

Yellowtail

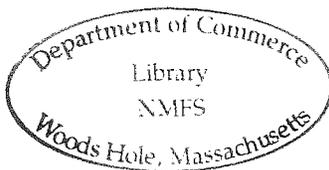
Yellowtail Flounder (Limanda ferruginea):

Status of the Stocks, February 1979

by

M. M. McBride and M. P. Sissenwine

National Marine Fisheries Service  
Northeast Fisheries Center  
Woods Hole Laboratory  
Woods Hole, Massachusetts 02543



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## SUMMARY

1. Currently available commercial catch and effort data indicates that landings were lower in 1978 than in 1977 for the Southern New England and Georges Bank stocks. Preliminary catch per unit of fishing effort estimates for Georges Bank, Southern New England, and Cape Cod stocks remain near the lowest values ever observed. However, a stabilizing trend is indicated.
2. Mean catch per tow values from the 1978 autumn bottom trawl survey show some general improvement, however, they remain among the lowest values ever observed. Catch per tow of pre-recruit (age 1) yellowtail flounder indicates improved prospects for recruitment relative to recent years. The pre-recruit catch per tow in the Southern New England area in 1978 was still significantly lower than was typical prior to the 1970's.
3. Based on the 1978 autumn bottom trawl survey, estimates for the 1979 catch at  $F_{0.1}$  and  $F_{max}$  are 1500 and 2250 metric tons for Southern New England and 2430 and 3800 metric tons for Georges Bank, respectively. These values are not significantly different from the corresponding estimates of last year.

## INTRODUCTION

This document updates yellowtail flounder catch and effort statistics to the year 1978 for Georges Bank, Southern New England, and Cape Cod grounds. It also presents the results of the 1978 autumn bottom trawl research vessel survey for Georges Bank, Southern New England, and the Mid-Atlantic areas. Presented herein are tables and graphs which update those in the January 1978 yellowtail flounder assessment by Sissenwine et al. (Laboratory Reference No. 78-02). Background information on the yellowtail fisheries and methods of using commercial and survey data for assessment purposes are reviewed in the earlier document.

## DISCUSSION

Preliminary commercial catch and effort data (see Tables 1-4) indicate that landings are down 14% for Southern New England, 53% for Georges Bank, and are up 42% for the Mid-Atlantic area. Cape Cod's landings are up 11% from last year. The reduction in catch from the Georges Bank area must in part reflect the sharp reduction in optimum yield implemented in 1978. The preliminary estimate of catch per unit of effort (CPUE) for the Georges Bank area is equal to that of 1977, about 1.4 metric tons per day. Southern New England and Cape Cod preliminary CPUE values are up 29% and 21% over those of 1977, respectively. Nonetheless the CPUE of 1978 in all three areas remains near the lowest values ever observed. However, recent data do indicate that CPUE is tending to stabilize and perhaps recover, after several years of decline that began in the late 1960's and early 1970's. Recent values of CPUE are not entirely comparable to earlier values because of the implementation of restrictions on landings per trip.

Results from the 1978 autumn bottom trawl survey (Tables 5-7) indicate that the mean catch per tow (in kg) is down 14% from 1977 for Georges Bank, yet this level exceeds those of 1975 and 1976. The Southern New England mean catch per tow is more than the 1977 value and is the highest value seen since 1972. Nevertheless, the 1978 value is only about one-third the lowest value ever observed prior to 1972. The mean catch per tow for the Mid-Atlantic area increased 25% from 1977 to 1978. This is the highest observed level since 1973, but still nearly two orders of magnitude lower than typical values prior to 1973.

The catch per tow of pre-recruit (age 1) yellowtail flounder during the fall 1978 survey shows a 57% decrease from 1977 for the Mid-Atlantic; while the Southern New England pre-recruit index shows a 94% increase. The Georges Bank stock also shows a sharp increase (425%) in number of age 1 yellowtail per tow. For Southern New England this 1978 value is the highest pre-recruit index observed since 1972, and it is the highest value observed since 1971 for Georges Bank.

