

ANNUAL MEETING - JUNE 1964On the Interpretation of Recent Trends in Cod and Haddock Landings  
of the Eastern Scotian Shelf

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Measurement of the effects of fishing on stocks of fish requires association of data on catches with data on the amounts and kinds of fishing effort expended in catching them. To obtain the necessary data on eastern Canadian fisheries, scientists at St. Andrews have set up and maintain a log-book record system in which the vessel skipper or a deputy is asked to supply detailed records of actual operations and estimated catches. The information so obtained constitutes a basic statistical series available for research purposes. From it are derived additional series. At the second level, the log-book effort data are summarized by trips and associated with trip landings statistics collected by the Department of Fisheries. Finally, the trip catch and effort records are summarized over types of gear, species sought, by month and area fished. This third series is supplied to ICNAF where it is published in association with similar series supplied by other countries. The resulting ICNAF statistical series provides a means of following trends in the fisheries but a review of recent records illustrates the difficulties of using them to differentiate among the various factors which may be responsible for the trends.

Figure 1 illustrates trends in the important haddock and cod fisheries of the eastern Scotian Shelf (ICNAF Divisions 4V-W) as revealed by the ICNAF statistical series. Annual total landings of haddock (Fig. 1A) have been relatively constant at an average of about 25,000 metric tons although there is some

