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CONTINUOUS PLANKTON RECORDS: Studies on Redfish in 1962.

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Sampling with Continuous Plankton Recorders, at the standard depth of 10 metres and at monthly intervals when possible, was continued in the north Atlantic in 1962 along the routes shown by Glover (1962, Fig. 6). With the help of Contract N62558-2834 between the Scottish Marine Biological Association and the United States Office of Naval Research an additional route was inaugurated in March, along the parallel of 60°N latitude from the north of Scotland to Cape Farewell (Greenland). This route is operated by the m.s. "UMANAK" of the Royal Greenland Trade Department in Copenhagen, and when ice conditions permit the sampling is continued up the west coast of Greenland. The additional sampling which has been achieved since 1960 has added much detail to the patterns of distribution of the young stages of Sebastes taken in the months April to July, but has not so far necessitated any material alterations to the distributions shown in earlier reports (Henderson, 1961a, 1961b, 1962).

Large numbers of young Sebastes , without sub-caudal melanophores, and within a size range suggesting their relatively recent extrusion, have occurred in April and May, principally over and to the west of the Reykjanes Ridge between latitudes 63° and 59° N, and between latitudes 58° and 54° N. There was also a smaller concentration off the northern edge of the Newfoundland Banks, between Flemish Cap and longitude 52° W, but young stages were abundant here only in April 1960. Occurrences of small numbers of these planktonic young stages were noted from other parts of the area sampled by the Recorder survey, and indeed in 1961 and 1962 there appeared to have been some return of moderate numbers of young to the large deep bight southeast of the Reykjanes Ridge and south of Iceland where they had been generally scarce since the mid-1930's (See Tåning, 1949, pp. 92, 93).

In a consideration of the results of the 1961 combined Icelandic-German larval redfish survey, Kotthaus (1961) suggested that there might be three centres of distribution of young Sebastes in the north Atlantic, and thought that this was evident in the charts shown by Henderson (1961b). These charts, however, were constructed by combining Recorder results from a number of successive years. It is thought, therefore, that Recorder sampling for a further two or three years, on a scale at least as thorough as that of 1961 and 1962, will be required before this pattern could be demonstrated.

In an earlier account of the young Sebastes in Recorder collections (Henderson 1961a Table I) an attempt was made to compare the mean numbers caught in April and May of each year in a standard area, usually well sampled, to the south and southwest of Iceland. It may be useful to bring this information up to date in case comparisons with similar data from other areas are desired, and these results are shown in Figure 1, the fluctuations being expressed in standard measure. The years up to 1957, before the route between Iceland and Newfoundland was operating, depend on sampling from weather ship routes to Ocean Weather Station 'A' only, and are thought to be less reliable; it seems certain also that

the 1960 figure was minimal, because a vital record across the area in May was lost but there were large numbers just outside the standard area. Figure 1 shows that young Sebastes were more abundant in 1961 and 1962 than ever before in the Recorder survey and, making allowance for the poor sampling in 1960, it seems possible that there was a big difference between their abundance in the first four and the last four years of the survey.

There have been some unfortunate, but unavoidable, gaps in the Recorder sampling in June and July, but the more widespread distribution of the larger sizes of young Sebastes in these months was seen in 1962, as in all the earlier years when the sampling was adequate. The numbers taken in these months were appreciably higher in 1962 than they had been in earlier years, but it is believed that this may be due in part to more complete sampling in this year, as well as being a consequence of the very large numbers of young found in May. It might appear reasonable, and attractive, to postulate a connection between the larger individuals found in Recorder collections from the Reykjanes Ridge area in June and July and those shown to occur in July and August along the Iceland-Greenland Ridge and down the east coast of Greenland (see Einarsson, 1960, Figs. 8,9). The Irminger Sea circulation could be suggested as providing a part of the transport mechanism, but it is the author's opinion that this concept cannot be demonstrated on the basis of the material and knowledge available at present. The effects of mortality, the mechanism of dispersal in both vertical and horizontal planes, the routes over which migration might take place and the precise identification of the larvae found in various parts of this oceanic area are all so imperfectly determined that none could be evaluated and applied. Indeed, the occurrences in Recorder samples of a very small number of quite large individuals in the Irminger Sea area in August (over the last two years) offers the possibility that a part of these larval populations may remain in the area. It is hoped that the continuation of Recorder sampling on the present scale over the next two or three years may provide some further knowledge in relation to these factors.

