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Ödemål, Kville sn, Bohuslän

Hällristning
Fiskare från
bronsåldern

Rock carving
Bronze age
fishermen



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Swedish Cod Fishery in the Baltic

by

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A b s t r a c t

A brief account is given of the development of the total cod fishery in the Baltic. It is shown that the catch varies most in the eastern part of the southern Baltic and neighbouring parts of the central Baltic, probably on account of varying contents of oxygen in the deep water. Maximum catches are often made first in this region, and a year later in the central and western parts of the southern Baltic. - Since 1964 the Swedish catch of cod has been small, due partly to a reduction in fishing. In 1970 the cod quantity declined by c. 3,000 tons (preliminary figure). The size distribution in the catch is described and the catch of undersized cod discussed. On the background of the development of the cod fishery in 1969-71 - especially in central and south-eastern Baltic (e.g. the Gotland Basin) - and the prevailing lack of oxygen and the presence of hydrogen sulfide in large parts of the central and southern Baltic, the importance of stricter protective legislation for cod is stressed, as well as the need for a new Baltic convention for fishing in general.

Development of the cod fishery in the Baltic

The general great increase in cod fishing in the Baltic during the last 30-40 years is well known. From a total catch by all nations of 4,000-7,000 tons in the 1920's and early 30's, a rapid increase took place towards the end of the 1930's and during World War II. This development continued after the war, particularly during the 1950's. The largest catch reported hitherto was in 1957, almost 174,000 tons. After that there was some decline and during the 1960's the total catch of cod varied between 105,000 (1964) and 157,000 tons (1968). The catches for the last five years of the 1960's were, according to the ICES' Bulletin Statistique, 105,222 tons in 1965, 135,746 in 1966, 144,626 in 1967, 157,339 in 1968 and 154,216 tons in 1969 (data for 1970 are not yet available).

The increase in the catch was made possible by the occurrence of cod populations not utilized earlier, the introduction of efficient trawl fishing, other fishery-technical development and by better possibilities of disposing the catch thanks to improved cold-storage and freezing techniques. Disregarding German fishing with North Sea trawlers in the central and southern parts of the Baltic during

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World War II, which in 1943 alone gave c. 53,000 tons of cod, the increase has been mainly in the Polish and Russian fishery. This is carried on mainly in the eastern parts of the southern Baltic and in neighbouring parts of the central Baltic. Other countries fish cod mainly from the Arkona Basin (W Bornholm) to the Slupsk Furrow in the east. During the five years mentioned their annual catch varied between 41,000 (1964) and 52,000 tons (1969). As shown in figure 1, Poland and the USSR each have, in some years, taken as much cod as all the other countries together. Generally speaking, however, it may be said that since the mid-1950's the level of the catch has become stabilized to some extent, and that the variations in the catch are now due mainly to the size and accessibility of the cod population. There are no longer any large unexploited reserves.

The diagrams in figure 1 show that variations in the catch since the mid-1950's have been the greatest in the east part of the southern Baltic and in neighbouring regions of the central Baltic. The rise in the catch seems as a rule - or in any case often - to appear first in these regions, and is noted in the Bornholm Basin and westwards a year later. This is a natural consequence of the fact that mature fish from the east and northeast move in large numbers to the Bornholm Basin to spawn - or are forced to migration by decreasing oxygen contents of the deep water (cf. Otterlind, 1966, 1967, 1968). The size of the variations in catches depends greatly - particularly in the Gotland Basin and surrounding waters - on the varying oxygen conditions during recent years. Both the local recruitment here and the abundance of cod are, of course, influenced by lack of oxygen. - No migration on a larger scale are made northwards by mature cod from the Bornholm Basin (according to our tagging experiments).

The Swedish cod fishery in the Baltic

Swedish cod fishing is carried on mainly in the south Baltic; nowadays less than 15 per cent of the total catch is taken in the central Baltic and north thereof. From the end of World War I until the middle of the 1930's, the total annual catch was c. 2,000-3,000 tons, but, for the reasons given above, it increased until, by 1949, it exceeded 25,000 tons. The greatest catch - 28,000 tons - was made in 1961. The variations in catches since 1949 are due to the size of the cod population and the extent of fishing. The latter has fluctuated with the possibilities of selling the catch, which were, on the whole, pretty good during the period 1958-66, but have become somewhat worse since 1967.

