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PRELIMINARY REPORT ON MULTI-VESSEL TRAWL SURVEY ON BOTTOMFISHES IN THE EASTERN BERING CONTINENTAL SHELF IN SPRINGTIME, 1980

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September 1980

Multi-vessel trawl survey with a main view to estimating the abundance of stocks of young pollock has been conducted every year since the fall of 1976 on the designated stations in the eastern Bering continental shelf using Danish seiners attached to Surimi mothership fleets. The survey was carried out twice, in spring and fall, this year, too. The spring survey conducted in June 1980 gathered further data in addition to those piled up by the preceding two spring surveys commenced in 1978. The results of the survey are currently under examination and, thus, outlined as hereunder only to an extent so far clarified:

For bibliographic purposes this document should be cited as follows:
YAMAGUCHI, Hirotsune. 1980: Preliminary report on multi-vessel trawl survey on bottomfishes in the eastern Bering continental shelf in springtime, 1980. Fisheries Agency of Japan. 16 P.

Outline of the Survey

The survey was carried out for about a fortnight from June 7 through June 19 by 5 Danish seiners attached to four Surimi mothership fleets in commercial operation. 125 stations were predetermined as designated in the past years south of 60°N latitude in the eastern Bering continental shelf. Four mothership fleets covered the designated stations shared almost equally and had one haul conducted at each station using one or two of seiners attached to respective Surimi mothership. Survey items covered at each station was composed of catch composition by species and fork length composition and age structure (scale) collection of pollock.

The designated stations were covered toward northwest from the southeastern area of the eastern Bering continental shelf as follows: 35 stations covered by Mitsu maru No. 50 (124.10 tons) of Mineshima maru fleet during June 9 - 17; 31 stations by Soho maru No. 32 (124.70 tons) of Hoyo maru fleet during June 11 - 19, 36 stations by Hokko maru No. 17 (124.54 tons) of Shikishima maru fleet during June 7 - 14 and 35 stations by Akatsuki maru No. 1 (96.61 tons) and Shoken maru No. 8 (96.94 tons) attached to Nisshin maru No. 2 fleet for the period of June 7 - 11. The above research vessels were composed as the year before except a new participant Soho maru No. 32.

16 stations were implemented hauls overlappedly by two vessels out of the total 137 stations at which hauls were carried out.

The gear used for the survey were of the same specifications as those for the preceding year.

The station number, charging area and sampling strata of each mothership fleet are illustrated in the Fig. 1.

Survey Results on Pollock

Catches by station: Distribution of pollock catches by station in shown in the Fig. 2.

In the Area E, the catch was large in the vicinity of the trawl prohibition zone provided along Alaska Peninsula. The distribution pattern there showed a possibility of high pollock density existing in the prohibition zone. Considerable catch was made in the area shallower than 80 m where very small catches were made for the spring surveys in the previous two years.

In the Area M, substantially high density of catch was confirmed southwest of Pribilof Islands, which is similar to the trend of catch distribution seen in the year before. It was characteristically observed with this area that considerably high catch was recorded in the area shallower than 80 m in depth in comparison with the preceding year.

In the Area W, high density of catch was recognized in the depth range of 100 - 150 m and the distribution of catch in 1980 is more akin to the pattern recorded in 1978 than in 1979.

Average fork length by station: Distribution of average fork length by station is shown in the Fig. 3.

In the Area E, distribution of schools with such average fork length was remarkable as follows: large-size fish over 50 cm in the depths shallower than 80 m; 40 - 50 cm size group in the depths over 150 m and 35 - 40 cm size group in the depth range of 100 - 150 m. This considerably differs from one of the characteristics for the previous year that the distribution of group over 40 cm was observed outstanding in the depths over 100 m.

In the Area M, only small-size group with less than 30 cm fork length distributed in the depths over 80 m while distribution of size group over 35 cm was mainly found in the shallower water than 80 m. In this area the trend toward smaller sizes were observed in comparison with the distribution of the preceding year.

In the Area W, distribution of stock with 30 - 40 cm fork length was primarily observed as in the previous year and average fork length was generally inclined to become smaller at any station.

CPUE by area and stratum (in kg per haul): The Fig. 4 shows CPUE (in kg per haul) by area and depth zone, both of which are defined in the same manner as in the preceding year, over three years of 1978 through 1980.

In the Area E, the CPUE value was higher in the depths shallower than 100 m and lower in the depths over 100 m in 1980 than the value recorded in 1979. Such a similar tendency was observed as in 1978 that high density was found in the 80 - 100 m depth zone while lower density was seen in other depths.

In the Area M, CPUE value was higher in the depths less than 100 m and, on the other hand, lower in the depths over 100 m in comparison with the previous year. Density in the depths over 150 m was high in 1979 while it was found lower in 1980. It is, however, necessary to take into account a tendency seen in the depth zone of 100 - 150 m for the purpose of determining the density of pollock in this area as the number of haul in the 150 - 300 m depth zone was counted only at one or two stations a year there.

In the Area W, CPUE value in 1980 was lowest in the depth zone of 80 - 100 m and higher in the depths other than that, which was a reversed situation of what was observed in the Area E. The above value in 80 - 100 m depth zone was more or less in the same level as seen in 1978 and the value in the other zones was higher than those recorded in the preceding years. In this area, the trend has been observed to gather stock density along with an increment of depth since 1978.

