Northwest Atlantic Fisheries Organization

Serial No. N821

NAFO SCR Doc. 84/VI/36

SCIENTIFIC COUNCIL MEETING - JUNE 1984

On Fishing Conditions and Catching Silver Hake Allocations on the Scotian Shelf Southward of Small Mesh Gear Line

by

V. A. Rikhter and Yu. S. Grinkov

Atlantic Research Institute of Marine Fisheries and Oceanography (AtlantNIRO)
5 Dmitry Donskoy Street, Kalingrad, 236000, USSR

Abstract

Some peculiarities of the Soviet fishery for silver hake on the Scotian Shelf in 1977 through 1983 are considered and factors having influenced catching silver hake allocations in different years discussed. Two clearly differing fishing periods (1977-1981 and 1982-1983) are deliniated, and possible correlation between the catch per unit effort, maturation rate in the beginning of the fishing season and dates of closure of directed hake fishery is suggested. A proposed fishery strategy is based on a flexible approach to utilization of the alloted fishing effort.

Introduction

Soviet fishermen have acquired sufficient experience in hake fishery on the Scotian Shelf under conditions established since introduction of 200-mile zones. However, notwithstanding the fact that the commercial hake biomass during this period has not undergone sharp fluctuations, remaining rather high, which is consistent with the estimates given by the ICNAF Scientific Committee, later by NAFO Scientific Council, in most cases the catches have been under the quota allocated to the USSR by Canada.

In this paper consideration is given to some factors of importance for fishery in the years mentioned, and an attempt is made to seek out possible ways for catching allocations despite the existing restrictions.

Materials and Methodology

Statistics for the Soviet silver hake catches and corresponding fishing efforts (number of fishing days) have been adopted from the ICNAF and NAFO Statistical Bulletins for 1979-1980 and 1981-1983 respectively, and from summary documents (NAFO SCS Doc.83/IX/22, 83/VI/5). These data were also used for calculation catches per unit effort (catch per fishing day) by month for 1977-1982. Provisional data on the 1983 catches have been derived from the NAFO Circular Letter 83/65 of 19 October 1983.

A six grade scale was used to determine the sexual maturity of hake. Average maturity stages were identified only for mature specimens, i.e. the second stage (the immatures) were not accounted for. Maturity determinations were made in the period from April to June inclusive. Over the entire observation period (1977-1983) a total of 28 300 fish specimens was examined for maturity determinations.

Results

The data on fulfilment of quotas for silver hake and corresponding fishing efforts (number of fishing days) are given in table 1. The data suggest that the fishing effort did not change considerably by year, except in 1977, when the number of fishing days appeared to be inadequate for catching allocations. As is evident from table 2, in 1977 the catches per unit effort were satisfactory throughout the fishing season, and the quota was expected to be fulfiled, if the corresponding amount of fishing effort were provided.

That the USSR had not been able to catch their allocation in spite of relatively high fishing intensity, can be accounted for by a low catch rate per unit effort over the major part of fishing period (April-July). Hydrometeorological factors, which caused although a prolonged but not too effective fishing for hake in the section southward of the small mesh gear line, might have been decisive.

The major reason impeding the foreign fishery for hake is the limitation of the fishing area to a narrow band along the Nova Scotian shelf slope (fig.1). Provided that the fishing intensity is adequate, the success of the fishery will depend on the abundance and distribution of hake in that area. Migration of hake to the north of the small mesh gear line may result in drastic reduction and then in complete closure of directed hake fishery in the shortest time, although the commercial biomass may be rather large.

It can be seen from table 1 that,in spite of restrictions in force,in 1979 and 1982 the quotas were taken completely. In the first case, a small group of Soviet ships was allowed to catch hake northward of the small mesh gear line. In spring 1982 anomalous hydrometeorological conditions were responsible for formation of extraordinarily dense hake aggregations on the shelf slopes.

