

Yield curves for Arctic cod and haddock

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The statistics of total landings of Arctic cod and haddock in 1968 were not available in the beginning of 1969. However, a population model in which the fishing mortality was assumed varying with age, was used in calculating the yield (Anon 1969). These calculations were based on the age-composition of that part of the stocks which was 3 years and older at the beginning of 1968. The fishing mortalities were assumed to be 110 % and 120 % of the 1967 level for cod and haddock respectively. The number of cod and haddock in each age-group expected to be in sea at the beginning of 1968, were estimated from total age-compositions of landings by an extension of the virtual population analysis. The number of 3 year old fish in sea could not be deduced from the age-compositions of the commercial landings. These were taken from a study of the year-class strength measured as number per hour fishing in the Soviet pre-recruit surveys, and the number of specimens of the same year-classes in sea at the beginning of their third year of age, estimated by the virtual population analysis. Incorporating the estimated stock at the beginning of 1968 and a natural mortality of  $M = 0,30$  for cod and  $M = 0,20$  for haddock in the model gave a total yield in 1968 of 802 000 tons of cod and 86 400 tons of haddock.

No one could in the beginning of 1969 say how the fishery might develop during this year, but assuming the same natural and fishing-mortalities in 1969 as in 1968, the expected total yields were estimated, by using the same model, to 723 000 tons of cod and 65 600 tons of haddock (Anon 1969).

The natural and fishing mortalities used in calculating the yields for 1968 and 1969 and the stocks expected to be in sea at the beginning of 1970 and 1971 were incorporated in the model calculating the expected yields in 1970 and 1971 for different level of fishing mortalities through these years (Anon 1969). The yields in 1970 and 1971 is depending on the fishing mortality rates in the respective years and in the previous years. More up-to date information for 1968 would therefore improve the precision of the estimates of the yield in later years. The effect of errors in the fishing mortality assumed for 1969, can be studied by calculating the yield in 1970 and 1971 for different fishing mortality rates in 1969. Data from such calculations can be compressed to isopleth diagrams, where the expected yield is represented by isolines. Yield curves showing expected yields of cod and haddock in 1970 by using different fishing mortalities in 1969 and 1970 are demonstrated for cod in Fig. 1A and for haddock in Fig. 2A. Information from calculation of the expected yields in 1971 can also be compressed to isopleth diagrams, one for each specified fishing mortality in 1969. Fig. 1B and 2B are showing the expected yields of cod and haddock in 1971. The fishing mortalities in 1969 were in these calculations assumed to be 110 % of the 1967 level for cod and 120 % for haddock, the same as used for 1968.

The calculations referred to were made at the University in Bergen on an IBM 360/50H computer, and the diagrams in Fig. 1 and 2 were drawn by a Calcomp Plotter 663.

Reference

- Anon 1969. North-east Arctic Fisheries Working Group. Report of the Meeting at Copenhagen January 13th-17th 1969. Coun. Meet. Int. Coun. Explor. Sea, 1969:Doc. F:2 (Mimio).