Throughout the areas, 50 - 80 m depth zone had high density of CPUE for all areas with highest density recorded in 1980. In the depth zone of 80 - 100 m, 1980 value intermediated the values for the previous two years with reflection of the result from wide year to year fluctuation seen in the Area E. In the 100 - 150 m depth range, the highest density was observed in 1978 with almost the same value for the years 1979 and 1980, as a result of 1978 high density recorded in the Area M.

The level of CPUE value was not only one essential factor for this survey which had it as one of primary objects to examine year to year fluctuation of the abundance of recruitment of young pollock. The tendency of abundance will be described later in the section to deal with the length composition.

Seasonal fluctuation of CPUE by area is shown in the Fig. 5. Such a pattern was confirmed by the 1980 survey that CPUE during the fall season was always higher than that of the spring season, which indicates a seasonal change existing in the density behaviour of pollock.

Fork length composition of pollock: The fork length composition by area and year from 1978 - 1980 are shown respectively in the Figs. 6 and 7 using the relative biomass estimated by multiplying the area at each stratum to the size composition of the CPUE.

In the Area E, the fork length composition shifted from modes of 31 cm and 49 cm in 1978 to those of 23 cm and 37 cm in 1979 with the distribution moving toward smaller size. But a shift toward larger size was observed with modes of 37 cm and 45 cm prevailing in 1980.

In the Area M, the stock abundance of small-size pollock was indicated to have appeared as very high modes were shown on 25 cm and 33 cm in 1979 in spite of a single mode of 27 cm recorded in 1978. In 1980 modes of 17 cm and 31 cm appeared with stocks of young pollock smaller than 20 cm having become approximately 1.4 times as much as observed in 1979.

In the Area W, considerable variation was observed as for the stock abundance and the value of mode appearing from year to year. This may substantiate existence of an extensive yearly fluctuation seen with the density behaviour of pollock in the Area W. Despite such an extremely high mode seen for 23 cm in 1978 indicating the density of small-size pollock, only low modes existed for 29 cm and 35 cm in 1979. Modes were observed on 25 cm, 35 cm and 45 cm in 1980, which showed a very similar pattern of composition seen in the Area E in 1979.

The fluctuation of fork length composition shown in the Fig. 7 indicates high mode for 23 cm reflecting a massive biomass of small-size pollock and such a mode for 47 cm as suggesting abundant large-size fish biomass in the Area W in 1978. In 1979, 23 cm and 33 cm were on mode reflecting the abundance of 20 - 30 cm size pollock in the Areas E and M as many fish groups were found there.

In 1980, modes appeared extensively on 17 cm, 27 cm, 35 cm and 45 cm. Pollock smaller than 20 cm were found 10.5 times and 1.1 times as those respectively in 1978 and 1979, although fluctuation of abundance by age cannot be shown as the aging is still under way. This is justified to indicate the abundance of recruitment of young pollock. Considerable number of pollock out of the group having appeared with mode of 23 cm in 1978 were observed to still remain in the range of 40 - 49 cm, by which survival of old pollock is assumed in good condition.

Horizontal distribution of bottom water temperature: The Fig. 8 sets out the isotherms based on the bottom water temperature observed at each station by research vessels using D.B.T. or reversing thermometers. The feature characterized with the year of 1980 was that mass of cold water under zero degree centigrade appeared unlike the preceding two years. It must have been colder in the continental shelf than the previous year. Pollock of average fork length of 20 - 29 cm are the majority of distribution in the depths shallower than 80 m in the Area E where the water temperature was over 4°C in 1979, but it was about 2 - 3°C with the average fork length of 50 - 59 cm there. It is assumed that the level of bottom water temperature may have a considerable influence on distribution pattern of old and young fishes.

The foregoing is the outline of the results derived from the spring survey conducted in 1980. Trend of recruitment of young pollock in 1980 will be determined with additional data to be obtained from the 1980 fall survey carried out in August through September and also results coming from the aging assessment. As far as, however, the preliminary results were obtained from examination of CPUE and fork length composition, nothing worse symptomatically appeared in 1980

than the preceding years on the biomass of adult and young pollock thereof in the eastern Bering Sea.