The 1978 Southern New England pre-recruit catch per tow value was used to update the population size index for 1979 following the method of Brown and Hennemuth (1971). The 1979 index for Southern New England is 23% higher than last years value, but still is an order of magnitude lower than values during the late 1960's. For Georges Bank, the mean catch per tow in weight from each autumn survey is used as a population size index for the following year. In Figures 2 and 3, population size indices based on bottom trawl survey data and relative abundance indices (CPUE) based on commercial fisheries data are plotted for Southern New England and Georges Bank,

respectively. Both sets of data indicate a general declining trend until the mid 1970's at which time the population size appears to have stabilized at a low level. For Southern New England, the rate of decline of the commercial abundance index is significantly lower than the rate of decline of the research vessel index. This may in part be the result of an artifact of the computational method used to calculate commercial fishing effort. Fishing effort is assumed to be directed at yellowtail flounder for fishing trips which land a catch comprised of at least 50% of that species. Using this method, the rate of decline in CPUE will be slower than the rate of decline in population size if the yellowtail population size declines more rapidly than the size of populations of other species caught as by catch (Sissenwine, 1978).

Time series graphs of population size indices based on autumn bottom trawl surveys vs. the subsequent year's catch are presented for Southern New England and Georges Bank areas (Figures 4 and 5). The slope from any point through the origin indicates the annual average fishing mortality rate ( $F$ ) relative to other years and relative to the reference lines provided on the graph. A general trend of decline in abundance is indicated for a series of years where  $F$  exceeded  $F_{\max}$ . For Georges Bank in 1978,  $F$  was sharply reduced to approximately the  $F_{\max}$  level. This action apparently affected a stabilization of the stock. The vertical line indicates the set of possible points for 1979; here the abundance is calculated based on results from the autumn 1978 survey. These graphs show the preliminary results of regulating removals from the stocks to about the  $F_{\max}$  level for 1978 (1,700 metric tons for Southern New England and 4,400 metric tons for Georges Bank). In both

cases, the stock size appears to have been stabilized when F was reduced to about the  $F_{\max}$  level given the observed trend in recruitment. Further reduction in F (to about the  $F_{0.1}$  level for example) probably would have resulted in some recovery in stock size, but full recovery to the levels observed in the mid 1960's cannot be realized without the benefit of improved recruitment.

Based on Figures 4 and 5, the estimated catches in 1979 that will correspond to  $F_{\max}$  and  $F_{0.1}$  are 2250 and 1500 for Southern New England,\* and 3800 and 2430 for Georges Bank, respectively. It is reasonable to assume that further significant declines in abundance of both stocks will be prevented by maintaining F at the  $F_{\max}$  level even if recruitment remains at the relatively poor levels observed in recent years.

The 1978 landings from the Cape Cod grounds ( $3.9 \text{ MT} \times 10^{-3}$ ) is near the highest level ever observed and is about double the long term average (1.8 MT for 1935-1975). The estimated annual catch from the Mid Atlantic area has gradually increased from a low of 253 MT in 1976 to 759 MT in 1978. Nevertheless, the 1978 catch is less than 10% of the peak value in 1972.

\*Note that the OY for SA 5Z W of 69<sup>0</sup> + 6 applies to the Southern New England and Cape Cod stocks and the Mid Atlantic area. In the past, 2000 MT has been included in the OY to account for the Cape Cod stock.

## References

Brown, B.E., and R.C. Hennemuth. 1971. Prediction of yellowtail flounder population size from pre-recruit catches. Redbook Int. Comm. NW Atlant. Fish., Part III: 221-228.

Sissenwine, M.P. 1978. Is MSY an Adequate Foundation for Optimum Yield? Fisheries, Vol. 3, No. 6., pp. 24-42.

\_\_\_\_\_, B.E. Brown, and M.M. McBride. 1978. Yellowtail Flounder (Limanda ferruginea) Status of the Stocks Report, January 1978. Lab. Ref. No. 78-02. 24 p.

Table 1. Yellowtail flounder catch statistics for Southern New England  
(catch in MT x 10<sup>-3</sup>).

