

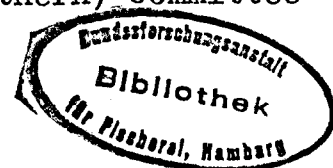
D

This paper not to be cited without prior reference to the authors



International Council for
the Exploration of the Sea

C. M. 1971/H:26
Pelagic Fish (Northern) Committee



OBSERVATIONS ON DISTRIBUTION AND MIGRATION OF
Micromesistius poutassou (RISSO, 1810) IN THE NORTHEAST
ATLANTIC

By

O. Dragesund and S. H. Jakupsstovu
Institute of Marine Research, Bergen, Norway

INTRODUCTION

The blue whiting Micromesistius poutassou (RISSO, 1810) is not at present subjected to a very extensive fishery in the Northeast Atlantic. Except for a Spanish blue whiting fishery centered in the Mediterranean off the Catalonian coast, catches of this species from Northeast Atlantic are grouped with several other species under the categories "various gadiformes" and "various other species" and landed for production of fish meal and oil. Recent investigations of the species composition of this unspecified category of industrial landings in Norway indicate that the proportion of blue whiting constitutes a significant part of the total catches. Both the catches and the percentage of blue whiting in the catches have increased during the last decade (RAITT 1968, LAHN-JOHANNESSEN and RADHAKRISHNAN 1970).

With the fragmentary knowledge at present available is it difficult to estimate the exploitable potential of this species in the Northeast Atlantic. SCHMIDT (1909) and HENDERSON (1957, 1964) have drawn attention to the very large number of blue whiting larvae that are found in the area West of the British Isles beyond the edge of the continental shelf from March to May. They concluded that the adult population in this area probably was considerable.

Observations made in the Norwegian Sea and the area between Iceland and the Faroes and farther East towards the West coast of Norway also show that blue whiting occur in abundance in this area (ØSTVEDT, 1961, MOHR 1968, BLINDHEIM, JAKUPSSTOVU, MIDTTUN and VESTNES 1971).

The total area of distribution in the Northeast Atlantic ranges from the Mediterranean to the Arctic Ocean (RAITT 1968, TÅNING 1958), but little is known about the likely subdivision of the total blue whiting population into smaller self sustaining spawning groups. SCHMIDT (1909) points out that the spawning areas are found in the Southern parts of the area where the species is distributed. He suggested that spawning takes place in mid-water on the lower slope of the coastal banks and off the banks towards deeper water West of Scotland and Iceland, bounded to the north by the Faroes and Iceland. More recent investigations have revealed that spawning may also take place in the southern part of the Norwegian Sea (ZILANOV 1966).

Before this potential resource assumes greater economic importance there is a strong need to fill in gaps in our knowledge about the differential oceanic distribution and migration, availability and catchability of the species. At the Institute of Marine Research, Bergen, more systematic research has been initiated to study the distribution and migration of blue whiting. The present paper reports some preliminary results from the most recent Norwegian investigations.

MATERIAL AND METHODS

The material includes data from surveys by research vessels and samples of blue whiting collected from commercial catches in the industrial fisheries.

Surveys

During the period from June 1970 to May 1971 five surveys of blue whiting were carried out in the Norwegian Sea by R/V "G.O. Sars" (BLINDHEIM, JAKUPSSTOVU, MIDTTUN og VESTNES 1971, BLINDHEIM, BRATBERG og DRAGESUND 1971, JAKUPSSTOVU og NAKKEN 1971). The acoustic instrumentation and the computer centered data logging system of R/V "G.O. Sars" are described in a pamphlet on the

vessel (Anon 1970). During the cruises Simrad echo integrators were linked to a Simrad EK. 38kHz echo sounder with the following settings: Output power 8.9 kw, 0.6 ms, receiver amplification 20 log R-20db. The amplification on the integrator was varied from 30 to 40 db and the threshold on the integrator was constantly set at 3. The integrator channels covered the following depths: 5-50, 50-100, 100-150, 150-200 and 200-250 m. In some instances when parts of the registrations were deeper than 250 m, one or two of the channels were extended to cover a deeper depth range. Echo integrator readings were recorded as average values of the echo abundance for every five nautical miles and isolines for equal levels of echo abundance were drawn on charts.

