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Preliminary Research Report on Redfish Larvae in Continuous Plankton Records during the NORWESTLANT surveys, 1963.

by

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Routine sampling with the Hardy Continuous Plankton Recorder in the North Sea and North Atlantic was carried out throughout 1963. Details of the Recorder survey in 1963 are provided by Glover and Robinson in a separate report to ICNAF (Serial No. 1338, Doc. No. 43). The work was supported by a grant from H.M. Treasury through the Development Fund and by Contract N62558-3612 between the Office of Naval Research, Department of the United States Navy, and the Scottish Marine Biological Association.

Every opportunity was taken to tow Recorders during the period April to July when the NORWESTLANT surveys were carried out but in April and May the sampling across the Irminger Sea towards Cape Farewell (Greenland) was rather less than had been expected, whereas in June and July this area was more thoroughly sampled. For details of the standard Recorder routes, see Glover and Robinson (Doc. No. 43, Fig. 1a). In previous years the Plankton Recorder survey, at the standard depth of 10 metres, has sampled young Sebastes (hereafter described as "non-pigmented") which have been without sub-caudal melanophores; this is the type apparently characteristic of the oceanic populations. Young of the "pigmented" type (i.e. with one to three, but mostly with two sub-caudal melanophores) had been taken west of Cape Race (E routes, see Glover and Robinson, Fig. 1a), over the Nova Scotian Banks and in the Gulf of Maine but only in fairly small numbers. In 1963, however, the new routes Na and Nb from Newfoundland to Ocean Weather Stations 'B' and 'D' provided sampling over areas not previously traversed, and the pigmented type of young Sebastes were sampled. The populations west of Cape Race were also represented in July. It was thought that it might be useful, for comparative purposes, to describe here the distribution, abundance and size composition of all the larvae found in Recorder samples in 1963, although many of them were taken outside the area of the NORWESTLANT surveys.

DISTRIBUTION

The distributions of all the young Sebastes taken at 10 metres in 1963 are shown in Fig. 1. The line drawn through 55°N, 55°W and 48°N, 40°W on all these monthly charts separates the two types of young. All those taken to the north and east of this line were the non-pigmented type, almost entirely in waters where the depth exceeds 1000 fathoms, whereas those taken to the south and west were the pigmented type, occurring over the shelf or the slope, mainly over depths of less than 250 fathoms.

The non-pigmented (oceanic) young were taken in April in relatively small numbers between the latitudes of 55°N and 61°N, mainly along the line of the Reykjanes Ridge. Their numbers were within the limits previously observed for April. Their distribution in May was very similar, over the Reykjanes and Mid Atlantic Ridges, with some to the east of the Reykjanes Ridge in 60° - 62°N. latitude, but their numbers were very much lower than those usually occurring in Recorder collections in May of previous years. In June these young were widely distributed in moderate abundance from Iceland to Greenland and as far south as 52°N latitude, but the occurrence of large numbers was somewhat patchy. In July the numbers were greater than in June, and the main area of abundance appeared to lie in an arc from east to south 200 to 300 miles off Cape Farewell, Greenland, rather to the west of the axis of the Reykjanes and mid-Atlantic Ridges but the sampling was inadequate to determine the south-easterly limits of the larvae. Only a single specimen was taken in August.

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The pigmented young were first found in May in a small patch at the north-east corner of the Newfoundland Bank, west of Flemish Cap, but this patch was not represented in the following months (in which the area was not as well sampled). In June there was a patch on the new 'Ha' route north of the Newfoundland Bank, the northern limit being at the latitude of the Strait of Belle Isle. The numbers were very small, but these larvae appeared to be the precursors of a very large population which was sampled on the same route in July, the numbers exceeding 100 per 10 m^2. A single specimen was found off the eastern edge of the Bank on the 'Nb' route. On the Nova Scotian shelf (Ea and Eb routes), the first specimens occurred in July, and this population was also represented in August when only two specimens occurred north of the Bank, presumably the remnants of the exceptionally abundant population which was found there in July. This 'pigmented' part of the young redfish population may be separated into two components, a 'slope' population off the Newfoundland Bank, and a 'shelf' population on the Nova Scotian Shelf and in the Gulf of Maine; there appear to be some possible differences between the size compositions in the two regions, see Fig. 3, but more sampling and much larger numbers of larvae will be needed to investigate this possibility.