In 1980, like in 1978, catches per unit effort appeared to be less than expected with the actual amount of the fishing effort. High abundance of squids on the shelf slope in 1981 prevented the Soviet fleet from catching their allocation. Early fulfilment of the squid quota led to premature cessation of fishing for hake. In 1983 conditions for taking out the quota were the worst over the entire observation period. Actually, according to provisional data the situation was quite favourable in April-May. Catches per unit effort exceeded those in all the other years but 1982. In the second half of June, however, the situation sharply changed for the worse due to massive withdrawal of hake northwards beyond the small mesh gear line. As a result, in 1983 the directed fishing for hake continued only 2.5 months.

So, it is clear that practically each fishing year in the alloted region brought around surprises of some kind. In the latter case the likely reason of migration of hake from the fishing ground might be hydrometeorological conditions, which favoured the movement of the fish in the northern direction unimpeded. However the impact of biologival factors, such as maturation rate, should not be eliminated, which can be illustrated by the data in table 3. The table 3 data suggest a higher maturation rate for hake in 1983 compared with the other years.

Only future investigations may show whether there exists a correlation between this index for the initial phase of fishery (April-May) and the time of migration of mature hake to the north. The importance of the fact, as such, of moving hake to shallow waters of Sable Island for spawning is beyond doubt. That the massive spawning takes place there in August-September has been known for a long time (Vialov, Karasyov, 1967). It is quite possible that under favourable hydrological conditions the attainment of certain maturity stages may in most cases be regarded as an incentive to begin spawning migration. It should be admitted, however, that in years with anomalous hydrological pattern a massive migration of hake from the fishing ground may occur irrespective of maturity stage of gonads.

The analysis of catch statistics showed that a drastic change of fishing conditions to the worse resulted from supposed migration of hake northward of the small mesh gear line, and approximate dates of these events are as follows:

1977 - August;

1978 - third ten-day period of August;

1979 - second and third ten-day periods of August;

1980 - second ten-day period of August;

1981 - second ten-day period of August;

1982 - second ten-day period of July;

1983 - third ten-day period of June.

It is evident that over first five years of new fishing regime a drastic decline of the catches occurred on approximately the same dates, which can be attributed to a relative stability of hydrometeorological conditions and maturation rate in those years. It should be noted that the catches per unit effort by month fluctuated insignificantly and were relatively low. In this respect the fishing conditions in 1982-83 considerably differed both in exceptionally large catches per unit effort in April and in earlier closure of the fishery. Supposedly, there exists a relationship between these events, which is conditioned by the influence of anomalous hydrometeorological conditions on the distribution and behaviour of hake. As noted above, the estimate of commercial biomass had not suffered sharp fluctuations throughout the observation period.

In case the fishery and research program are continued, new facts will arise to confirm or to disprove the assumption on the existence of a relationship between the catch rate per unit effort at the start of the fishery and the time of its cessation. The above-stated, undoubtedly, bears a direct relation to conditions responsible for fulfilment of the Nova Scotian hake quota.

So, in years with relatively small catches per unit effort and extended fishing period, July and August inclusive, an even distribution of fishing effort by month may provide the best conditions for catching allocations. Conversely, when anomalously large catches are taken in April-May, which suggests earlier (beginning of July) conclusion of fishing, the only possible way to fulfil the quota would be maximized utilization of the alloted fishing effort during the period from April to June inclusive.

Thus, two fishing strategies can be suggested for the region open to foreign fishery for hake with bottom trawls. However the alternative will prove successful, if, depending on established circumstances, a flexible approach is made to utilization of the alloted fishing effort, for it is hardly possible to precisely forecast the future situation in good time prior to fishing activities.

References

1. Assistant executive secretary. Historical catches of selected species by stock, area and country for the period 1972-1981. NAFO SCS Doc.83/VI/5.