When other species than blue whiting were recorded within the same integrator intervals, the total echo abundance was divided between blue whiting and other species according to their relative abundance as found by experimental fishing and analysis of the echo traces.

Blue whiting samples

During the surveys blue whiting were caught by midwater trawls on all but one occasion when the light bottom trawl used by the "industrial" trawlers was used. The midwater trawls were either the large German "Engel" type trawl or a smaller Norwegian capelin trawl ("Harstad" trawl).

For biological analysis the first 100 specimens were taken from a basket chosen at random from the catch. On some occasions length measurements of all the fish in a basket were taken. The length was measured to the nearest half cm below.

On landing the commercial catches are often in such a condition that only fish from the last haul is fit for length measurements. Therefore data on length, weight, age etc. were recorded for 20 l of blue whiting taken at random from the last haul. In order to estimate the species composition of the catch, 20 l more were taken, 10 l from the middle of the charge and 10 l from the bottom. The same procedure was used when sampling from shrimp trawlers. The locations of the different fishing grounds are shown in Figure 1.

RESULTS

Distribution and abundance

The integrator readings showing the echo abundance of blue whiting are given in Figs. 2 and 3. In June 1970 the densest concentrations were found in the area between East Iceland and the Faroes. Thinner, but still rather abundant concentrations were, also recorded Northeast of the Faroes. The gradients of the echo abundance indices were largest north of the Faroes. In July-August the blue whiting, were more scattered than in June and the boundaries of the distribution were found farther to the Northwest and Northeast with denser concentrations in the northeastern part of the Norwegian Sea. The records in November-December also demonstrated a rather scattered distribution with maximum concentrations Northwest of the Faroes almost in the same area as in June. In April-May 1971 only scattered recordings of blue whiting were obtained north of latitude 63° N. The greatest concentrations were found between the Faroes and the North Sea plateau. Minor, but fairly dense concentrations were found in the North Sea at the entrance of the Norwegian Deep and north of the Faroes.

Length in relation to area of distribution

The samples of blue whiting collected in different periods are grouped according to areas as indicated in Fig. 1. This grouping is chosen in order to show the difference in lengths between blue whiting observed in the open ocean (areas I-III) and those recorded at the continental shelf (areas IV and V). The most homogeneous length distributions were found in areas I and II with relatively large modal lengths (Fig. 4). In area II the modal lengths varied around 30 cm, while farther to the North (in area I) somewhat greater modal lengths were observed. Some of the length distributions in area III (Fig. 5) were similar to those in area II, but in most cases the modal lengths were lower and some length distributions were bimodal. In contrast to areas I, II and III, fish of lengths between 25 and 30 cm were rather scarce in area IV (Fig. 5). In this area mainly smaller fish, below 25 cm, occurred. On the other hand, large fish (above 30 cm) were also recorded in some of the samples. In area V only young fish were recorded.

CONCLUDING REMARKS

The present investigations demonstrates that a northward migration of blue whiting takes place through the channel between the Faroes and Shetland in spring. The echo surveys in April-May 1971 and in June 1970 suggest that there are two migration routes into the Norwegian Sea. One is towards Northwest, probably along the warmer side of the front between the cold East Icelandic Current and the warmer Atlantic water. In June this migration has reached the area off East Iceland and is found on the warmer side of the Polar front. The other migration is directed northwards in Atlantic water through the central part of the Norwegian Sea.

During the summer from July to August a farther northward migration takes place. In order to cross the cold East Icelandic Current the fish recorded in the area East of Iceland ascend into the surface layer to migrate farther North in water of temperature of 3-5°C (BLINDHEIM, BRATBERG og DRAGESUID 1971). In August-September the blue whiting are scattered all over the central and northeastern part of the Norwegian Sea with the most dense concentrations in the area West of the continental shelf between northern Norway and Spitsbergen.

