THE SEASONAL ABUNDANCE OF YOUNG FISH X. THE YEAR 1948

By P. G. Corbin, B.A. Zoologist at the Plymouth Laboratory

(Text-figs. 1-2)

Records of the young fish and plankton of Plymouth off-shore waters taken in $\frac{1}{2}$ hr. oblique hauls of the 2 m. stramin ring-trawl were continued in 1948. They show an even lower production of young fish than in 1947 and a continued poverty of plankton organisms other than young fish. The dates on which collections were made are given in Table I.

TABLE I. DATES ON WHICH COLLECTIONS WERE MADE, 1948

All 2 miles east of Eddystone, unless otherwise stated

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
6	3	I	12*	19	I	5	4	6	4*	4	6
14	9	11+	14	25	7	12	9	13	7	9	15
20	12*	II*			8*	19	18	20	12	16	20
26	16	15			14	26	23	28	21	22	
		23			21	29*	30		26	29	
							31*		27*	30*	

* Station E 1.

† Station L 4.

TABLE II. FORTNIGHTLY AVERAGE CATCHES OF ALL YOUNG FISH EXCLUDING CLUPEIDS, 1930–34, 1947 AND 1948

		Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1930–34* (average)	1st fortnight 2nd fortnight	58	10 15	27 89	110 374	635 573	299 78	100 85	152 48	48 9	II 6	73	2
1947	1st fortnight 2nd fortnight	n.r. o	5 43	6 13	5	n.r. 54	20 27	10 5	11 16	II	2 0	1 +	+++++++++++++++++++++++++++++++++++++++
1948	1st fortnight 2nd fortnight	+	3 16	15 15	12 n.r.	n.r. 65	13 32	9 17	9 5	+ 0	4+	o +	I O

* Data kindly supplied by Mr F. S. Russell.

n.r., no records. + average of less than 1.

The fortnightly averages of all young fish, excluding clupeids, are now too low to be graphed against the same averages for the period 1930-34 as in Fig. 1 of former reports: they are therefore given numerically in Table II below, with the 1947 averages for comparison. *Callionymus* spp. and *Solea variegata* contributed principally to the highest of these fortnightly averages in the second half of May; the next highest value in the second half of June was also mainly due to *Callionymus* spp.

Earlier parts of this series (Russell, 1930–47; Corbin, 1948) also give a table of the monthly average catches of young fish. These have now fallen to so low

TABLE III. MONTHLY TOTAL CATCHES OF POST-LARVAE PER HALF-HOUROBLIQUE HAULS WITH 2 M. STRAMIN RING-TRAWL, 1948

The number of hauls per month is shown by the small figure against each month at the head of the column. A + is used in the 2nd, 4th and 6th lines to denote monthly average of less than 0.5. Sum of

