An Evaluation of the use of Available Catch/Effort Data in the Georges Bank Cod Stock Prediction Program

by

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The stock prediction program currently used in the Georges Bank cod stock uses the estimated age composition of the most recent year's catch in the fisheries to calculate the population size based on the relationship between fishing mortality and population size. At the present time the catch in numbers consists of primarily the 1974 and 1975 year-classes (Serchuk et al. 1978). The procedure used in that assessment determines the size of these year-classes as two-year-olds based on the relationship between catch-per-tow in the USA autumn bottom trawl survey and the stock size as estimated by virtual population analysis for those years where that size is determined by the accumulated fishery catches at age (i.e., is not under major influence of the fishing mortality inputed into the model for the last year for the fishery). The correlation coefficient for this relationship was 0.78 which is significant at the five percent level.

An alternative procedure would be to estimate fishing mortality on these year-classes by a relationship between effort in the fishery (as determined from dividing fishery catch-per-unit-effort into the catch) and the fishing mortality as determined from the virtual population analysis. The available catch-per-unit-effort data is based on large trawlers from Boston (over 150 gross tons, Table 1). The corresponding values are plotted in Figures 1 and 2. Not only are the correlation coefficients low and not significant (0.34 for two-year-olds and 0.22 for three-year-olds), but the slope is negative instead of positive. This means that as more effort is put into the fishery the smaller the proportion of the population that will be harvested. Thus with a very small effort as estimated for 1977 roughly 40 percent of the population would die from fishing, while a

very large effort twenty times that for this year would take only one-third of the population. Therefore, this procedure using commercial catch-per-unit-effort data could not be used in the current assessment. It should be noted that this result is what would be expected if the cod fishery has shifted, over this time period, from being a more secondary species in the haddock fishery to a more primary species in the groundfish fishery. It is also the logical consequence of concentrating additional fishing effort during periods when good year-classes are available.

Literature Cited

Serchuk, F. M., P. W. Wood, and B. E. Brown. 1978. Atlantic cod (*Gadus morhua*) assessment and status of the Georges Bank and Gulf of Maine stocks, January 1978. Lab. Ref. No. 78-03, National Marine Fisheries Service, Northeast Fisheries Center, Woods Hole, MA 02543.

Table 1. Commercial Catch Per Day Index for cod from Georges Bank.

Year	MT/day	Year	MT/day	Year	MT/day
1932	2.0	1951	1.3	1970	2.1
1933	2.5	1952	1.0	1971	2.1
1934	2.0	1953	1.1	1972	2.6
1935	1.9	1954	1.1	1973	4.2
1936	2.9	1955	1.4	1974	3.9
1937	3.1	1956	1.4	1975	3.8
1938	2.4	1957	1.4	1976	3.9
1939	1.6	1958	1.1	1977*	5.6
1940	1.6	1959	1.5		
1941	1.9	1960	1.5		
1942	1.9	1961	2.2		
1943	2.7	1962	1.2		
1944	2.8	1963	1.8		
1945	3.0	1964	1.0		
1946	1.6	1965	0.9		
1947	1.5	1966	1.1		
1948	1.7	1967	1.0		
1949	1.6	1968	1.4		
1950	1.3	1969	1.6		

*Provisional for period Jan-Oct.