Year	Food Landings	Discard	Industrial	Foreign	Total	Days fished in 1000's	Catch per day in MT
1935	6.0	2.4			8.4		
1936	6.8	2.7			9.5		
1937	7.6	3.0			10.6		
1938	7.7	3.1			10.8		
1939	9.5	3.8			13.3		
1940	14.2	5.7			19.9		
1941	19.3	7.7			27.0		
1942	28.4	9.9			38.3		
1943	18.0	7.3			25.3	5.75	4.4
1944	10.6	4.8			14.9	4.13	3.6
1945	10.4	4.2			14.6	2.86	5.1
1946	10.8	4.4			15.2	3.64	4.2
1947	12.1	4.9			17.0	4.59	3.7
1948	9.9	4.0			13.9	5.14	2.7
1949	4.7	1.9	0.2		6.8	3.40	2.0
1950	4.7	1.9	0.2		6.8	3.23	2.1
1951	2.8	1.1	0.1		4.0	2.00	2.0
1952	3.0	1.2	0.2		4.4	2.44	1.8
1953	2.0	0.8	0.3		3.1	1.63	1.9
1954	1.5	0.6	0.2		2.3	1.35	1.7
1955	2.2	0.9	0.3		3.4	1.70	2.0
1956	3.5	1.4	0.6		5.5	2.61	2.1
1957	5.5	2.2	0.7		8.4	2.62	3.2
1958	8.9	3.6	0.6		13.1	3.85	3.4
1959	7.7	3.1	0.5		11.3	5.13	2.2
1960	7.8	3.2	0.5		11.5	4.60	2.5
1961	11.6	4.7	0.7		17.0	4.85	3.5
1962	13.1	5.3	0.2		18.6	4.04	4.6
1963	22.0	5.4	0.3	0.2	27.9	5.47	5.1
1964	19.0	9.5	0.5	-	29.0	5.08	5.6
1965	18.9	7.0	1.0	1.4	27.8	6.61	4.2
1966	19.9	5.3	2.7	0.7	23.6	8.42	2.8
1967	10.8	7.7	4.5	2.8	25.8	6.51	4.0
1968	14.3	6.3	3.9	3.5	28.0	6.66	4.2
1969	11.4	2.4	4.2	17.6	35.6	10.78	3.3
1970	13.1	4.7	2.1	2.5	22.4	6.40	3.5
1971	8.2	3.3	0.4	0.3	12.2	3.81	3.2
1972	8.2	1.7	0.3	3.0	13.2	4.71	2.8
1973	7.2	0.1	0.3	0.2	7.8	4.11	1.9
1974	6.4	0.7	<0.1	0.1	7.1	3.74	1.9
1975	3.2	0.2	<0.1	0	3.4	2.43	1.4
1976	1.6	0.2	<0.1	<0.1	1.8	1.50	1.2
1977	2.8	<0.1	<0.1	<0.1	2.9	2.0	1.4
1978*	2.1	0.3	<0.1	-	2.5	1.40	1.8

\*Preliminary

Table 2. Yellowtail flounder catch statistics for Georges Bank  
(catch in MT x 10<sup>-3</sup>).

Year	Food landings	Discard	Industrial	Foreign	Total	Days fished in 1000's	Catch per day in MT
1935	0.3	0.1			0.4		
1936	0.3	0.1			0.4		
1937	0.3	0.1			0.4		
1938	0.3	0.1			0.4		
1939	0.4	0.1			0.5		
1940	0.6	0.2			0.8		
1941	0.9	0.3			1.2		
1942	1.6	0.5			2.1		
1943	1.3	0.4			1.7	0.20	8.6
1944	1.7	0.6			2.2	0.22	10.0
1945	1.4	0.5			1.9	0.28	6.7
1946	0.9	0.3			1.2	0.23	5.2
1947	2.3	0.8			3.1	0.48	6.5
1948	5.7	2.0			7.7	1.12	6.8
1949	7.3	2.5			9.8	2.49	3.9
1950	3.9	1.4			5.3	1.64	3.2
1951	4.3	1.5			5.8	1.61	3.6
1952	3.7	1.3			5.0	1.60	3.1
1953	2.9	1.0			3.9	1.24	3.1
1954	2.9	1.0			3.9	1.38	2.8
1955	2.9	1.0			3.9	1.23	3.2
1956	1.6	0.6			2.1	0.79	2.7
1957	2.3	0.8			3.1	0.82	3.8
1958	4.5	1.6			6.1	1.40	4.4
1959	4.1	1.4			5.5	1.97	2.8
1960	4.4	1.5			5.9	2.02	2.9
1961	4.2	1.5			5.7	1.82	3.1
1962	7.7	2.7			10.3	2.35	4.4
1963	11.0	5.6		0.1	16.7	3.63	4.6
1964	14.9	4.9		-	19.8	3.53	5.6
1965	14.2	4.4		0.8	19.2	4.68	4.1
1966	11.3	2.1		0.3	13.7	5.71	2.4
1967	8.4	5.5		1.4	15.3	4.13	3.7
1968	12.8	3.6		1.8	18.2	4.66	3.9
1969	15.9	2.6		2.4	20.9	6.71	3.1
1970	15.5	5.5		0.3	21.3	6.26	3.4
1971	11.9	3.1		0.5	15.5	6.20	2.5
1972	14.2	1.2		2.2	17.6	8.00	2.2
1973	15.9	0.6		0.3	16.7	6.96	2.4
1974	14.6	1.2		1.0	16.8	8.40	2.0
1975	13.8	1.0		0.1	14.6	8.59	1.7
1976	11.4	0.7		<0.1	12.0	7.50	1.6
1977	9.5	0.2		0	9.7	6.70	1.4
1978*	4.5	<0.1	<0.1	<0.1	4.6	3.33	1.4

\*Preliminary

Table 3. Yellowtail flounder catch statistics for Cape Cod Ground  
(catch in MT x 10<sup>-3</sup>).