The return migration from the feeding area to the spawning grounds West of the British Isles probably takes place in opposite direction during late autumn and early winter.

The hypothesis outlined for the migration routes of the blue whiting (Figs. 2 and 3) is also supported by the length distributions. The blue whiting caught in areas I, II and partly III were adults with negligible admixture of smaller fish. The occurrence of larger fish, with modal lengths above 30 cm, in the northernmost part of area I and in some of the samples from the continental shelf indicates that older fish may penetrate farther away from the center of distribution than the younger fish.

Samples from area IV had a greater admixture of smaller fish, and those caught on the Faroe Plateau were entirely young fish (area V, Fig. 5), indicating that the slope of the shelf is an important nursery area. The mixed composition of the samples in area III may be explained by recruitment of younger fish to the

adult population.

It is tentatively concluded that young blue whiting mixed with adults may be recorded in catchable concentrations along the slope of the shelf and adult fish may occasionally form fairly dense shoals during summer and early autumn in the Norwegian Sea. However, during the period covered by this investigation the most dense concentrations were observed in April-May. Therefore the period prior to, during and just after spawning should be more thoroughly investigated, i.e. from February to May.

REFERENCES

- ANON. 1970. The new R/V "G.O. Sars". Bergmanns Boktrykkeri A/S, Bergen. 38 pp.
- BLINDHEIM, J., JAKUPSSTOVU, S. H., MIDTTUN, L. og VESTNES, G. 1971. Kolmuleundersøkelser med F/F "G.O. Sars" til Norskehavet 12-29 juni 1970. Fiskets Gang, 57: 26-29.
- BLINDHEIM, J., BRATBERG, E. og DRAGESUND, O. 1971. Fiskeriundersøkelser med F/F "G.O. Sars" i Irmingersjøen og Norskehavet 28 juli-21 august 1970. Fiskets Gang, 57: 168-173.
- HENDERSON, G.T.D. 1957. Continuous plankton records. The distribution of young Gadus poutassou (Risso). Bull. mar. Ecol., 4: 179-202.
- HENDERSON, G.T.D. 1964. Young stages of blue whiting over deep water west of the British Isles. Annls. biol., Copenh., 19: 59-60.
- JAKUPSSTOVU, S.H., og HAKKEN, O. 1971. Kolmuleundersøkelser i Norskehavet i april-mai 1971. Fiskets Gang, 57: 605-607.
- LAHN-JOHANNESSEN, J. and RADHAKRISHNAN, N. 1970. Observations on silver smelts (Argentina sp.) from the Norwegian Deep. Coun. Meet. int. Coun. Explor. Sea, 1970 (F 13): 1-9 [Mimeo].
- MÖHR, H. 1968. Beobachtungen über Vorkommen und Verhalten des Blauen Wittlings (Micromesistius poutassou, Risso), Precht. Fisch. Tech., 11: 116-127.
- RAITT, R.F.S. 1968. Synopsis of biological data on the blue whiting. Micromesistius poutassou, (Risso 1810). F. A. O. Fisheries synopsis No. 34, Rev. 1. 30 pp.
- SCHMIDT, J. 1909. The distribution of the pelagic fry and the spawning region of the gadoids of the North Atlantic from Iceland to Spain. Rapp. P. -v. Réun. Cons. perm. int. Explor. Mer, 10: 1-229.
- TÅNING, Å. V. 1958. Observations on supposed intermingling or a certain connection between some stocks of boreal and sub-arctic demersal food fishes of the eastern and western Atlantic. Spec. Publs. int. Comm. NW. Atlant. Fish., 1: 313-325.
- ZILANOV, U. K. 1968. Occurrence of Micromesistius poutassou (Risso) larvae in the Norwegian Sea in June 1961. Rapp. P. -v. Réun. Cons. perm. int. Explor. Mer, 158: 122-125.
- ØSTVEDT, O.J. 1961. Sildundersøkelser i Norskehavet med F/F "G.O. Sars" 5-17 des. 1960. Fiskets Gang, 47: 364-365.

