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Pre-recruit indices of abundance and predicted numbers of recruits
in the southern Gulf of St. Lawrence cod stock

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Introduction

The establishment of future total allowable catches for selected species stocks requires estimates of the size of recruiting year-classes which will enter a fishery in any given year. These estimates are derived from known correlations between pre-recruit indices of abundance from research vessel surveys and stock sizes at first entry to a fishery from virtual population analysis. The purpose of this report is to utilize pre-recruit indices of abundance of age 2 and 3 cod in ICNAF Div. 4T to predict the abundance of the exploitable population at age 4 in subsequent years in Div. 4T-4Vn.

Materials and Methods

Pre-recruit indices of abundance were derived from annual autumn surveys in the southwestern Gulf of St. Lawrence (Strata 16, 17, 18, 20, 22, as defined by Halliday and Kohler 1971) by the research vessels M.V. *HARENGUS* prior to 1967 and E. E. *PRINCE* thereafter. Based upon comparative fishing data, the *HARENGUS* catches were adjusted upward by 10.024% for comparison to the *PRINCE* catches. Because surveys were conducted using the standard-line system up to 1970 and the stratified random sampling design in subsequent years, only those catches in strata sampled by both sampling methods were used in the calculation of catch per tow in the surveys. No significant differences were observed in the annual survey catch per tow data between former station sets retained in recent surveys and randomly selected stations.

A logarithmic transformation was applied to the numbers caught per tow in each survey because the catches were positively skewed. The indices of pre-recruit abundance were expressed as the \log_{10} mean number per tow. These abundance estimates of pre-recruit cod at age 2 and 3 were compared with stock size estimates at age 4 derived from Pope's cohort analysis technique on commercial catches (Halliday 1974). The paired data were plotted and a least-squares linear regression line was fitted to the plots. Using the fitted line, estimates of the numbers of exploitable cod at age 4 were made for the 1967-1971 year-classes (1970-1975).

Results

Significant arithmetic correlations were found between stock size at age 4 and pre-recruit indices of abundance at age 2 ($r = 0.90$; $P < .01$) and at age 3 ($r = 0.66$; $P < .05$) (Fig. 1). The data used in the correlations and the estimated stock sizes from pre-recruit indices of abundance are given in Table 1.

Discussion

The highly significant correlation between the pre-recruit indices at age 2 and stock size at age 4 presumably is due to the fact that age 2 cod were not exposed to the fishery whereas nominal catches (up to 3.5 million fish) of age 3 pre-recruits have been reported (Halliday 1972). Using this correlation it is possible to estimate the recruiting year-class 2 years in advance. The commercial abundance of cod should show a moderate increase in 1975 because of increased recruitment (Table 1).

Table 1. Research indices of abundance of pre-recruit cod in ICNAF Div 4T and predicted stock sizes of same year-classes subsequent to those estimated from Pope's cohort analysis in Div. 4T-4Vn.

Year-class	Log ₁₀ mean number per standard tow		Stock size from cohort analysis (Number x 10 ⁻⁶)	Predicted stock size from surveys (Number x 10 ⁻⁶)	
	Age 2	Age 3	Age 4	Age 4	
1957	0.498	0.832	110.0		
1958	0.132	0.460	37.7		
1959	0.149	0.461	49.7		
1960	0.155	0.232	33.8		
1961	0.198	0.912	51.4		
1962	0.153	0.584	43.9		
1963	0.188	0.400	51.8		
1964	0.490	1.119	94.4		
1965	0.264	0.629	93.1		
1966	0.282	0.242	56.6		
1967	0.087	0.342		33.5 ^a	47.7 ^b
1968	0.125	0.249		40.2	42.1
1969	0.013	0.267		20.5	43.2
1970	0.161	0.474		46.5	55.6
1971	0.263			64.4	

