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An Update of the Status of Roundnose Grenadier in Subareas 0+1 and 2+3

by

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Introduction

The catches of roundnose grenadier in SA 0+1 continued to be low in 1985 (51 t) although twice as much was caught as in 1984 (Table 1, Fig. 1a). In 1984, when the USSR took all of the reported catch (Table 2a) fishing was conducted in the second half of the year (Table 3a) but in 1985, Denmark (G) accounted for most of the total catch, and landings were spread more evenly throughout the year. This difference is due to the fact that the USSR fishes primarily in SA 0 where ice is a problem in the first half of the year. Denmark (G) fishes in SA 1 where ice is not a hindrance. There has been no reported directed fishery in this area since 1978 and hence, assessment updates are not possible.

The catch of grenadier in SA 2+3 was up in 1985 (4759 t) almost 1000 t over that of 1984 although nominal catches remain relatively low compared to those before 1979 (Table 1, Fig. 1b). The increase in 1985 is the result of an increased catch by the USSR (147 t in 1984 and 1018 t in 1985) (Table 2b). As has been the case in recent past years, the 1985 catch was taken from August through December (Table 3b). There are insufficient data available to carry out an analytical assessment of this stock.

Methods and Results

Catch and effort data for the roundnose grenadier fishery in SA 2+3 were extracted from ICNAF/NAFO statistics for the period 1967-1984. Only those data where grenadier accounted for >50% of the total catch were used. A second set of data was available from the Canadian Observer Program for the period 1978-1985. These data were examined on a set by set basis using the selection criterion of >50% described above.

Both data sets were input into a multiplicative model (Gavaris 1980) in order to derive two standardized catch rate series. Those data points that accounted for <10 units of catch and/or effort were deleted because of potential biases introduced through rounding of these low values. The regressions were weighted step-wise by \log_{10} effort. The parameters used and their groupings are shown in Tables 4a and 4b.

Analyses of both sets of data resulted in significant regressions (Tables 5a and 5b). It can be seen (Table 6a, Fig. 2a) that effort has been relatively low since 1978. It can also be seen that catch rates declined from the early 1970's through 1983 but increased again in 1984 (Table 6a, Fig. 3a).

The results from the observer data (Table 6b, Fig. 2b) also indicate a drop in effort after 1978. These data indicate an increase in catch rate between 1983 and 1984 as noted above but also show a decline in 1985 (Table 6b, Fig. 2b).

The two catch rate series, when standardized to their means (1978-1984) and compared (Fig. 4), indicate differences in 1978 and 1979 but generally similar trends from 1980-1984.

Questions have been raised in recent years concerning the use of these catch rate data as indicators of stock status as the restriction of a 10% bycatch limit of Greenland halibut in a time of increasing Greenland halibut biomass has been cited as causing changes in fleet behavior and hence, catch rates.

The regression of standardized catch rate on unlagged standardized effort (from ICNAF/NAFO statistics) was not significant, lagging these data 4 and 6 years (Gulland 1961) resulted in significant regressions but the slopes were positive. As a result, an equilibrium general production model was not run.

No Canadian research data are available for either of these two stocks.

Discussion

An equilibrium general production model run previously (Atkinson MS 1985) using catch and effort data from SA 0+1 for 1967-1978 indicated a yield at 2/3 MSY effort of 8390 t, very close to the present TAC of 8000t. There are no data available to enable any revisions to the assessment and thus the TAC in 1987 should remain at its present level of 8000 t for grenadier in SA 0+1.

The available data do not allow any in-depth assessment of roundnose grenadier in SA 2+3. The relationships between catch rates and effort, showing positive slopes, negate the use of an equilibrium general production model. The decline in catch rates from the early 1970's onwards has slowed and there was some increase in 1984 over 1983 although the observer data indicate another decline in 1985. Whether these catch rates are indicative of stock status or fleet behavior is unclear. The data available are insufficient to suggest a change in the TAC for grenadier in SA 2+3 for 1987 from the present level of 11,000 t.

