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Assessment of yellowtail from ICNAF Divisions 3LNO

by

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This stock has been regulated since 1973 with the various TACs and catches as follows:

	1973	1974	1975	1976	1977
TAC ('000 tons)	50.0	40.0	35.0	9.0	12.0
Catch ('000 tons)	32.8	24.2	22.9	7.8*	

* Provisional figure.

The assessment presented in 1975 pointed to a drastic reduction in stock abundance and very high levels of fishing mortality were required to take the 1973-75 catches although the latter were considerably below the recommended TACs (Table 1).

A major difficulty in assessing this stock is determining the abundance of the recruiting year-class (5-year-olds). The regression of the numbers at age from the cohort analysis on the average number per set from research trawler surveys gave good correlation for most age groups (Fig. 1 and 2), however for the 5-year-olds it is evident that the research vessel survey data is of little use in determining the recruitment level (Fig. 1). It is impossible to say if the difficulty lies in the inability of the research gear to properly sample the small fish, or if there are errors in the estimates in the cohort analysis possibly caused by the fact that discards of small fish were not taken into consideration.

At the 1976 Assessments Subcommittee Meeting, TACs were calculated by projecting several recruitment levels to give the 1977 TAC. A value 60×10^6 was used as the recruitment levels for 1975-77 to give a TAC for 1977 of 12,000 tons.

Using the same level of recruitment to project the 1978 TAC (Table 2) indicates that the 1976 TAC was taken at an average fishing mortality (F) (fully recruited) of 0.41, just below $F_{0.1}$ (0.5) (Fig. 3). The 1977 TAC (12,000 tons) should require a fishing level (F) of about 0.50 (Table 2). This would give a projected TAC for 1978 at $F_{0.1}$ of approximately 14,000 tons.

At least a stabilization of this stock appears to have occurred. The abundance indices from the 1976 research vessel surveys (Fig. 4) indicate an increase in catch per set both in Div. 3L and 3N and 3LN combined. The catch per hour for total effort has remained relatively constant since 1974 although the "main species" rates declined slightly in 1976. Total abundance indices (average numbers and weight) from research vessel surveys gave excellent correlation with total population weight and numbers from cohort analysis (Fig. 5).

It would appear that the drastic action taken in 1975 in reducing the TAC of 35,000 to 9,000 tons has had the desired effect in gradually restoring the stock.

Table 1. Yellowtail - Div. 3LNO

Age	partial recruitment	1971	1972	1973	1974	1975	1976
				Population ('000 fish)			
5	0.13	88608	80529	85999	86360	75883	38936
6	0.35	78248	50158	50940	45394	46936	46504
7	0.76	44510	31829	24457	17330	18049	16753
8	1.00	14231	13939	6868	3440	3199	2409
9	1.00	4539	5491	1244	1027	483	187
10	1.00	584	1510	448	179	29	38
Biomass	(Tons)	110930	93064	74898	64399	61465	47641
				Fishing Mortality			
5		0.104	0.158	0.399	0.310	0.189	(.078)
6		0.599	0.583	0.778	0.622	0.730	(.210)
7		0.861	1.233	1.661	1.390	1.714	(.456)
8		0.652	2.117	1.600	1.663	2.539	(.600)
9		0.800	2.207	1.637	3.254	2.245	(.600)
10		0.730	1.910	1.560	1.850	2.000	(.600)
				Catch ('000)			
5		7534	10128	21280	19800	11240	2529
6		30369	22502	23709	18100	20931	7650
7		22117	19416	17053	11200	12737	5361
8		5869	10553	4718	2400	2536	953
9		2152	4206	862	850	372	74
10		245	1110	300	130	23	15

Table 2.

