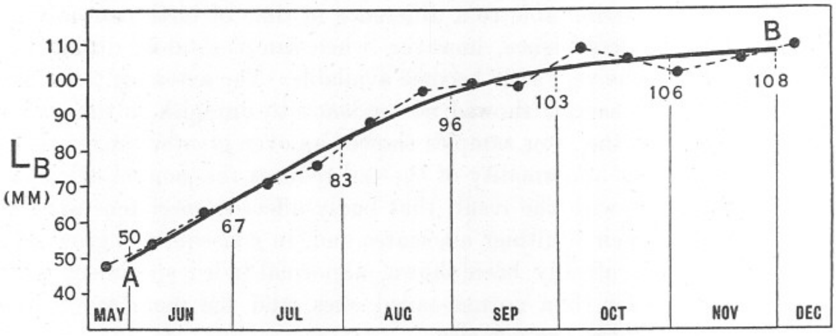


Fig. 2.—Median body length (L_B) for samples of young herrings caught in Tamar, 1927. The curve A B is a freehand curve indicating the general upward trend of the median. The values of the median on the first day of each month is shown.

the median body length (L_B), then it is seen that the average growth from month to month may be expressed as follows :—

Date. 1927.	Median Body Length. L_B. mm.	inches.	Median Total Length. $L_T = 7/6\ L_B$. mm.	inches.	Median Total Length. Monthly increments. mm.	inches.
June 1st	50	2·0	58·3	2·3		
July 1st	67	2·6	78·1	3·1	June, 19·8	0·78
Aug. 1st	83	3·3	96·8	3·8	July, 18·7	0·74
Sept. 1st	96	3·8	112·0	4·41	Aug., 15·2	0·60
Oct. 1st	103	4·06	120·1	4·73	Sept., 8·1	0·32
Nov. 1st	106	4·17	123·6	4·87	Oct., 3·5	0·14
Dec. 1st	108	4·25	126·0	4·96	Nov., 2·4	0·09

Thus, the median length increased most rapidly during June and July, less and less rapidly during August, September, and October, until during November it remained almost stationary. Fig. 3 will convey a good impression of the alteration in appearance of the fish as growth proceeds. Some idea of the growth by weight may be obtained by using the values of the cubes of the successive total lengths as functions of the weights as shown on page 312.

It is seen that whereas in the case of length, the monthly increment added falls continuously from June onwards, the increment of weight increases from June to the maximum in August, and then subsequently falls away, arriving at the minimum in November.

