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Fishing Patterns and Management Measures Regulating Size at Capture In the Georges Bank Sea Scallop Fishery: A Brief Historical Review

by

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SUMMARY

A brief historical summary of the major events and fishery practices characterizing the exploitation of the Georges Bank sea scallop resource is presented, with emphasis on trends in cull size and age at first capture in both the USA and Canadian fisheries. The tendency for these fisheries to exert high effort and a lower cull size during periods of resource abundance has been recognized as detrimental to the husbanding of the resource with respect to yield per recruit considerations. Accordingly, both the USA and Canada implemented management measures aimed at regulating size (age) at first capture. Management measures based on an average maximum meat count have not effectively reduced exploitation on young and immature scallops. A minimum size on landed meats appears to be a more effective management measure in enhancing potential yield per recruit.

INTRODUCTION

The Georges Bank sea scallop resource has been the principal source of Northwest Atlantic sea scallop landings for nearly 50 years, supporting significant USA and Canadian commercial fisheries since the late 1930's and mid-1950's, respectively. Fishery yields have exhibited large temporal fluctuations; brief periods of elevated landings have alternated with much longer periods of substantially lowered production. Examination of historical and recent trends in fishery performance and harvesting practices suggests that, in addition to variable recruitment, the fishery itself can markedly influence both the amplitude and duration of the yield "cycle".

This report briefly summarizes the important events and fishery practices that lead to implementation of both USA and Canadian management measures and evaluates the efficacy of these measures with respect to current fishery and resource conditions and attainment of management objectives.

BACKGROUND

Although the Georges Bank scallop fishery developed prior to World War II, it was not until the postwar period that fishery effects became significant. A summary of these major events includes:

1) As fishery effort expanded and yields increased during the late 1940's and early 1950's, accumulated stock on Georges Bank was diminished both in abundance and age composition. Resource composition, initially comprised of large numbers of older scallops (≥age 5), was altered through fishery removals towards fewer and younger age groups (Figure 1). As abundance declined in the late 1950's, the cull size shifted downward as the fishery attempted to maintain yields. Although cull size dropped from about age $5\frac{1}{2}$ to 5 (110 mm to 100 mm shell height) during this period, average landed meats still averaged less than 40 count (number per pound).

2) Exceptional recruitment of the 1955 year class beginning in late 1959 was accompanied by large increases in fishing effort and record yields during 1959-1964. The large expansion of the Canadian offshore scallop fleet occurred during these years. Although cull size was maintained as the year class initially passed through the fishery, the heavy exploitation quickly resulted in sharp declines in total scallop abundance. Since subsequent recruitment was much poorer, cull size in the late 1960's and early 1970's again dropped, but much more steeply. Prevailing cull sizes in this

latter period had fallen from age 5 to age 3 in the Canadian fishery and from age 5 to age 4 in the USA fishery. Meat counts in excess of 70 count were landed by the Canadian fleet and in excess of 40 count by the USA fleet.

3) From 1965 to 1975, the Georges Bank fishery was characterized by relatively low yields. Generally, recruitment was low and fishing effort moderate. The USA fleet had significantly declined in vessel number by 1971. Although resource abundance was low, the reduced fishing effort permitted residual accumulation of older scallops. USA meat counts during this period seldom exceeded 35 count and, on an annual basis, averaged less than 30 count.

4) Outstanding recruitment of the 1972 year class in the mid and late 1970's was accompanied, as for the 1955 year class in the early 1960's, by record landings levels and large effort increases. Peak yields lasted four years (1976-1979) with commercial CPUE peaking in 1977 for both the USA and Canadian fleets. Effort, however, continued to remain at record or near-record levels afterwards. As a result, the year class was quickly fished down; abundance and biomass of commercial sized scallops decreased by over 50% from 1977-1980. Ex-vessel prices, however, more than doubled during this period stimulating continued high effort.

5) By 1980, the Georges Bank scallop resource was comprised of only a few age groups of commercial-sized scallops (primarily ages 4 and 5), and these were of low abundance. Recruitment of a significant 1977 year class was apparent on the Northern Edge and Peak region of Georges Bank (Figure 2) although the small size of these scallops (>100 count; <60 mm shell height) precluded their harvesting. However, in 1981, both the USA and Canadian fleets intensively exploited this cohort since abundance of older scallops had already been severely depressed. Meat counts in 1981 sharply increased as scallops averaging 75 mm shell height (40-100 count) were harvested (Figure 3). Exploitation was so great that by 1982, abundance of the cohort had been reduced by over 60%.

6) A similar pattern of exploitation, as observed for the 1977 year class, was apparent in late 1982 and 1983 on the 1979 year class in the South Channel region of Georges Bank. Again, the fishery concentrated on small scallops whose meats ranged between 40 and 200 count. Because of prevailing maximum average meat count regulatory measures, however, small meats were commonly "mixed" or "blended" in with larger scallop meats to attain the legal average count. The result was a 70% reduction in abundance of the 1979 year class between 1982 and 1983.