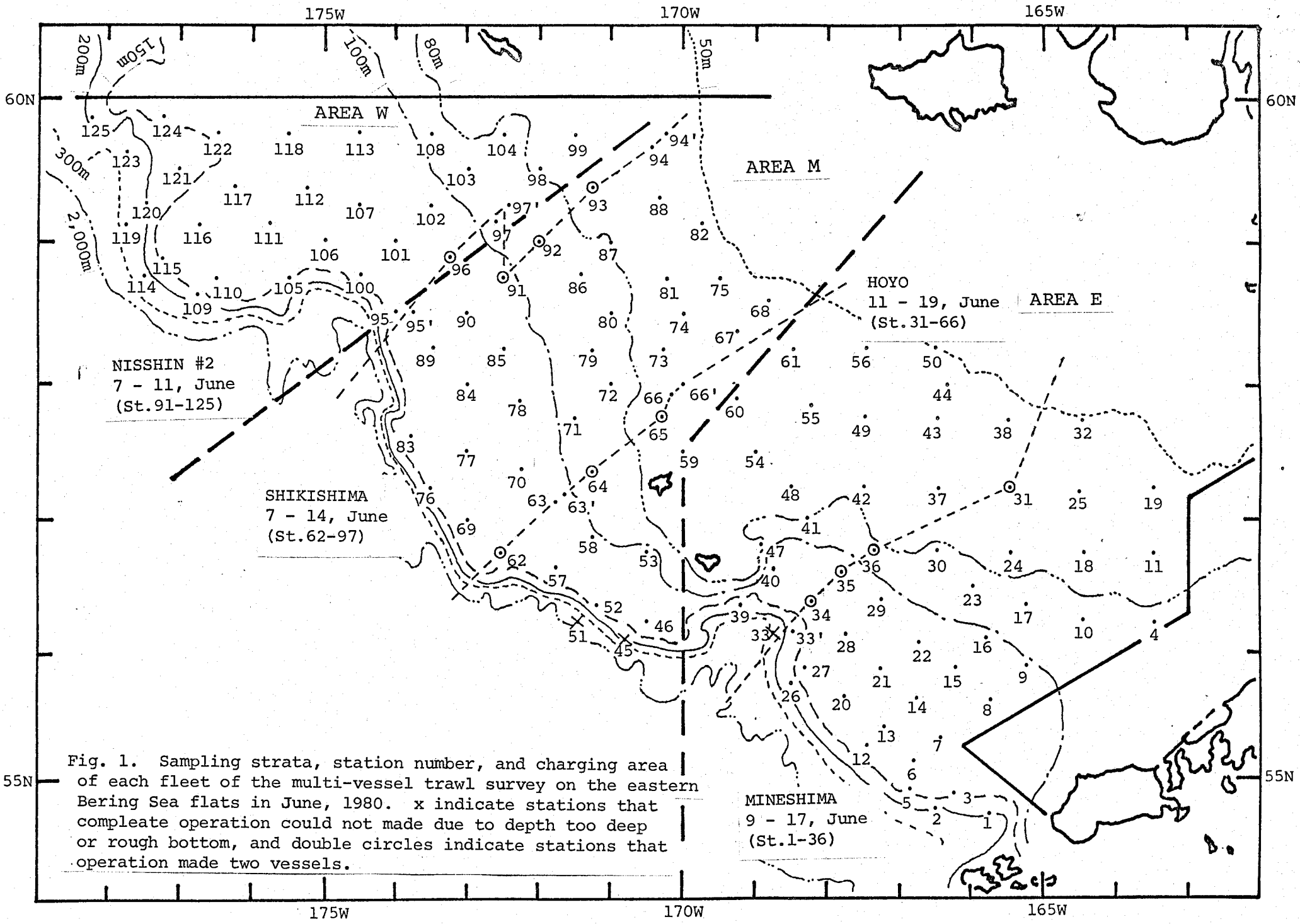

Fig. 1. Sampling strata, station number, and charging area of each fleet of the multi-vessel trawl survey on the eastern Bering Sea flats in June, 1980. x indicate stations that compleate operation could not made due to depth too deep or rough bottom, and double circles indicate stations that operation made two vessels.

