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Estimation of Silver Hake stock size
off Nova Scotia, Div. 4VWX, in 1966-1980,
and of allowable catch for 1980

by

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Abstract

The silver hake stock size in Div. 4vwx and allowable catch
for 1980 have been estimated by the V.P.A. using the species
composition data, the natural mortality rate of 0.5 and the
fishing mortality rate calculated from the catch-per-tow data
obtained on trawlers of BMRT type. These estimates are 557 thous.
tons and 100-105 thous. tons respectively.

Materials and Methods

The catch statistics for all countries from the ICNAF Stat-
istical Bulletins and age composition of the Soviet catches (the
USSR takes 84 to 95% of the total catch) were used for the stock
size assessment. The natural mortality rate on 2 year olds and
older had been estimated as 0.5 (Res.Doc. 76/VI/57). The optimum
fishing mortality ($F_{0.1}$) on 4 year olds and older had been est-
imated as 0.7. Mean body weights by age groups are presented in
Res.Doc. 76/VI/57.

Age	2	3	4	5	6	7
Weight, kg	0.095	0.151	0.214	0.319	0.478	0.590

Results

The 1978 total fishing mortality rate was derived from the
difference between the numbers of specimens of the same year
classes caught per tow by BMRT type vessels in 1977 and 1978.

It was estimated as 1.0 for 4 year olds and 1.2 (on the average) for 5 year olds and older. The initial values of the fishing mortality used in the V.P.A. were 0.70 for 5 year olds and older, 0.50 for 4 year olds, 0.30 for 3 year olds and 0.02 for 2 year olds.

The data on age composition of silver hake catches obtained as a result of estimating the fishing mortality and stock size by the V.P.A. method are presented in Tables 1, 2 and 3. The stock size estimate given in tons was corrected with regard for the ratio of calculated and observed catches (see Table 4). It can be seen easily from Tables 1 and 2 that over the 1976 to 1978 period the stock size and catches of the silver hake off Nova Scotia ranged markedly between 83 thous. tons in 1966 and 849 thous. tons in 1976. Following the recruitment of the strong 1976 year class to the silver hake stock in 1978, the latter increased to 456 thous. tons compared with 192 thous. tons in 1977.

The stock size estimate recorded at the beginning of 1978 and the total mortality rate in that very year were used for the assessment of the 1979 stock size (see Table 1).

Since 1966 the mean abundance of 2 year old recruits has been estimated as $2 \cdot 10^8$ specimens. Thus, the calculated 1979 stock size and total allowable catch are 493 and 70 thous. tons respectively. The total allowable catch of 70 thous. tons can be taken provided that the fishing mortality rate is somewhat lower than in 1978.

The stock size for the beginning of 1980 calculated in the same way as for 1979 was 857 thous. tons. This allows to establish the allowable catch of 100-105 thous. tons provided that the fishing intensity is close to the optimum.

References

1. NOSKOV, A. S. 1976. Estimation of stock size and allowable catch of silver hake on the Nova Scotia Shelf in ICNAF Div. 4W. ICNAF Res. Doc. 76/VI/57.

Table 1. Silver hake catches from Div. 4VWX given in 10⁵ sp. and tons.

Years	1	2	3	4	5	6	7	8+	Total in 10^5 sp.	Catch in tons
1963	12	689	2778	2045	442	21	6	10	6003	123028
1964	10	86	1188	1702	342	83	6	-	3417	81147
1965	1	5	452	1050	301	44	4	-	1857	50022
1966	1	102	123	182	107	16	1	-	532	10323
1967	1	2	20	69	22	3	1	-	118	2483
1968	8	77	107	20	9	6	4	1	232	3447
1969	440	261	837	786	300	103	20	12	2759	46351
1970	921	1400	3648	1952	626	45	29	14	8635	163045
1971	201	1603	2769	2758	777	93	28	60	8289	128653
1972	430	1374	2617	1531	1015	146	27	25	7165	114043
1973	591	981	7612	6765	2297	528	146	51	18971	299530
1974	333	1083	2721	1648	363	82	35	30	6295	95745
1975	368	1096	2274	1573	450	115	53	17	5946	116286
1976	454	2991	1937	638	233	38	19	-	6310	97184
1977	43	143	712	578	115	15	3	1	1610	35765
1978	60	417	694	556	198	40	20	-	1985	44838

Table 2. Fishing mortality on silver hake in Div. 4VWX in 1966-1978.