Year	Food landings	Discard	Industrial	Foreign	Total	Days fished in 1000's	Catch per day in MT
1935	0.4	0.1					
1936	0.4	0.1					
1937	0.5	0.2					
1938	0.5	0.2					
1939	0.6	0.2					
1940	0.9	0.3					
1941	1.3	0.4					
1942	1.5	0.5					
1943	1.3	0.4			1.7	0.53	3.2
1944	1.5	0.5			2.0	1.01	2.0
1945	1.2	0.4			1.6	0.61	2.6
1946	1.2	0.4			1.6	0.62	2.6
1947	1.1	0.3			1.4	0.75	1.9
1948	0.7	0.2			0.9	0.47	1.9
1949	1.2	0.4			1.6	0.68	2.4
1950	1.3	0.4			1.7	0.95	1.8
1951	0.8	0.2			1.0	0.79	1.3
1952	0.8	0.2			1.0	0.76	1.3
1953	0.8	0.2			1.0	0.78	1.3
1954	1.1	0.3			1.4	0.89	1.6
1955	1.3	0.4			1.7	1.00	1.7
1956	1.4	0.4			1.8	1.34	1.3
1957	2.4	0.7			3.1	1.44	2.2
1958	1.6	0.5			2.1	0.92	2.3
1959	1.5	0.5			2.0	0.76	2.6
1960	1.5	0.5			2.0	1.12	1.8
1961	1.8	0.6			2.4	0.91	2.6
1962	1.9	0.6			2.5	1.01	2.5
1963	3.6	1.0			4.6	1.00	4.6
1964	1.8	0.6			2.4	0.71	3.4
1965	1.5	0.5			2.0	0.70	2.8
1966	1.8	0.3			2.1	1.37	1.6
1967	1.5	0.8			2.3	1.69	1.4
1968	1.6	0.6			2.2	0.99	2.3
1969	1.3	0.3			1.6	0.68	2.5
1970	1.2	0.4			1.6	0.53	3.0
1971	1.7	0.7			2.3	0.79	2.9
1972	1.4	0.3			1.6	0.67	2.4
1973	1.7	<0.1			1.7	0.89	1.9
1974	2.1	0.2			2.3	1.21	1.9
1975	2.0	0			2.0	1.25	1.6
1976	3.6	0.1			3.7	2.31	1.6
1977	3.5	0			3.5	2.42	1.4
1978*	3.9	0			3.9	1.98	2.0

\*Preliminary

Table 4. Yellowtail flounder catches in ICNAF statistical area 6  
1964-1977, in metric tons.

Year	USA Landings	USA Discards	Foreign Catch	Total
1964	1809	*	0	1809
1965	2117	*	0	2117
1966	2240	*	0	2240
1967	5340	*	0	5340
1968	3272	*	0	3272
1969	3886	*	683	4569
1970	4050	*	118	4168
1971	6867	*	961	7828
1972	8774	*	117	8891
1973	4937	244	197	5382
1974	1906	32	16	1932
1975	655	17	3	653
1976	253	0	0	253
1977	535	25	0	560
1978*	759	0	0	759

\*Preliminary

Table 5. Autumn bottom trawl survey results for Southern New England yellowtail flounder.

Year of survey	No. per tow Age 1	Total no. per tow	Total weight per tow (kg)	Population size index*
1963	16.3	50.6	16.8	
1964	18.6	60.8	19.1	
1965	11.5	38.7	12.7	
1966	35.5	50.3	9.4	
1967	20.0	57.7	14.1	102.5
1968	10.0	40.2	10.1	119.2
1969	12.8	54.8	14.4	92.6
1970	7.3	39.8	11.0	71.9
1971	6.3	41.7	9.2	53.6
1972	4.3	42.7	10.7	40.0
1973	1.9	7.9	2.3	30.8
1974	1.1	7.3	2.1	20.1
1975	1.7	2.9	0.7	11.9
1976	2.6	10.7	2.9	9.5
1977	1.8	5.01	1.5	10.2
1978	3.5	11.4	3.0	11.0
1979				13.6*

\*Calculations based on method described by Brown and Hennemuth (1971) using  $M = 0.2$ ,  $F = 0.4$  for 1969-1970 and  $F = 0.3$  for all other years at age 2 and  $F = 1.2$  for 1969-1970 and  $F = 1.0$  for 1971-1974 and  $F = 0.7$  for 1975-1978.