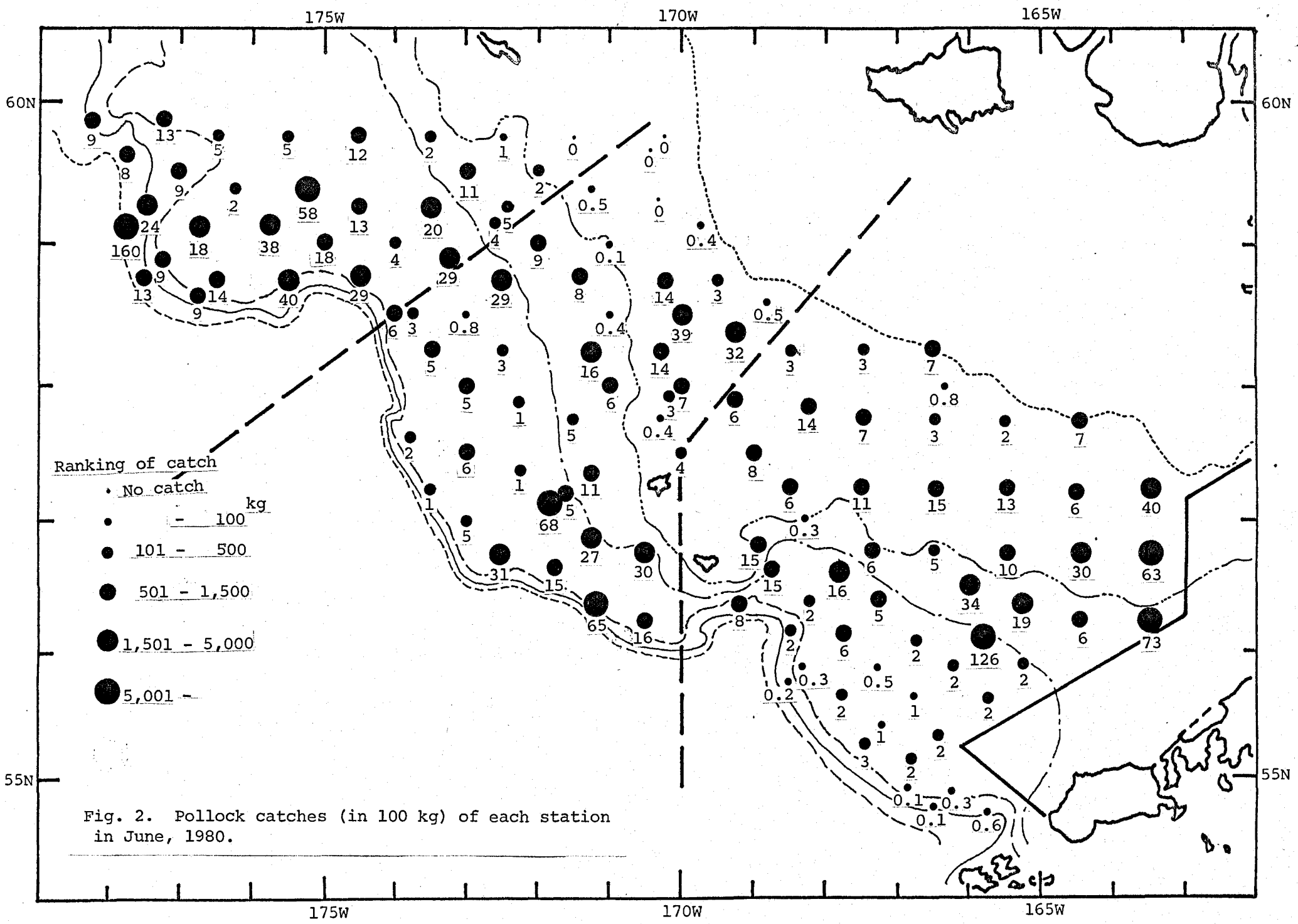

Fig. 2. Pollock catches (in 100 kg) of each station in June, 1980.

