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# THE SEASONAL ABUNDANCE OF YOUNG FISH XI. THE YEAR 1949

By P. G. Corbin, B.A.

Zoologist at the Plymouth Laboratory

(Text-figs. 1, 2)

The 1949 production of young fish and plankton in Plymouth off-shore waters continued to remain at the low level characteristic of the last few years. Collections were made by half-hour oblique hauls of the 2 m. stramin ring-trawl; the dates are given in Table I. The fortnightly averages of all young fish, excluding clupeids, are shown in Table II with comparative figures for 1948 and for the period 1930–34. The highest value, in the second half of June, may have been unduly weighted, since only one collection was made in the fortnight. The monthly total catches of young fish are given in Table III. The sum of the monthly averages for all young fish (459) was slightly higher than the 1948 value (311[1]), due to larger catches of clupeids; young fish other than clupeids continued to decrease. A few post-larval herring were present in January, and for the third successive year young *Mugil* spp. occurred; two in October and one in December. No young plaice were caught, although a very small number of plaice eggs were present in January and February. Plankton, other than young fish, was very sparse throughout the year, *Calanus* being even scarcer than in 1948. *Sagitta setosa* was the dominant *Sagitta* species, although never abundant, and as in recent years the numbers were particularly low from February to June. A few *S. elegans* occurred in November and December (maximum, 66 specimens). The abundance and percentages of the *Sagitta* species are shown in Fig. 1.

In the account of conditions in 1948, it was noted that small immature *S. setosa* appeared to predominate in the catches, indicating perhaps a further step in the progressive decline of the macroplankton of the area. In order to examine this question, the maturity stages of all the 1949 catches of *setosa* were determined. But the low numbers caught preclude any reliable information concerning trends in the proportions of the stages, and make it difficult to interpret the data regarding the numbers of mature populations and of spawnings during the year. It would seem, however, that there were not more than five mature populations and probably only five spawnings. This, in contrast to at least six breeding populations and eight spawnings in the period September 1930—August 1931 (Russell, 1932), points to a considerably lowered productivity.

[1] Misprinted as 331 in the 1948 report.

Three specimens of *Muggiaea atlantica*, which was present throughout 1948, occurred in January and February. During the summer no *Muggiaea* were caught, until small numbers of *M. kochi* appeared in October–December (maximum, 33 specimens). Three small *Aglantha* were present in the catch of 14 November. *Liriope*, which occured in considerable quantity at the end of 1948, continued to be present in 1949 until 1 February. A single salp was taken on 5 January and one *Themisto* on 20 January.

The numbers of pilchard eggs in the catches are given in Table IV. The monthly averages have again fallen very considerably since the low averages of 1948.

TABLE I. DATES ON WHICH COLLECTIONS WERE MADE, 1949

All 2 miles east of Eddystone, unless otherwise stated

| Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 3 | 1* | 7 | 11 | 2† | 8 | 1 | 3 | 1 | 4 | 7 | 8 |
| 5* | 7 | 14 | 13* | 4 | 9* | 11 | 8* | 5 | 6* | 8* | 12 |
| 10 | 14 | 21 | 14 | 9* | 14 | 22 | 8 | 8* | 8 | 14 | 19 |
| 14‡ | 21 | 29 | 25 | 10 | 24 | 26 | 26 | 12 | 10 | 28 | 22* |
| 14§ | 28 | | 27‡N | 16 | | | | 19 | 17 | | 28 |
| 14 | | | 29N | 24 | | | | 26 | 27 | | |
| 17 | | | 29N | 30 | | | | | | | |
| 20 | | | | | | | | | | | |
| 24 | | | | | | | | | | | |
| 31 | | | | | | | | | | | |

* Station E1. † Station L5. N, night collection.
‡ Station L4. § Station L6.