Figure 2 shows two diagrams illustrating the catch of cod in the southern Baltic (approximately south of the latitude through the south point of Öland). The unbroken line gives the total Swedish catch in the area, while the dotted line gives the catch taken by trawlers from Skåne and Blekinge (it also includes very small catches outside the Baltic, and, during earlier years, fishing with Danish seines). The difference between these two diagrams consists of catches by boats from the west coast and fish taken by local fishermen using lines, nets and pound nets. The last-named catches are now insignificant. The west coast fishermen have, since the 1930's, taken part to a varying extent in the fishing during the cod season in winter and spring. The decline in the total catch during the years 1961-63 was due largely to reduced fishing by the the west coast boats, which have later only to a limited extent participated in the cod fishing here. To judge the size variations in the cod population, the dotted line is therefore rather more reliable. The fishery is carried on mainly from the Hanö Bay to the waters around the Slupsk Furrow.

A great reduction of the catch in the southern Baltic occurred during 1964 - for the south coast trawl fishery from 19,880 to 13,027 tons, or by slightly more than 34 per cent. At the same time, the trawl catch of herring increased by 15 per cent, and thus the transfer to herring fishing explains only part of the decline in the quantity of cod. Otherwise, as is shown in figure 3, increa-

catches
 sed herring since the mid-1950's has been associated with lesser cod catches and vice versa. Figure 1 shows that the decrease in the catch of cod in 1964 was also general in the whole of the Baltic region (but not in the Belt Sea). After a low catch level in 1965, too, there was a great increase in the eastern fishing waters, as is shown by the Russian and Polish catches in 1966 (see fig. 1). In the western regions the increase did not begin until a year later. The Swedish catch of cod, however, remained more or less unchanged, with a slight increase during the years 1967-69. The preliminary figures for 1970 show a decrease in the total Swedish cod catch in the southern Baltic of more than 2,000 tons to c. 12,650 tons (full weight). The catch of cod during the first half of 1971 was about the same as during the corresponding period of 1970. The herring catch taken by the south coast trawl fishery, however, increased during 1970 by c. 1,250 tons. A switch-over to herring fishing may therefore explain part of the decline in the catch of cod (c. 2,870 tons in the fishery mentioned). The total catch per fisherman in the trawl fishery has dropped relatively little (see fig. 3). For the total Swedish cod fishery in the Baltic 1970 the decrease was c. 3,000 tons.

That development of the Swedish catch was not more positive during the latter part of the 1960's was due partly to fewer fishermen and boats engaged in trawling. In 1964 there were 178 trawlers and 664 fishermen from the south coast. The number of boats and fishermen had then remained rather constant since 1955. In 1969 the corresponding figures were 153 and 464 respectively, and the preliminary reports for 1970 give 134 boats and 440 fishermen. The smaller number of boats and fishermen has, of course, been neutralized to some extent by larger, more efficient vessels and better equipment. From 1964 to 1969 the catch of cod (as well as the total catch) per fisherman engaged in trawl fishing increased (cf. fig. 3). It must be pointed out here that the large cod catches per fishermen in 1949 and earlier to a large extent were due to the fact that relatively little herring fishing with trawls was carried on then from the south coast of Sweden.

The Swedish catches in the central Baltic and north thereof have always been moderate in size. The chief cause of this is the sparse or poor stock of cod. The populations in the northernmost parts of the Baltic proper, in the Åland Sea and to the north are recruited by immigration of mainly young cod from the south. One year only (1952) the catch along the whole of the east coast of Sweden was as great as 5,000 tons, but by 1970 it had dropped to c. 850 tons (fig. 2). The diagrams in figure 4 illustrate the development of catches in the most important landing regions at the east coast. The causes of the great fluctuations must be sought in both natural and cultural factors. The cod fishing increased in the Åland Sea during World War II, and culminated in the 1950's, to decline rapidly around 1960. The decline was a consequence of both the reduced stock of cod and economic problems (better paid work was available in industry, etc.). The catches around Gotland dropped at the same time owing to a reduced supply of fish, while the county of Kalmar (including Öland) showed a peak catch, as did the fishery in the southern Baltic. Cod fishing (with nets and lines) in the Bothnian Sea off the coast of the county of Västernorrland increased mainly in conjunction with the demand for food during World War II, since then it has declined considerably. During recent years most of the catch has been used as food for minks. Here, and in the Åland Sea, mainly old cod are caught in deep waters, from 75 to 250 m deep (the last-named depth is the most usual one in line fishing in the Åland Sea). The cod stock in the Åland Sea has improved during the past two years, but line fishing is not considered profitable enough now. It is practised by only a few fishermen. The increased catch landed on Gotland and in the county of Kalmar 1966-68 is coincident with the richer catches taken by Poland and USSR (cf. figs. 4 and 1).