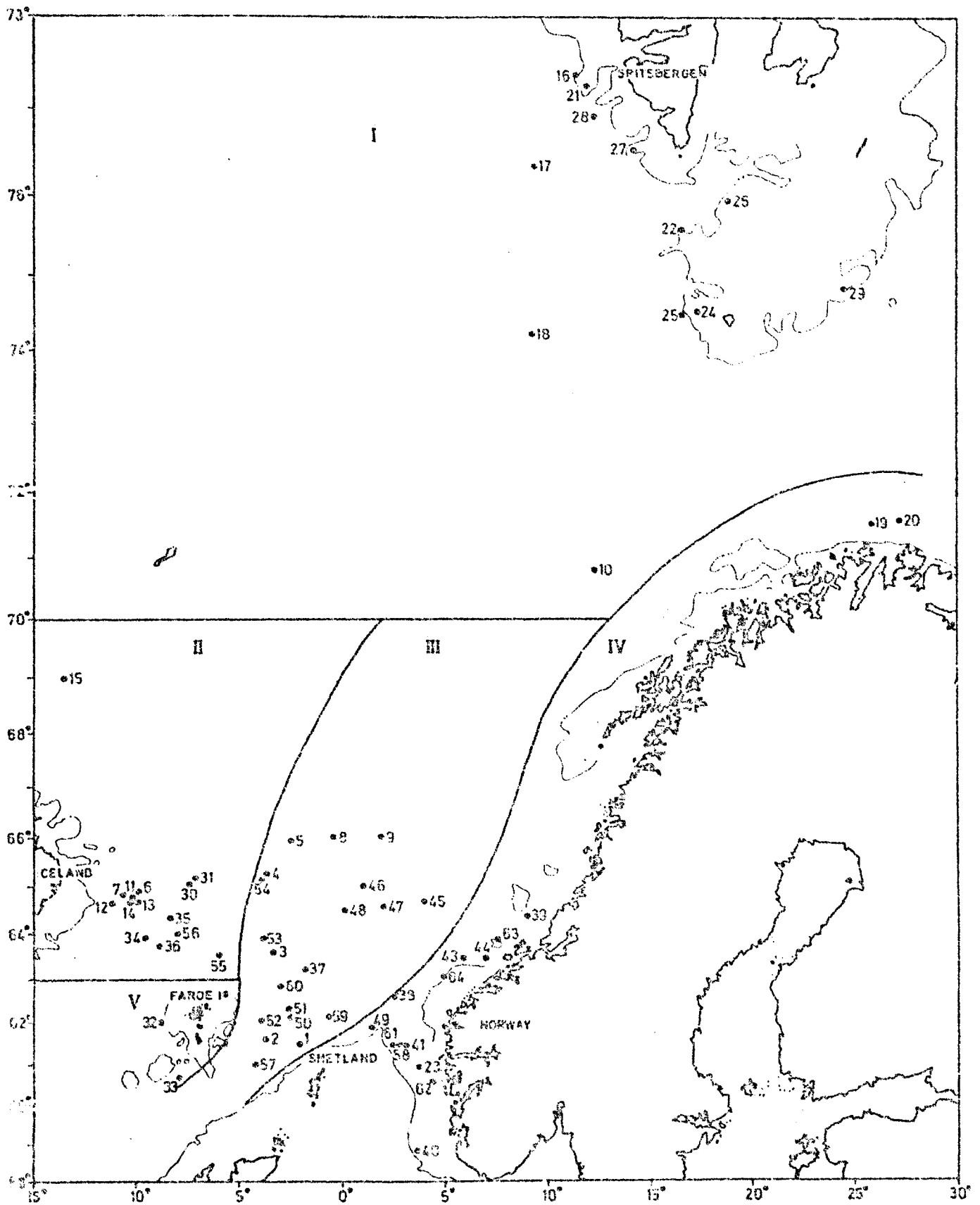


Fig. 1. Distribution of blue whiting samples collected from June 1970 to May 1971. The number correspond to sample numbers in Figs. 4 and 5. The lines indicate the subdivision of areas and the roman numerals denote the code numbers of the areas.