OCCURRENCES OF NEWLY EXTRUDED YOUNG.

Dr A. Kotthaus (in the press) has suggested that the actual 'spawning' areas of the redfish in the north Atlantic might be considerably less in extent than the area which the late Dr A. V. Tåning had outlined as the 'breeding' area of the species. Kotthaus considered that an examination of the distribution of the smallest sizes of young Sebastes might indicate more precisely the main areas of 'spawning' and suggested that specimens of 7mm in length and under might be considered as the immediate post extrusion stage. The presence of specimens in this size range is plotted in Fig. 2 for the months April to July. The distribution of these larvae in the oceanic area in April is identical with that shown in Fig. 1 as none exceeded 7mm in length in that month. In May they amounted to about 50% of the numbers taken and extended over almost the same area, whereas in June there was only a single occurrence E.S.E. of Cape Farewell, Greenland. The very small stages of pigmented young in the western shelf and slope regions occurred later than those of the oceanic stock. Small numbers found west of Flemish Cap in May were not seen in the following months in this area, but off the northern part of Newfoundland these very young larvae occurred in June and July, whereas west of Cape Race the smallest sizes were found in July and in August. No very clear picture of the distribution of the immediate post-extrusion young of either stock can be constructed from the collections in 1963, but it seems possible that there may be quite a wide distribution of 'spawning' adults and particularly those giving rise to the non-pigmented oceanic larvae.

THE SIZE COMPOSITION.

It is clearly essential to consider separately the non-pigmented, and pigmented forms. Further, in view of their geographical and temporal separation, it seems advisable to distinguish between the pigmented forms found north of the Newfoundland Bank and those of the Nova Scotian Shelf. The percentage size compositions are shown in Fig. 3, where the oceanic non-pigmented young show a size composition very similar to that found in this region in previous years (Henderson, 1961). The stocks off the Newfoundland Bank appear somewhat different in that they apparently commence 'spawning' later, and continue longer, than the oceanic stock, but start and finish earlier than the stock of the Nova Scotian Shelf which did not, apparently, spawn until July, and continued into August. Clearly, however, it is impossible to make any generalizations from a single year's samples, particularly as 1963 seems to have been a rather poor year for the smaller oceanic larvae in May, when formerly they have been very abundant.

ABUNDANCE.

In earlier years an assessment of the annual abundance has been based on the sampling in April and May within a rectangular area, roughly corresponding with area B6 in Glover and Robinson Fig. 1b (Doc. No. 43), to the south and southwest of Iceland. This region has been fairly well sampled from 1955 onwards.

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The mean numbers per 10 m^3 in the area in April and May for each year are shown in Table 1, where it may be noted that the figures for 1963 are almost as low as in the exceptionally poor year of 1958. That year was found to be one of unusually low abundance over the whole area of distribution of Sebastes, but it cannot yet be determined whether the same is true of 1963. It is hoped that sampling from NORWESTLANT cruises over areas not traversed by Recorder routes may supplement the assessment of young Sebastes in 1963, as the numbers taken in May appear a good deal lower than would have been expected from the abundance of larvae in June and July.

TABLE I.

Mean numbers of Sebastes larvae per $10m^3$ during April and May in the standard area south of Iceland.

YEAR	1955	1956	1957	1958	1959	1960	1961	1962	1963
Nos/$10m^3$	2.7	1.3	3.1	0.4	4.9	1.1	5.4	5.8	0.45

REFERENCES.

HENDERSON, G.T.D. (1961). Continuous Plankton Records: The distribution of young Sebastes marinus (L.). Bull. Mar. Ecol., 5: 173-193.

KOTTHAUS, A. In the press. The Breeding and larval Distribution of Redfish in relation to water temperature. Serial 1230 (B. Rept.O.) Contribution No. B.17. ICNAF Environmental Symposium, Rome, 1964.

LEGENDS FOR FIGURES.

FIGURE 1. Charts showing the distribution of young Sebastes in Recorder collections during the months April to July, 1963. The heavy line separates the "pigmented" and the "non-pigmented" types (see text).

FIGURE 2. Charts showing the occurrences of young Sebastes of lengths of 7mm and under in Recorder collections during the months April to July, 1963. Abundance is not indicated.