It is obvious that the stock of cod in the northernmost regions is closely related to the reproduction and recruitment in the central parts of the Baltic proper. The peak catches have at least partly been preceded by a renewal of the deep water in the last mentioned areas. The relatively rich catches in the

Aland Sea during the 1950's, for example, consisted to a large extent of cod born in 1952 and later - after the great influx of salt water into the Baltic in the late autumn of 1951. A renewal of the deep water often implies a higher salinity, better oxygen conditions and a mobilization of accumulated nutrients (cf. Otterlind 1966). A more comprehensive account of the relations between the recruitment of cod to the northern areas and the hydrographical factors is planned.

Size composition of the cod catches in the southern Baltic

It has been reported earlier that the proportion of cod 50 cm or more long declined in Swedish catches from the southern Baltic during the 1960's (Otterlind, 1967, 1968). The further development is shown in figure 5 for two of the landing regions, Blekinge and the Trelleborg area (no later statistics are available for Simrishamn). The diagram for Blekinge shows that, from a minimum in 1967 with only 27,2 per cent of large cod (50 cm long or more) in the catch, an increase to 36,2 per cent occurred in 1970. The Blekinge catches are made chiefly N and E of Bornholm. The Trelleborg catches, on the other hand, emanate mainly from the Arkona Basin (W Bornholm). There was here a rise in the proportion of large cod in 1967-68, followed by a drop to a minimum in 1970: 19,5 per cent. Generally speaking, it is a rule that the proportion of young cod is always greater in this relatively shallow water (maximum depth c. 50 m) with a greatly varying hydrography.

Up to and including 1968, the cod catch was classified in two sizes: one of cod at least 50 cm in length, and one of cod from 35 to 49 cm in length. Smaller fish were sold for mink food. A minimum length of 30 cm (total length) for cod and a minimum mesh size of 70 mm for cod trawls has been applied since 1957. From December 1965, 10 per cent (on weight basis) of the cod landed as industrial fish may be less than 30 cm long. In 1969, new trade classification regulations were introduced by the fish-trade and the fishermen's organizations as follows:

1. 65 cm and longer
2. 50-64 cm
3. 38-49 cm
4. 33-37 cm

Thus, fish measuring 30-32 cm are now landed as industrial fish as well as the above-mentioned 10 per cent of the small cod. Cod up to c. 35 cm long are often still sold, however, as mink fish. Control of the 10 per cent undersized cod is probably insufficient, too.

The catch of undersized cod

The quantities of cod mentioned above and in figures 1-5 refer to cod landed for human consumption. Considerable quantities of undersized cod have, since the 1950's at least (no statistics exist prior to 1956), been used as mink food and included in the Swedish catch of industrial fish together with undersized herring and partly also sprat. In 1966 the catch of industrial fish in the southern Baltic was 6,783 tons. Since then the amount landed has increased, owing mainly to a larger proportion of inferior herring landed in Denmark. The highest total quantity for the southern Baltic was reached in 1968, with 8,186 tons (fig. 6). The amount of mink cod landed from this area during the latter part of the 1960's was probably 5,000 to 6,000 tons a year. Low prices since 1966-67 have contributed to reduce the landings. During the first half of 1971 only 617 tons of mink cod were landed in Blekinge as opposed to 1,666 tons in the same period 1970. Corresponding cod landings were 4,264 tons (1971) and 4,406 tons (1970). The decrease of the "mink" landings is mainly ascribed to marketing conditions in 1971 - not exclusively, however. A lower abundance of small cod is reported.

A diagram in figure 6 shows the landings of industrial fish from the central Baltic and the areas north thereof. Here the quantities are naturally much smaller and the proportion of herring varying considerably. Mink cod is landed mainly on Gotland (where separate statistics are available) and in the county of Kalmar. For Gotland, where locally a minimum length of 40 cm is stipulated for cod for human consumption, the catch of mink cod is usually greater than that of consumption cod. In 1968 the catch reported by the fish trade was 748 tons of mink cod, in 1969 536 tons and in 1970 175 tons - the quantities for human consumption were 402, 270 and 224 tons (gutted weight), respectively. During the first half of 1971 the cod quantity was 30 tons and the catch of mink cod 51 tons (1970 81,5 and 117 tons, respectively). In this area there has been a very drastic real decrease in the abundance of cod during the years 1969-71. The cod here is taken mainly as a secondary catch in trawling for herring off the east coast of Gotland.