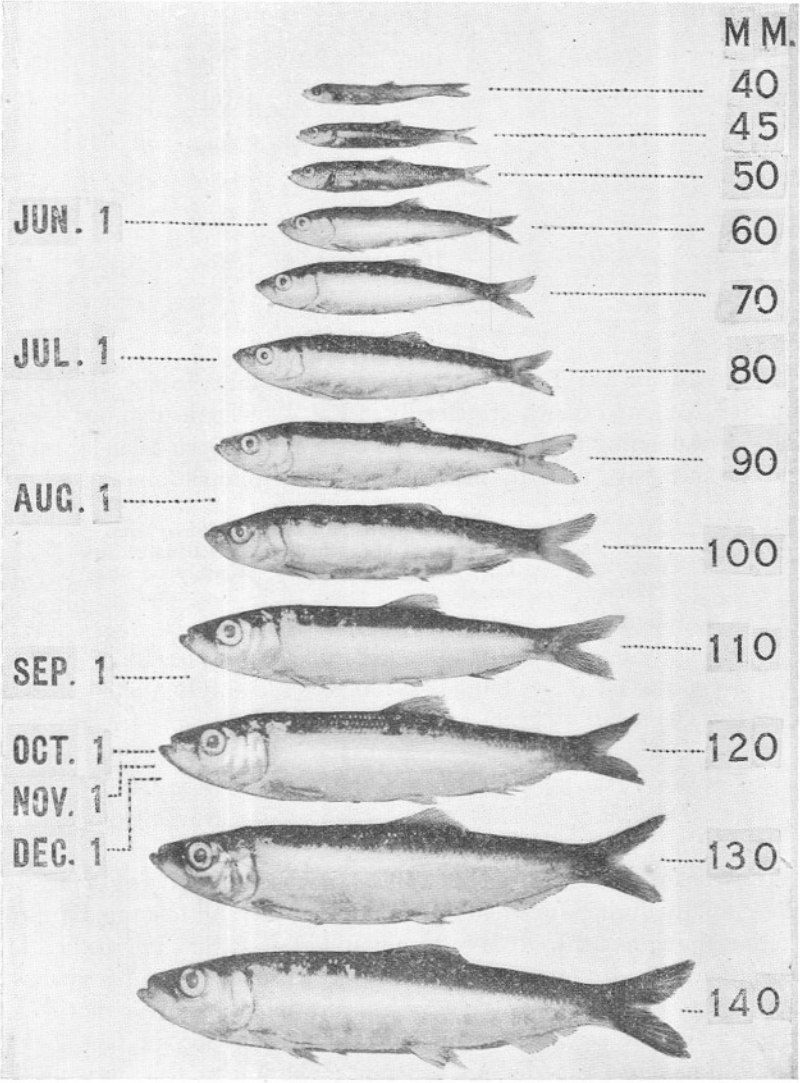


FIG. 3.—Photograph to illustrate the average growth made by the Tamar fish from June 1st to December 1st, 1927. The total lengths L_T are shown. (*ca.* $\times \frac{1}{2}$).

Date. 1927.	Median Total Length. L_T mm.	$\left(\frac{L_{T_x}}{L_{T_1}}\right)^3$	$\left(\frac{L_{T_x}}{L_{T_{x-1}}}\right)^3$	Monthly increments of weight. $=K\{L_{T_x}^3 - L_{T_{x-1}}^3\}$
June 1st	$58{\cdot}3 = L_{T_1}$	1·0	—	
July 1st	$78{\cdot}1 = L_{T_2}$	2·4	2·40	June $= K \times 10^4 \times 27{\cdot}83$
Aug. 1st	$96{\cdot}8 = L_{T_3}$	4·6	1·94	July $= K \times 10^4 \times 43{\cdot}07$
Sept. 1st	$112{\cdot}0 = L_{T_4}$	7·1	1·55	Aug. $= K \times 10^4 \times 49{\cdot}78$
Oct. 1st	$102{\cdot}1 = L_{T_5}$	8·7	1·23	Sept. $= K \times 10^4 \times 32{\cdot}70$
Nov. 1st	$123{\cdot}6 = L_{T_6}$	9·5	1·09	Oct. $= K \times 10^4 \times 15{\cdot}60$
Dec. 1st	$126{\cdot}0 = L_{T_7}$	10·1	1·06	Nov. $= K \times 10^4 \times 11{\cdot}30$

Lynher Samples.

The data for the Lynher samples are given in Tables IV and VI (pp. 318, 319), and shown graphically in Fig. 4. The median body length and corresponding total length at the beginning of each calendar month, and the successive monthly increments added, were as follows :—

Date. 1927.	Median Body Length. L_B. mm.	Median Total Length. L_T. mm.	Median Total Length. Monthly increments. mm.
June 1st	59	68·8	
July 1st	75	87·5	June, 18·7
Aug. 1st	89	103·8	July, 16·3
Sept. 1st	99	115·5	Aug., 11·7
Oct. 1st	105	122·5	Sept., 7·0
Nov. 1st	109	127·1	Oct., 4·6
Dec. 1st	111	129·5	Nov., 2·4

Thus, as for the fishes from the Tamar, the median total length increased most rapidly during June and July, and then less and less rapidly during the remaining months. It is to be noted, however, that the median total length on June 1st for the Lynher fishes was some 10 mm. greater than the corresponding Tamar value. This initial difference, whatever its cause, would, to some extent at any rate, account for the fact that the monthly increments added are different ; the Tamar fish, starting from the smaller June length of 58·3 mm., adding the larger increment of 19·8 mm. during June, while the Lynher fish starting from the larger June length of 68·8 mm., adding the smaller increment of 18·7 mm. during June.