References

- Atkinson, D.B. MS 1985. The Roundnose Grenadier of Subareas 0+1 and 2+3. NAFO SCR Doc. 85/46. Ser. No. N995. 10pp.
- Gavaris, S. 1980. Use of a multiplicative model to estimate catch rate and effort from commercial data. Can. J. Fish. Aquat. Sci. 37: 2272-2275.
- Gulland, J.A. 1961. Fishing and stocks of fish at Iceland. U.K. Min. Agric. Fish. Food, Fish. Invest. (Ser. 2) 23(4): 52 p.

Table 1: Summary of nominal catches of roundnose grenadier by Subarea and Division.

Year	0	1	Total	TAC	2G	2H	2J	3K	Other	2+3	TAC
1967	1,129	6	1,135		-	868	217	16,009	210	17,304	
1968	5,996	284	6,280		2,536	4,089	479	23,553	606	31,263	
1969	2,642	68	2,710		387	-	264	11,682	-	12,333	
1970	545	5,980	6,525		-	-	468	22,267	129	22,864	
1971	4,172	4,132	8,304		54,179	2,738	81	18,392	55	75,445	
1973	5,783	2,311	8,094		2,161	655	293	21,122	155	24,386	
1972	1,054	3,830	4,884		5,880	232	632	10,655	165	17,564	
1974	2,661	9,657	12,318		3,220	2,007	333	22,816	40	28,416	32,000
1975	204	4,749	4,953	10,000	6,489	3,536	1,754	15,388	258	27,425	32,000
1976	2,610	5,893	8,503	14,000	3,841	1,460	1,381	13,636	275	20,593	32,000
1977	721	2,214	2,935	8,000	2,597	525	206	11,935	123	15,386	35,000
1978	-	5,839	5,839	8,000	3,112	1,412	913	15,250	12	20,699	35,000
1979	106	6,815	6,921	8,000	1,035	3,090	438	3,200	19	7,782	35,000
1980	32	1,721	1,753	8,000	279	493	726	451	104	2,053	30,000
1981	-	392	392	8,000	967	1,693	463	3,920	42	7,085	27,000
1982	43	48	91	8,000	719	734	182	2,709	-	4,344	27,000
1983	46	22	68	8,000	140	1,390	36	1,916	87	3,569	11,000
1984*	25	-	25	8,000	107	289	3	3,362	112	3,873	11,000
1985*			51	8,000						4,759	11,000
1986				8,000							

* Provisional.

Table 2a: Nominal catches of roundnose grenadier in Subarea 0+1 by country and year.

Country	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984*	1985*
Denmark (G)	5	6	1	10	32	21	-	39	37	22	-	49
GDR	2,804	186	181	61	-	-	-	-	-	-	-	-
FRG	-	33	147	519	5,807	6,794	1,721	353	11	-	-	-
USSR	9,509	4,728	8,174	2,345	-	106	32	-	43	46	25	2
TOTAL	12,318	4,953	8,503	2,935	5,839	6,921	1,753	392	91	68	25	51

* Provisional.

Table 2b: Nominal catches of roundnose grenadier in Subarea 2+3 by country and year.

Country	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984*	1985*
Canada (M)+	-	-	-	-	2	-	-	-	-	-	-	-
Canada (N)	-	-	16	15	7	4	-	-	-	-	-	-
FRG	199	-	1	174	973	-	32	-	-	-	23	-
GDR	1,766	2,705	497	613	1,801	480	898	1,407	1,640	2,586	3,650	3,729
Poland	181	1,499	101	-	51	96	36	18	15	50	51	12
Romania	-	-	-	7	108	-	-	-	-	-	-	-
USSR	26,270	23,221	19,978	14,577	17,760	7,201	1,087	5,660	2,689	933	147	1,018
Japan	-	-	-	-	-	-	-	-	-	-	2	-
TOTAL	28,416	27,425	20,593	15,386	20,702	7,781	2,053	7,085	4,344	3,569	3,873	4,759

* Provisional.