MANAGEMENT MEASURES

The historical tendency for the fishery to exert high effort and a low cull size during periods of resource abundance has been recognized as detrimental to the husbanding of the resource. Based on yield-per-

recruit analyses, substantial gains in yield for any given recruitment, are possible by delaying age at first capture to between age 7 and 8 and reducing fishing mortality. Accordingly, both the United States and Canada have implemented regulations on the maximum average meat count permissible in the landings to increase the age at first capture in the fishery. Ancillary anticipated benefits from increasing average age at harvest were a projected improvement in spawning stock abundance and a more balanced age distribution within the population.

Canada implemented a 60 meat count regulation in 1973 and subsequently reduced the average maximum meat count to 40 count beginning in May 1976. The USA implemented a 40 meat count average in 1982 and reduced this to 35 count beginning in May 1983. Canada cooperated with the USA 35 meat count standard through a certification program for Georges Bank scallops.

The efficacy of the average meat count approach to increasing yield per recruit can be evaluated in two fashions: (1) by identifying possible combinations of meat counts to attain any prescribed maximum average count; and (2) to compare fishery meat count distributions under existing average meat count standards to assess whether average age at first harvest is actually being increased in the fishery.

Table 1 illustrates possible mixing combinations of different meat counts that would theoretically be possible under a 30 meat count average. Although a 30 meat count average has not been implemented at any time in the fishery, the tabular combinations can be used as a "restrictive" scenario.

The combinations listed in Table 1 suggest that through "mixing" of small and large scallops, it is possible to continue to harvest small scallops and attain a 30-count average. For example, by mixing 20, 60-count

scallops with only 10 15-count scallops, a 30 count average is achievable. Under conditions when the abundance of larger scallops is relatively low compared to smaller sized scallops, mixing of this type will occur as the fishery attempts to maintain yield. This type of blending activity occurred in the USA South Channel fishery on the 1979 year class as scallops from this cohort were mixed with less abundant but much larger scallops from other areas of Georges Bank.

Examination of USA commercial size frequency distributions for 1983 corroborates this inference. Although none of the 22 commercial samples obtained from South Channel landings had an average meat count in excess of 35 count (the standard during 1983), 27% of the scallops sampled had calculated meat sizes of 35 count and greater.

Figure 4 depicts the same type of mixing of meats in Canadian scallop landings. During 1978-1981, a 40 meat count average was the regulatory standard in the Canadian fishery. In all years, however, meats as small as 150 count (3 grams) appear in the commercial samples. Moreover, an increasing percentage of small scallops comprised the Canadian catch between 1978 and 1982 as suggested by the increased skewness of the weight distributions during 1979-1981. In 1981, for example, more than 50% of the landed meats were greater than the prevailing 40 count standard. Clearly, no improvement in average age at capture or yield per recruit was achieved during these years.

CONCLUSIONS

The mixing of scallop meats in the fishery has enabled attainment of average maximum meat count standards but has not effectively reduced exploitation on young and immature scallops. Accordingly, the utility of

the average meat count approach in enhancing yield per recruit and minimizing exploitation on newly recruited scallops has effectively been compromised in the recent fishery. Even at a 30 count average standard, mixing could actively proceed in the fishery. Given this situation, a minimum size on landed meats seems to be a much more effective approach to attain management objectives. The minimum size approach essentially limits fishing mortality on individuals smaller than the minimum size. Since smaller scallops tend to be found in separate beds from older animals, the minimum size strategy would constrain harvesting of these areas until individuals in these beds attained the minimum size.

Table 1. Possible mixing combinations of sea scallops of different meat counts under an average 30 meat count standard.

Meat Count	Meat Count			
	25	20	15	10
80	7/23	13/17	18/12	22/ 8
75	7/23	13/17	18/12	23/ 7
70	7/23	14/16	19/11	23/ 7
65	8/22	14/16	19/11	23/ 7
60	8/22	15/15	20/10	24/ 7
55	9/21	15/15	20/10	24/ 6
50	10/20	16/14	21/ 9	25/ 5
45	11/19	18/12	22/ 8	25/ 5
40	13/17	20/10	24/ 6	26/ 4
35	17/13	23/ 7	26/ 4	28/ 2