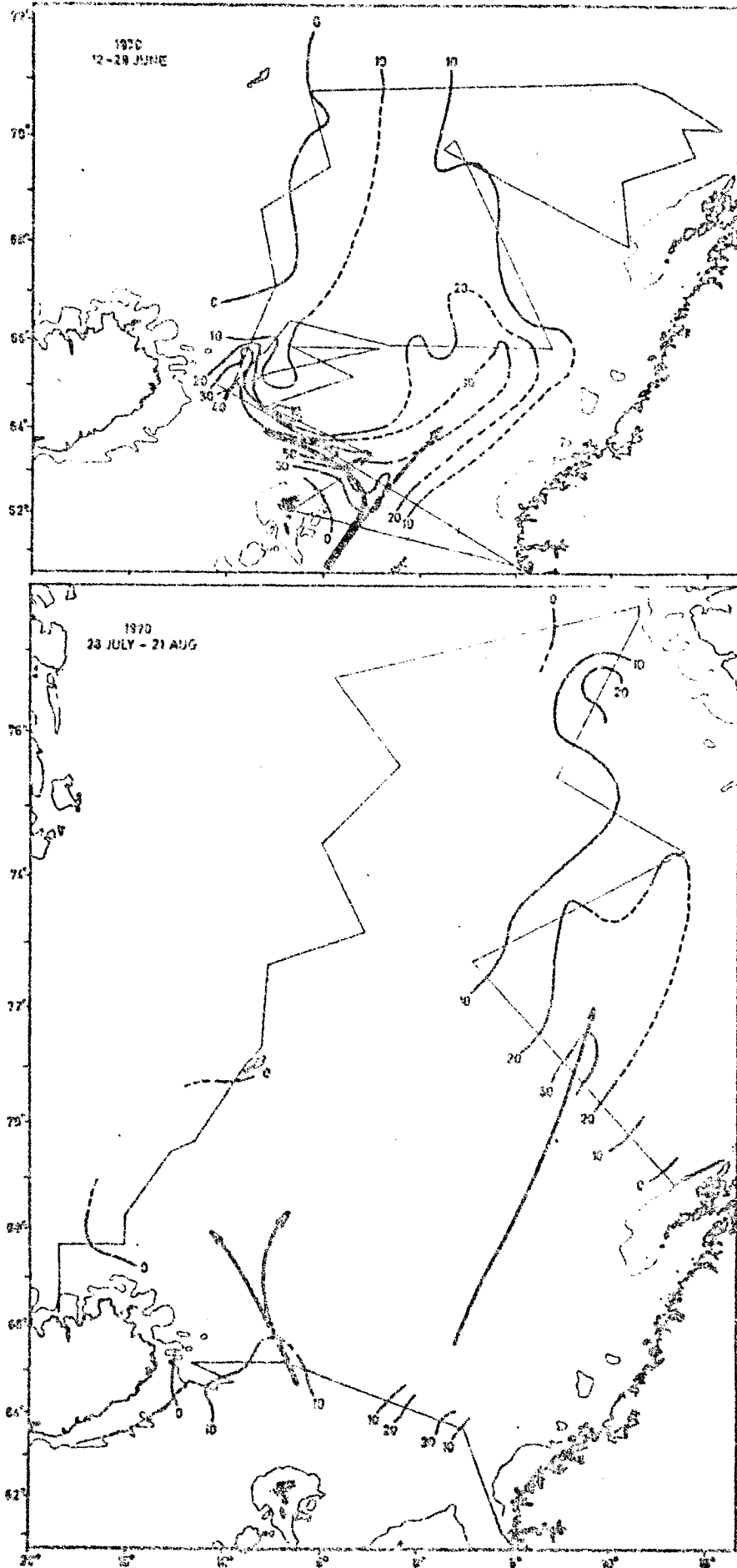


Fig. 2. Echo abundance distribution of blue whiting, as determined by the echo integrator during the surveys in June and July-August 1970. The arrows indicate the likely migration route of blue whiting.