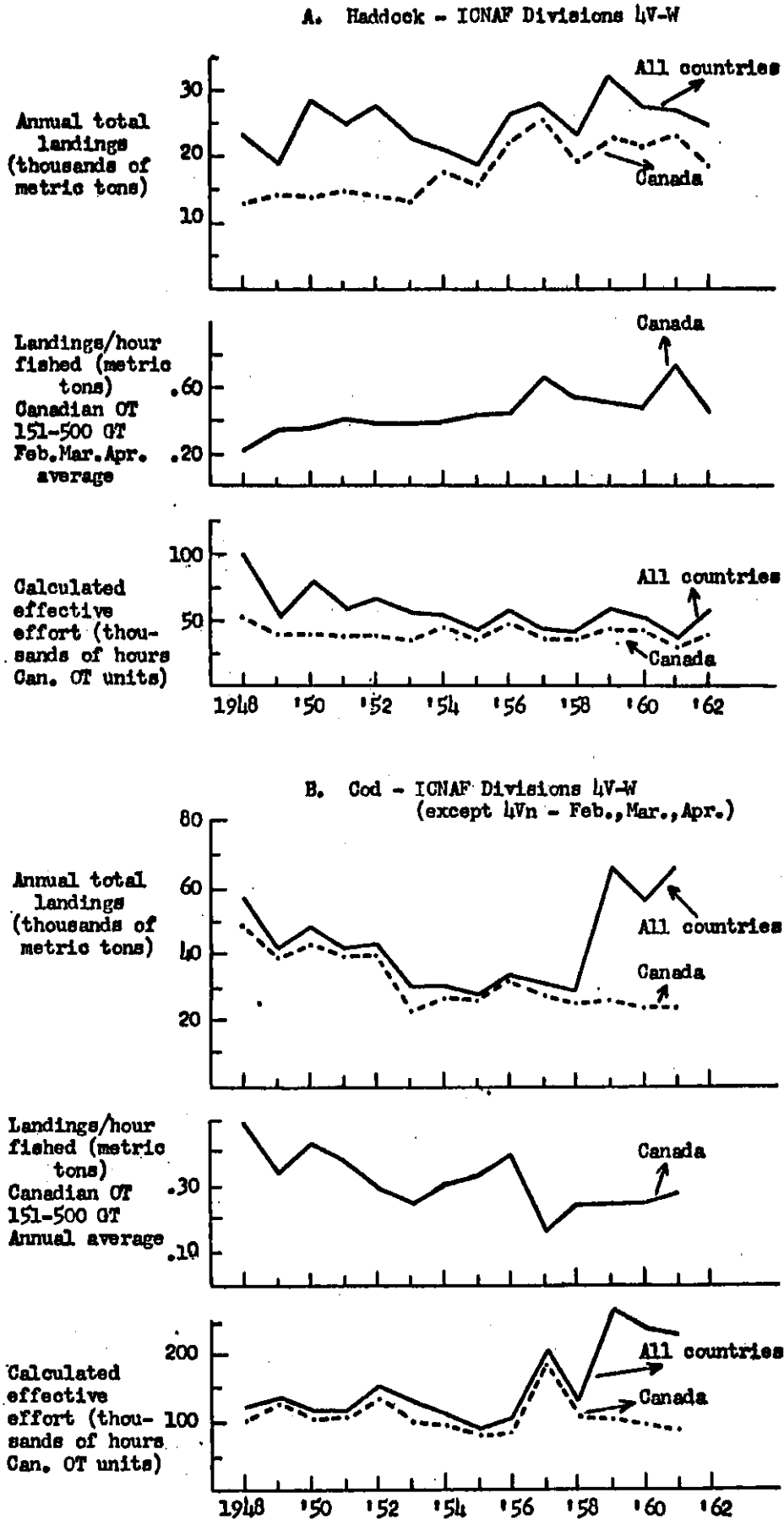


Fig. 1. Trends in haddock and cod fisheries, ICNAF Divisions 4V-W.

indication of a gradual upward trend. Canada's share of this catch has been increasing steadily with the increased use of otter trawlers. The United States landed important quantities up to the mid 1950's; since 1958, non-Canadian landings have

again increased with increased activity by Spanish vessels fishing mainly in summer. Their primary interest is in the cod fishery, haddock being taken only incidentally.

The landings per hour fished by large Canadian otter trawlers during February, March and April, when haddock fishing in the area is pursued most vigorously, show a slight upward trend, indicative of an increased availability of haddock to the fishing units. This increase is in almost direct proportion to the landings increase so that calculated total effective effort for haddock, in large otter-trawl units, has remained almost constant over the past 15 years.

The trends of landings by the cod fishery of the area are rather different (Fig. 1B). Up to 1959, landings were almost wholly by Canada, and from 1948 to 1958 dropped steadily, largely because of the steady decline in Canadian dory-schooner fishing. Landings increased sharply in 1959 with the appearance of Spanish vessels, but the Canadian catch has continued its downward trend. Average annual catch of cod per hour fished shows a downward trend, again almost in proportion to landings. The resulting estimate of annual total effort by the Canadian fishery remains relatively constant throughout the period.

Changes in catch per unit effort, reflecting relative availability, are often equated with relative abundance change. Such reasoning applied to these fisheries would suggest a decrease in abundance of cod and an increase in abundance of haddock. However, in this fishery, which is now dominated by the catches of otter trawlers, the same vessels catch significant amounts of both species on a single trip, although the proportion of each one may be very different from trip to trip. To date, we are unable to distinguish from our statistics between trips intended for haddock and those intended for cod. Therefore, the same trips have been used to calculate catch per unit effort for each species. Under such conditions, one might equally interpret the reverse trend of catch per hour to represent a situation in which fishermen direct their efforts towards the catching of the species of their choice. The

slight upward trend may then simply reflect some increasing market preferability for haddock.

This possible interpretation is supported if we consider catch per hour fished for the first quarter of the year for both haddock and cod. The two are plotted in Fig. 2 in which the reverse trend of Fig. 1A and B becomes an inverse relation with slope about  $-1.00$  with a correlation coefficient of  $-0.73$ . That is, a change in catch per unit effort of one