+ Maritimes and Quebec were combined prior to 1979.

Table 3a: Nominal catches of roundnose grenadier in Subarea 0+1 by month and year.

Year	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total
1974	85	-	-	1	-	1	390	1,306	182	528	2,289	7,527	12,309
1975	46	158	35	43	-	111	307	672	439	109	1,171	1,862	4,953
1976	475	7	1	197	-	-	-	206	631	1,793	3,276	1,917	8,503
1977	464	94	20	14	2	5	58	1,094	1,089	38	18	39	2,935
1978	139	130	723	2,554	1,942	343	4	2	1	-	-	-	5,838
1979	605	759	348	626	1,658	1,122	123	118	1	185	545	831	6,921
1980	686	385	-	-	-	-	-	418	117	118	23	6	1,753
1981	1	4	13	12	1	2	-	-	170	183	-	-	386
1982	1	3	9	6	4	11	1	3	-	14	25	7	91
1983	-	3	6	5	1	-	-	-	7	5	21	14	68
1984*	-	-	-	-	-	-	-	14	11	-	-	-	25
1985*	1	5	9	7	1	-	22	-	4	-	2	-	51

* Provisional.

a includes catch of 7t from month 'unknown'.

b includes catch of 6t from month 'unknown'.

Table 3b: Nominal catches of roundnose grenadier in Subarea 2+3 by month and year.

Year	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total
1974	205	22	187	5	2	520	2,479	1,459	2,214	4,976	9,050	7,297	28,416
1975	784	1,388	400	807	47	1,596	812	6,516	7,498	3,301	2,332	1,944	27,425
1976	843	1,225	1	605	290	106	257	1,856	1,170	3,961	4,530	5,749	20,593
1977	44	8	12	45	13	6	1,776	5,698	3,411	1,973	1,681	719	15,386
1978	264	467	13	45	7	405	6,416	3,963	1,814	3,964	1,487	1,866	20,711
1979	103	32	44	6	136	683	1,169	1,612	1,691	611	745	949	7,781
1980	3	4	48	13	2	-	-	130	376	794	577	106	2,053
1981	40	14	1	2	4	1	168	1,636	1,391	759	1,751	1,318	7,085
1982	4	-	3	5	3	4	559	563	410	698	1,465	630	4,344
1983	3	18	4	-	3	1	1	74	1,292	861	866	446	3,569
1984*	31	13	6	19	-	5	-	45	460	3,018	123	153	3,873
1985*	13	-	1	4	4	-	2	888	1,880	1,375	586	6	4,759

* Provisional.

Table 4a: Parameter estimates from the analysis of catch/effort for grenadier in SA 2 + 3 using a multiplicative model and ICNAF/NAFO statistics.

Country-Gear-TC	Estimate	Month	Estimate
GDR OTB 5	-0.322	Jun.	
GDR OTB 6		Jul.	combined
		Aug.	since no
USSR OTB 6	0.000	Sep.	significant
USSR OTB 7		Oct.	differances
		Nov.	
GDR OTB 7	0.243	Dec.	
USSR OTM 7			
		Div.	
		2J	-0.188
		2G	0.000
		3K	
		2H	0.137

Table 4b: Parameter estimates from the analysis of catch/effort for roundnose grenadier in SA 2 + 3 using a multiplicative model and Canadian Observer Program statistics.