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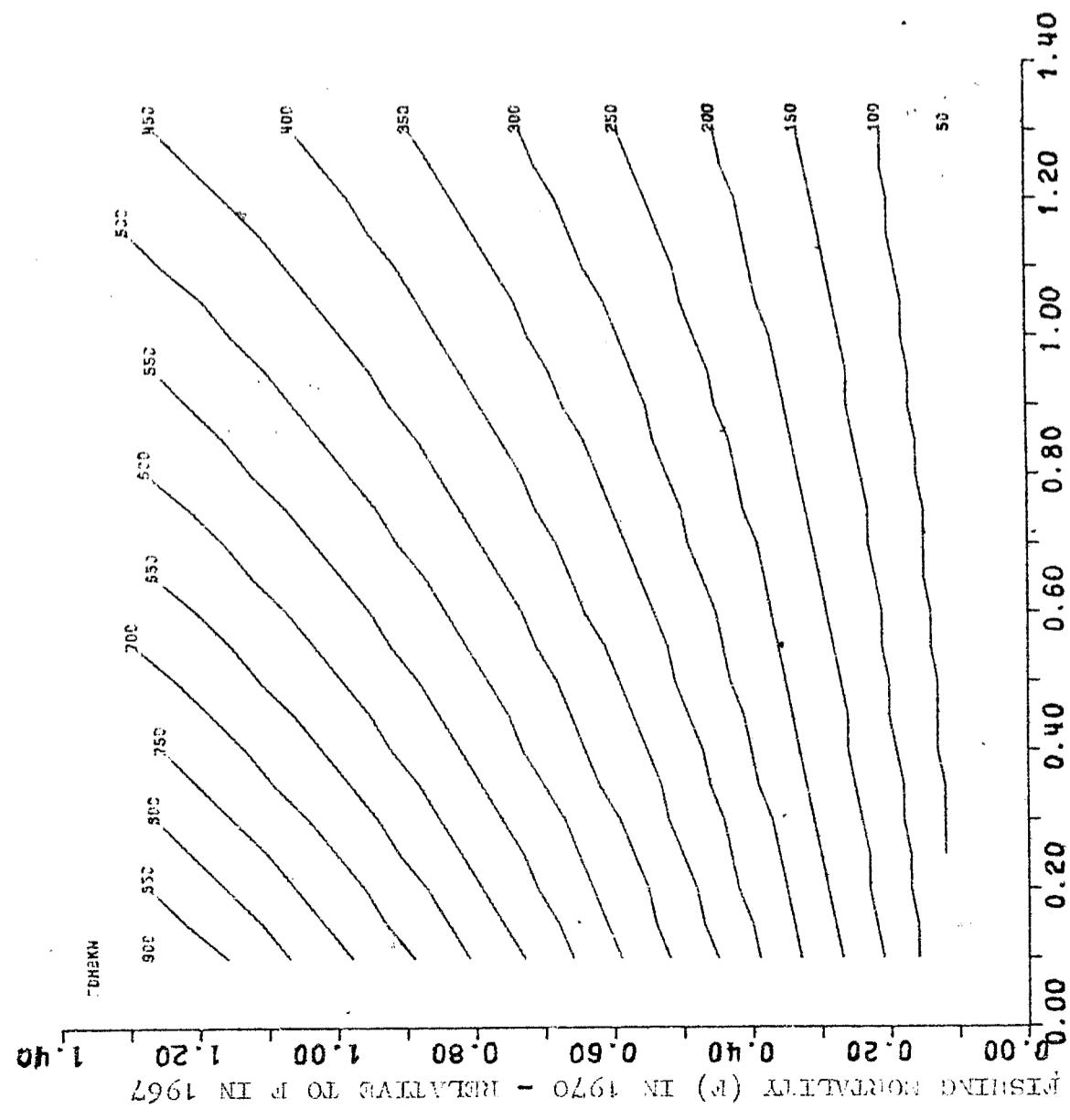


Fig. 1A. Expected total yield of Arctic cod in 1970. Numbers on the curves are 1000 tons, round fresh weight.