Figure 7 gives the relation (in %) of the amount of industrial fish to the catch of consumption cod (100 %) landed on the south coast of Sweden (Skåne and Blekinge; gutted weight), and the amount of mink cod, in the same relation for three of the most important landing regions of the south coast. (There are no data available for Simrishamn since 1967.) The diagrams show that the proportion of mink cod has declined in Blekinge since 1966, when it was equal to 51 per cent of the consumption cod (gutted weight). The gutted weight of the consumption cod here in 1970 was 6,006 tons, and the quantity of mink cod 2,086 tons, or 34,7 per cent. At Trelleborg, on the other hand, high values were registered in 1968-69, too, and the level is generally higher there than in Blekinge (cf. above with reference to cod assortment in the Arkona Basin). The landings at Trelleborg are usually relatively small (1970, 611 tons consumption cod - gutted weight - and 281 tons mink cod).

New measures are needed to protect the cod population

The decline in Swedish catches of cod in 1970 and information suggesting a correspondingly low level of catch during the first half of 1971 imply, like the declining trend in catches landed in Poland and the USSR in 1969, that the population of cod, as earlier, is being exploited heavily. The very pronounced decline in the abundance of young cod in 1971 particularly off the coast of Gotland speaks in favour of a low reproduction and/or low recruitment to the stock. The catch of cod for consumption will probably decrease in 1972. In view of the low contents of oxygen prevailing in great parts of the central and southern Baltic during recent years (e.g. in 1968) - at times with considerable occurrences of hydrogen sulfide in the deep waters - there is reason to suspect that the reproduction of cod has become impaired. From the end of August 1971, our hydrographers have reported hydrogen sulfide at depths of only 70-80 m in the Bornholm Basin and also in the deep waters east and west of Gotland. The conditions were more favourable in 1969-70 after the renewal of the deep water in 1969.

The need for better protection of the cod population and trawling experiments with 85-90 mm meshes in the cod ends have been discussed in an earlier paper (Otterlind, 1967). Swedish south coast fishermen have agreed that the minimum mesh size of the cod trawls should be increased to 90 mm. They want an international agreement with this object in view. The mesh size used most frequently now is c. 80 mm. A new convention for the Baltic fishery in general is also urgently needed.

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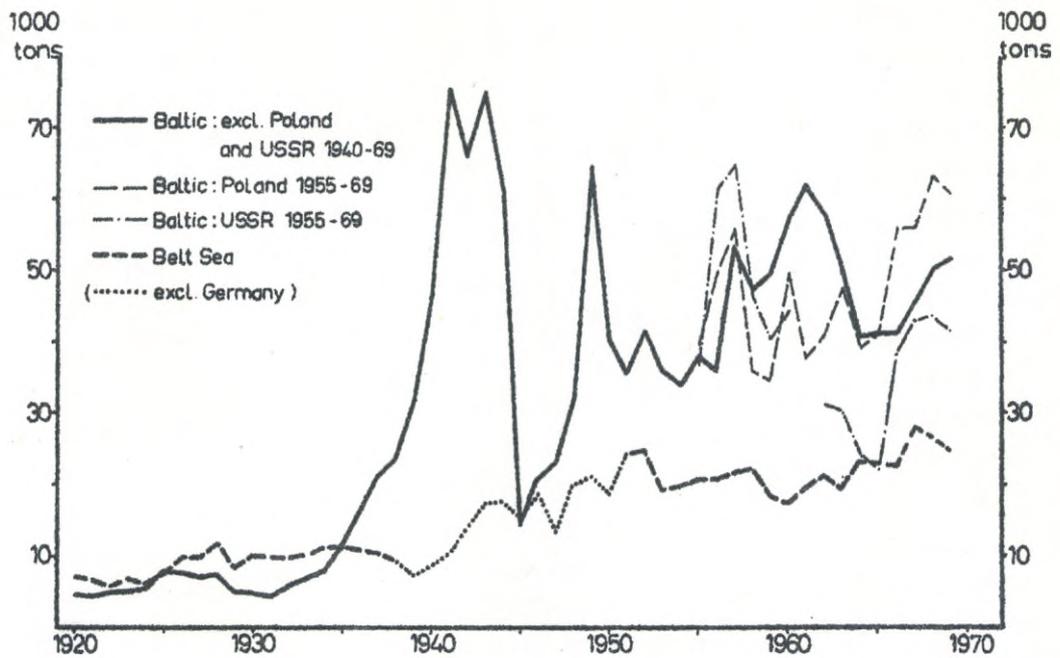


Fig. 1. Annual catch of cod in the Baltic and in the Belt Sea (incl. the Sound) 1920-1969, according to ICES' Bull. Statistique.