Table 6. Autumn bottom trawl survey results for Georges Bank yellowtail flounder.

Year of survey	No. per tow Age 1	Total no. per tow	Total weight per tow (kg)	Population size index*
1963	11.6	30.1	10.0	-
1964	2.6	23.0	10.6	10.0
1965	1.3	15.0	7.1	10.6
1966	9.8	14.8	3.1	7.1
1967	7.0	19.2	5.9	3.0
1968	10.6	25.0	8.2	5.9
1969	7.6	23.1	7.3	7.3
1970	4.8	13.4	3.9	7.3
1971	5.8	15.2	5.0	3.9
1972	2.4	15.8	5.0	5.0
1973	2.7	14.8	5.1	4.9
1974	3.5	10.0	2.9	5.1
1975	4.1	7.7	1.8	2.9
1976	0.3	2.5	1.2	1.8
1977	0.8	5.4	2.5	1.2
1978	4.2	7.2	2.2	2.5
1979				2.2

\*Catch per tow (lbs) is assumed directly related to the size of the fish population. The survey population size index should correspond to the size of the population at the start of the year following the survey.

Table 7. Autumn bottom trawl survey results for the Mid Atlantic area (ICNAF SA 6)

Year	mean number/tow	mean weight (kg)/tow	mean number age 1/tow
1963	28.8	8.9	11.1
1964	16.4	4.9	5.3
1965	49.1	5.8	19.2
1966	48.3	8.9	14.2
1967	55.6	9.3	12.5
1968	81.3	13.5	11.6
1969	45.4	9.9	0.6
1970	45.2	10.3	1.9
1971	27.0	3.8	11.0
1972	38.3	9.9	0.6
1973	8.2	1.9	0.69
1974	0.7	0.2	0.04
1975	0.9	0.1	0.46
1976	0.4	0.06	0.07
1977	1.43	0.2	1.4
1978	1.2	0.2	0.604