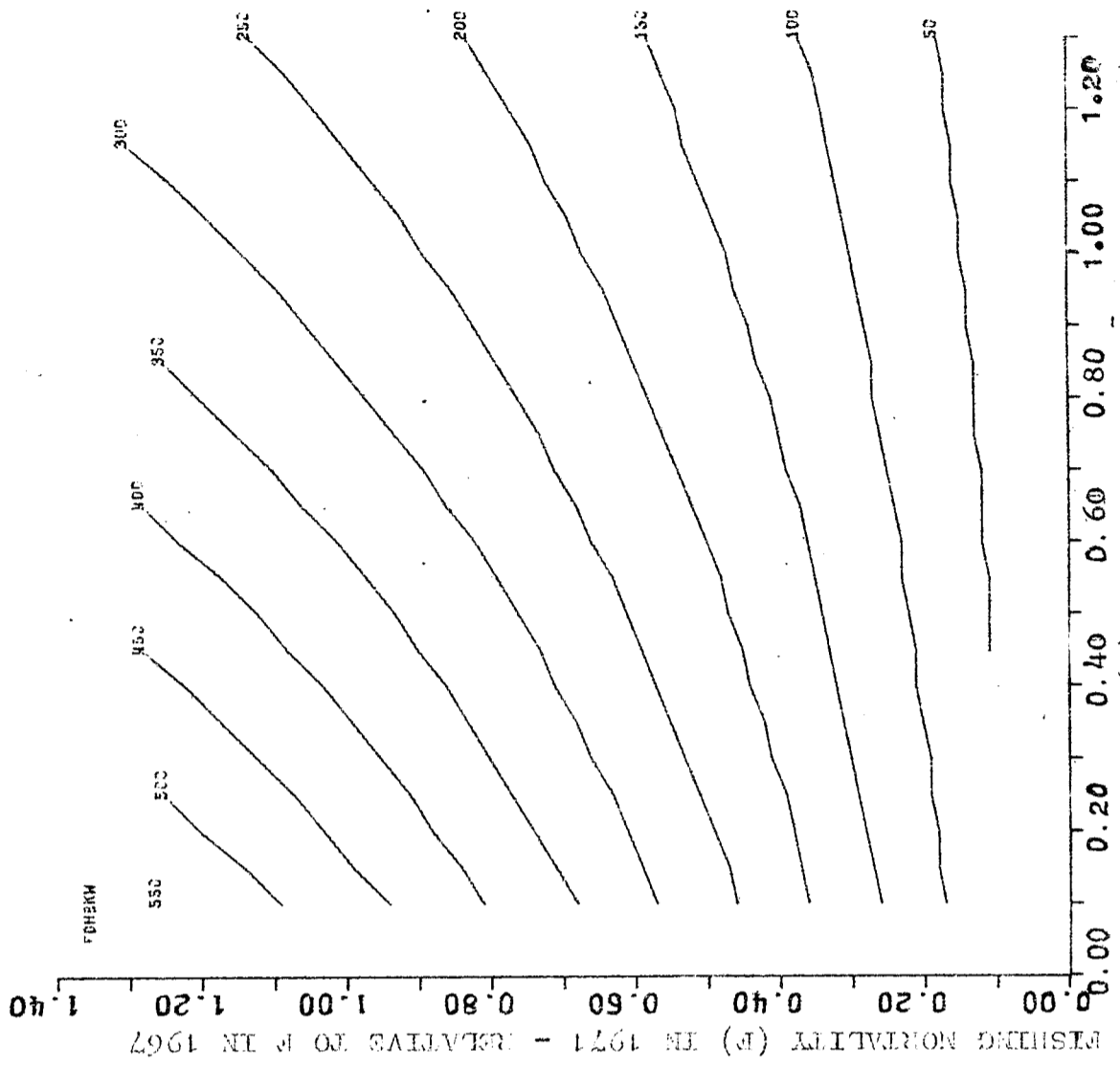


Fig. 1B. Expected total yield of Arctic cod in 1971, assuming fishing mortality rate in 1969 to be 110 % of that in 1967. Numbers on the curves are 1000 tons, round fresh weight.