FIGURE 3. Histograms showing the percentage size frequency composition of young Sebastes during the months April to July, 1963. Separate series of histograms are shown for (a) the oceanic stock, (b) the stocks around the Newfoundland Banks, and (c) the stocks on the Nova Scotian Shelf and the Gulf of Maine.

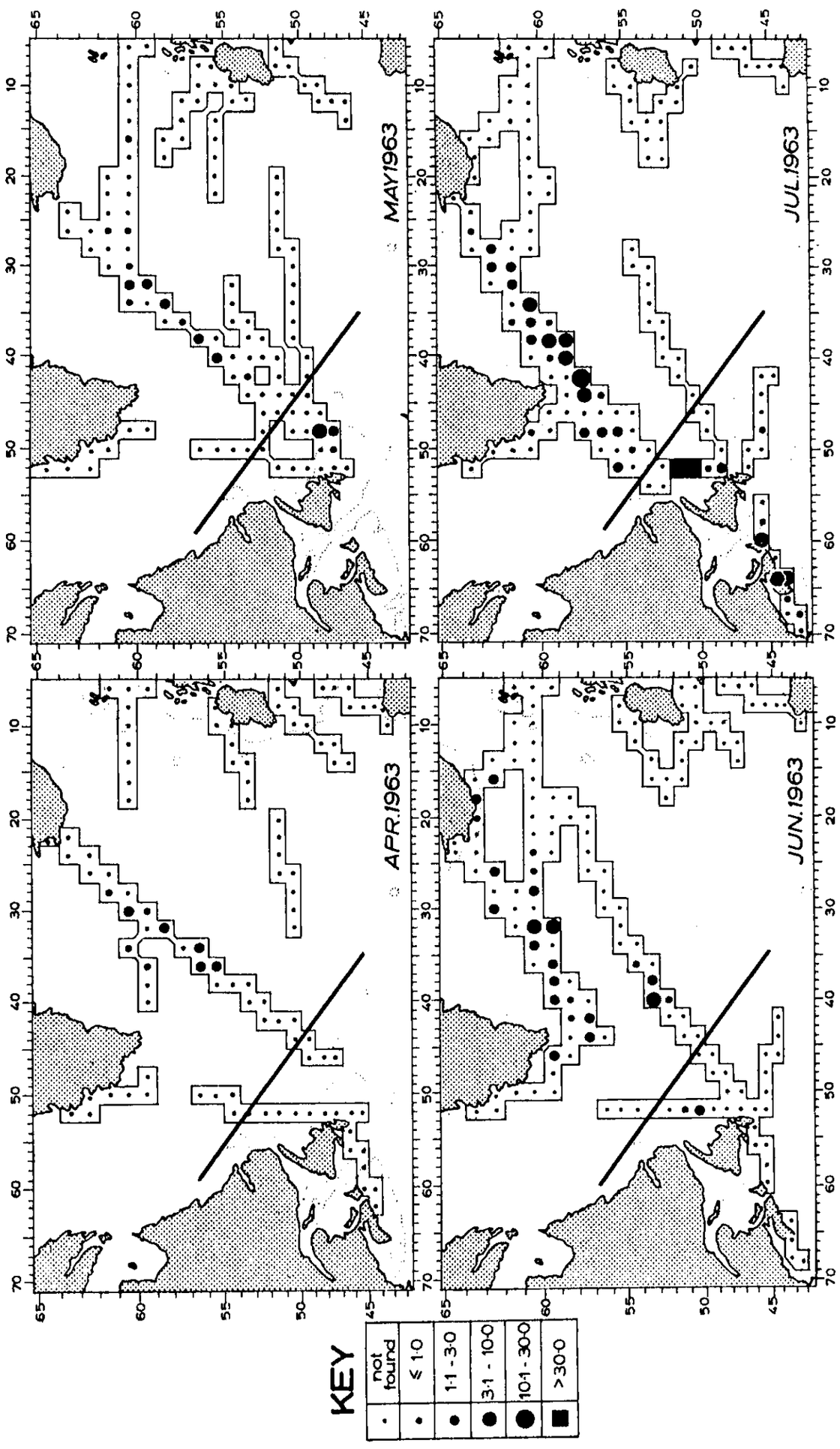
MAY 1963
JUL. 1963
APR. 1963
JUN. 1963
KEY
not found
≤ 1·0
1·1 - 3·0
3·1 - 10·0
10·1 - 30·0
>30·0