1 YELLOWTAIL 3LNO

NATURAL MORTALITY= 0.3000 YEAR= 1975

AGE	POP. NO. (X10-3)	CATCH NO. (X10-3)	FISHING MORT.	MEAN WT. KG.	POP. WT. (METRIC TONS)	CATCH WT. (METRIC TONS)	RESIDUAL (POP. NOS.)
5	75833.	11240.	0.188	0.322	24418.2	3619.3	46550.4
6	46504.	20931.	0.718	0.486	22600.9	10172.5	16802.8
7	18049.	12737.	1.549	0.615	11100.1	7833.3	2841.7
8	3199.	2536.	2.078	0.814	2604.0	2064.3	296.5
9	483.	372.	1.915	1.029	497.0	382.8	52.7
10	29.	23.	2.080	1.201	34.8	27.6	2.7
TOTAL	144097.	47839.			61255.1	24099.7	66546.7

NATURAL MORTALITY= 0.3000 YEAR= 1976

AGE	POP. NO. (X10-3)	CATCH NO. (X10-3)	FISHING MORT.	MEAN WT. KG.	POP. WT. (METRIC TONS)	CATCH WT. (METRIC TONS)	RESIDUAL (POP. NOS.)
5	60000.	2529.	0.050	0.322	19320.0	814.3	42281.3
6	46550.	7650.	0.210	0.486	22623.5	3717.9	27953.4
7	16803.	5361.	0.455	0.615	10333.7	3297.0	7897.5
8	2842.	953.	0.484	0.814	2313.1	775.7	1297.5
9	297.	74.	0.338	1.029	305.1	76.1	156.7
10	53.	15.	0.395	1.201	63.3	18.0	26.3
TOTAL	126544.	16582.			54958.8	8699.1	79612.4

1 YELLOWTAIL 3LNO

NATURAL MORTALITY= 0.3000 YEAR= 1977

AGE	POP. NO. (X10-3)	CATCH NO. (X10-3)	FISHING MORT.	MEAN WT. KG.	POP. WT. (METRIC TONS)	CATCH WT. (METRIC TONS)	RESIDUAL (POP. NOS.)
5	60000.	3267.	0.065	0.322	19320.0	1052.1	41651.8
6	42281.	5890.	0.175	0.486	20548.7	2862.5	26294.1
7	27953.	7707.	0.380	0.615	17191.3	4739.9	14161.6
8	7898.	2718.	0.500	0.814	6428.6	2212.5	3548.6
9	1297.	447.	0.500	1.029	1335.1	459.5	583.0
10	157.	54.	0.500	1.201	188.2	64.8	70.4
TOTAL	139586.	20083.			65011.9	11391.3	86309.4

NATURAL MORTALITY= 0.3000 YEAR= 1978

AGE	POP. NO. (X10-3)	CATCH NO. (X10-3)	FISHING MORT.	MEAN WT. KG.	POP. WT. (METRIC TONS)	CATCH WT. (METRIC TONS)	RESIDUAL (POP. NOS.)
5	60000.	3267.	0.065	0.322	19320.0	1052.1	41651.8
6	41652.	5802.	0.175	0.486	20242.8	2819.9	25902.6
7	26294.	7250.	0.380	0.615	16170.9	4458.5	13321.0
8	14162.	4874.	0.500	0.814	11527.6	3967.4	6363.2
9	3549.	1221.	0.500	1.029	3651.5	1256.7	1594.5
10	583.	201.	0.500	1.201	700.2	241.0	262.0
TOTAL	146239.	22615.			71612.8	13795.7	89094.9