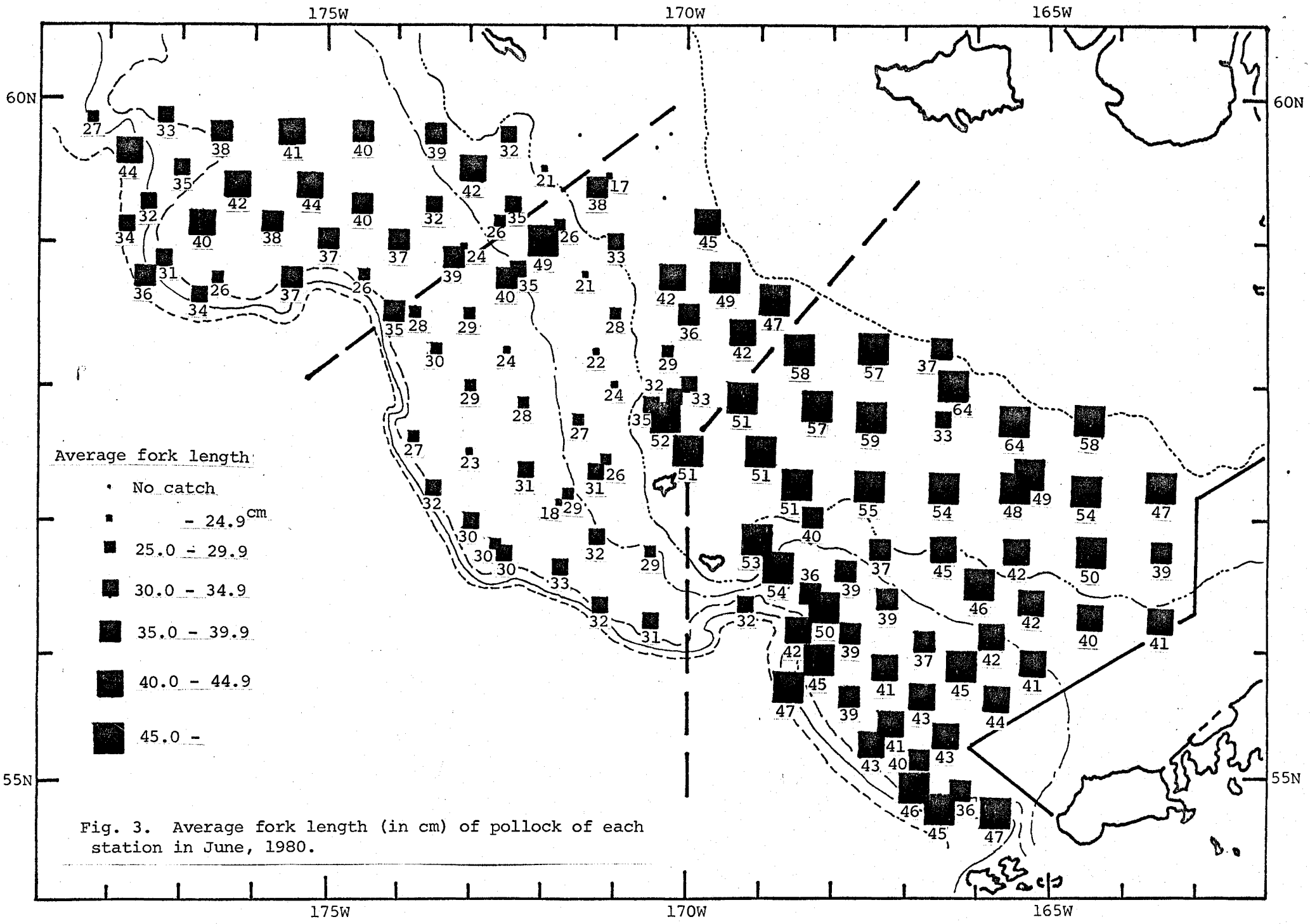

Fig. 3. Average fork length (in cm) of pollock of each station in June, 1980.

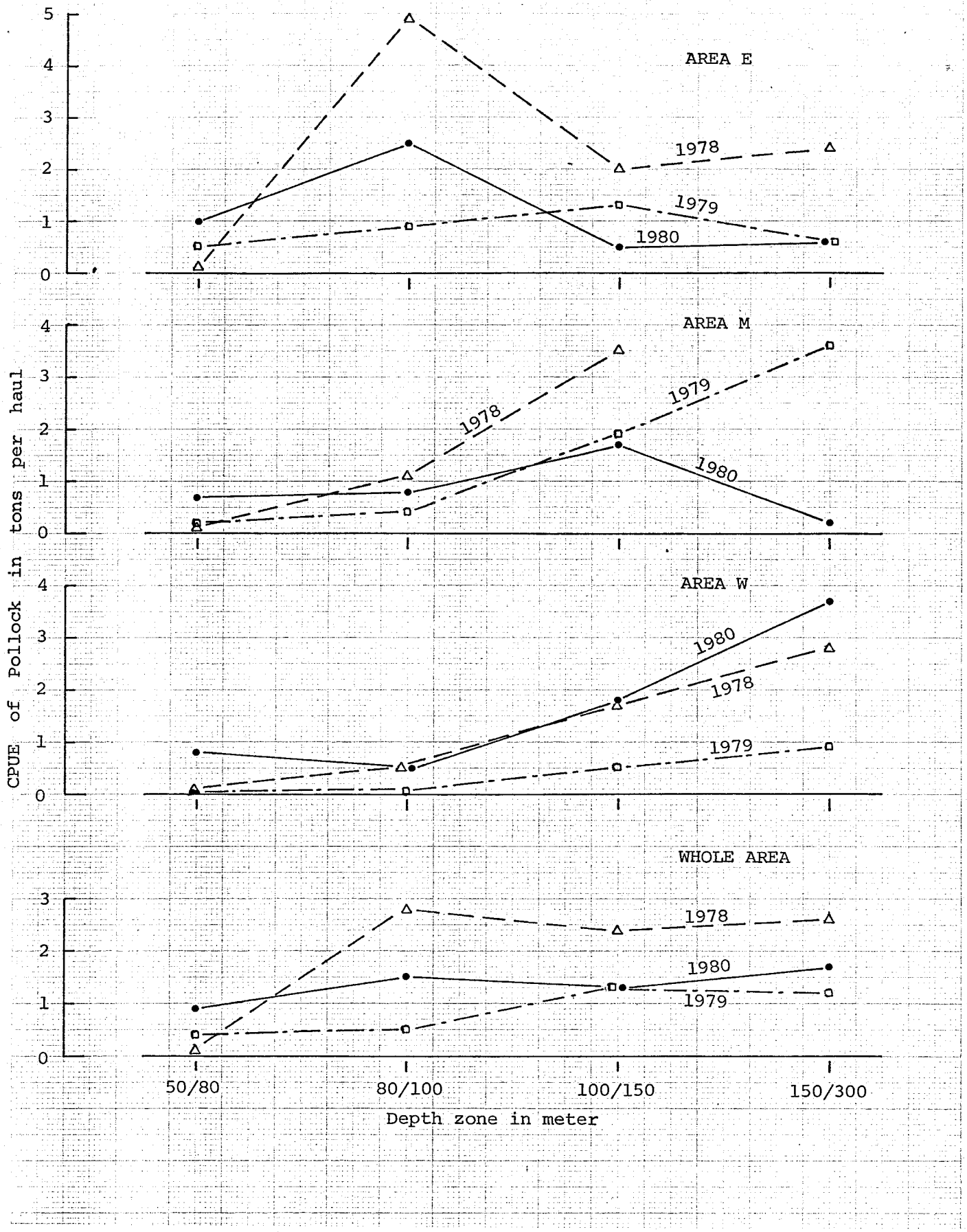

Fig. 4. CPUE of pollock (in tons per haul) by strata in June from 1978 to 1980.