Country-Gear-TC	Estimate	Month	Estimate
GDR OTB 5		Jul.	
GDR OTB 7	0.000	Aug.	combined
USSR OTB 7		Sep.	since no
USSR OTB 6	0.000	Oct.	significant
USSR OTB 7		Nov.	differances
		Dec.	
GDR OTB 7	0.243		
USSR OTM 7			
		Div.	
		2G	
		2J	0.000
		2H	0.206

Table 5a: Regression of multiplicative model for roundnose grenadier in SA 2+3 using ICNAF/NAFO statistics.

multiple r.....0.636
multiple r squared.....0.405

analysis of variance

source of variation	df	sums of squares	mean squares	f-value
intercept	1	1.374e1	1.374e1	
regression	21	2.453e1	1.168e0	6.543
type 1	2	3.668e0	1.834e0	10.275
type 2	2	1.143e0	5.717e ⁻¹	3.202
type 3	17	1.634e1	9.610e ⁻¹	5.384
residuals	202	3.606e1	1.785e ⁻¹	
total	224	7.433e1		

Table 5b: Regression of multiplicative model for roundnose grenadier in SA 2+3 using Canadian Observer Program statistics.

multiple r.....0.642
multiple r squared.....0.412

analysis of variance

source of variation	df	sums of squares	mean squares	f-value
intercept	1	1.008e ⁻¹	1.008e ⁻¹	
regression	8	3.720e0	4.660e ⁻¹	4.812
type 1	1	4.121e ⁻¹	4.121e ⁻¹	4.255
type 2	7	3.583e0	5.119e ⁻¹	5.286
residuals	55	5.327e0	9.685e ⁻²	
total	64	9.156e0		

Table 6a: The predicted catch rate for roundnose grenadier in SR 2+3 using ICNAF/NAFO statistics.

year	total catch	catch rate		effort
		mean	s.e.	
1967	17304	1.609	0.361	10756
1968	31263	1.189	0.150	26302
1969	12333	1.352	0.263	9120
1970	22864	2.174	0.234	10518
1971	75445	1.792	0.136	42092
1972	24386	1.523	0.207	16010
1973	17564	2.117	0.346	8296
1974	28416	1.495	0.204	19007
1975	27425	1.714	0.223	16003
1976	20953	1.456	0.185	14396
1977	15367	1.234	0.133	12464
1978	20699	1.379	0.117	15013
1979	7782	0.912	0.089	8532
1980	2053	1.137	0.174	1805
1981	7085	0.842	0.104	8413
1982	4344	0.834	0.122	5209
1983	3569	0.796	0.176	4483
1984	3873	1.315	0.320	2945

average c.v. for the mean:0.144

Table 6b: The predicted catch rate for roundnose grenadier in SR 2+3 using Canadian Observer Program statistics.

year	total catch	catch rate		effort
		mean	s.e.	
1978	20699	0.883	0.139	23446
1979	7782	1.644	0.396	4733
1980	2053	1.017	0.126	2018
1981	7085	0.985	0.086	7192
1982	4344	1.013	0.088	4287
1983	3569	0.588	0.076	6069
1984	3873	1.507	0.202	2571
1985	4759	0.814	0.083	5849