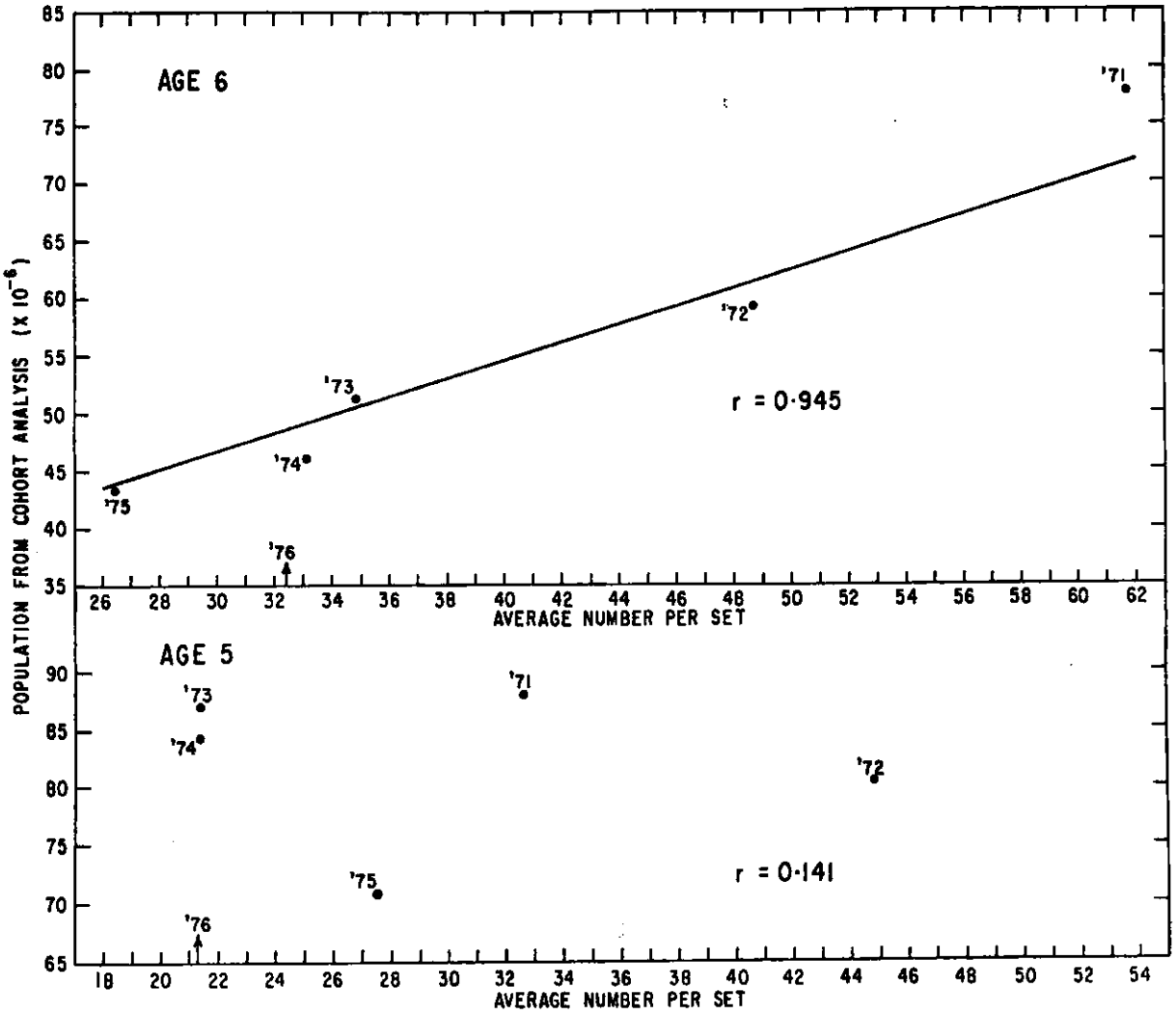

Fig. 1. Population size of 5- and 6-year-old yellowtail from cohort analysis plotted against average no./set from research vessel surveys.