TABLE II. FORTNIGHTLY AVERAGE CATCHES OF ALL YOUNG FISH EXCLUDING CLUPEIDS, 1930–34, 1948 AND 1949

| | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1930–34 (average): | | | | | | | | | | | | |
| 1st fortnight | 5 | 10 | 27 | 110 | 635 | 299 | 100 | 152 | 48 | 11 | 7 | 2 |
| 2nd fortnight | 8 | 15 | 89 | 374 | 573 | 78 | 85 | 48 | 9 | 6 | 3 | 2 |
| 1948: | | | | | | | | | | | | |
| 1st fortnight | + | 3 | 15 | 12 | nr | 13 | 9 | 9 | + | 4 | 0 | 1 |
| 2nd fortnight | 0 | 16 | 15 | nr | 65 | 32 | 17 | 5 | 0 | + | + | 0 |
| 1949: | | | | | | | | | | | | |
| 1st fortnight | + | 1 | 0 | 1 | 10 | 22 | 20 | 22 | + | + | 1 | 2 |
| 2nd fortnight | + | + | 2 | 11 | 18 | 77 | 26 | 1 | 1 | 0 | 1 | + |

nr, no records. + average of less than 1.

It is necessary that a note should be included in these records concerning the quality of the stramin used in the 2 m. ring-trawl. Pre-war stramin has an average of sixteen threads in both warp and weft to the inch when dry and unused. It is evenly woven and there is only slight variation in the thickness of the threads, so that the actual holes between the meshes have a very fair uniformity of size; the threads are also free of projecting tufts. Stramin of this quality became unobtainable after the war. The post-war stramin has an average of fourteen threads in the warp and thirteen in the weft to the inch. It is very unevenly woven, the thickness of the strands is extremely variable and

## TABLE III. MONTHLY TOTAL CATCHES OF POST-LARVAE IN HALF-HOUR OBLIQUE HAULS WITH 2 M. STRAMIN RING-TRAWL, 1949

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.