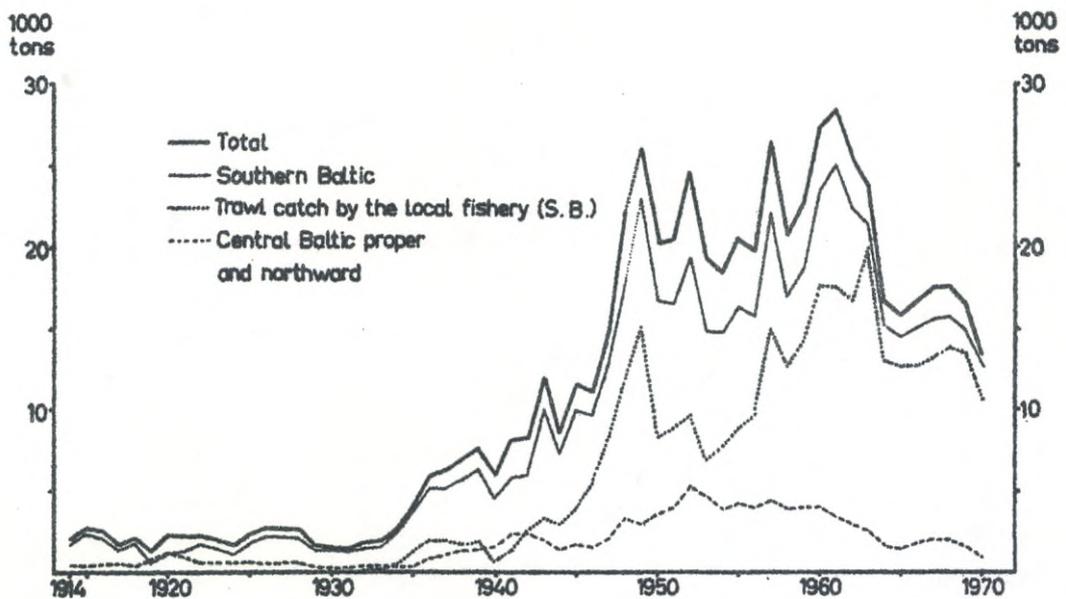


Fig. 2. Swedish annual catch of cod in the Baltic, according to Official Statistics of Sweden. Corrections for round fresh weight are made since 1949.