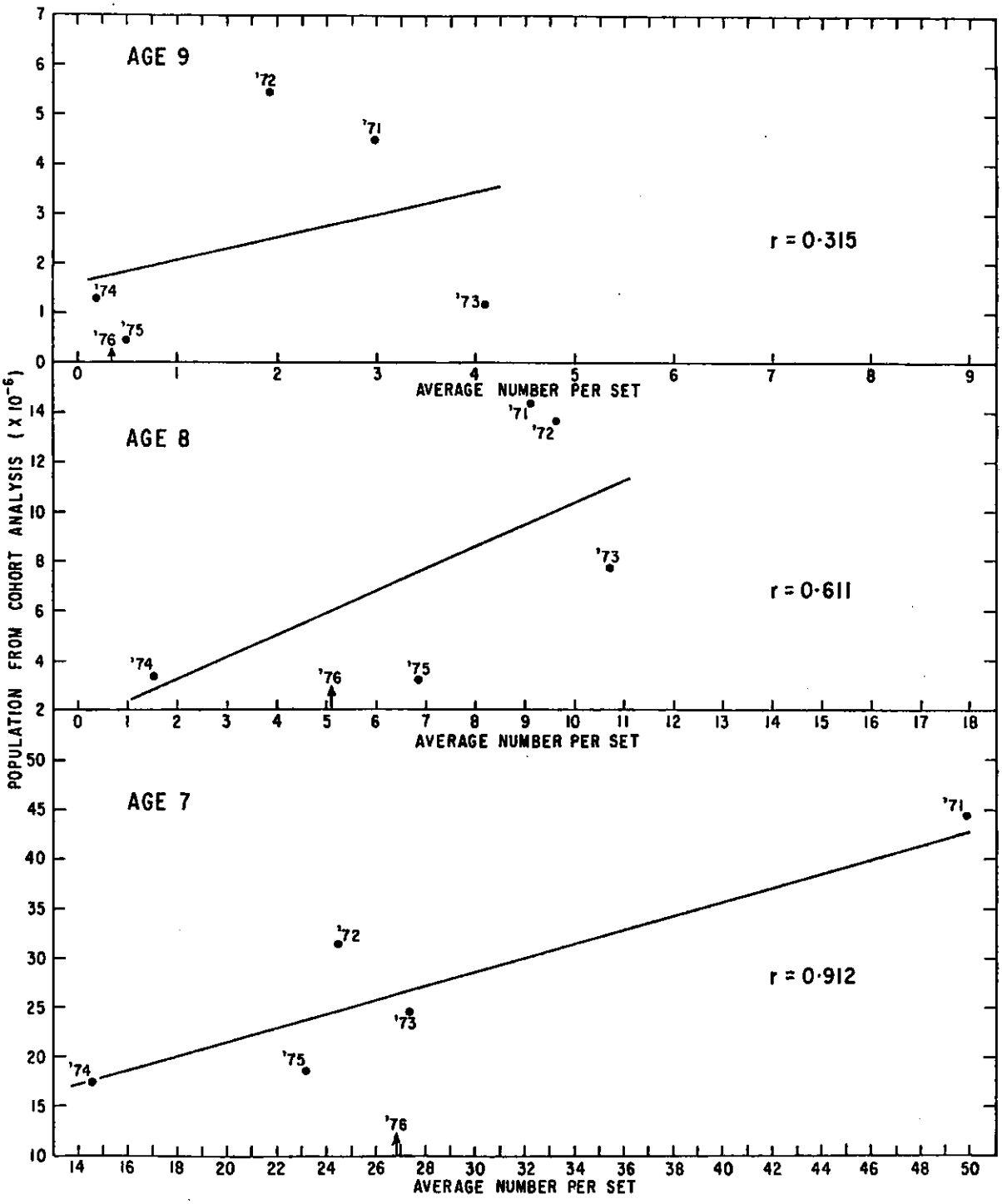

Fig. 2. Population size of 7-, 8- and 9-year-old yellowtail from cohort analysis plotted against average no./set from research vessel surveys.