	Jan.4	Feb.4	Mar. ⁵	Apr. ²	May ²	June ⁵	July ⁵	Aug.6	Sept.4	Oct.6	Nov.6	Dec. ³	Total	monthly averages
Total young fish Monthly average, T.Y.F.	4 1	107 27	406 81	27 14	149 75	198 39	162 32	83 14	6 1	151 25	1 +	5 2	1299	331
T.Y.F., less Clupeids Monthly average, ditto	I +	26 6	74 15	23 12	130 65	83 17	70 14	39 6	2 +	14 2	1 +	3 I	466	138
All Clupeid spp. Monthly average, ditto	3 I	81 20	332 66	4 2	19 10	115 23	92. 18	44 7	4	137 23	0	2 I	833	172
Clupea harengus														
Gadus pollachius														
Gadus merlangus			I	I	5	4	2		• •	• •	۰.	• •	13	4.4
Gadus minutus			7	. I		••		••					8	1.0
Gadus callarias	1		10	•••							1	1	19	3 45
Onos spp.				5	20	2							27	12.9
Phycis blennioides													Í	0.3
Molva molva		· · ·												
Merluccius merluccius								••	• •		• •		• •	••
Kaniceps raninus		••		•••			•••	••		• :			• :	0.77
Zous faber										1			1	017
Arnoglassus SDD.	•••						12	 TT					31	5.57
Rhombus spp.							ĩ	3					4	0.7
Scopthalmus norvegicus					6	6							12	4.2
Zeugopterus punctatus						I							I	0.5
Zeugopterus unimaculatus						2							2	0.4
Pleuronectes platessa			13		••	••					• •	• •	13	2.0
Pleuronectes limanda	••-			••	5	I	••						0	2.7
Pleuronectes Jiesus			••	••	••	••	•••		•••	••	•••		• •	
Solea sulgaris	s											•••	•••	
Solea variegata					33	2							35	16.0
Solea lascaris							I	2		I			4	0.7
Solea lutea														
Serannus cabrilla							I						I	0.5
Caranx trachurus							9	4	• •	2			15	2.8
Mullus surmuletus	••		••		••		I	••	•••	• •	•••	••	I	0.5
Ammodutes lanceolatus							• • •	••	••	• •	•••	•••	12	4.2
Ammodytes tobianus				2		-	4						2	0.7
Ammodytes marinus				ī									ī	0.2
Ammodytes sp. IV		12	13	2									27	6.6
Cepola rubescens								I	I				2	0.42
Callionymus spp.			2	7	60	27	8	4		I			109	41.0
Labrus bergylta	••			••	••	2	I	••	• •	••	••	••	3	0.0
Ctonolabrus rubestris				••				•••	•••	••	•••	•••		6.57
Crenilabrus exoletus						20	12	1	••	• •	•••		33	0.57
Trachinus vipera							 T	3					4	0.7
Scomber scombrus							3	ĩ					4	0.77
Gobius spp.		I				4	3	I	I				IO	2.07
Lebetus scorpioides							I	I					2	0.32
Blennius ocellaris						••								
Blennius pholis	••		••	••	••	•••	• :	I	• •	• •	••	••	I	0.17
Chinalaphie galarita						9	0	5	•••			• •	20	3.8
Mugil snn.		13	10								•••	÷	31	0.05
Agonus cataphractus														0 33
Trigla spp.			3			I							4	0.8
Cottus spp.			:											
Liparis montagui														
Lepadogaster bimaculatus			7											
Lophius piscatorius				•••			•:	•:	•••	•••		••	•:	
ripe listi			1		1.00		2	1	· · · ·	2	••	••	0	1.1
											1.58		466	138

708

a level for almost all species that it is considered more informative to show the monthly total catches for species (Table III) rather than the monthly average catches, many of which are now considerably less than one. For comparison with previous records, the sums of the monthly averages for the year are given in the last column of this table, and the monthly averages of (i) total young fish, (ii) total young fish less clupeids, and (iii) total clupeids are also shown (2nd, 4th and 6th lines, in black). The number of hauls per month is included so that the monthly averages for the species are immediately derivable.

A few young plaice, *Pleuronectes platessa*, again occurred this year, in March. A single specimen of *Mugil* spp. was taken on 15 December: in 1947 another single specimen was caught at E I, on 13 November (this haul was not included in the 1947 data).

A young specimen (33 mm.) of *Phycis* was also taken in the haul of 15 December this year. It very probably belongs to *P. blennioides* as this is the only *Phycis* species occurring in the area. No young stages of this genus have previously been recorded off Plymouth.

As already mentioned, plankton other than young fish was very scarce throughout the year. The maximum haul of *Calanus* (adult and stage V) contained 280 odd specimens (I June 1948), and only four other catches during the year contained more than 100 *Calanus*. This, when compared with the rich catches of 1930 (Russell, 1933), gives some indication of the present poverty. In 1930, thirty-four of the forty-four hauls taken during the year contained more than 100 *Calanus* and seventeen out of the forty-four had catches of over 1000: the maximum haul contained the very large total of 318,450 specimens (7 May 1930).

Sagitta setosa was the dominant Sagitta species throughout the year (Figs. 1 and 2). It was, however, considerably less numerous than in 1947: on only two occasions were catches of more than 1000 taken (1 March, 31 August; 1200 odd). As in 1947, it was almost completely absent during the period April-July. The occurrence of S. elegans was very intermittent during the year and the numbers caught were extremely small (maximum, ten specimens).