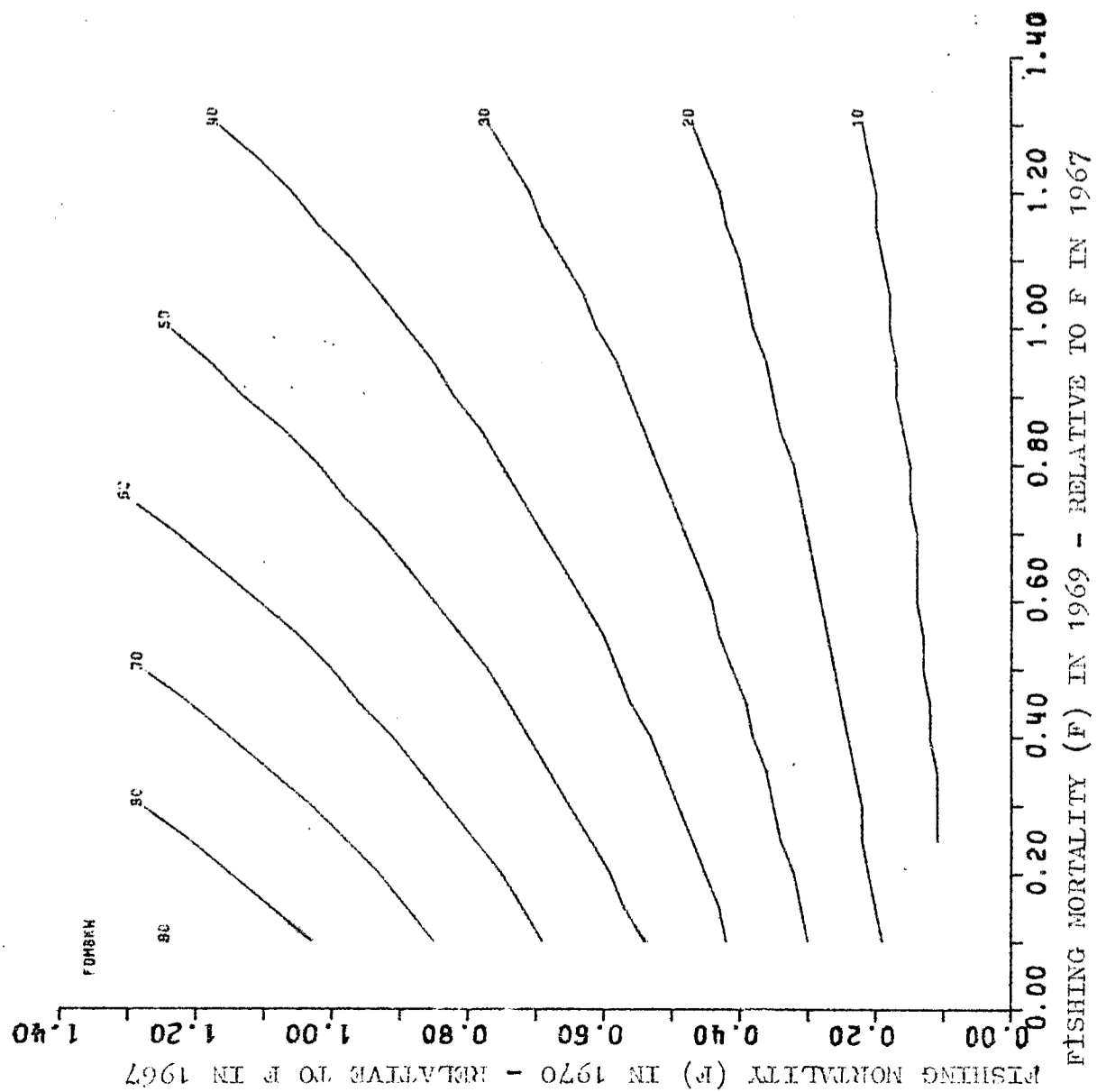


FIG. 2A. Expected total yield of Arctic haddock in 1970. Numbers on the curves are 1000 tons, round fresh weight.