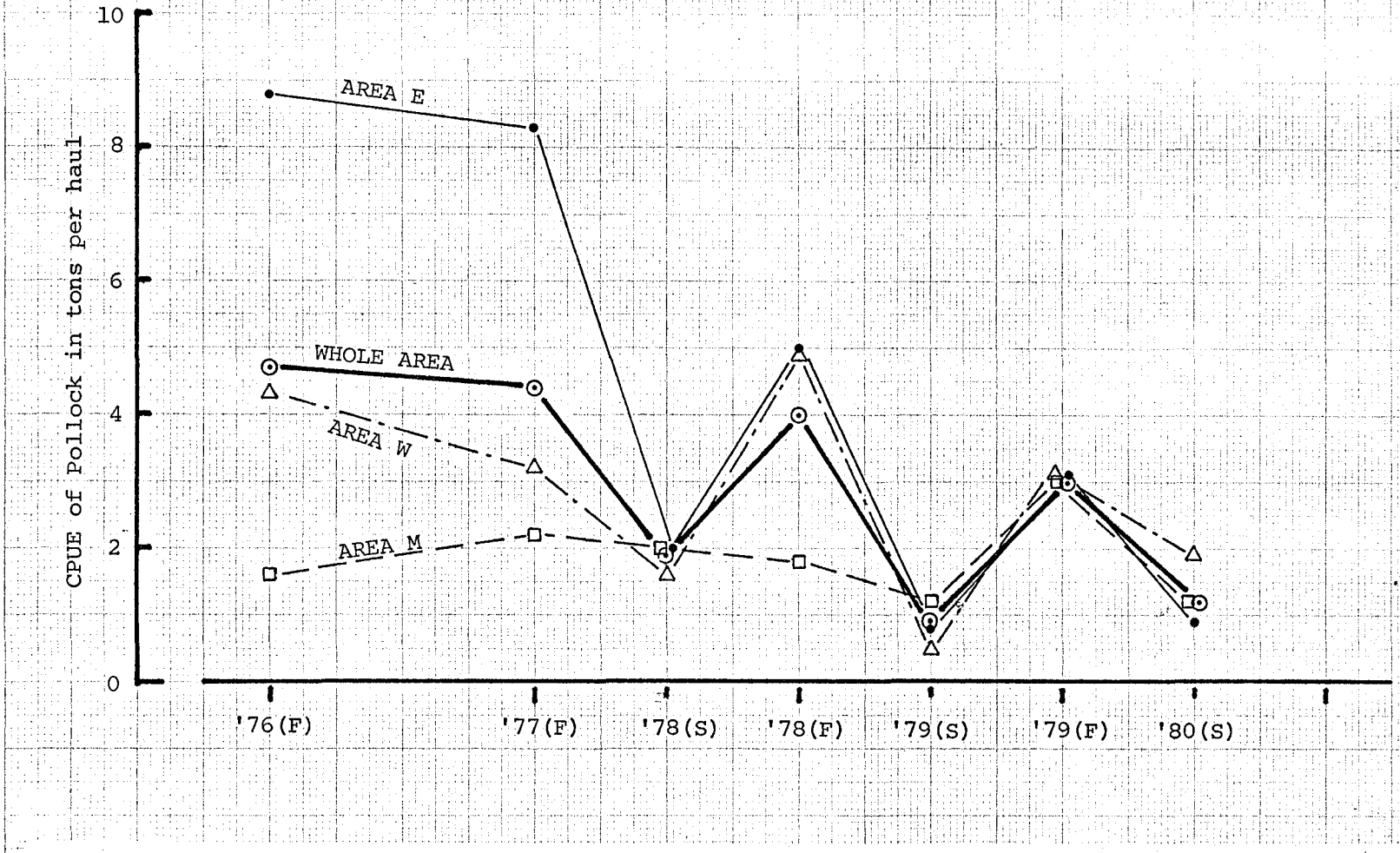

Fig. 5. CPUE of pollock (in tons per haul) by spring's area from 1978 to 1980.