^a numbers estimated from age 2 pre-recruit indices

^b numbers estimated from age 3 pre-recruit indices

Literature Cited

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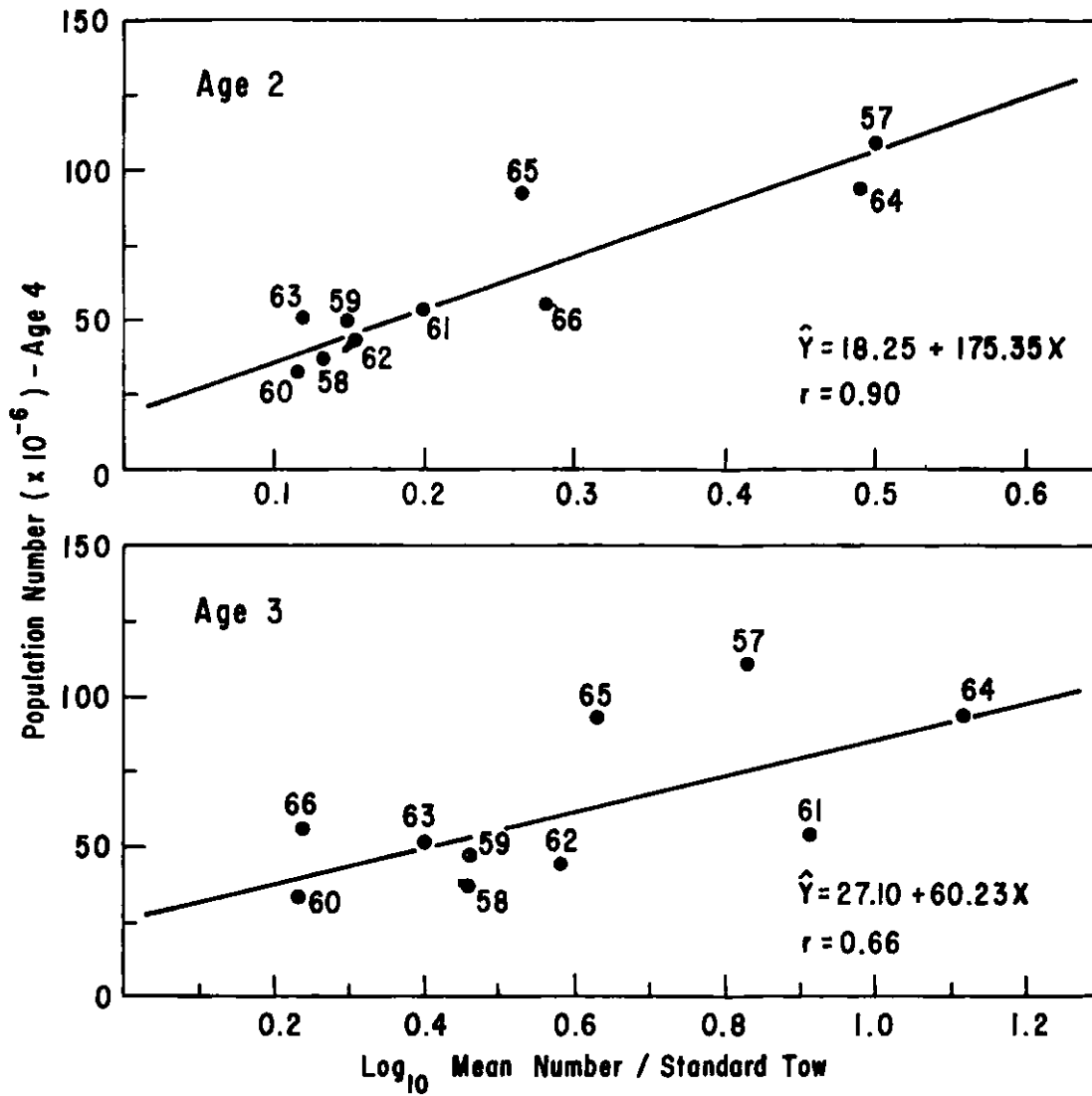


Fig. 1. Correlation of indices of abundance of pre-recruit year-classes of cod at age 2 and 3 from research vessel surveys in ICNAF Div. 4T and stock sizes of same year-classes at age 4 from cohort analysis in Div. 4T-4Vn.