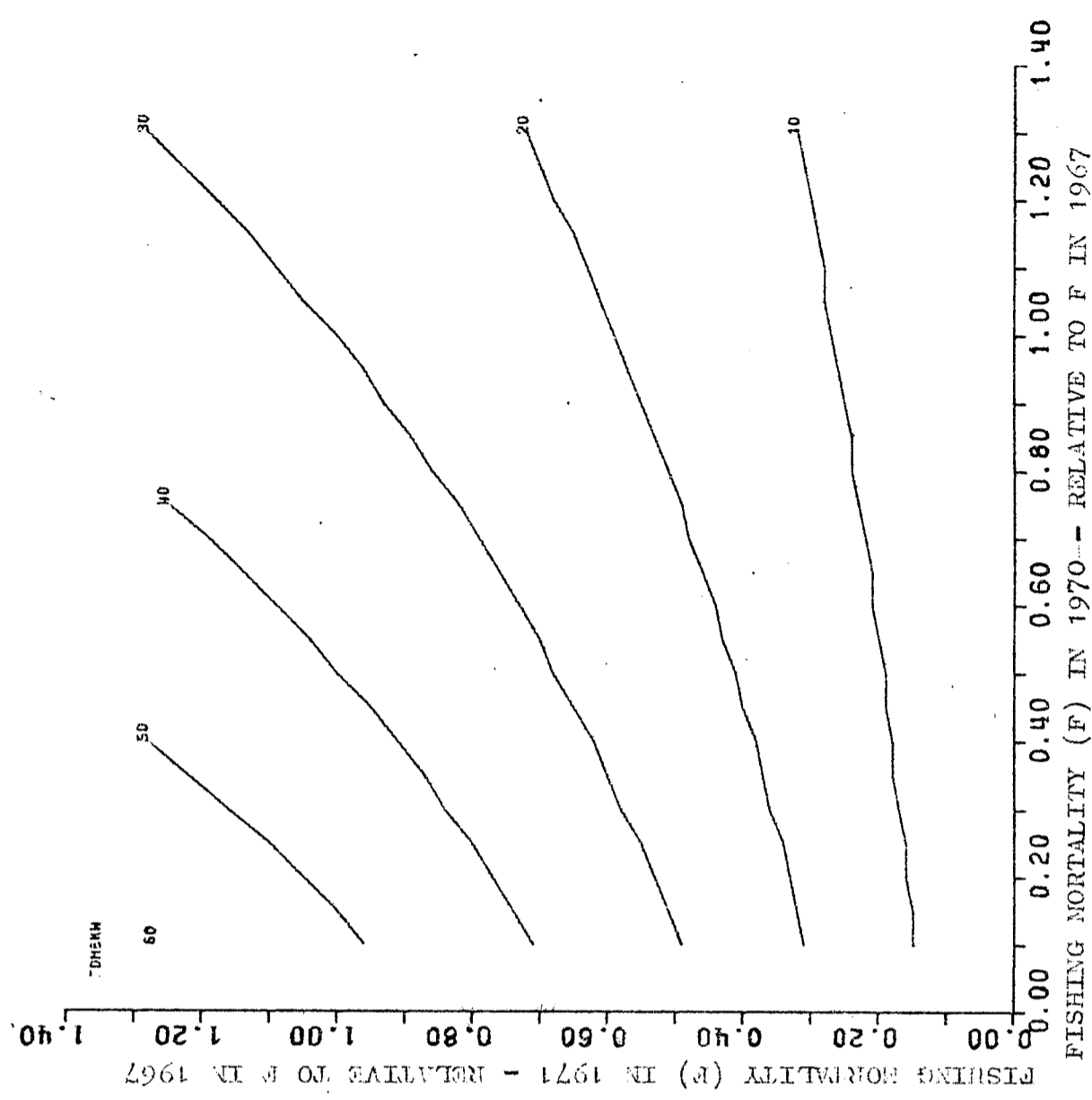


FIG. 2B. Expected total yield of Arctic haddock in 1971, assuming fishing mortality rate in 1969 to be 120% of that in 1967. Numbers on the curves are 1000 tons, round fresh weight.