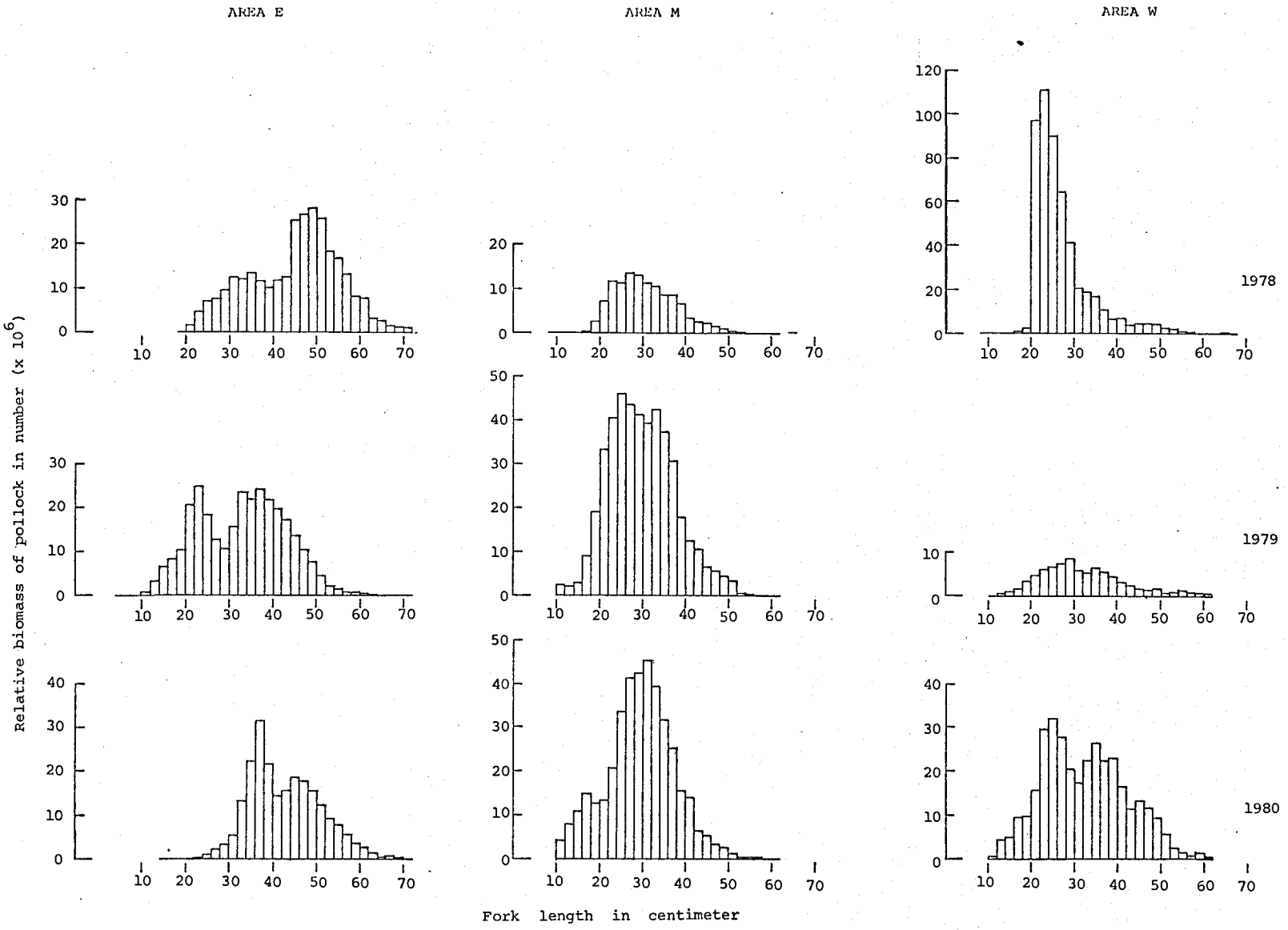

Fig. 6. Size composition of pollock in relative biomass by area in June, from 1978 to 1980.