The superior median length of the Lynher fish at the commencement of the period of observation was undoubtedly due in a marked degree to the fact that the proportion of normal-tailed individuals was very much higher than in the Tamar during the same period. Thus, the first Lynher sample, taken on June 13th, 1927, included only 98 abnormal-tailed specimens in a total of 613, whereas a Tamar sample of 884 taken on June 23rd, 1927, included 602 abnormal-tailed specimens. We have already seen (p. 307) that on average the normal-tailed specimens of a sample were larger than the abnormal-tailed.

Growth during First Season in Scaled Condition.

In all estimations of age and growth of adult fishes from scale readings, it is essential that the investigator should possess precise knowledge of the significance of the first winter-ring (see Part I, p. 242). From the above results it may be concluded that by the end of November, 1927, practically all growth for the season had been made,

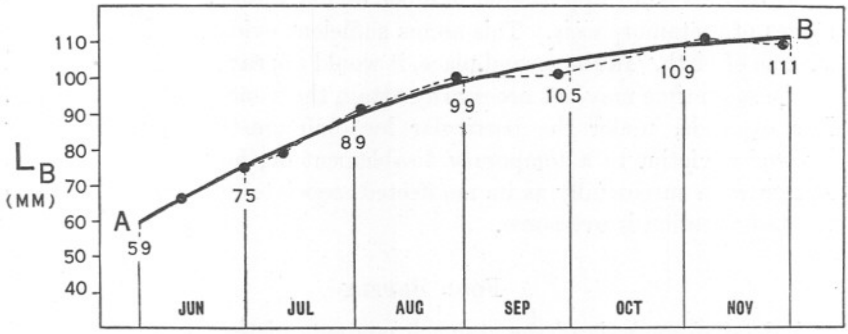


Fig. 4.—Median body length (L_B) for samples of young herrings caught in Lynher, 1927. Details as in Fig. 2.

although some subsequent slight increase in length during the winter may yet be possible, especially on the part of the smaller specimens. Taking the Tavy sample of December 5th as an approximation to the final position, it is seen that there is a range in *body* length from about 80–140 mm., with a median value of approximately 110 mm. Expressed as *total* length, the range is thus from about 90–160 mm., with a median total length of approximately 130 mm. Now it may be accepted that the great bulk of the small herrings captured on May 26th, 1927 (the first of the series of samples), had either acquired their scales or were in actual process of doing so in the *calendar year* 1927. Their subsequent growth to the median length of 130 mm. by December thus represents the first season's growth in the scaled condition. When, therefore, these fish eventually grow to adults, they will show a first winter-ring at a length l_1 of approximately 130 mm. on average, but with a range of variation of from 90–160 mm. It is of interest and importance to note that the calculated values of l_1 for adult fishes visiting Plymouth during the winter season compare quite favourably with those for the young fishes taken from the Tamar and Lynher. Thus, in 1924–25, a total of 244 "4-zoned 4-ringed" fishes showed a range in l_1 from 85 mm. to 175 mm., with an average of 138·8 mm. A total of 1122 fishes of the "5-zoned 5-ringed" class of the same season varied from 65 to 185 mm. in their value of l_1, the average value being 128·6 mm. That the scales of the young fish under discussion will actually show a winter-ring is proved by the fact that in the later samples the well-marked clear "winter-edge" was beginning to appear, and was well established in the last samples.

The reason for the amount of variation in the length l_1 appears to be twofold. In the first place, the time of spawning undoubtedly plays its part. On May 26th, 1927, while many were fully scaled and growing well, there was an appreciable number of individuals still in the early stages of metamorphosis. This seems sufficient evidence of a difference in time of birth. In the second place, it would appear that fishes spawned at the same time may not necessarily attain the same ultimate length, l_1. For example, under the particular local circumstances, a fish may become a victim to a temporary disablement of the tail and therefore not grow so successfully as its unaffected associate until (if such occurs) the tail affection is overcome.