Years	Age					
	2	3	4	5	6	7
1966	0,03	0,11	0,54	1,67	0,00	0,00
1967	0,00	0,01	0,12	0,16	0,24	0,00
1968	0,00	0,03	0,02	0,03	0,08	0,70
1969	0,01	0,10	0,40	0,55	0,71	0,70
1970	0,07	0,31	0,51	1,02	0,20	0,70
1971	0,06	0,26	0,59	0,58	0,58	0,70
1972	0,07	0,20	0,31	0,66	0,28	0,70
1973	0,09	1,05	1,99	1,88	1,49	0,70
1974	0,16	0,59	1,08	0,88	0,42	0,70
1975	0,16	0,84	1,34	1,89	1,28	0,70
1976	0,45	0,67	0,94	1,19	1,61	0,70
1977	0,03	0,27	0,64	0,63	0,29	0,70
1978	0,02	0,30	0,50	0,70	0,70	0,70

Table 3. Stock sizes of silver hake in Div. 4VWX in 1966-1978.

Years	2	3	4	5	6	7	Total 10^5 sp.	2+ thous.t
1966	4170	1445	539	157	0,0	0,0	6311	83
1967	8262	2451	782	189	18	0,0	11702	128
1968	18238	5008	1471	422	98	12	25249	286
1969	28835	11002	2953	876	249	78	43995	499
1970	27119	17285	6032	1197	305	106	52044	842
1971	32548	15372	7710	2184	262	216	58292	677
1972	25291	18514	7211	2601	740	128	54485	697
1973	13777	14286	9226	3208	816	483	41796	357
1974	9457	7601	3038	763	300	160	21319	281
1975	9459	4905	2565	626	192	172	17919	287
1976	9984	4897	1283	406	57	47	16674	223
1977	5723	3796	1516	304	75	10	11424	192
1978	26739	3361	1759	486	98	49	32432	456

Table 4. Observed and calculated catches of silver hake (tons) from Div. 4VWX in 1966-1980.

Year	Observed catch	Calculated catch	Calculated/Observed
1966	10,323	10,960	1,0617
1967	2,483	2,704	1,0890
1968	3,447	3,683	1,0454
1969	46,351	51,067	1,0967
1970	169,045	140,587	0,8317
1971	128,653	152,313	1,1839
1972	114,048	130,830	1,1471
1973	299,530	382,964	1,2824
1974	95,745	108,064	1,1304
1975	116,286	99,158	0,8994
1976	97,184	58,897	0,9621
1977	31,723	26,117	0,8232
1978	44,838	35,800	0,7984

$$\overline{X} = 1,0270$$

Table 5. Catches and stock size of silver hake in Div. 4VWX in 1978-1980.

Age		2	3	4	5	6	7+	Total 2+ 10^5 sp.	Total 2+ thous. t
N	78	26739	3361	1759	486	98	49	32492	456
F	78	0,02	0,30	0,50	0,70	0,70	0,70		
C	78	417	649	556	198	40	20	1880	45[x)]
N	79	(20000)	1591	1509	647	146	44	38256	493
F	79	0,02	0,28	0,46	0,64	0,64	0,64		
C	79	298	3062	444	246	56	17	4123	70
N	80	(20000)	11900	7287	578	207	60	40032	557
F	80	0,02	0,30	0,50	0,70	0,70	0,70		
C	80	320	2463	2303	236	84	25	5431	103

C - catch
N - stock size

* Including the catch of the youngs-of-the-year of 0.4 thous. tons