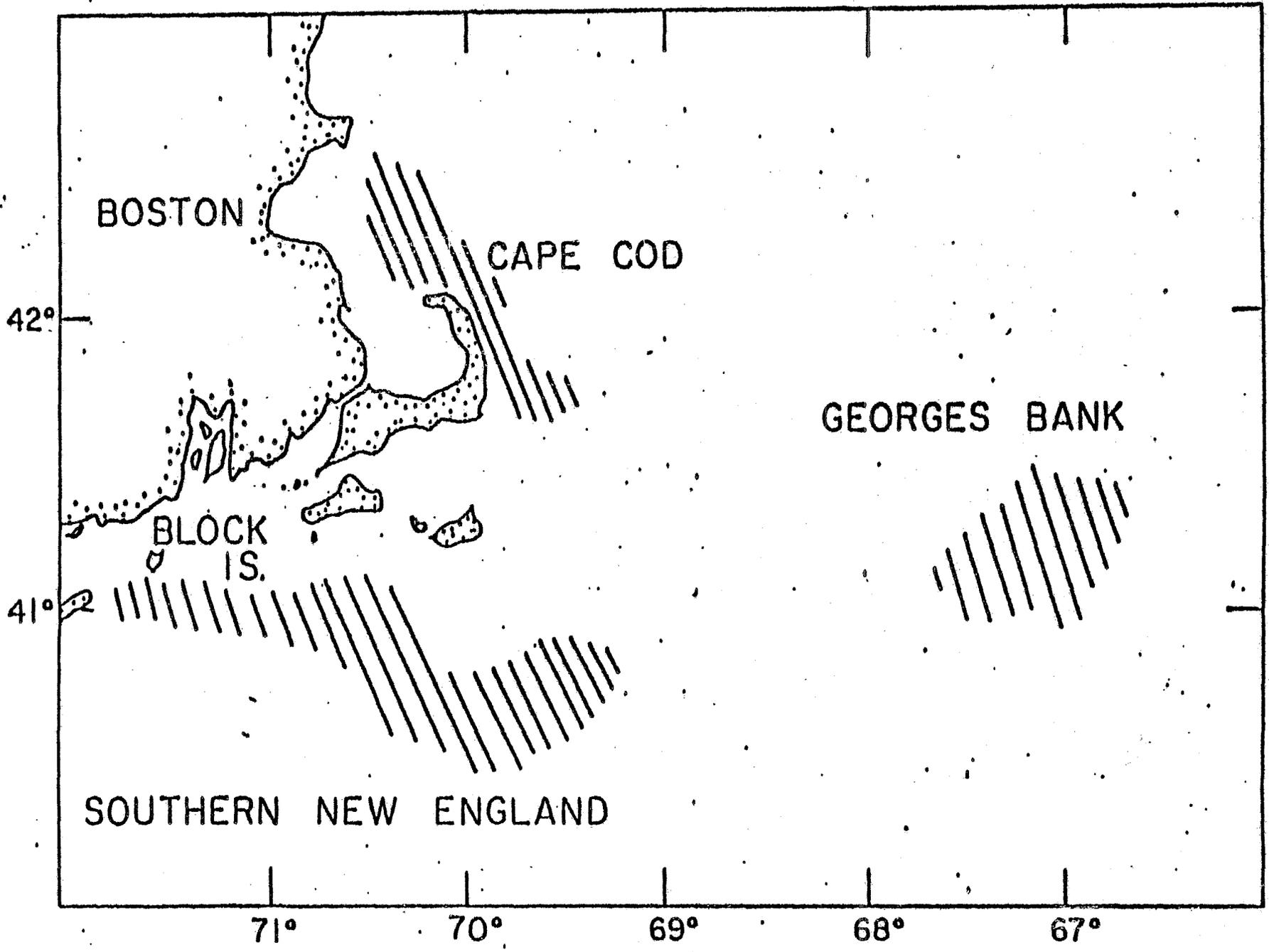


Figure 1. Yellowtail flounder fishing grounds.

Figure 2. Survey vs. Commercial indices of abundance for Southern New England.