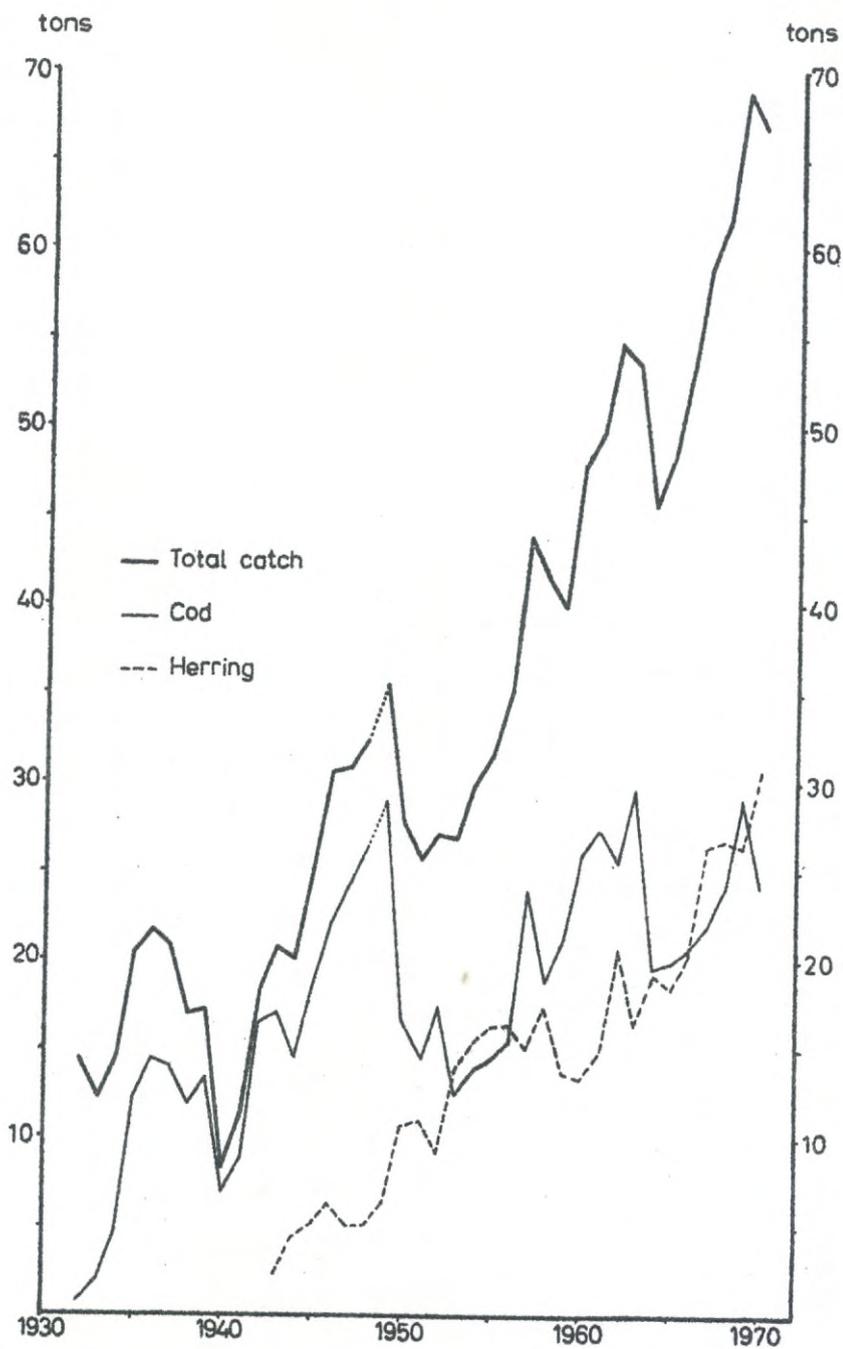


Fig. 3. Annual quantity of fish caught per fisherman in the trawl fishery of the Swedish south coast 1932-1970.

