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Population Assessments of Shellfish Stocks
No. 1

Catch and effort data of the lobster fishery in south eastern
Norwegian waters during 1928-1975

by

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Introduction

The lobster (Homarus gammarus L.) fishery along the Norwegian Skagerrack coast takes place during a short autumn season, mainly. The spring catches has always been small, and during the last years they have been negligible. The lobster is quite stationary (Dannevig 1936, Tveite 1970) in these waters, and variations between local stocks may occur. In this paper, however, mainly general trends applicable for the whole coast are looked for. In order to have some measures of year to year variations of the stock, a program for collecting catch per unit effort data was started in 1928. Length measurements of samples have also been made. Parts of this material have earlier been dealt with by Dannevig (1936, 1951).

Material and Methods

Between 22 and 34 fishermen have yearly been answering a questionnaire. From 1928 to 1939 it was sent to fishermen between area Kragerø and Mandal. From 1940 onwards the Lista area was included and after 1962 two fishermen at Hvaler have been answering the questionnaire (Fig. 1). The informations collected were: Location of fishing, duration, no. of traps, no. of traps lost, no. of lobsters caught, weight og lobster, and bait used. The fishermen were also asked to judge the abundance of undersized lobsters and edible crabs.

Length measurements of both undersized and marketable lobsters has been made regularly since 1949.

The temperature of the sea water, pumped from 15-19 m depth at Flødevigen, has been measured every day. The averages for the months May to October are calculated (Fig. 3).

Results

The total catch of lobsters along the Norwegian Skagerrack coast increased from 1928 to 1932 whereafter the catches became smaller until 1944. Since 1947 there has been a falling trend in the commercial catches.

The catch per unit effort has been calculated as number of lobsters per trap per day. By regression analysis this measure is found to be significantly dependent of the number of traps used and of the length of the periode fished, in the way that in long seasons the chance of catching lobsters is gradually reduced and many traps reduce the efficiancy per trap. The relationship between number of days fished and catch per trap per day can be seen from Fig. 2 where the data for one fisherman participating in the program from 1928 till 1974 are shown. However, when the data from all fishermen from the whole area are added, the average number of traps and days did not vary much from year to year. The effect of these factors should therefore be, at least partly eliminated. From 1928 onwards the c.p.u.c. decreased till 1935 (Fig. 3). Then the values were increasing until 1945. After 1945 there has been a falling trend until the minimum was observed in 1971.

The weight per trap per day has decreased at a lower rate than the numbers during the last 15 years (Fig. 3). This is due to an increased average weight of the lobsters, especially after 1964 when the minimu legal size was raised to 22 cm.

When the material is split in smaller areas, random variations are dominating. To elucidate the trends of the local stocks, successive five year means for c.p.u.e. have been calculated and reproduced in Fig. 4. The same trends as for the total material can be seen, more or less pronounced. In the eastern areas the average c.p.u.e. is higher than in the western (Table 1).

Table 1. Average c.p.u.e. by number, for 11 years before and 11 years after the minimum legal size was raised.

	Area	1	2	3	4	5	6	7	8
1952-63		.35	.22	.28	.18	.17	.19	.12	.19
1964-75		.24	.14	.20	.13	.10	.10	.09	.08

From 1928 there was an increase in the effort until 1935. It resulted in increased catches until 1932 (Fig. 3). Although quite high number of traps were used in 1933, -34 and -35 the catches went down. This is, however, the only periode when there is great discrepancy between the catch and the effort. From 1960 the catch went down to approximately one fourth in 1971 whereas the c.p.u.e. decreased to nearly the half.

The informations collected about the stock of edible crab have been given the values 1, 2 or 3 according to whether the fishermen considered the stock to be small, medium or big. A mean of these are calculated (Fig. 3). In 1962 and 1975 all fishermen considered the stock to be above "average". This average is simply judged by the fishermen and is therefore dependent of the catch the nearest years before. An average catch might therefore be different in different years. Now and then information on the actual numbers of crabs caught are given. These informations indicate that the raise in the late fifties should be even more pronounced than shown in Fig. 3.