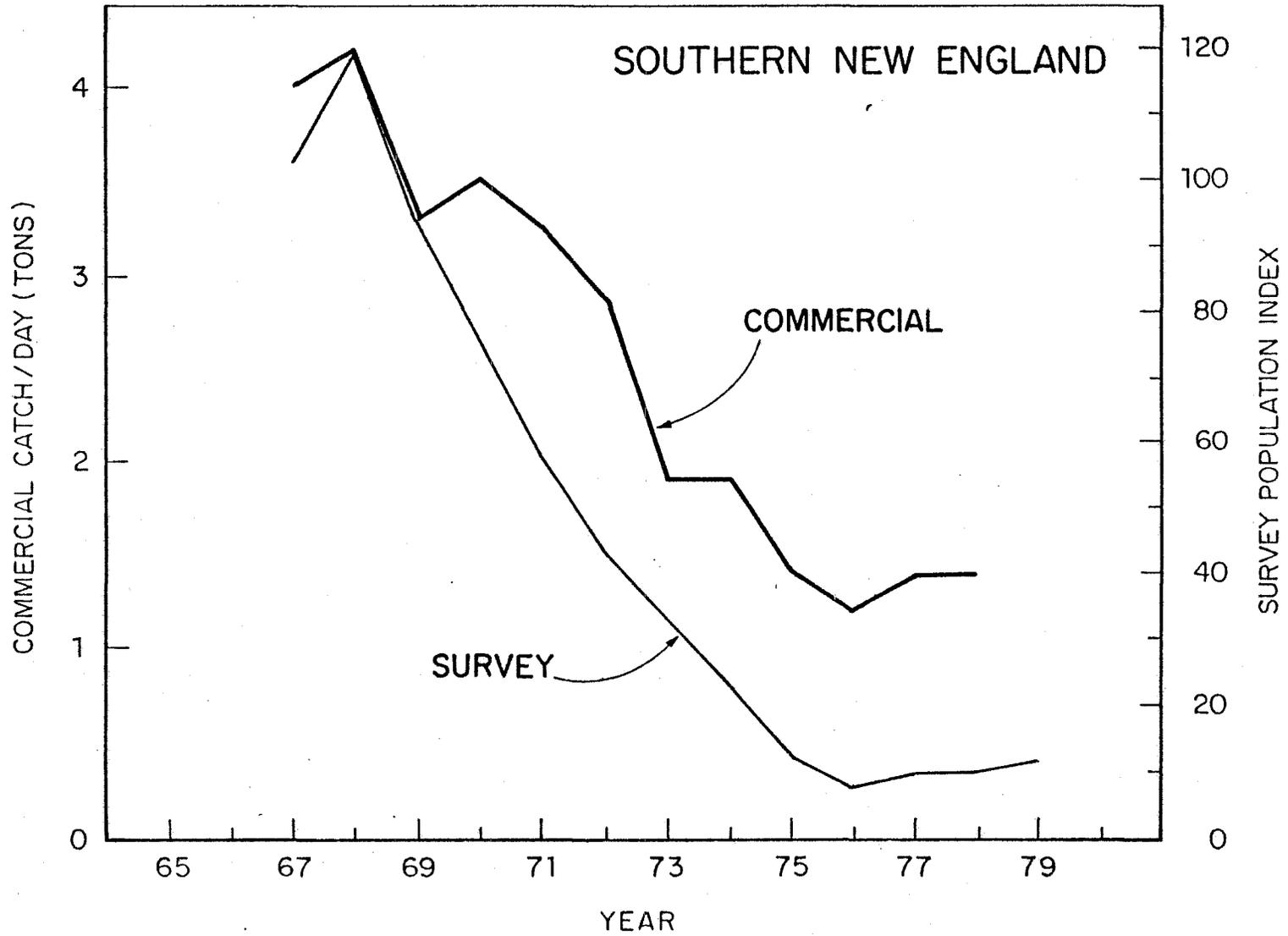


Figure 3. Survey vs. Commercial indices of abundance for Georges Bank.

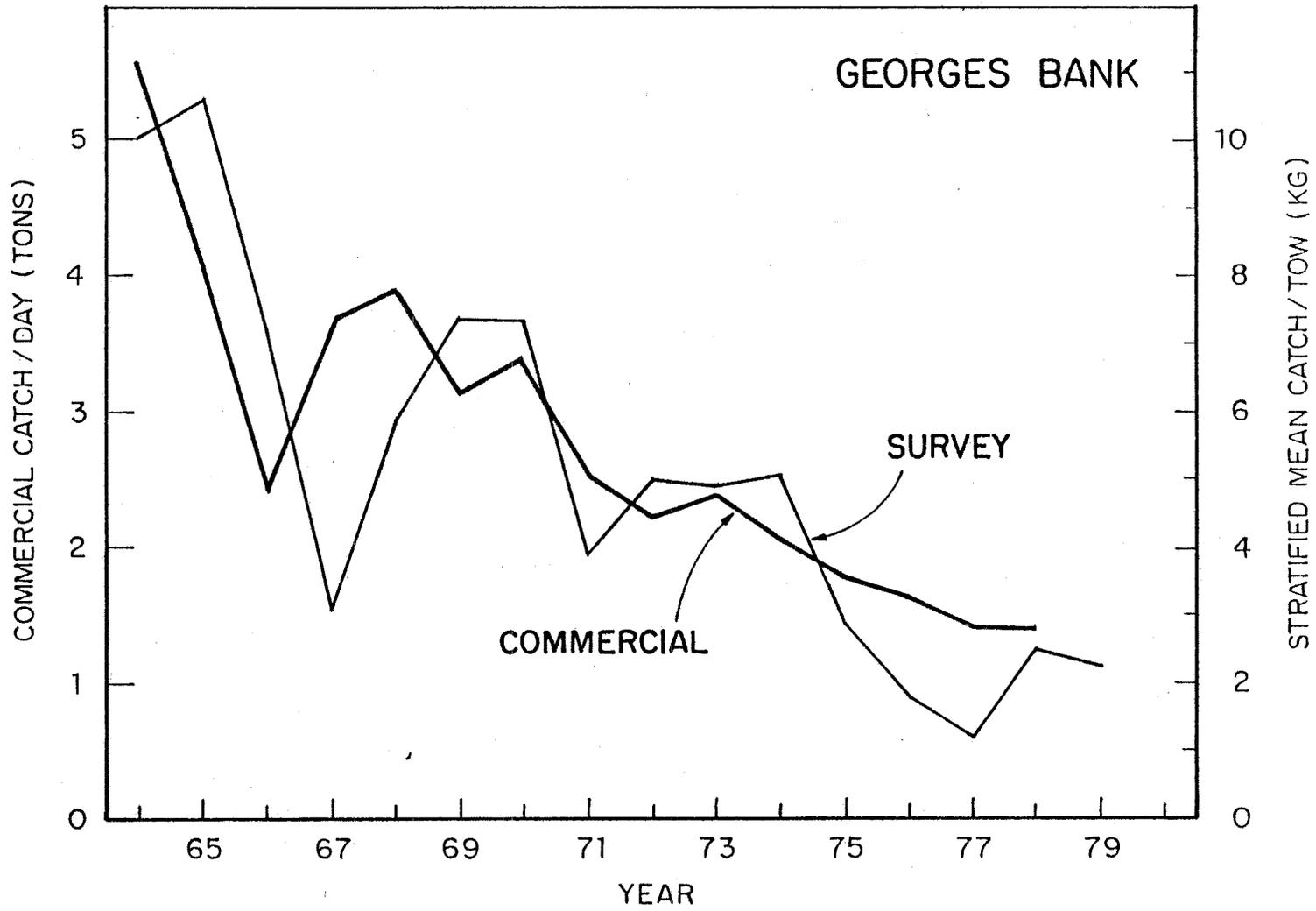


Figure 4. Population size index based on USA autumn bottom trawl survey versus catch for the Southern New England ground. Points are labelled by year of catch.