| | Jan.[10] | Feb.[5] | Mar.[4] | Apr.[7] | May[7] | June[4] | July[4] | Aug.[4] | Sept.[6] | Oct.[6] | Nov.[4] | Dec.[5] | Total | Sum of monthly averages |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total young fish | 85 | 11 | 3 | 69 | 314 | 304 | 692 | 272 | 27 | 119 | 189 | 15 | 2100 | .. |
| Monthly average, T.Y.F. | 9 | 2 | 1 | 10 | 45 | 76 | 173 | 68 | 5 | 20 | 47 | 13 | .. | 459 |
| T.Y.F., less clupeids | 5 | 5 | 1 | 49 | 93 | 144 | 94 | 66 | 4 | 3 | 4 | 5 | 473 | .. |
| Monthly average, ditto | 1 | 1 | + | 7 | 13 | 36 | 24 | 17 | 1 | 1 | 1 | 1 | .. | 103 |
| All clupeid spp. | 80 | 6 | 2 | 20 | 221 | 160 | 598 | 206 | 23 | 116 | 185 | 10 | 1627 | .. |
| Monthly average, ditto | 8 | 1 | 1 | 3 | 32 | 40 | 149 | 51 | 4 | 19 | 46 | 2 | .. | 356 |
| *Clupea harengus* | 31 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 31 | 3·1 |
| *Gadus pollachius* | .. | .. | .. | .. | 6 | 1 | .. | .. | .. | .. | .. | .. | 7 | 1·11 |
| *Gadus merlangus* | .. | .. | .. | .. | 3 | 5 | .. | .. | .. | .. | .. | .. | 8 | 1·68 |
| *Gadus minutus* | .. | .. | .. | 7 | .. | .. | .. | .. | 11 | .. | .. | .. | 7 | 1·0 |
| *Gadus luscus* | 3 | 2 | .. | .. | .. | .. | .. | .. | .. | .. | 2 | 3 | 10 | 1·8 |
| *Gadus callarias* | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| *Onos* spp. | .. | .. | .. | 3 | 26 | 11 | 3 | .. | .. | .. | .. | .. | 43 | 7·88 |
| *Phycis blennoides* | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| *Molva molva* | .. | .. | .. | .. | 1 | .. | .. | .. | .. | .. | .. | .. | 1 | 0·14 |
| *Merluccius merluccius* | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| *Raniceps raninus* | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| *Capros aper* | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| *Zeus faber* | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| *Arnoglossus* spp. | .. | .. | .. | .. | .. | 1 | 8 | 9 | 1 | .. | .. | .. | 19 | 4·67 |
| *Rhombus* spp. | .. | .. | .. | .. | 3 | 2 | .. | .. | 1 | .. | .. | .. | 6 | 1·1 |
| *Scopthalmus norvegicus* | .. | .. | .. | 3 | 1 | } 1 { | .. | .. | .. | .. | .. | .. | 4 } 9 | 0·57 } 1·39 |
| *Zeugopterus punctatus* | .. | .. | .. | 2 | 2 | | .. | .. | .. | .. | .. | .. | | 0·57 |
| *Zeugopterus unimaculatus* | .. | .. | .. | .. | .. | | .. | .. | .. | .. | .. | .. | .. | .. |
| *Pleuronectes platessa* | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| *Pleuronectes limanda* | .. | .. | .. | 1 | .. | .. | .. | .. | .. | .. | .. | .. | 1 | 0·14 |
| *Pleuronectes flesus* | .. | .. | .. | .. | 4 | .. | .. | .. | .. | .. | .. | .. | 4 | 0·6 |
| *Pleuronectes microcephalus* | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| *Solea vulgaris* | .. | .. | .. | .. | 1 | 10 | .. | .. | .. | .. | .. | .. | 11 | 2·64 |
| *Solea variegata* | .. | .. | .. | 2 | 1 | 14 | .. | .. | .. | .. | .. | .. | 17 | 3·94 |
| *Solea lascaris* | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| *Solea lutea* | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| *Serannus cabrilla* | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| *Caranx trachurus* | .. | .. | .. | .. | .. | .. | 8 | 20 | .. | 1 | .. | .. | 29 | 7·17 |
| *Mullus surmuletus* | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| *Morone labrax* | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| *Ammodytes lanceolatus* | .. | .. | .. | 4 | 20 | .. | 1 | .. | .. | .. | .. | .. | 25 | 3·85 |
| *Ammodytes tobianus* | .. | .. | .. | } 1 { | .. | .. | 1 | .. | .. | .. | .. | .. | 1 } 8 | 0·25 } 1·49 |
| *Ammodytes marinus* | .. | .. | .. | | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| *Ammodytes immaculatus* | 2 | 2 | 1 | | .. | .. | .. | .. | .. | .. | 1 | .. | 6 | 1·1 |
| *Cepola rubescens* | .. | .. | .. | .. | .. | .. | .. | 2 | .. | .. | .. | .. | 2 | 0·39 |
| *Callionymus* spp. | .. | .. | .. | 2 | 13 | 51 | 6 | 10 | .. | .. | .. | .. | 82 | 19·3 |
| *Labrus bergylta* | .. | .. | .. | .. | .. | 1 | .. | .. | .. | .. | .. | .. | 1 | 0·25 |
| *Labrus mixtus* | .. | .. | .. | .. | 1 | 1 | .. | .. | .. | .. | .. | .. | 2 | 0·39 |
| *Ctenolabrus rupestris* | .. | .. | .. | .. | 5 | 19 | 18 | 2 | .. | .. | .. | .. | 44 | 10·71 |
| *Crenilabrus exoletus* | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| *Trachinus vipera* | .. | .. | .. | .. | .. | .. | 3 | 2 | .. | .. | .. | .. | 5 | 1·25 |
| *Scomber scombrus* | .. | .. | .. | .. | .. | .. | 16 | 9 | .. | .. | .. | .. | 25 | 6·25 |
| *Gobius* spp. | .. | .. | .. | 19 | .. | .. | 6 | 4 | .. | .. | 1 | .. | 30 | 5·46 |
| *Lebetus scorpioides* | .. | .. | .. | 1 | 1 | .. | 2 | 1 | .. | .. | .. | .. | 5 | 1·03 |
| *Blennius ocellaris* | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| *Blennius pholis* | .. | .. | .. | 1 | 3 | 3 | .. | .. | .. | .. | .. | .. | 7 | 1·32 |
| *Blennius gattorugine* | .. | .. | .. | .. | 1 | 23 | 21 | 5 | .. | .. | .. | .. | 50 | 12·64 |
| *Chirolophis galerita* | .. | 1 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 1 | 0·2 |
| *Mugil* spp. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 2 | .. | 1 | 3 | 0·53 |
| *Agonus cataphractus* | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| *Trigla* spp. | .. | .. | .. | .. | .. | 1 | 2 | 2 | .. | .. | .. | .. | 5 | 1·25 |
| *Cottus* spp. | .. | .. | .. | 1 | 1 | .. | .. | .. | .. | .. | .. | .. | 2 | 0·28 |
| *Cyclopterus lumpus* | .. | .. | .. | .. | .. | .. | .. | .. | 1 | .. | .. | .. | 1 | 0·34 |
| *Liparis montagui* | .. | .. | .. | 1 | .. | .. | .. | .. | .. | .. | .. | .. | 1 | 0·14 |
| *Lepadogaster bimaculatus* | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| *Lophius piscatorius* | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Pipe fish | .. | .. | .. | .. | .. | .. | .. | .. | 1 | .. | .. | .. | 1 | 0·17 |
| Unidentified | .. | .. | .. | .. | .. | .. | .. | .. | 1 | .. | .. | .. | 1 | 0·17 |