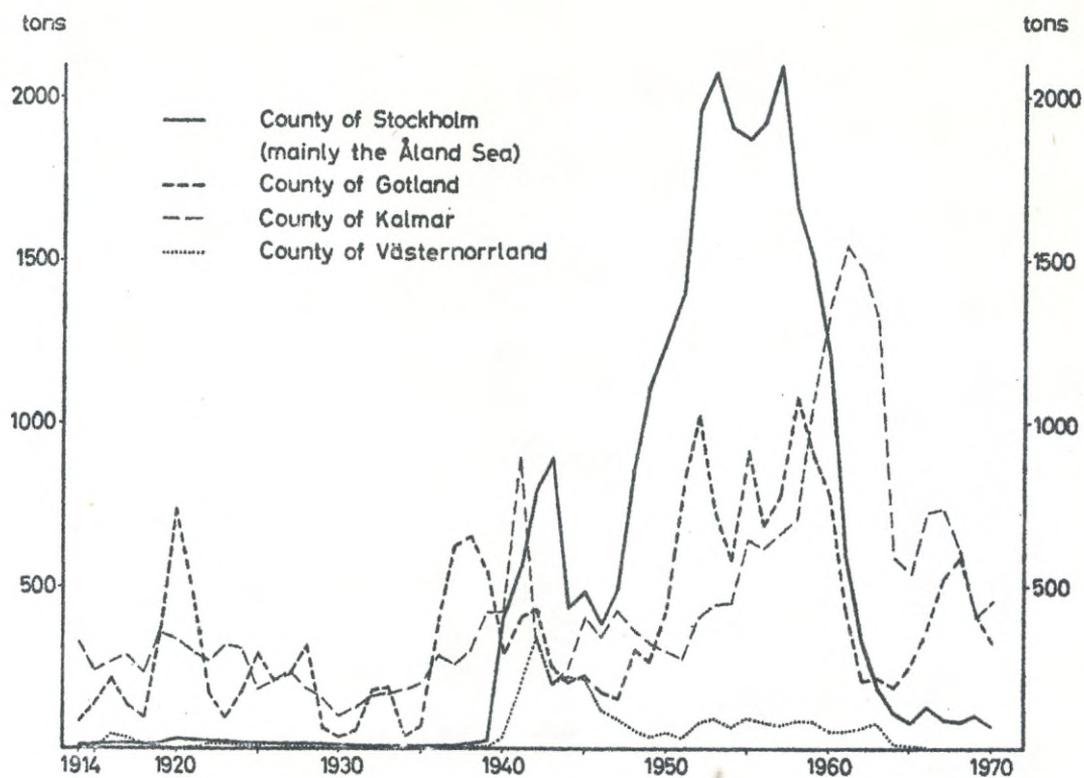


Fig. 4. Annual catch of cod from some main areas off the Swedish east coast.

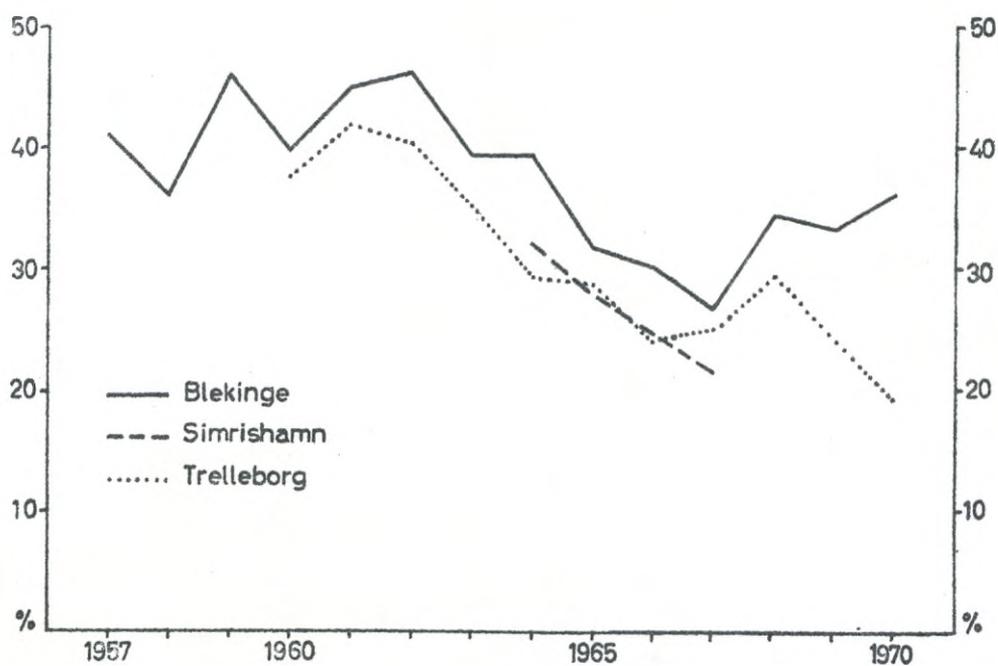


Fig. 5. Percentage of large cod, 50 cm total length and longer, in the cod catches landed in the main fishery districts at the Swedish south coast.