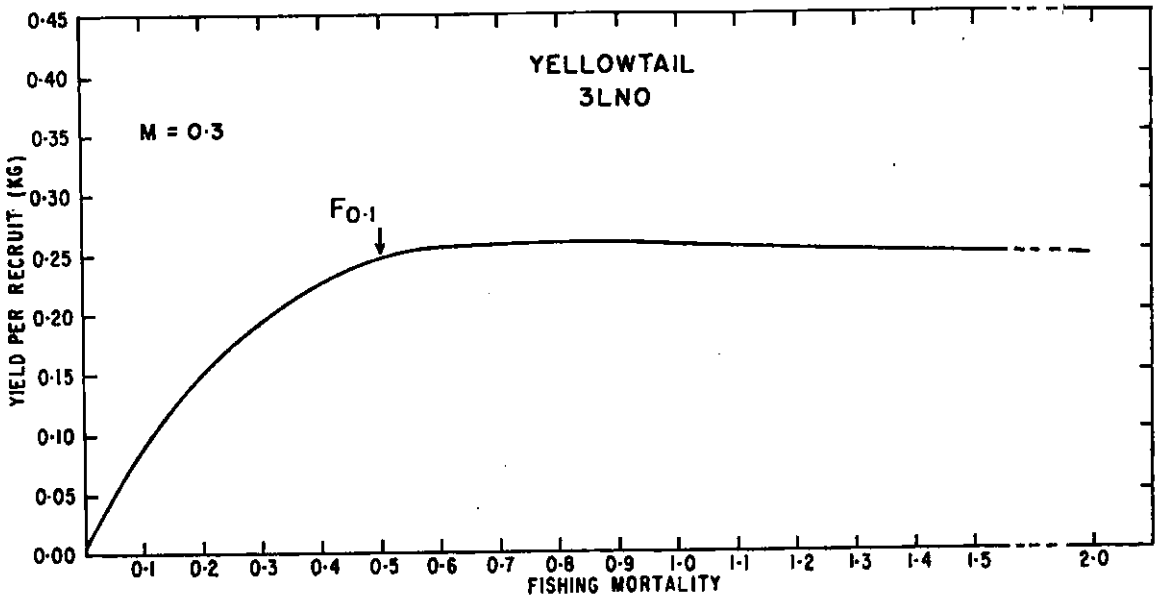

Fig. 3. Yield per recruit for yellowtail from ICNAF Div. 3LNO.

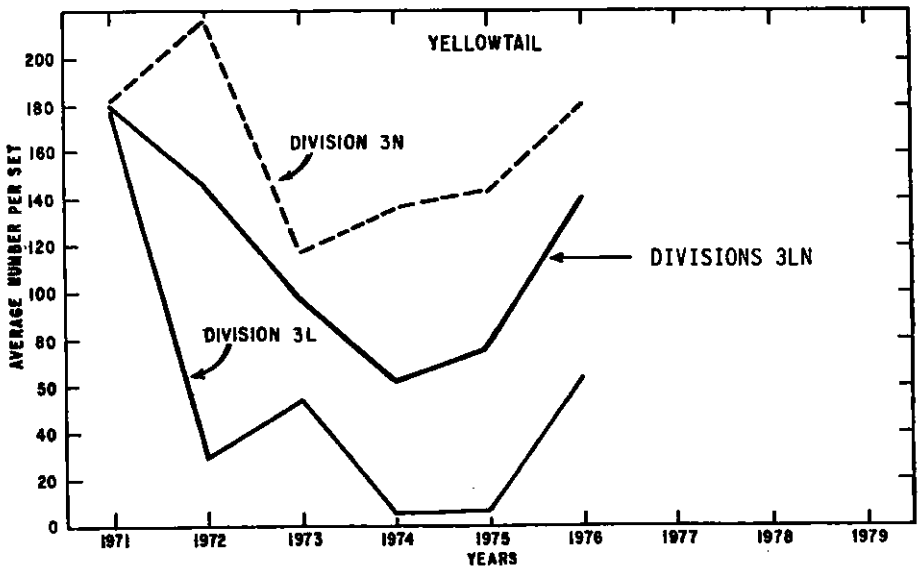

Fig. 4. Average number per set from research vessel surveys for Div. 3L and 3N separately.