there are noticeably more thinner threads than in the pre-war material. In consequence the mesh holes are considerably larger and very much less uniform than in the pre-war stramin. The threads are also very tufted and fuzzy.

Since it was important that this series of observations should continue,

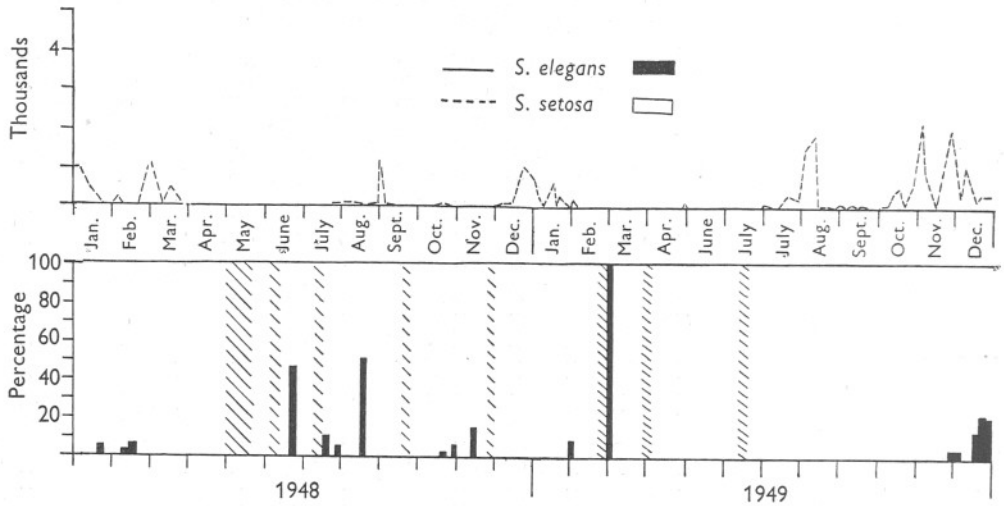


Fig. 1. Above, curves showing the abundance of *Sagitta elegans* (——) and *S. setosa* (– – – – –) in half-hour oblique hauls with the 2 m. stramin ring-trawl in 1948 and 1949. Below, percentage composition of the *Sagitta* populations during the same period: *S. elegans*, black; *S. setosa*, white; no *Sagitta*, hatched. (Continued from Corbin, 1949, p. 710, fig. 1.)