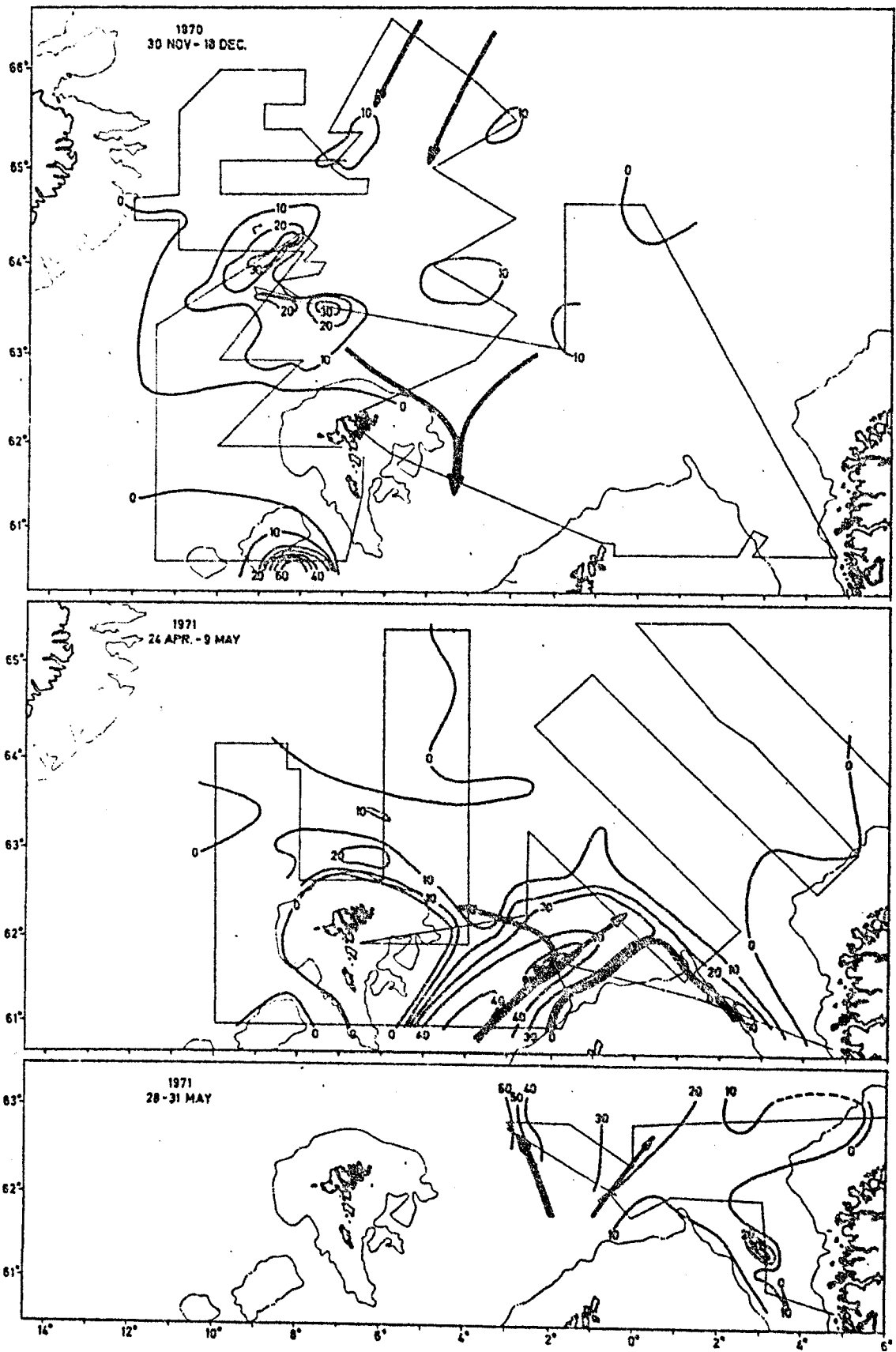


Fig. 3. Echo abundance distribution of blue whiting as determined by the echo intergrator during the surveys in November-December 1970, April-May and May 1971. The arrows indicate the likely migration route of blue whiting.