Plankton Recorder sampling on routes between Cape Race and Halifax and between Halifax and Boston, which lie mainly within the 100 fathom contour, was available in the latter half of 1961 and 1962. Catches of young Sebastes were taken in the Gulf of Maine and over the Nova Scotian Shelf in the months of June, July and August, and the outline of the distribution patterns is shown by Henderson (1962, Fig.4) for the 1961 results. The distribution in 1962 is generally similar, but with the addition of sampling in June. All these young stages are characterised by the presence of one or more sub-caudal melanophores, usually two, and fall within a size range that does not correspond with that determined for the oceanic populations (see Henderson 1962, Fig. 3). The numbers are as yet too limited to provide percentage size frequency histograms, but the numerical size composition is shown in the following table:-

Table 1. The numbers of young Sebastes at each length taken west of Cape Race in 1961 and 1962.

Length in mm	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
JUNE	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
JULY	2	12	11	3	-	-	2	-	1	1	1	1	1	-	-
AUGUST	-	1	-	-	-	1	1	-	-	1	-	-	-	-	-
TOTAL	3	13	11	3	-	1	3	-	1	2	1	1	1	-	-

As stated above, the Recorder catches of young Sebastes in the oceanic areas were composed of specimens without sub-caudal melanophores, which have been considered to be Sebastes marinus. Doubts as to the reliability of this identification are growing, however, see Kotthaus, 1961; Raitt, 1962; and Graham, 1962 (p. 148) and it is evident that more directly related information about parents and young is required. As a result of the

successful angling for redfish at Ocean Weather Station 'A' by the Dutch weather ship "CUMULUS" in May and June, 1961, a series of experimental fishing trials was carried out at this station from British and Dutch weather ships from April to September, 1962. The objectives were, (a) to catch gravid females to furnish material for studies on the characteristics of the pre-extrusion larvae, and (b) to examine the stock of adults which produced the larvae regularly found in abundance in this and adjacent areas. The ships were asked to fish a standard sequence of depths down to 400 metres twice weekly while on station, and apart from one or two periods of bad weather, maintained this schedule throughout. The total reported catch was 107 fish between April 23rd and 14th September, of which 99 were taken in June and July. All were caught within the depth range 80 to 200 metres, and all but 13 between 120 and 200 metres. Thirty specimens, preserved in formalin, were returned to the laboratory, 22 of these from the June-July period. There were 27 female and 3 male fish, and all agreed with the published criteria for mentella type redfish.

There were no gravid females among the specimens returned, all but one apparently immature individual having released their young. However, nearly all these specimens contained a few larvae which had not been extruded. Normally these would be gradually resorbed into the ovarian mass, and in the specimens caught late in the season the larvae were degenerating, but in most of those taken before mid-July many of the retained larvae were in almost perfect condition. No sub-caudal melanophores were seen in any of these larvae, a somewhat unexpected finding in the light of the results presented by Templeman and Sandeman (1959) for pre-extrusion larvae of the marinus and mentella types. It is relevant to note, however, that preliminary results of recent studies on stocks in the Irminger Sea and Icelandic areas by Kotthaus and Raitt have shown that sub-caudal melanophores are not characteristic of young stages of mentella or marinus type redfish from these areas.

These fishing trials from British and Dutch weather ships have been resumed and, with the additional co-operation of the Norwegian and French ships, will be continued throughout 1963. The results of the 1962 trials, with additional reports of catches in September/October and in December, and the results, from January to March, 1963, of the resumed trials, show that adult redfish are present in the vicinity of Ocean Weather Station 'A' (Lat. 62°N, Long. 33°W) for a large part of the year. It now seems possible that there may be a resident population in this area, rather than a concentration of gravid females which have arrived solely for the extrusion of young, after which they disperse. The information available up to the beginning of April 1963 is tabulated below.