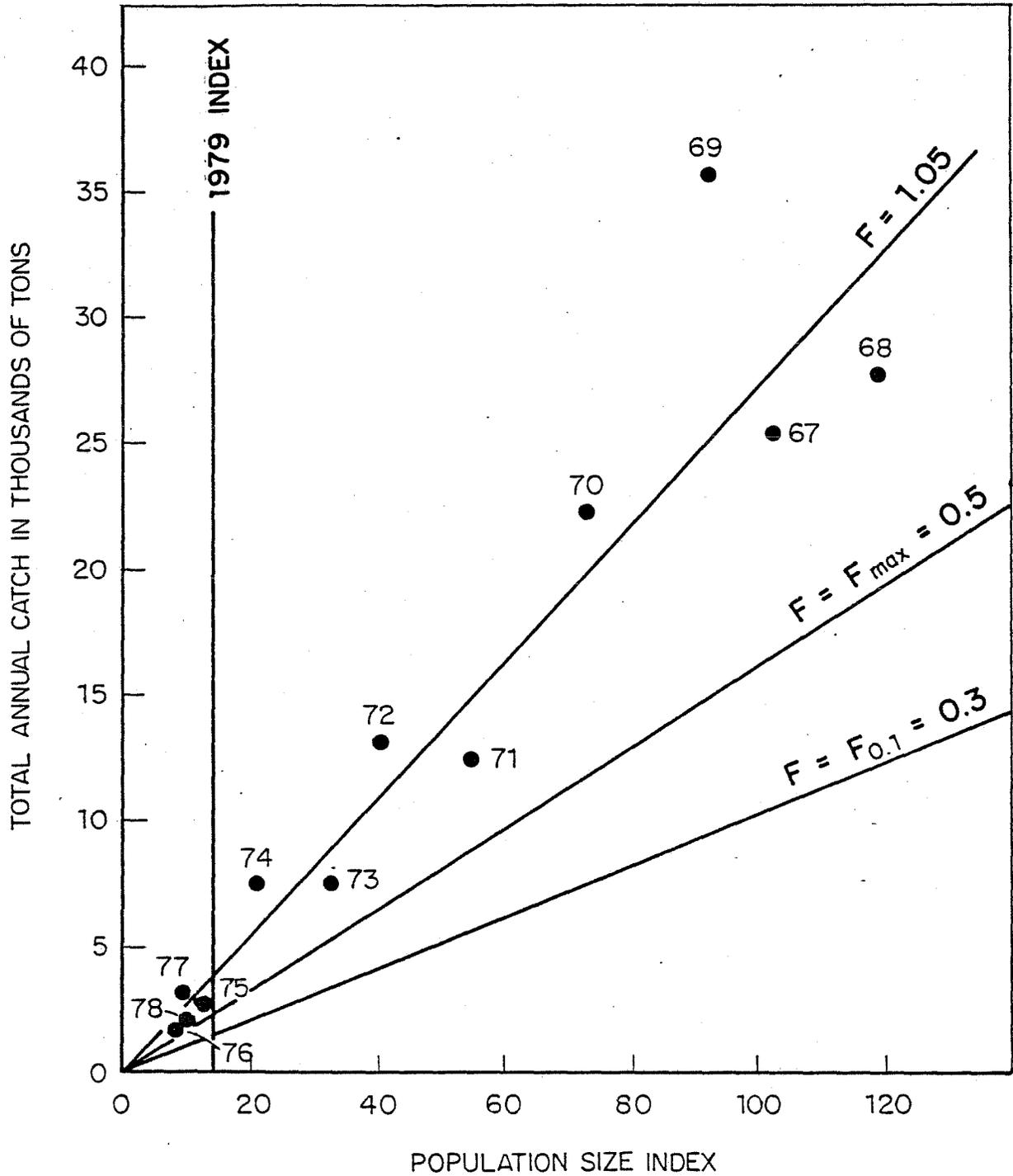


Figure 5. Survey mean catch/tow by autumn bottom trawl survey versus catch the following year for the Georges Bank ground. Points are labelled by year of catch.