average c.v. for the mean:0.133

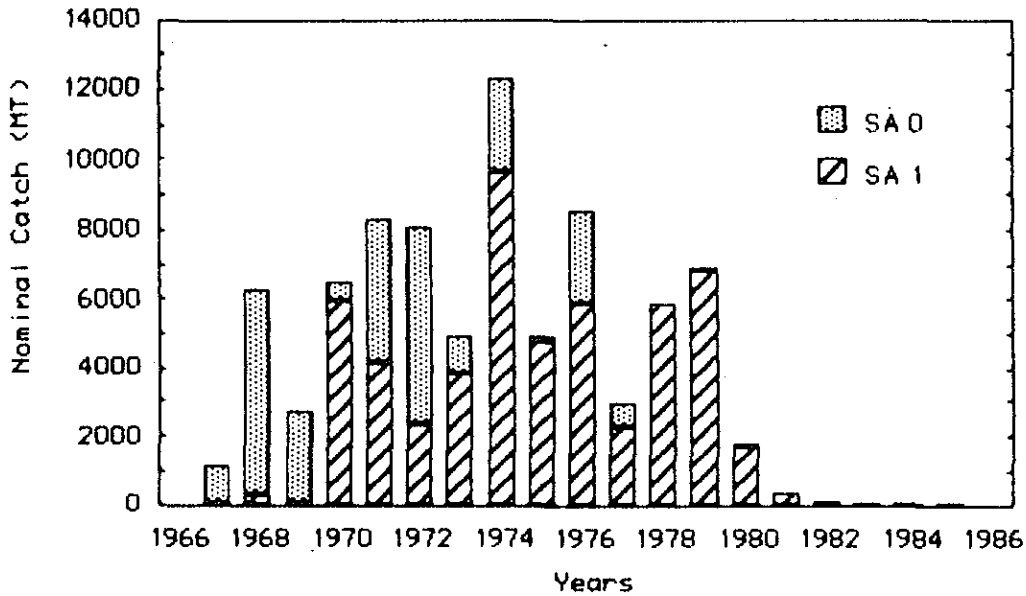


Fig. 1a: Nominal catches of roundnose grenadier from SA 0+1, 1967-1985. (1984 and 1985 are provisional)

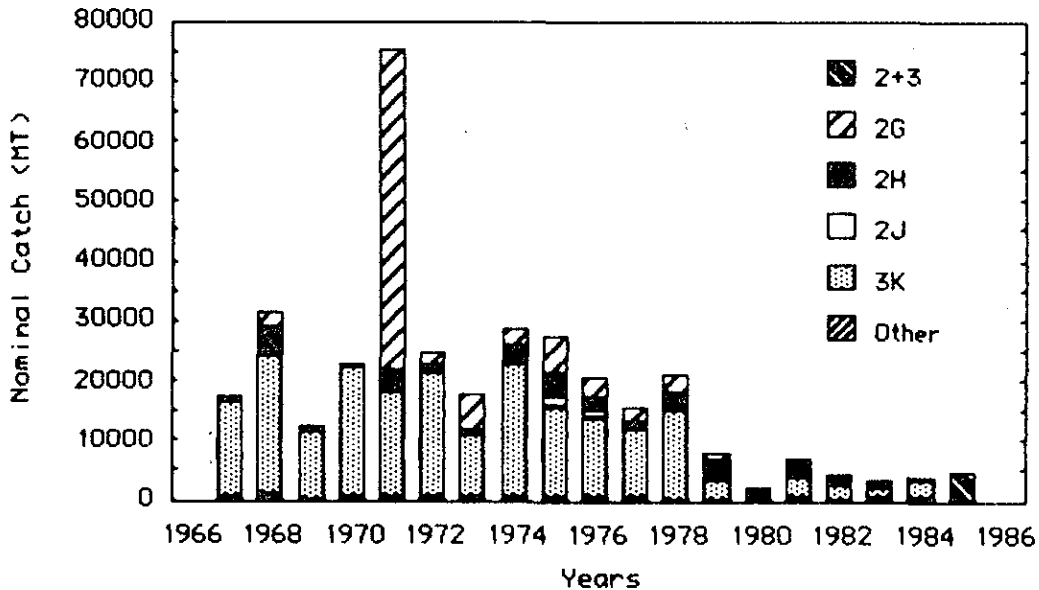


Fig. 1b: Nominal catches of roundnose grenadier from SA 2+3, 1967-1985. (1984 and 1985 are provisional)