Food Supply

A detailed analysis of the stomach contents of the fishes has not yet been completed, but from the observations so far made it is abundantly evident that the fully-scaled fishes were feeding throughout with great avidity almost entirely on mysids. The rivers abound with mysids, and the stomachs examined during the summer were always well filled.

Acknowledgments.

I am greatly indebted to Mr. J. H. Blake, of Saltash, both for constructing the successful small-meshed seine and for his skilful superintendence of the actual fishing operations. I wish also to thank Mr. W. Searle, of the Laboratory staff, for his willing and valuable services in the collection of the samples.

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2 Orton, J. H. "An Account of the Researches on Races of Herrings carried out by the Marine Biological Association at Plymouth, 1914–15." Journ. Mar. Biol. Assoc., Vol. XI, No. 1, 1916.

TABLE I.

Correlation Table. Body Length and Total Length (Orton's Samples of Adult Fishes).
1914–15.

Body Length. Central values for 9 length groups, (cm.)	Total Length. Central values for 11 length groups (cm.) 21·5	22·5	23·5	24·5	25·5	26·5	27·5	28·5	29·5	30·5	31·5	Totals	Arith. means.
18·5	3	2										5	21·9
19·5		19	23									42	23·0
20·5			50	88								138	24·1
21·5				62	171	1						234	25·2
22·5					64	294	7					365	26·3
23·5						20	156	19				195	27·5
24·5							4	73	6			83	28·5
25·5									9	3		12	29·75
26·5											1	1	31·5
Totals	3	21	73	150	235	315	167	92	15	3	1	1075	

TABLE II.

Correlation Table. Body Length and Total Length. Young Herrings, Plymouth, 1927.

Total Length. Central Values for 26 length groups (5 mm.).

Body Length. Central Values for 23 length groups (5 mm.).	37·5	42·5	47·5	52·5	57·5	62·5	67·5	72·5	77·5	82·5	87·5	92·5	97·5	102·5	107·5	112·5	117·5	122·5	127·5	132·5	137·5	142·5	147·5	152·5	157·5	162·5	Totals.	Arith. Means.
32·5	66																										66	37·5
37·5		58	7																								65	43·0
42·5			11	5																							16	49·1
47·5				22	28																						50	55·3
52·5					51	40																					91	59·7
57·5						13	35	2																			50	66·4
62·5							15	107	10																		132	72·3
67·5								27	195	33																	255	77·6
72·5									4	57	10																71	82·9
77·5											43	20															63	89·1
82·5												25	28														53	95·1
87·5													23	27													50	100·2
92·5														5	30												35	106·8
97·5															8	42	10										60	112·7
102·5																2	51	25									78	119·0
107·5																		53	28								81	124·2
112·5																		2	43	32							77	129·4
117·5																				22	27						49	135·5
122·5																					6	28	1				37	141·5
127·5																							13	2			15	148·2
132·5																								4	1		5	153·5
137·5																									3	1	4	159·0
142·5																										2	2	162·5
Totals	66	58	18	27	79	53	50	136	209	90	53	45	51	32	38	44	61	80	71	54	35	28	14	6	4	3	1305	

TABLE III.

Samples from Tamar and Tavy.