Abundance of sub-legal sized lobsters has been judged the same way as crabs. From 1928 to 36 the fishermen considered the small lobsters to be quite numerous. From 1937 to 45 there were few in spite of increasing c.p.u.e. of the legal sized lobsters. Then the numbers increased till 1951. From 1951 onwards the stock showed a decreasing trend with quite big fluctuations (Fig. 3).

The length measurements (Fig. 5) confirms the observations on average weight from the questionnaires. From 1949 onwards the length distribution was fairly wide, then gradually the maxima came closer to the minimum size. During the later years there again has been a wider distribution. The variations were not equeal in all areas. In the Kragerø (2) area the length distribution has always been more even than in others. At Arendal (4) and partly at Mandal (7) the

distributions were closer to the minimum size during the 1949 to 54 periode than in the two other areas and at Hvaler (1) lobsters bigger than 27 cm are comperatively rare. During the years 1930 to 1931 Dannevig (1936) reported length distributions close to the minimum size.

Discussion

The data presented in this paper are found suitable to describe the general trends of the lobster fishery within the periode concerned. However, for details and local variations a larger program would be necessary.

From 1928 onwards the lobsters were quite abundant. During those years an increasing number of unemployed people started fishing. The increase in effort resulted in higher catches up to 1932 when in spite of further increased effort the total catch went down. The lobster stock was most heavily exploited during the periode from 1932 to 1938. The reduction in effort because of the war, lead to increased catch per unit effort in spite of poor recruitment to the stock. From 1945 to the early fifties the fishery were quite good, due to the positive recruitment situation. The falling trend of the fishery the last twenty years has mainly been caused by low recruitment. This is shown both by the low index for sublegal sized lobsters and by the increasing weight of marketable lobsters. The effort shown on Fig. 3 has been almost as low during the last years as it was during the war. The beneficial effect, however, has not reached the same level as during those years, most probably due to a relative high "unofficial" effort during the later years.

Except for the fishery itself, the only relevant factors available for explanation of the variations are temperature and abundance of crabs. Perhaps the relative high summer temperatures from 1943 to 1950 have made some successful broods of lobsters possible. And the low temperatures after 1962 might have been unfavorable for breeding.

The abundance of crabs has increased considerably since 1960. Although crabs and lobsters have somewhat different preferences for food and habitat, there might be competition when one of the stocks is big.

In 1964 the minimum legal size was raised from 21 cm to 22 cm. This has made the weight of the catches higher than they otherwise would have been, because the recapture rate is very high around this size (Tveite 1970). However, whether the new minimum size have had any influence on the reproduction is impossible to say from the present material.