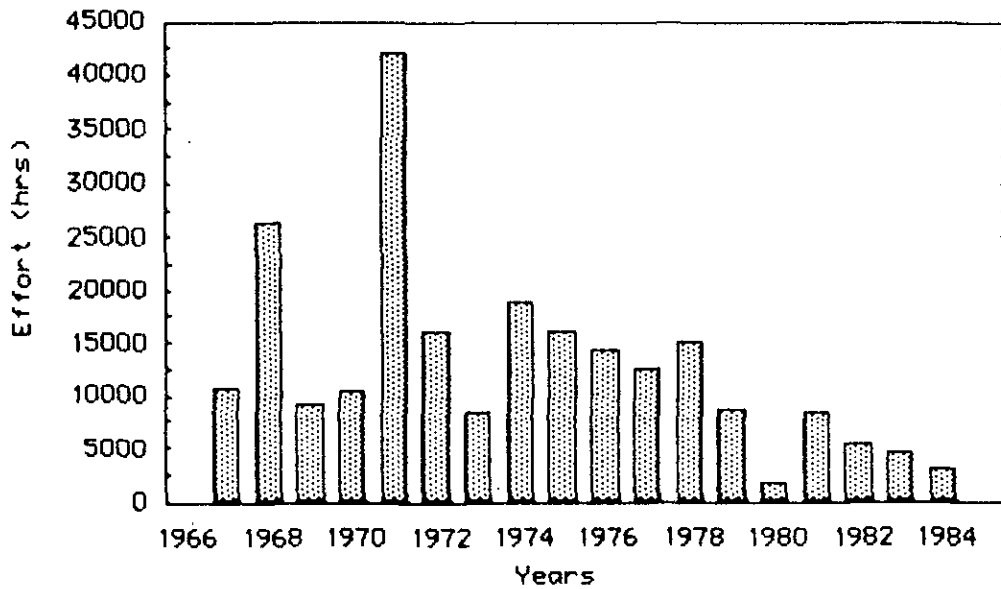


Fig.2a: Standardized effort for roundnose grenadier in SA 2 + Div.3K derived from ICNAF/NAFO statistics (1984 is provisional).

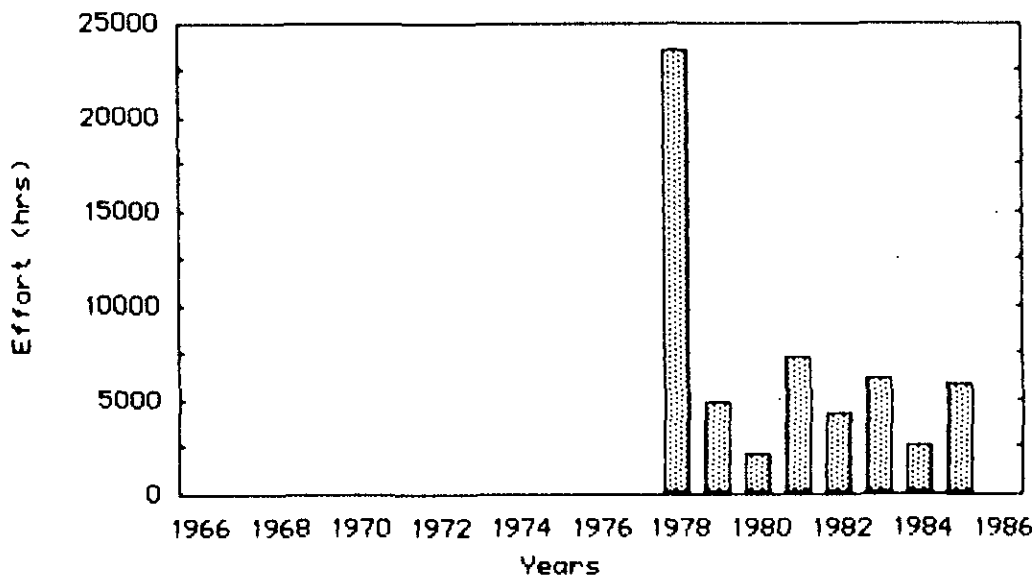


Fig.2b: Standardized effort for roundnose grenadier in SA 2 + Div.3K derived from Canadian Observer Program statistics.