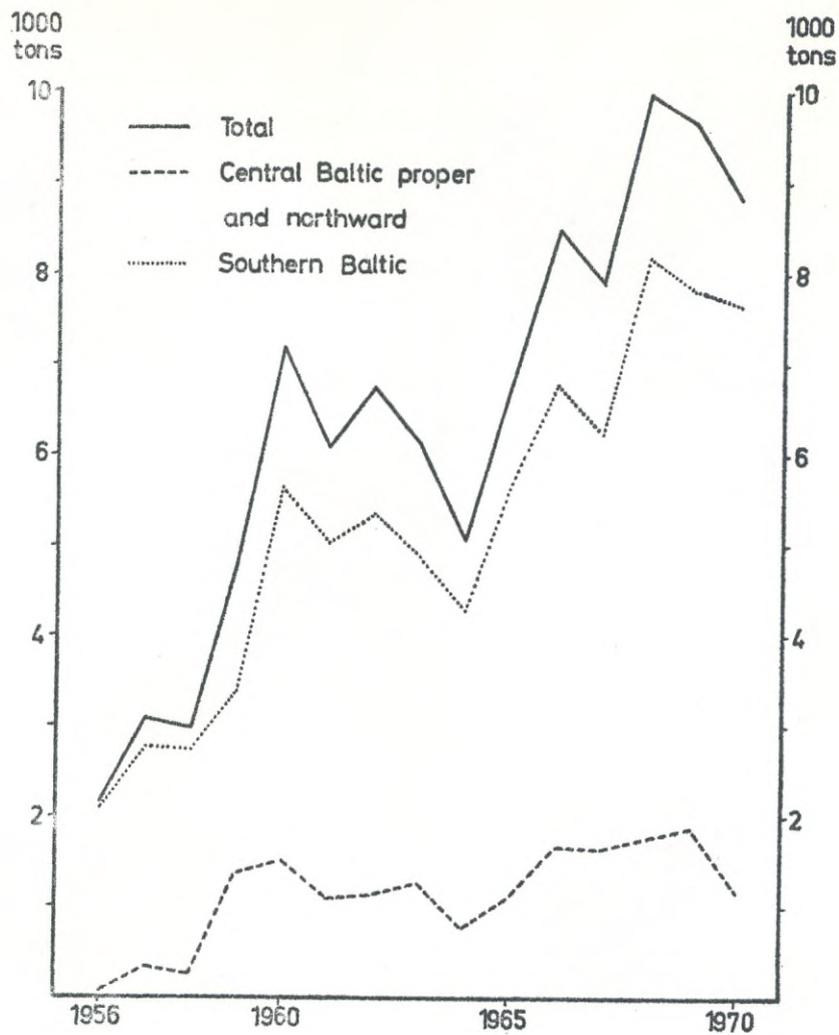


Fig. 6. Total annual Swedish catch of industrial fish in the Baltic, in the southern Baltic and in the central Baltic and northward.

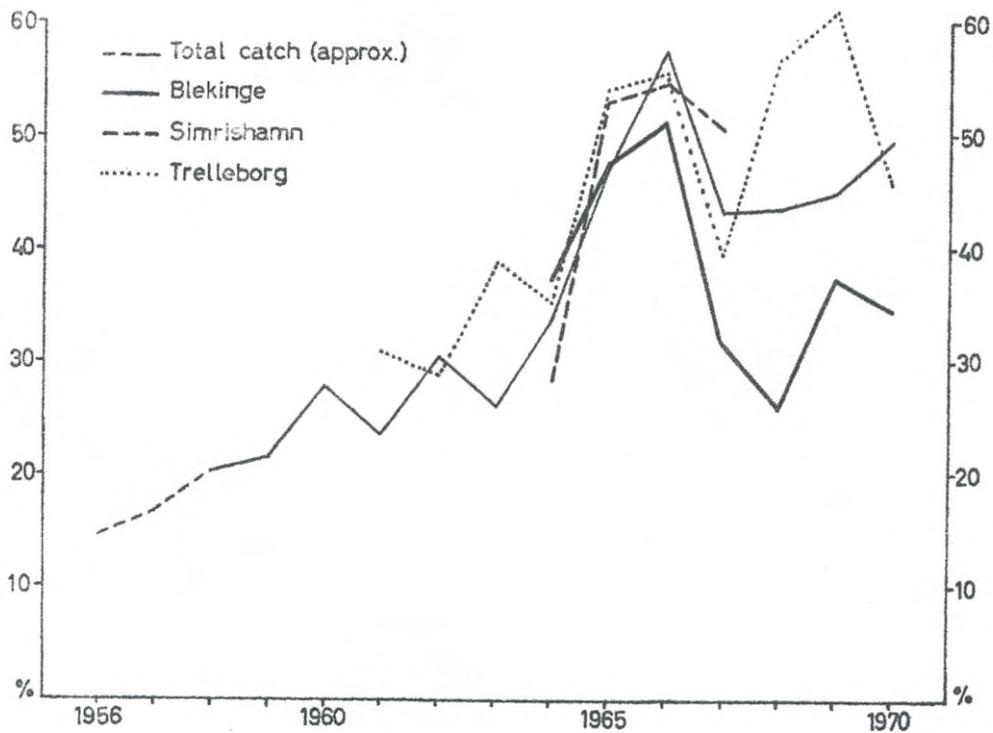


Fig. 7. Total annual Swedish catch of industrial fish (incl. "mink-cod") landed on the Swedish south coast compared with corresponding catch of cod (cleaned weight), and the catches of mink-cod compared with the cod landings (cleaned weight) in the main districts. (Cod catch equal to 100 %.)