Figure 1

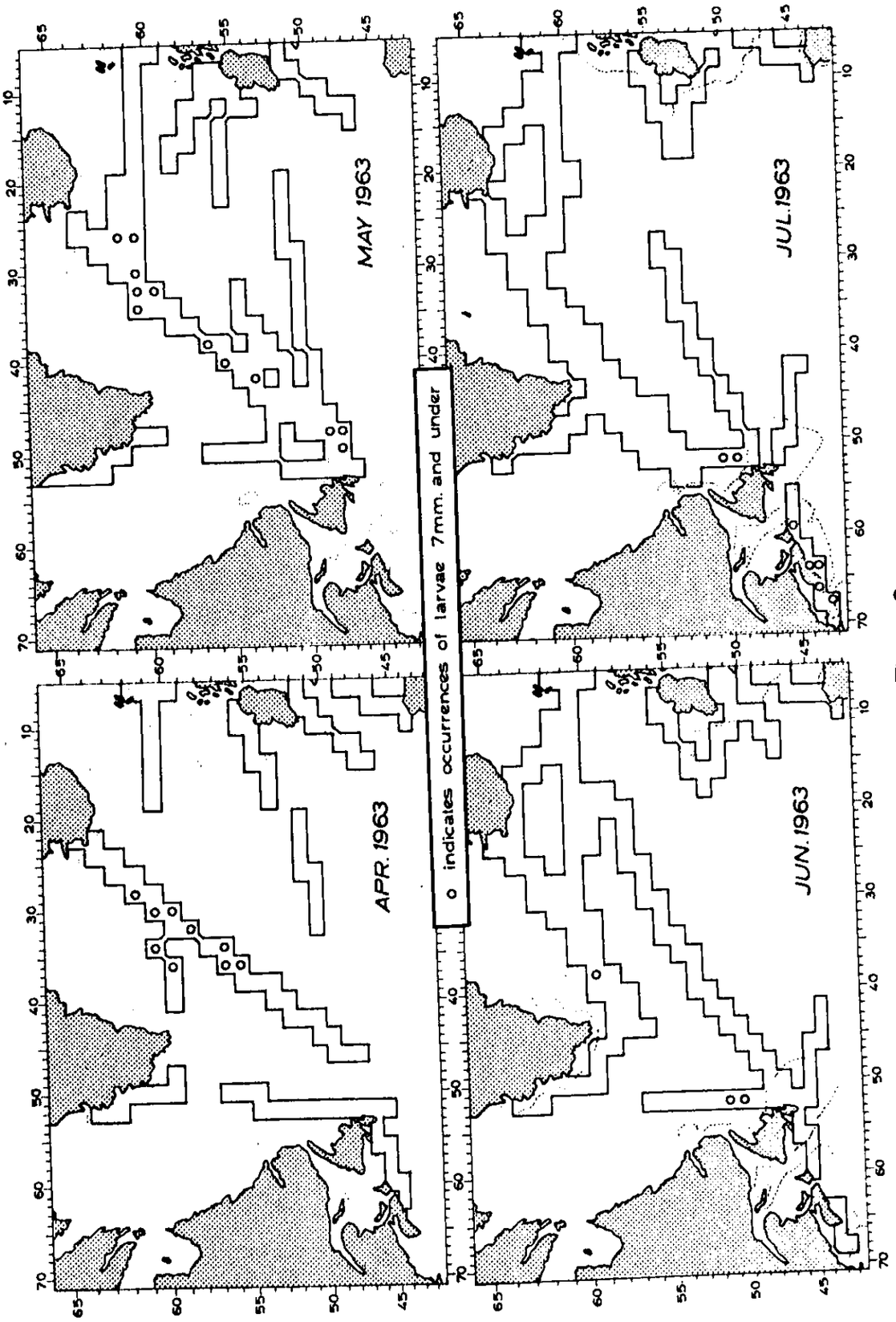
MAY 1963
JUL. 1963
APR. 1963
JUN. 1963
o indicates occurrences of larvae 7mm. and under