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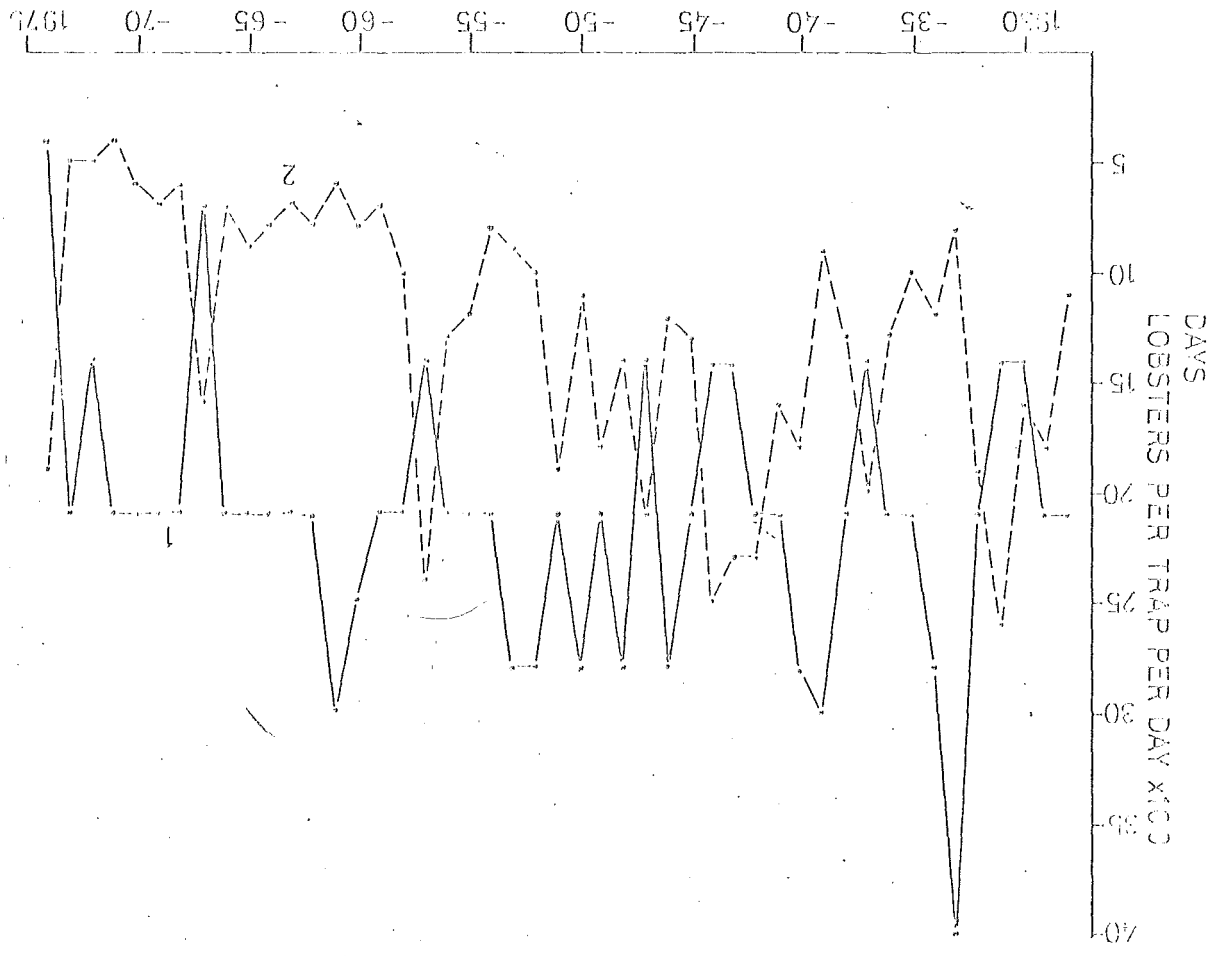
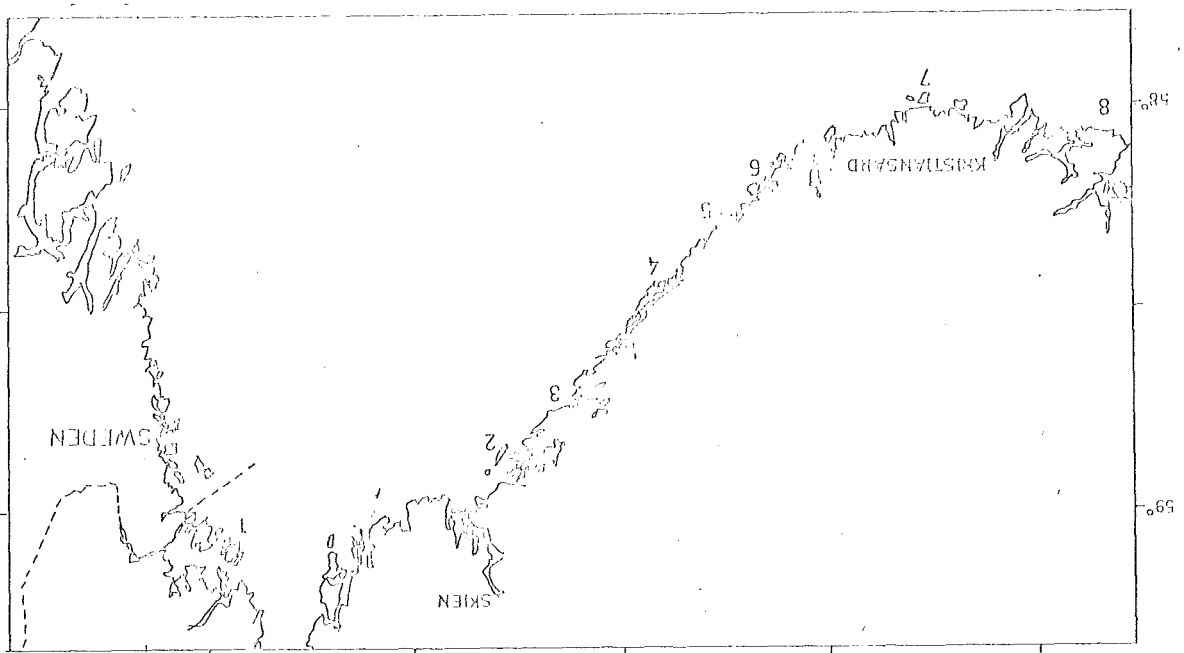