## Table IV. Pilchard Egg Catches, 1949

See Table I for dates of hauls

| | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0* | 0 | 0* | 6 | 630 | 420 | 13 | 0 | 42 | 107 | 0 | 4 |
| | | 3 | | 36 | 590 | 716 | 6 | 0 | 20 | 448 | 0 | 3 |
| | | 63 | | 49 | 412 | 1,610 | 9 | 0 | 96 | 1 | 1 | 1 |
| | | 0 | | 56 | 184 | 568 | 1 | 24 | 2 | 61 | 40 | 0 |
| | | 0 | | 31 | 1,328 | | | | 9 | 1 | | 18 |
| | | | | 157 | 1,160 | | | | 0 | 0 | | |
| | | | | 228 | 836 | | | | | | | |
| Monthly average, 1949 | 0 | 13 | 0 | 80 | 734 | 828 | + | + | 28 | 103 | 10 | + |
| Monthly average, 1937–39 and 1946–47 | + | 0 | + | 478 | 5,868 | 14,093 | 6,196 | 385 | 415 | 305 | 398 | + |

\+ Average of less than 10.
* None taken in any haul in these months.

the 2 m. ring-trawls had to be made up in the inferior material despite the discrepancy of mesh size. The post-war stramin has been in use since mid-September 1947.

The larger mesh of the post-war stramin will undoubtedly have resulted in a loss of some of the catch, particularly the smaller organisms. There has certainly been a very marked poverty of copepods in the catches of the last 2 years. On the other hand, considerable numbers of small *Sagitta* and clupeid larvae have at times been caught, and it is possible that the fuzziness of the threads may have had a slight effect in reducing the actual mesh size.

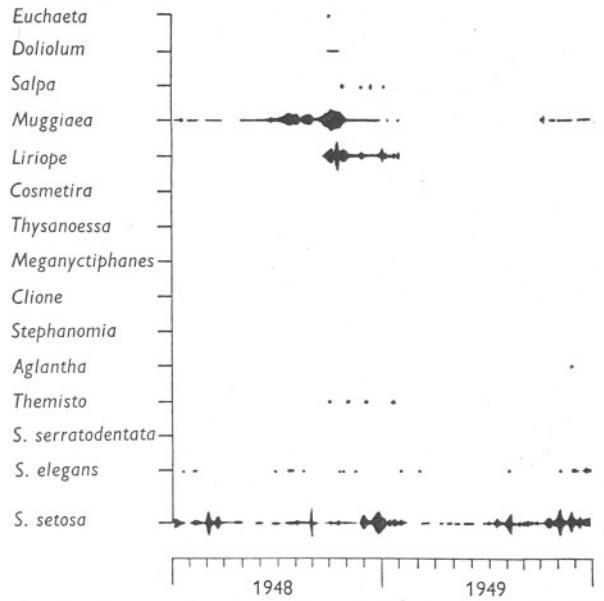


Fig. 2. Diagram showing the occurrence of plankton indicators in the collections off Plymouth in 1948 and 1949. *Note.* The *Muggiaea* present in October–December 1949 were all *M. kochi*. (Continued from Corbin, 1949, p. 711, fig. 2.)

A measure of the loss of catch will be possible by comparative hauls, when stramin of the pre-war quality becomes available.

There is thus some doubt as to the reliability of comparisons between data obtained with the pre- and post-war stramin. Nevertheless, it would seem improbable that major fluctuations would have been obscured, and this appears to be upheld by the continued decline in the sum of the monthly averages of young fish excluding clupeids and in the monthly average catches of pilchard eggs in 1948 and 1949, during both of which years the poorer stramin was in use.

## REFERENCES

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