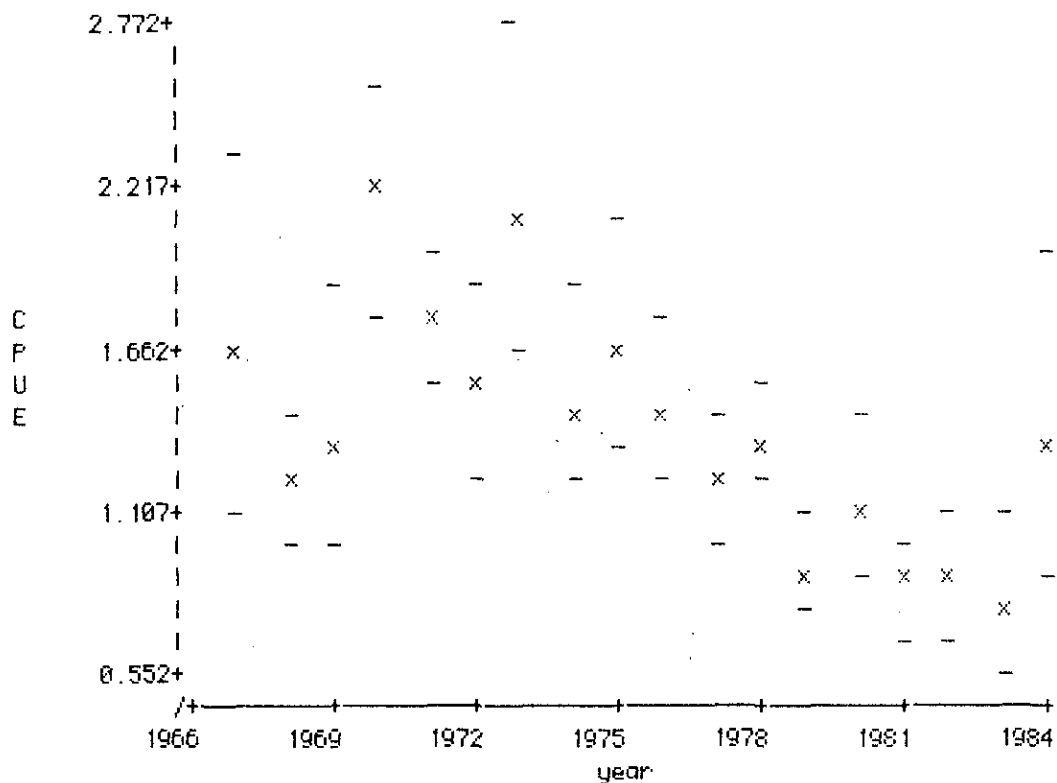


Fig. 3a: Standardized CPUE (t/hr) for roundnose grenadier in SA 2+3, 1967-1984, as derived from ICNAF/NAFO statistics. (1984 Provisional)