Date, 1927.	Condition of Tail.	Body Length. 5 mm. Groups. 25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	105	110	115	120	125	130	135	140	Total No. of Fishes.	Grand Total
May 26th	Normal and Abnormal	3	136	96	181	700	383	56	27	32	19	5	1	–	–	–	–	–	–	–	–	–	–	–	–	1639	1639
June 8th	Normal and Abnormal	–	13	26	20	85	146	102	77	39	12	11	2	1	–	–	–	–	–	–	–	–	–	–	–	534	534
June 23rd*	Normal	–	–	2	–	3	10	42	68	81	50	21	5	–	–	–	–	–	–	–	–	–	–	–	–	282	884
	Abnormal	–	1	1	1	15	65	161	170	91	44	23	21	6	3	–	–	–	–	–	–	–	–	–	–	602	
July 11th	Normal	–	–	–	–	7	4	4	4	14	24	38	45	28	4	3	–	–	1	–	–	–	–	–	–	176	1061
	Abnormal	–	–	2	16	19	31	94	164	143	135	131	88	44	12	3	2	1	–	–	–	–	–	–	–	885	
July 25th	Normal	–	–	–	–	–	–	1	3	5	4	13	29	44	30	19	4	–	1	–	–	–	–	–	–	153	996
	Abnormal	–	–	–	2	19	25	40	75	137	156	120	114	68	57	17	9	3	1	2	–	–	–	–	–	843	
Aug. 9th*	Normal	–	–	–	–	–	–	–	1	1	6	17	27	22	49	31	13	4	1	–	–	–	–	–	–	172	543
	Abnormal	–	–	–	–	–	–	2	2	12	36	57	61	63	49	49	21	15	3	1	–	–	–	–	–	371	
Aug. 23rd	Normal	–	–	–	–	1	–	–	–	1	2	3	14	16	33	62	93	33	8	2	1	–	–	–	–	269	1225
	Abnormal	–	–	–	–	2	1	1	10	30	53	122	156	147	128	145	84	45	19	9	3	–	1	–	–	956	
Sept. 7th	Normal	–	–	–	–	–	–	–	1	1	1	2	6	2	12	20	35	20	24	6	–	–	–	–	–	130	1035
	Abnormal	–	–	–	–	–	–	–	–	–	6	19	53	111	129	199	163	99	78	37	8	3	–	–	–	905	
Sept. 20th	Normal	–	–	–	–	–	–	–	–	2	–	1	1	1	4	7	13	19	25	12	3	–	–	–	–	88	566
	Abnormal	–	–	–	–	–	–	–	1	3	13	15	32	74	87	75	53	58	48	15	2	–	–	–	–	478	
Oct. 7th	Normal	–	–	–	–	–	–	–	–	1	–	–	–	4	4	16	13	20	30	26	17	2	2	–	1	136	538
	Abnormal	–	–	–	–	–	–	–	–	–	1	1	9	15	30	44	62	68	58	55	43	13	3	–	–	402	
Oct. 20th	Normal	–	–	–	–	–	–	–	–	–	1	1	2	3	9	5	13	16	18	15	9	4	–	1	–	97	483
	Abnormal	–	–	–	–	–	–	–	–	1	–	1	9	24	35	59	64	71	52	32	25	7	5	1	–	386	
Nov. 3rd	Normal	–	–	–	–	–	–	–	–	–	–	–	1	–	1	1	1	5	2	2	1	–	–	–	–	14	123
	Abnormal	–	–	–	–	–	–	–	–	–	1	3	8	11	14	14	19	17	11	5	4	–	2	–	–	109	
Nov. 21st	Normal	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	3	–	1	–	–	–	–	–	4	86
	Abnormal	–	–	–	–	–	–	–	–	–	–	–	1	6	4	16	13	17	8	10	3	1	3	–	–	82	
Dec. 5th*	Normal	–	–	–	–	–	–	–	–	–	–	–	1	–	–	1	–	2	4	2	–	–	1	–	–	11	97
	Abnormal	–	–	–	–	–	–	–	–	–	–	–	–	1	5	11	15	14	14	16	5	3	1	–	1	86	

* Tavy samples.

TABLE IV.

Samples from Lynher.