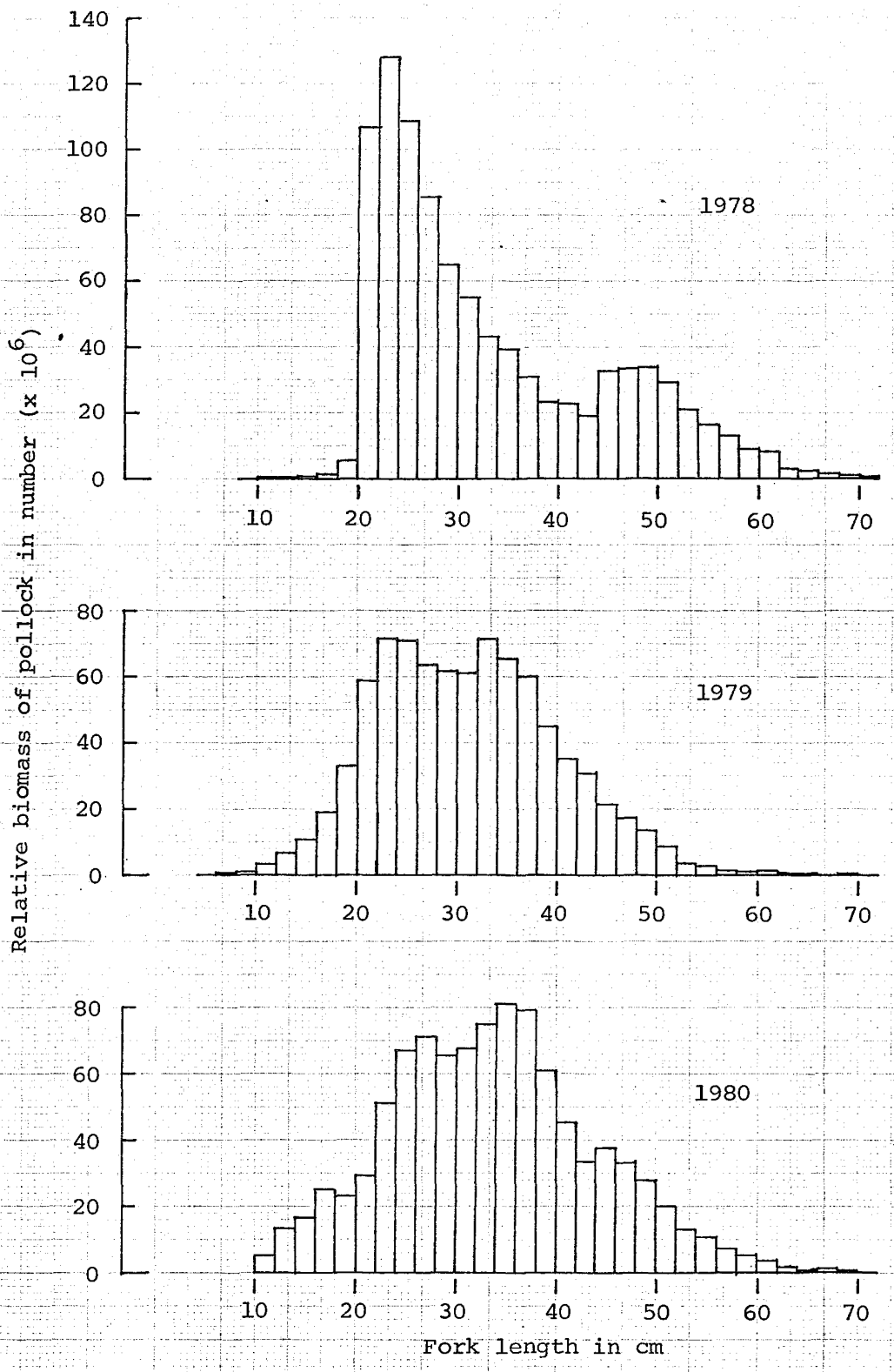

Fig. 7. Size composition of pollock in relative biomass by year in June, from 1978 to 1980.

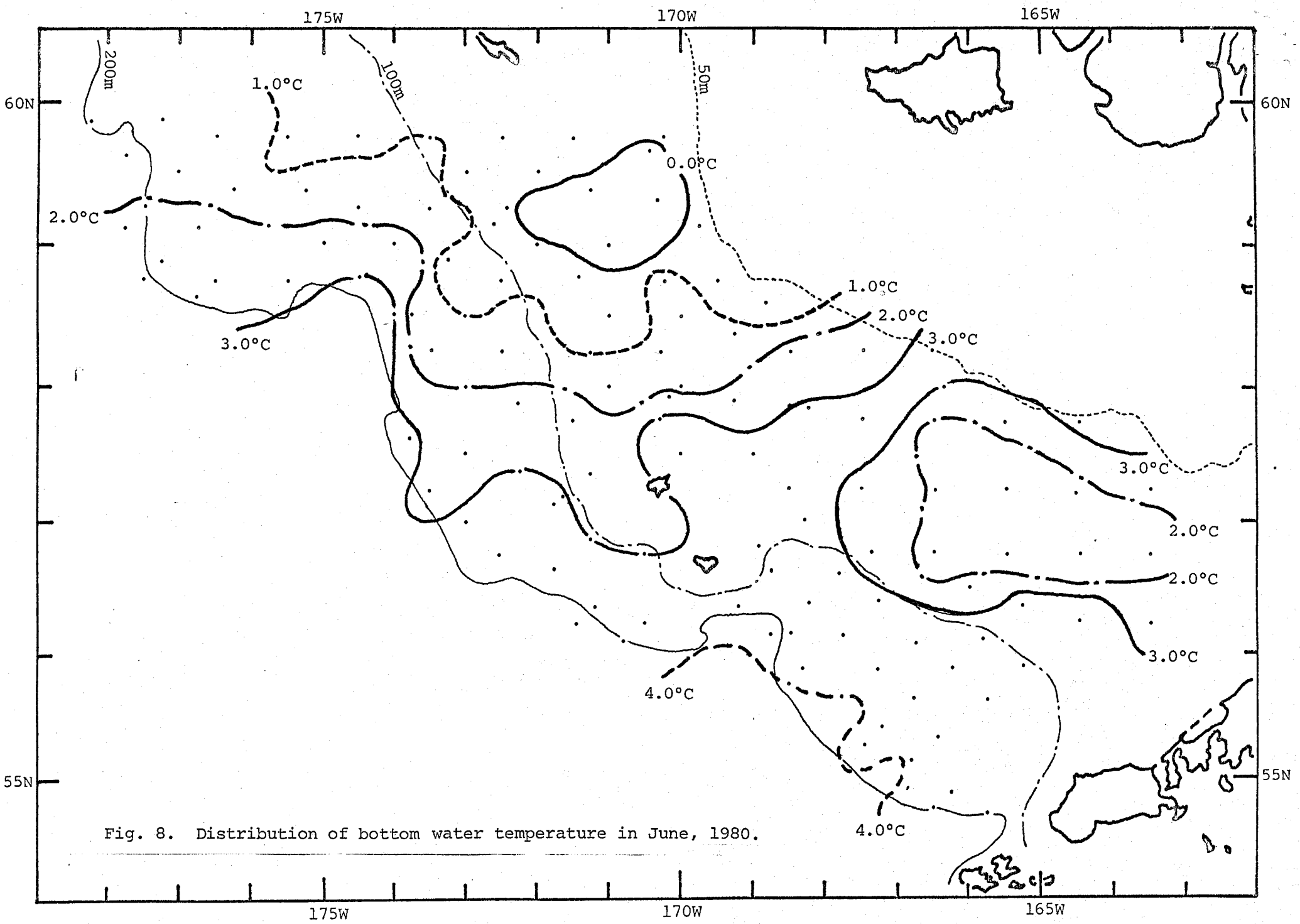

Fig. 8. Distribution of bottom water temperature in June, 1980.