Table 2. Samples and Reports of Catches of Adult Redfish at Ocean Weather Station 'A'. 1961-63.

MONTH		JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DI
CATCHES REPORTED[4]		+	+	+	-	+	+	+	+	+[3]		-	+
FISHING TRIALS CARRIED OUT.	T	T	T	T	T[1]	T	T	T	T	T[2]	-	-	(
SPECIMENS RETURNED	No.	7	5	8	0[1]	3(1)	14	8	5	0[2]	-	-	-

(1) 2nd half of month only. (2) 1st half of month only.

(3) between 15 Sept. and 7 Oct., exact date not given.

(4) Catch reported after "personal" fishing.

The specimens received from fishing trials by the Norwegian weather ships in January, February and March, 1963, were all mentella type, with developing ovaries in all the females taken. Although the total number of specimens returned is very small,

it is believed to be the largest sample of this oceanic population which has yet been examined, and it is providing information on the identity of the stocks, the embryology and larval characteristics, the food and feeding, and the parasites, which has not previously been available. It is hoped that more detailed reports will be possible when a full year of sampling has been completed.

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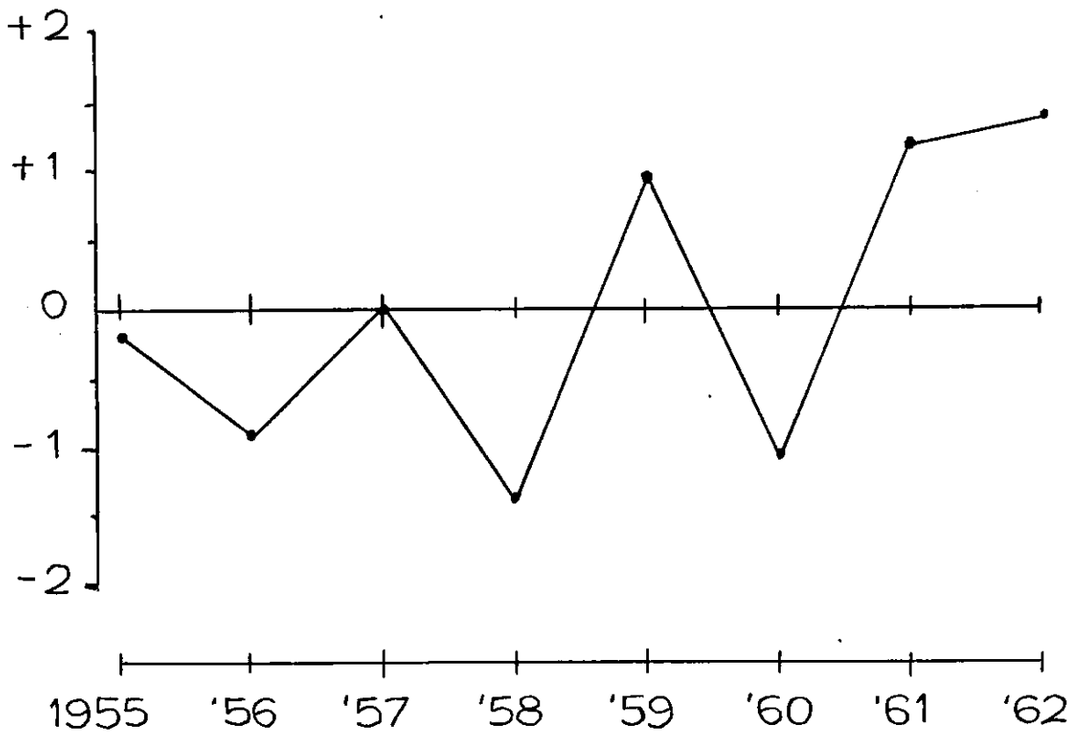

Fig. 1. Fluctuations in the mean numbers per 10 m^3 of young Sebastes in the months of April and May within an area south and southwest of Iceland bounded by the parallels of 59° and 63°N. latitude and the meridians of 19° and 35°W. longitude. The fluctuations are shown as numbers of standard deviations above and below the mean for the years 1955 to 1962.

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