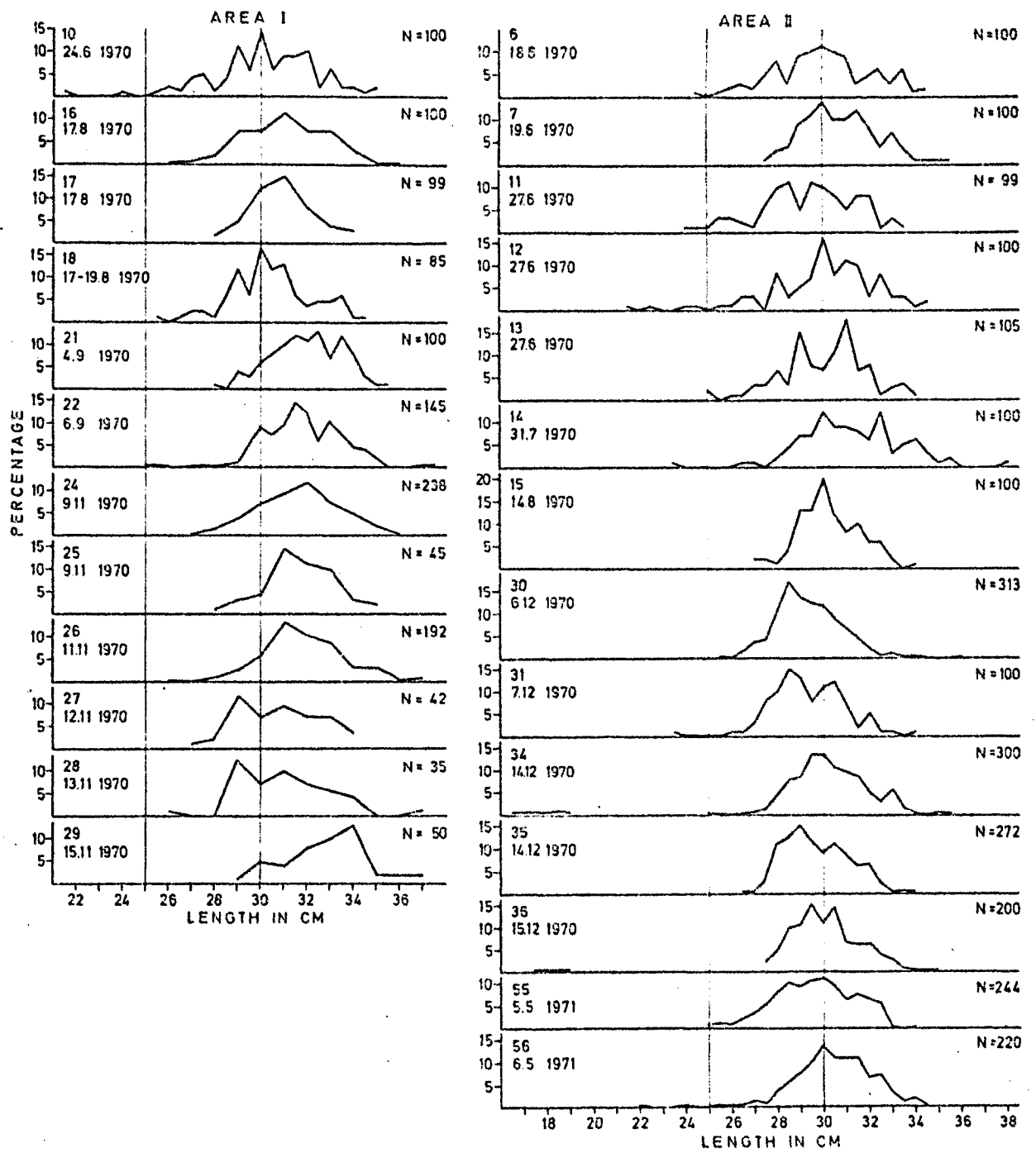


Fig. 4. The length composition of blue whiting caught in areas I and II in 1970 and 1971.