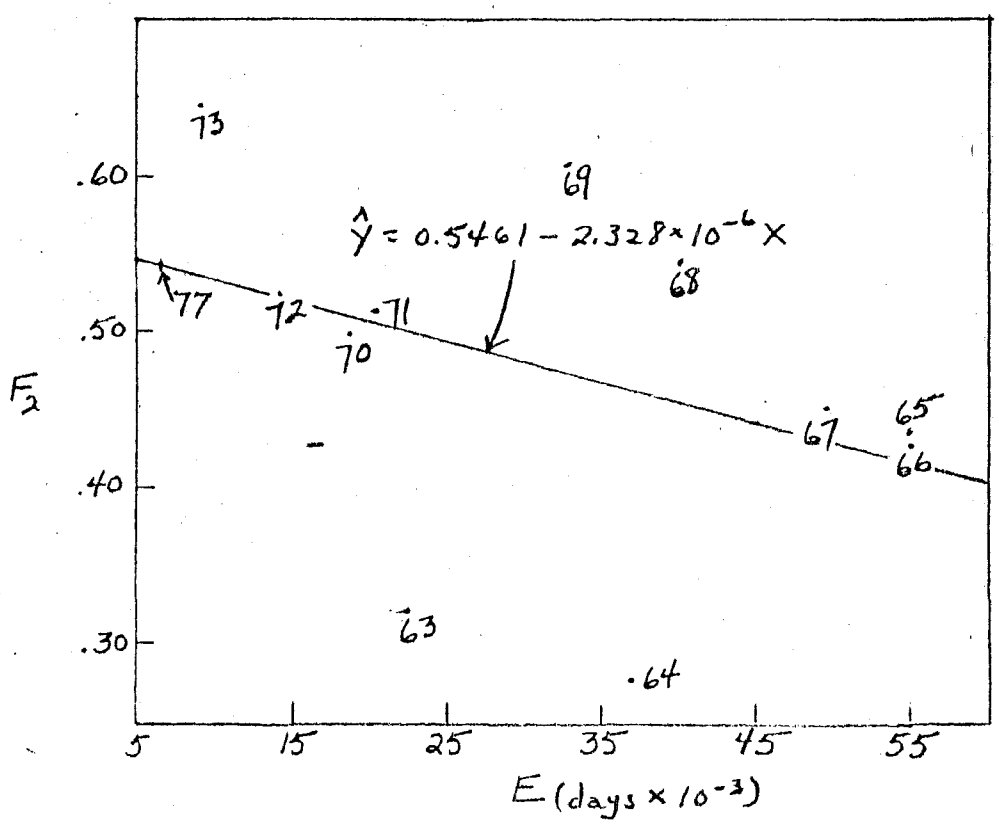

Figure 1. Relationship between fishing mortality for two year old cod (F_2) and total fishing effort (E) based on commercial catch per day statistics $r^2 = 0.0495$, $r = 0.2225$.

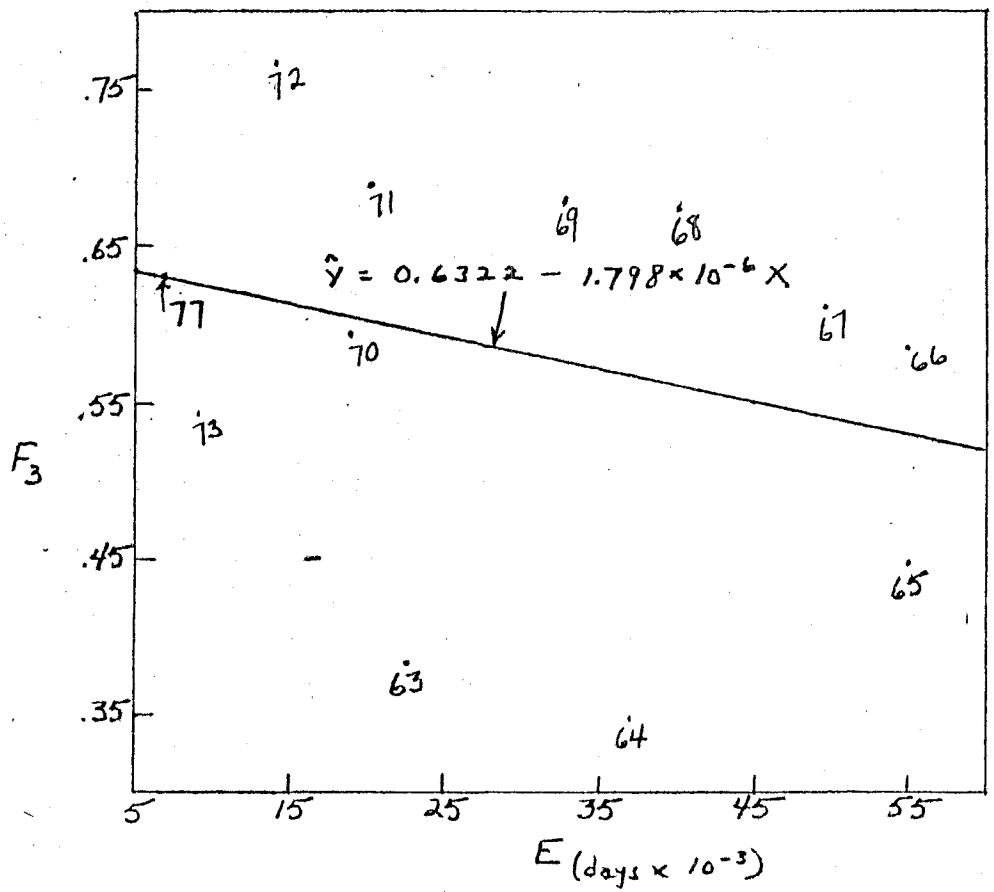

Figure 2. Relationship between fishing mortality for three year old cod (F_3) and total fishing effort (E) based on commercial catch per day statistics $r^2 = 0.0495$, $r = 0.2225$.