A particularly noticeable feature of the *S. setosa* catches throughout the year was the preponderance of very small immature specimens (Stages I and II; Russell, 1932a). This departure from the normally expected proportions of development Stages (I-III) in the catches would appear to indicate an unusually low survival of individuals reaching maturity. Measurements and counts, comparable with those made by Russell (1932b), are required for verification of this trend. It is, however, felt that it should not remain unrecorded, since it may possibly represent a further aspect of the continued and progressive impoverishment of the macroplankton caught by the 2 m. ring-trawl in this area.

Except during April, Muggiaea atlantica was present during all months of

709



Fig. 1. Above, curves showing the actual abundance of Sagitta elegans (----) and S. setosa (----) in half-hour oblique hauls with the 2 m. stramin ring-trawl during the period June 1946 to December 1948. Below, percentage composition of the Sagitta populations during the same period: S. elegans, black; S. setosa, white; no Sagitta, hatched. (Continued from Corbin, 1948, p. 720, fig. 2.)

710

the year: it was numerous from the end of July until the end of August and again from the end of September until the end of October.

M. kochi, which was present in very small numbers in 1946 (Russell, 1947) but did not occur in 1947 (Corbin, 1948), was also represented in the catches throughout the year except during February and April. It did not generally exceed one-third of the numbers of *M. atlantica*. In the earlier part (January–June) and at the end of the year (November and December), the catches of both *Muggiaea* species were small.





At the end of September (28th), *Liriope* appeared in considerable numbers. It continued until the end of the year in the catches, although only in small numbers in November and December.

Salps occurred on three occasions (27 October (35), 30 November (1), 15 December (69)), and doliolids were taken twice in October (4th (25), 21st (3)).

Three specimens of *Euchaeta hebes* also occurred in the catch of 4 October, and the hyperiid amphipod, *Themisto* was present in three hauls at the end of the year (4 October (I), 4 November (II), 6 December (I)).

Beroe was present during October, November and December, and *Aequorea pensilis* occurred in some numbers during November and December. Mr F. S. Russell kindly identified the *Aequorea* specimens.

TABLE IV. PILCHARD EGG CATCHES, 1948

See Table I for dates of hauls.

0 0 T	0	0	17	2 160	- 0/-						
0 T	0	-		3,100	1,800	1,300	0	0	57	I	0
T		0	II	1,450	3,000	5	0	104	6	0	3
*	0	2			7,980	103	0	14	7	4	I
0	0	0			6,880	40	0	240	132	0	
		I			2,100	0	0		IO	0	
							0		0	4	
+	0	+	14	2,305	4,364	290	0	89	35	+	+
+	0	+	478	5,868	14,093	6,196	385	415	305	398	+
	++++	+ 0 + 0	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	$\begin{array}{cccccccccccccccccccccccccccccccccccc$							

* Calculated from data in previous reports of this series.

+ Average of less than 10.

Pilchard eggs were taken during all months of the year except in February and August. Their occurrences are given in Table IV. The average catch in June, the month of maximum pilchard spawning in this area, was very considerably lower than in previous years.

REFERENCES

CORBIN, P. G., 1948. On the seasonal abundance of young fish. IX. The year 1947. Journ. Mar. Biol. Assoc., Vol. XXVII, pp. 718-22.

RUSSELL, F. S., 1930-47. On the seasonal abundance of young fish. I-VIII. *Journ.* Mar. Biol. Assoc., Vols. xvi, pp. 707-22; xx, pp. 147-79 and pp. 595-604; xxi, pp. 679-86; xxii, pp. 493-500; xxiii, pp. 381-6; xxiv, pp. 265-70; xxvi, pp. 605-8.

— 1932*a*. On the biology of *Sagitta*. The breeding and growth of *Sagitta elegans* Verrill in the Plymouth area, 1930–31. *Journ. Mar. Biol. Assoc.*, Vol. XVIII, pp. 131–46.

1932 b. On the biology of Sagitta. II. The breeding and growth of Sagitta setosa.
 J. Müller in the Plymouth area, 1930-31, with a comparison with that of S. elegans Verrill. Journ. Mar. Biol. Assoc., Vol. XVIII, pp. 147-60.

— 1933. The seasonal distribution of macroplankton as shown by catches in the 2 metre stramin ring-trawl in off-shore waters off Plymouth. *Journ. Mar. Biol.* Assoc., Vol. XIX, pp. 73–82.