2. Fishery statistics for 1977. ICNAF Statistical Bull., Vol.27, 1979.

3. Fishery statistics for 1978. ICNAF Statistical Bull., Vol.28, 1980.

4. Fishery statistics for 1979. NAFO Statistical Bull., Vol.29, 1981.

5. Fishery statistics for 1980. NAFO Statistical Bull., Vol.30, 1982.

6. Fishery statistics for 1981. NAFO Statistical Bull., Vol31, 1983.

7. NAFO Secretariat. Provisional nominal catches in the Northwest Atlantic, 1982. NAFO SCS Doc.83/IX/22.

8. Yu.A.Vialov, B.B.Karasyov, 1967. Physical and geographic review and characteristic of resources in the Northwest Atlantic. Coll.Fisheries in the Northwest Atlantic. AtlantNIRO, Kaliningrad, pp.5-280.

Table 1 Quotas, catches and fishing efforts in the USSR silver hake fishery on the Scotian Shelf, 1977-1983

Years	Quota, thous.t.	Catch, thous.t.	% fulfilled quotas	No. of fishing days
1977	45	33	73	1159
1978	52	44	85	2005
1979	45	45	100	1819
1980	56	41	73	2183
1981	48	40	83	1641
1982	48	47	98	1772
1983*	43	27	63	-

* Provisional data for January-August

Table 2 Silver hake catches per unit effort (catch per fishing day, t) by month, 1977-1982

Months	Years					
	1977	1978	1979	1980	1981	1982
April	20.2	17.4	21.4	18.0	13.0	55.6
May	18.5	15.1	23.0	16.9	28.2	35.5
June	15.2	17.4	24.1	17.2	18.4	30.8
July	18.2	16.3	26.1	18.0	22.4	10.7
August	22.7	24.4	18.0	9.1	19.6	-

Table 3 Average maturity stages for hake by month, 1977-1983

Months	Years						
	1977	1978	1979	1980	1981	1982	1983
April	-	3.6 (3000)	3.1 (300)	-	-	-	4.2 (1400)
May	-	3.8 (700)	4.0 (2100)	3.2 (1300)	3.7 (300)	3.4 (1000)	4.2 (2600)
June	4.0 (1800)	3.9 (3900)	4.2 (2500)	4.0 (900)	3.8 (1500)	4.0 (1100)	4.5 (3700)

* In parentheses numbers of examined fish is given

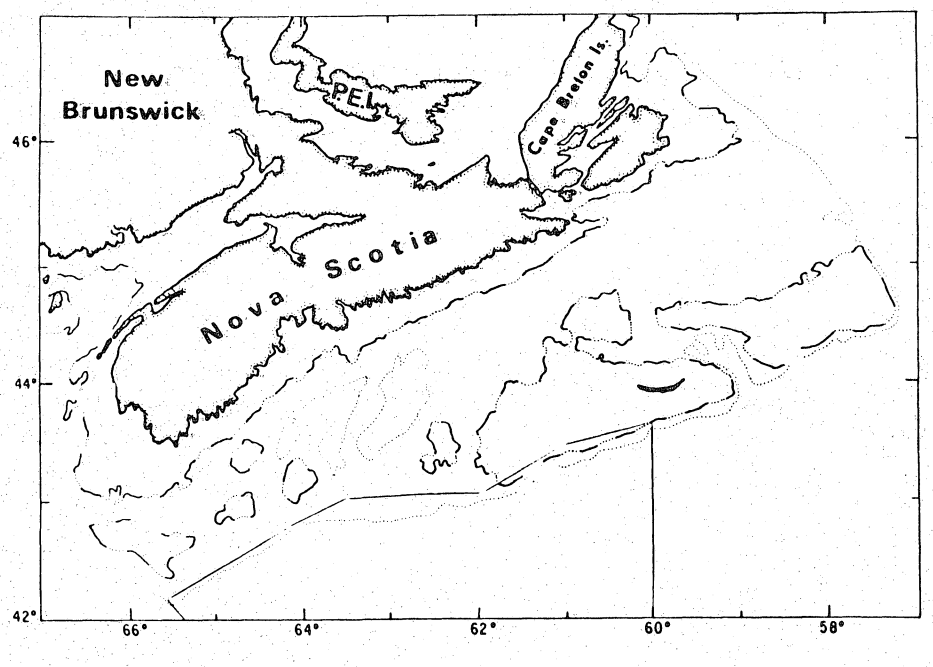

Figure 1.