Fig. 2. Comparison of duration of fishing season in days (1) and c.p.u.e. (2) for one fisherman participating in the program from 1928 to 1975.

Fig. 1. Location of areas considered, numbered from east towards west: 1 Hvaler, 2 Kragerø, 3 Risør, 4 Arendal, 5 Homborsund, 6 Høvåg, 7 Mandal and 8 Lista.



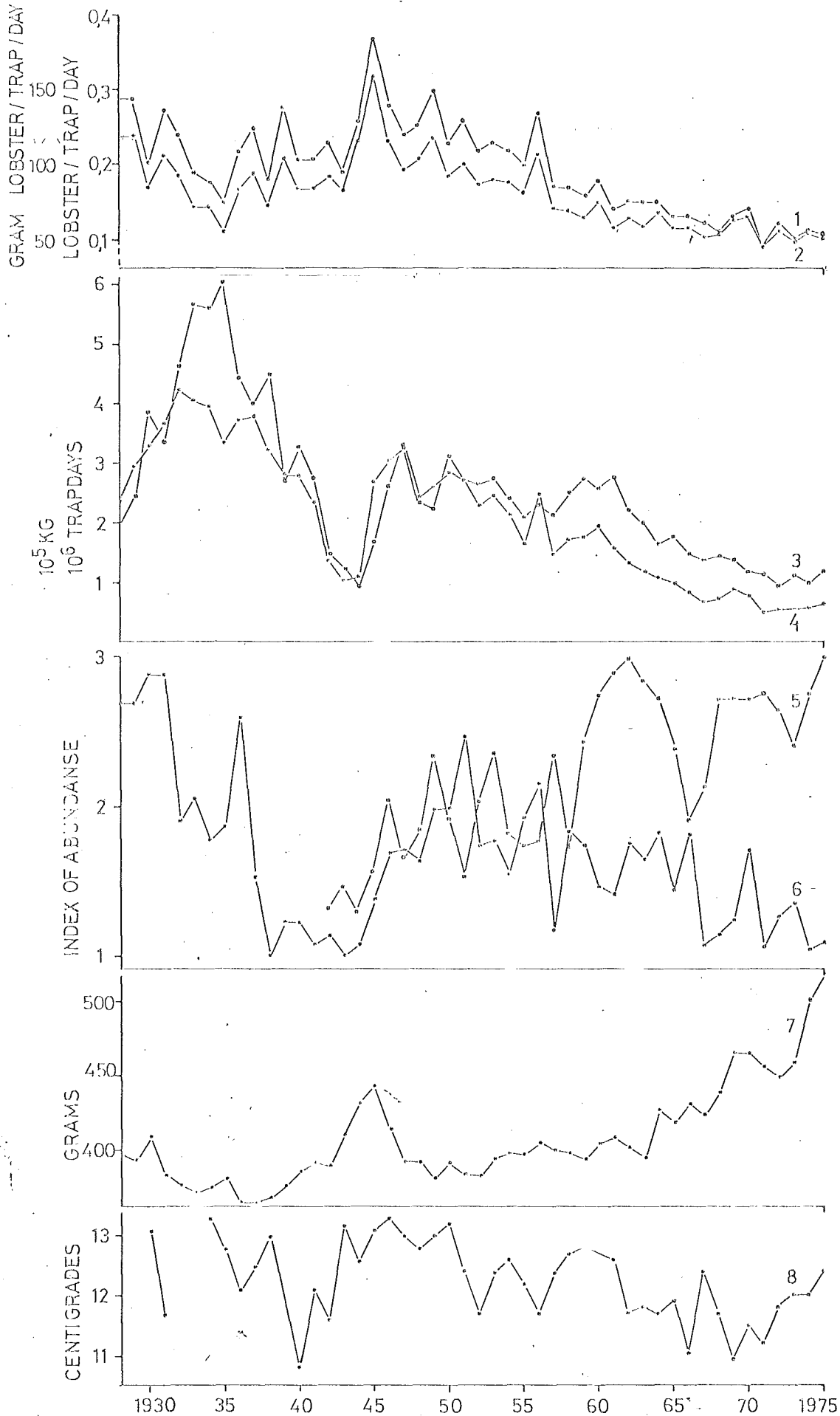
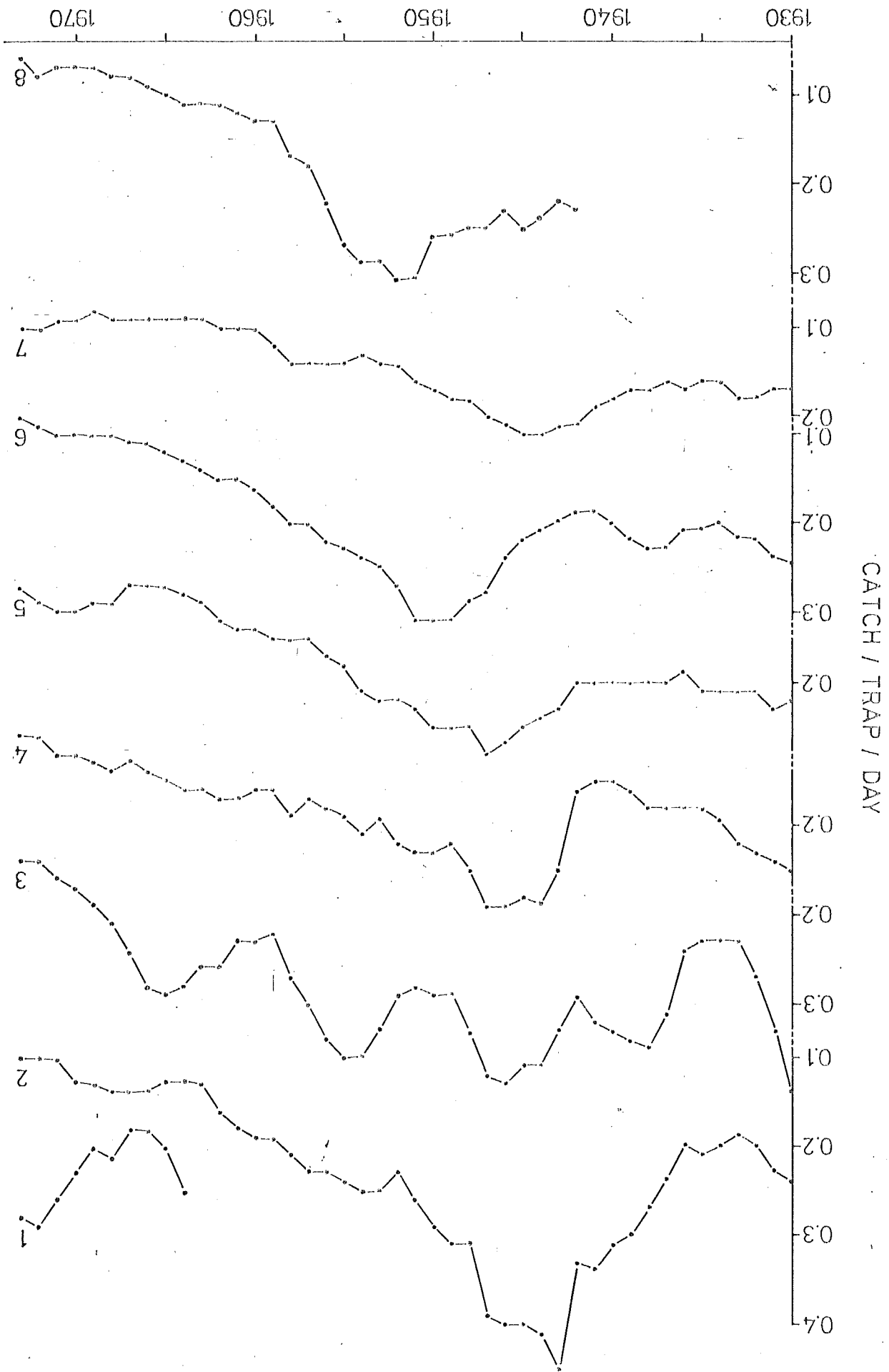