Figure 2

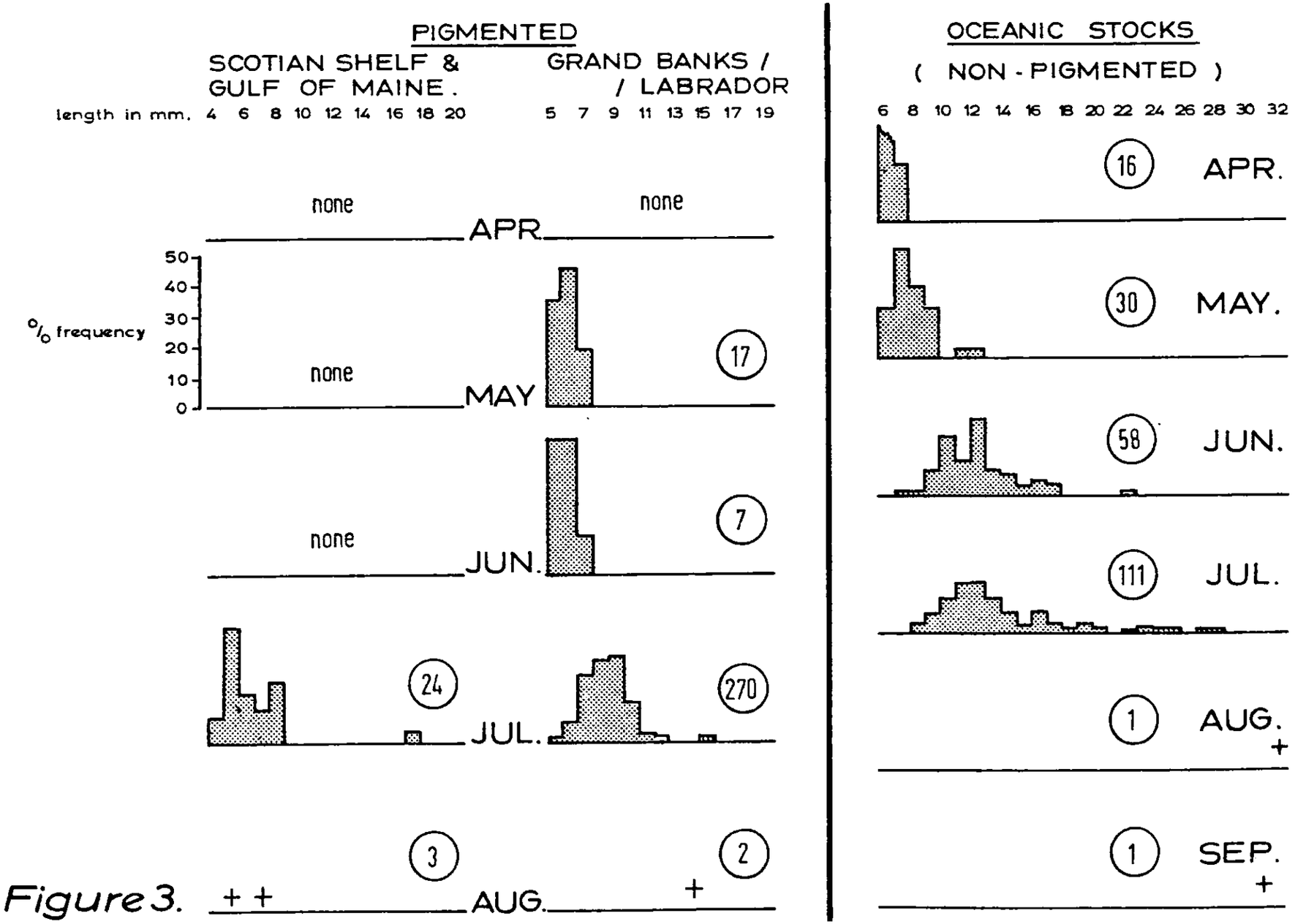
PIGMENTED
SCOTIAN SHELF & GULF OF MAINE.
GRAND BANKS / / LABRADOR
length in mm. 4 6 8 10 12 14 16 18 20
5 7 9 11 13 15 17 19
% frequency
50
40
30
20
10
0
none
APR
none
none
MAY
17
none
JUN.
7
24
JUL.
270
3
AUG.
++
2
+
OCEANIC STOCKS
(NON - PIGMENTED)
6 8 10 12 14 16 18 20 22 24 26 28 30 32
16 APR.
30 MAY.
58 JUN.
111 JUL.
1 AUG. +
1 SEP. +

Figure 3.