Date, 1927.	Condition of Tail.	Body Length. 5 mm. Groups.																								Total No. of Fishes.	Grand Total.
		25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	105	110	115	120	125	130	135	140		
June 13th	Normal	–	–	–	1	2	12	23	132	255	69	13	4	2	1	1	–	–	–	–	–	–	–	–	–	515	613
	Abnormal	–	–	–	–	1	13	31	20	19	6	3	3	2	–	–	–	–	–	–	–	–	–	–	–	98	
July 1st	Normal	–	–	–	–	–	2	2	11	52	159	173	70	10	–	–	–	–	–	–	–	–	–	–	–	479	748
	Abnormal	–	–	–	–	–	3	6	23	43	64	71	43	12	4	–	–	–	–	–	–	–	–	–	–	269	
July 12th	Normal	–	–	–	–	–	–	–	1	6	16	29	23	7	1	–	–	–	–	–	–	–	–	–	–	83	183
	Abnormal	–	–	–	1	–	–	–	1	4	17	35	24	11	7	–	–	–	–	–	–	–	–	–	–	100	
Aug. 3rd	Normal	–	–	–	–	–	–	–	1	–	4	11	32	98	118	82	23	2	–	–	–	–	–	–	–	371	879
	Abnormal	–	–	–	–	–	–	–	–	4	14	23	83	103	136	108	29	6	2	–	–	–	–	–	–	508	
Aug. 30th	Normal	–	–	–	–	–	–	–	1	1	1	1	4	7	17	40	58	46	16	5	1	–	–	–	–	198	947
	Abnormal	–	–	–	–	–	–	–	2	6	9	19	40	69	103	141	155	119	61	19	5	1	–	–	–	749	
Sept. 28th	Normal	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	1	–	–	–	1	–	–	–	3	131
	Abnormal	–	–	–	–	–	–	–	3	–	2	1	11	18	9	16	20	18	14	10	1	2	2	1	–	128	
Nov. 7th	Normal	–	–	–	–	–	–	–	–	–	–	1	–	–	–	1	3	3	4	2	2	2	–	–	–	18	147
	Abnormal	–	–	–	–	–	–	–	–	–	1	2	–	3	8	11	18	18	18	17	19	9	3	1	1	129	
Nov. 29th	Normal and Abnormal	–	–	–	–	–	–	–	–	–	2	–	1	11	12	33	54	87	76	54	25	7	1	–	–	363	363

TABLE V.

Samples from the Tamar and Tavy, 1927.

Date. 1927.	Total No. of Fishes.	Body-Length, Distribution. Deciles, Quartiles, and Median (cm.). d_1.	Q_1.	Q_2.	Q_3.	d_9.
May 26th	1639	3·63	4·48	4·79	5·30	5·47
June 8th	534	4·36	4·99	5·42	6·06	6·66
June 23rd	884	5·43	5·80	6·30	6·86	7·45
July 11th	1061	5·64	6·26	7·09	7·90	8·47
July 25th	996	6·09	6·80	7·63	8·54	9·27
Aug. 9th	543	7·44	8·01	8·80	9·53	10·09
Aug. 23rd	1225	8·09	8·83	9·67	10·48	11·00
Sept. 7th	1035	8·56	9·20	9·90	10·57	11·26
Sept. 20th	566	8·33	8·99	9·80	10·77	11·34
Oct. 7th	538	9·42	10·06	10·89	11·68	12·15
Oct. 20th	483	9·07	9·77	10·59	11·34	12·08
Nov. 3rd	123	8·47	9·23	10·20	10·93	12·04
Nov. 21st	86	9·21	9·83	10·59	11·34	11·97
Dec. 5th	97	9·62	10·18	10·97	11·65	12·22

TABLE VI.

Samples from the Lynher, 1927.

Date. 1927.	Total No. of Fishes.	Body-Length, Distribution. Deciles, Quartiles, and Median (cm.). d_1.	Q_1.	Q_2.	Q_3.	d_9.
June 13th	613	5·80	6·23	6·63	6·91	7·29
July 1st	748	6·64	7·10	7·52	7·90	8·29
July 12th	183	7·10	7·50	7·86	8·29	8·71
Aug. 3rd	879	8·12	8·57	9·13	9·59	9·93
Aug. 30th	947	8·57	9·32	10·03	10·61	11·09
Sept. 28th	131	8·33	8·94	10·12	10·97	11·74
Nov. 7th	147	9·49	10·24	11·11	12·03	12·56
Nov. 29th	363	9·66	10·30	10·90	11·48	11·98