Fig. 3. 1: C.p.u.e. by numbers of lobsters, 2: C.p.u.e. by weight, 3: Effort calculated from catch and c.p.u.e. 4: Total catch for the Norwegian Skagerrack coast, 5: Abundance index for edible crab, 6: Abundance index for sublegal-sized lobsters, 7: Average weight of lobsters from fishermen's informations, 8: Average temperature at 15-19 m depth at Flødevigen for the months May through October.

Fig. 4. Five year means of c.p.u.e. for all areas numbered as in Fig. 1.



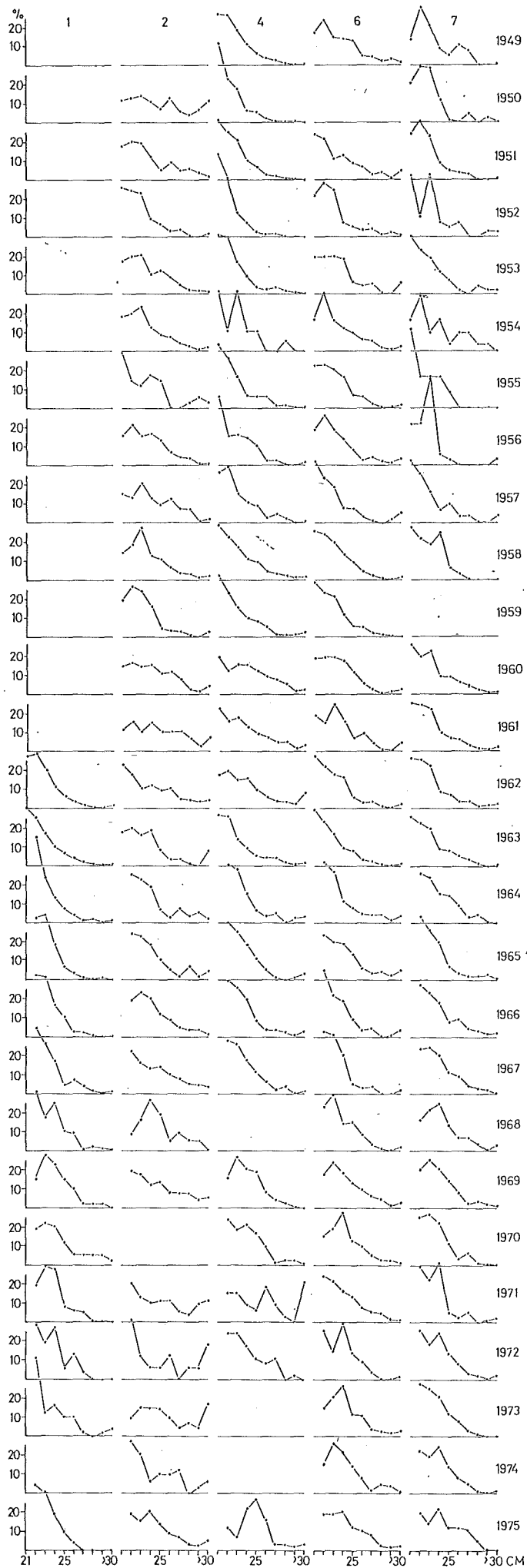


Fig. 5. Length distribution of marketable-sized male lobsters.
 Top: area numbers as in Fig. 1.