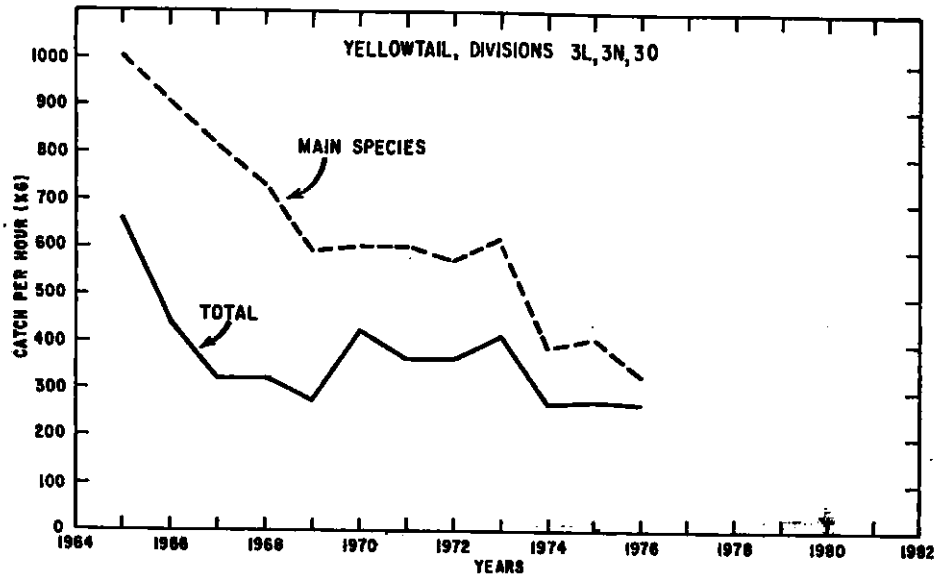

Fig. 5. Catch per hour for commercial yellowtail in Div. 3LNO.

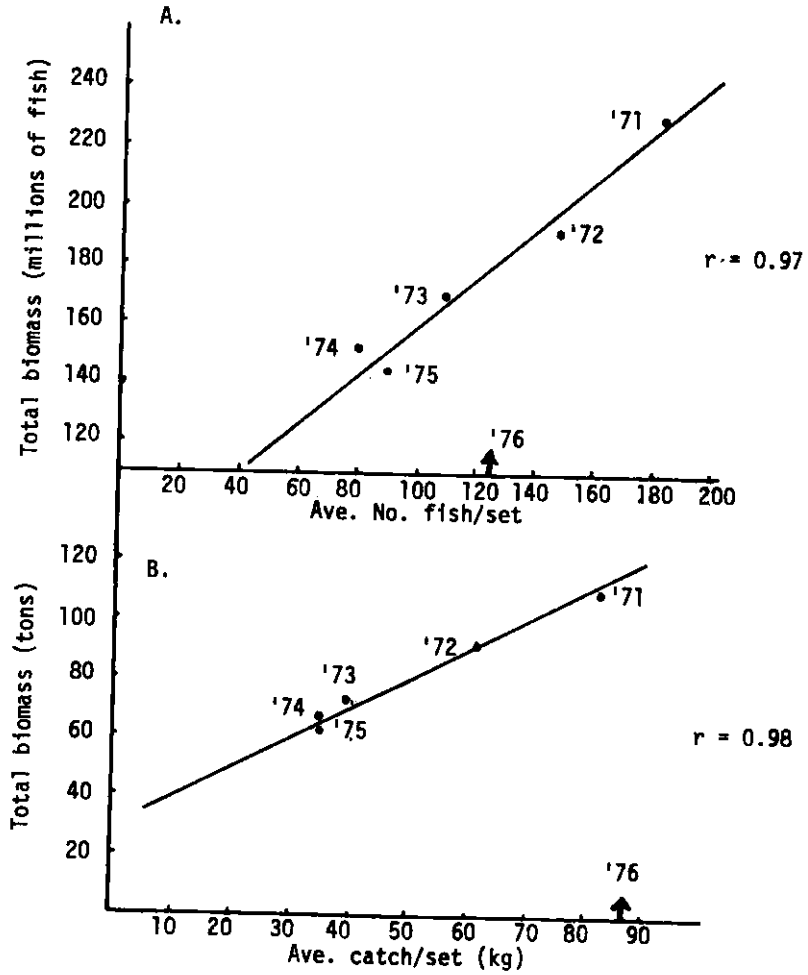

Fig. 6. A. Total population size numbers from cohort analysis against average no./set from research vessel surveys.
B. Total biomass (tons) from cohort analysis against average wt/set (kg) from research vessel surveys.