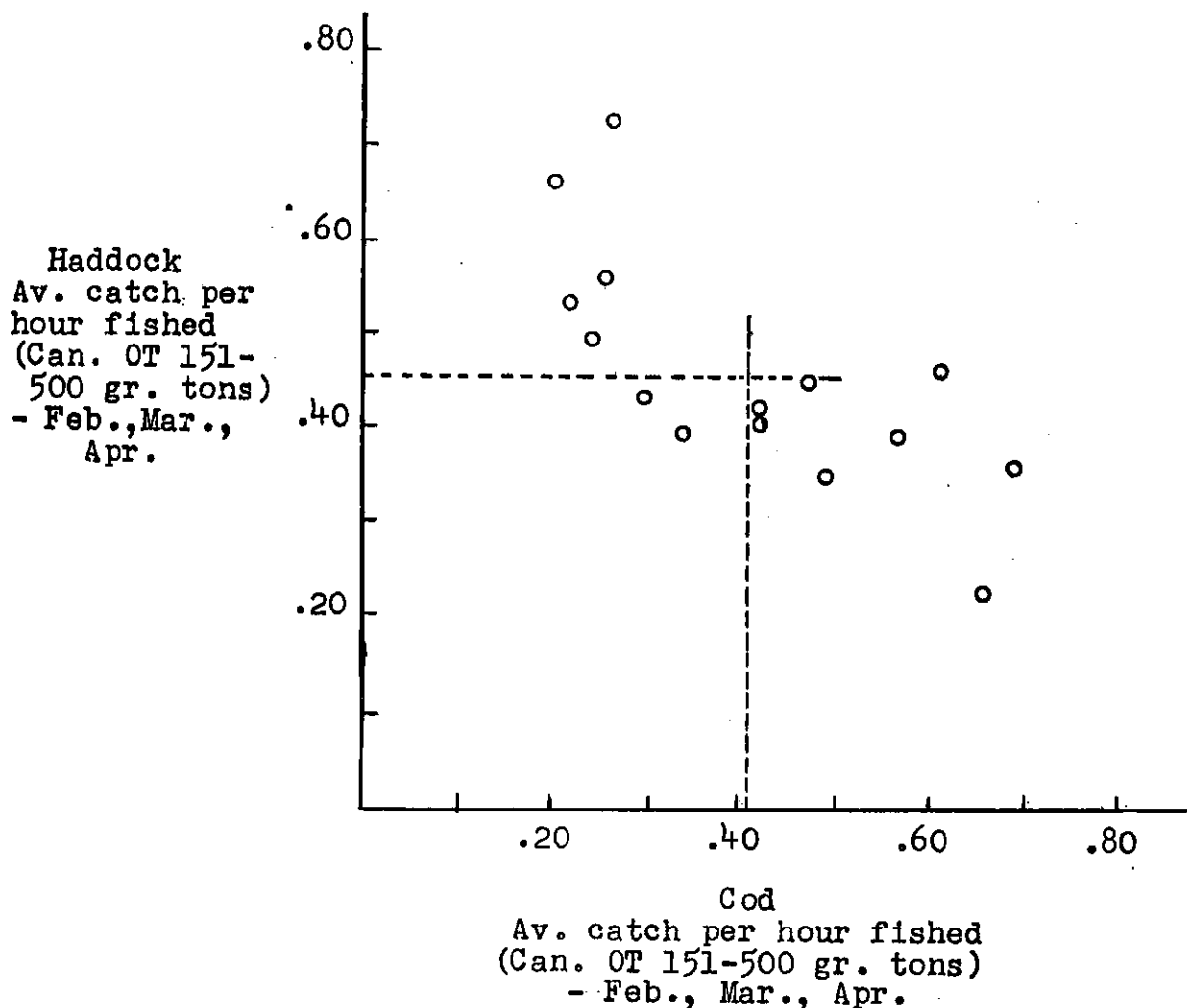


Fig. 2. Relative availability of cod and haddock to Canadian large otter trawlers in ICNAF Divisions 4V-W, Feb., Mar., Apr.

species is almost exactly made up for by a change in the catch of the other as though the fisherman directs his efforts rather specifically for the one species or the other. Further support for this view comes from the studies of species associations in individual commercial catches reported last year by J. E. Paloheimo (1963 Annual Meeting, Doc. No. 52). His tables suggest that, for 1957, the year in which catch per unit effort for cod dropped most sharply, simultaneous with a rise in catch per unit effort for haddock, the rank correlations of cod and

haddock in catches took higher negative values than for the following year. That is, the trips which landed haddock and cod were better separated than in the following year. The lower catch per hour calculated for the otter-trawl-caught cod may, therefore, have resulted from fewer trips made specifically for cod. Since, however, the total cod landings did not show a drop in 1957, the trips which were actually cod trips must, on the whole, have been rather good ones, although this does not emerge from the averaged statistical data.

This review of the overall statistics, while showing overall trends, illustrates the virtual impossibility of differentiating fishery from stock changes without rather detailed information on the fishing operation. While the statistical indices reviewed here are interpreted as giving evidence of the selectivity of fishing operations, they do not eliminate the possibility of real stock changes. To do this would require at least two additional data: First, a knowledge of the intention of the skipper to fish for one species or the other at various times during his trip and how effectively he implements this intention; and second, a more detailed knowledge of the actual distribution of cod and haddock on the grounds. The first information might be obtainable from log records, although it may require specific first-hand study. The second could only be obtained by extensive and detailed research-vessel sampling, such as by combined echo-sounder and fishing surveys.