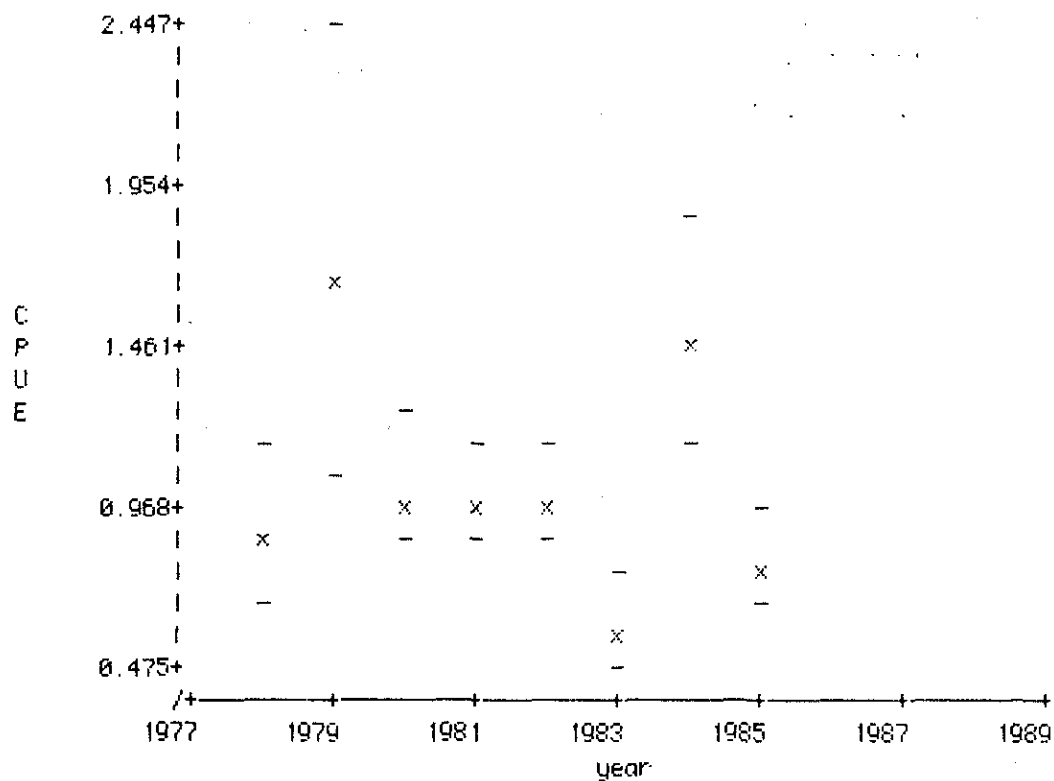


Fig. 3b: Standardized CPUE (t/hr) for roundnose grenadier in SA 2+3, 1978-1985, as derived from Canadian Observer statistics.

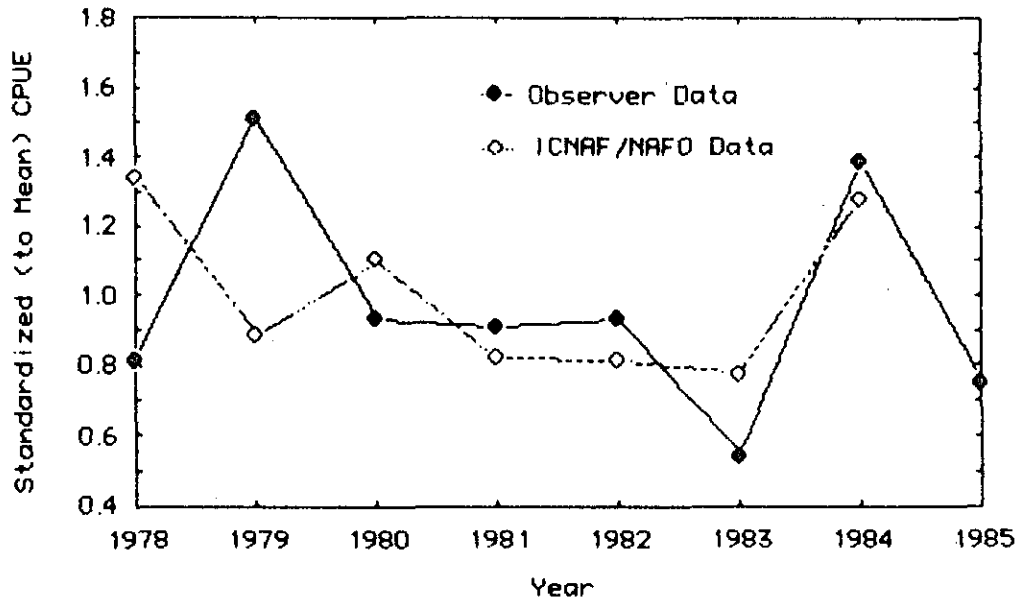


Fig. 4: Comparison of catch rates for grenadier in SA 2+3 derived from ICNAF/NAFO statistics and Canadian Observer Program data (standardized to 1978-1984 mean).