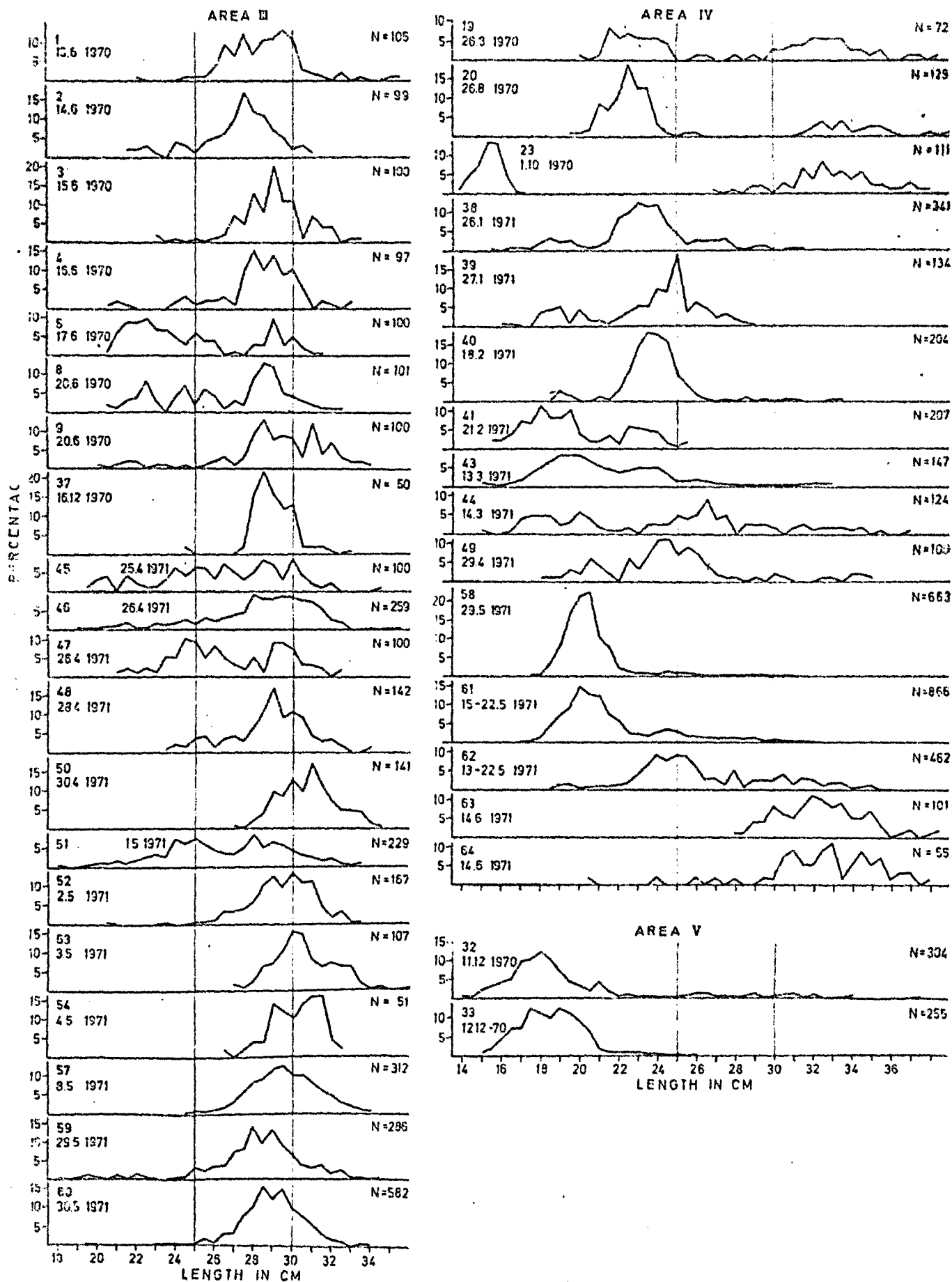


Fig. 5. The length composition of blue whiting caught in areas III, IV and V in 1970 and 1971.