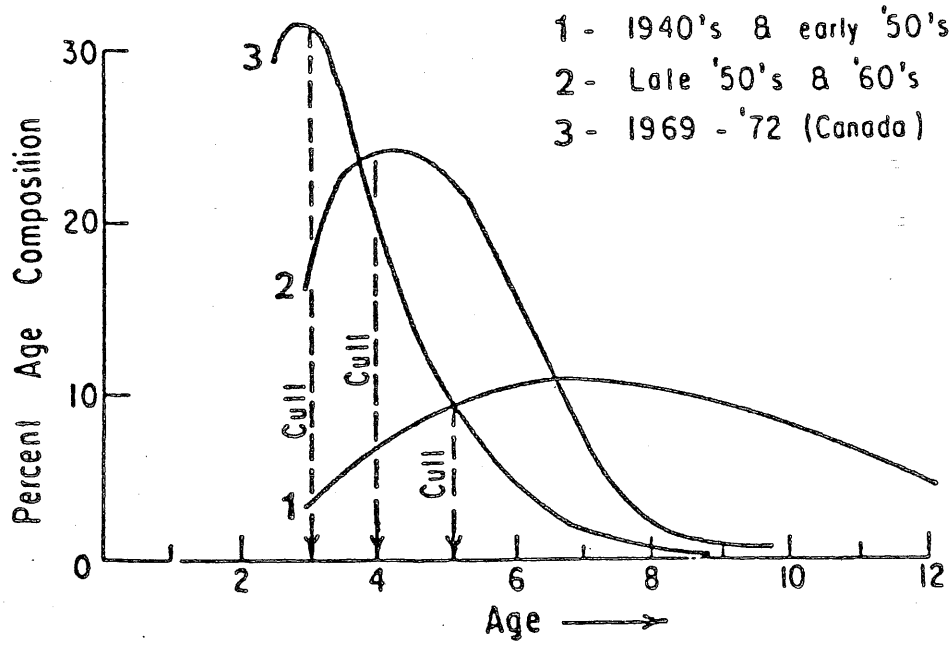

Figure 1. Hypothesized percentage age composition curves of the catch before cull, and estimates of trends in age at first capture for Georges Bank sea scallop stocks since the 1940's (from Caddy 1976, Status of Georges Bank scallop stocks and alternative strategies for optimal utilization of the resource. Talk presented in Lunenburg, Nova Scotia, 7-8 September 1976).

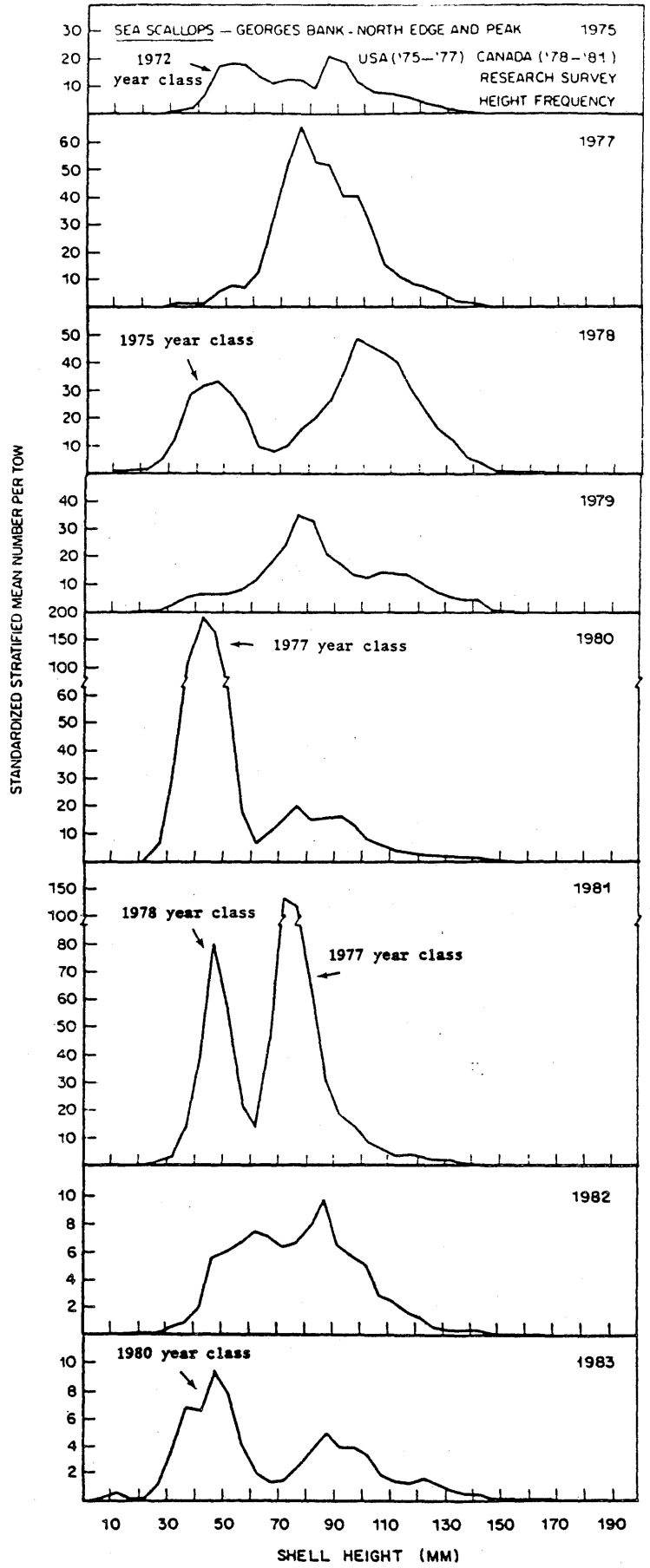

Figure 2. Sea scallop research vessel survey shell height frequency distributions of sea scallops from the Northern Edge and Peak region (Strata 61-66 and 71-74) of Georges Bank, 1975,1977-1983. Frequency distributions for 1975, 1977, 1982, and 1983 were derived from USA research vessel surveys. Frequency distributions for 1978-1981 were derived from Canadian research vessel surveys.

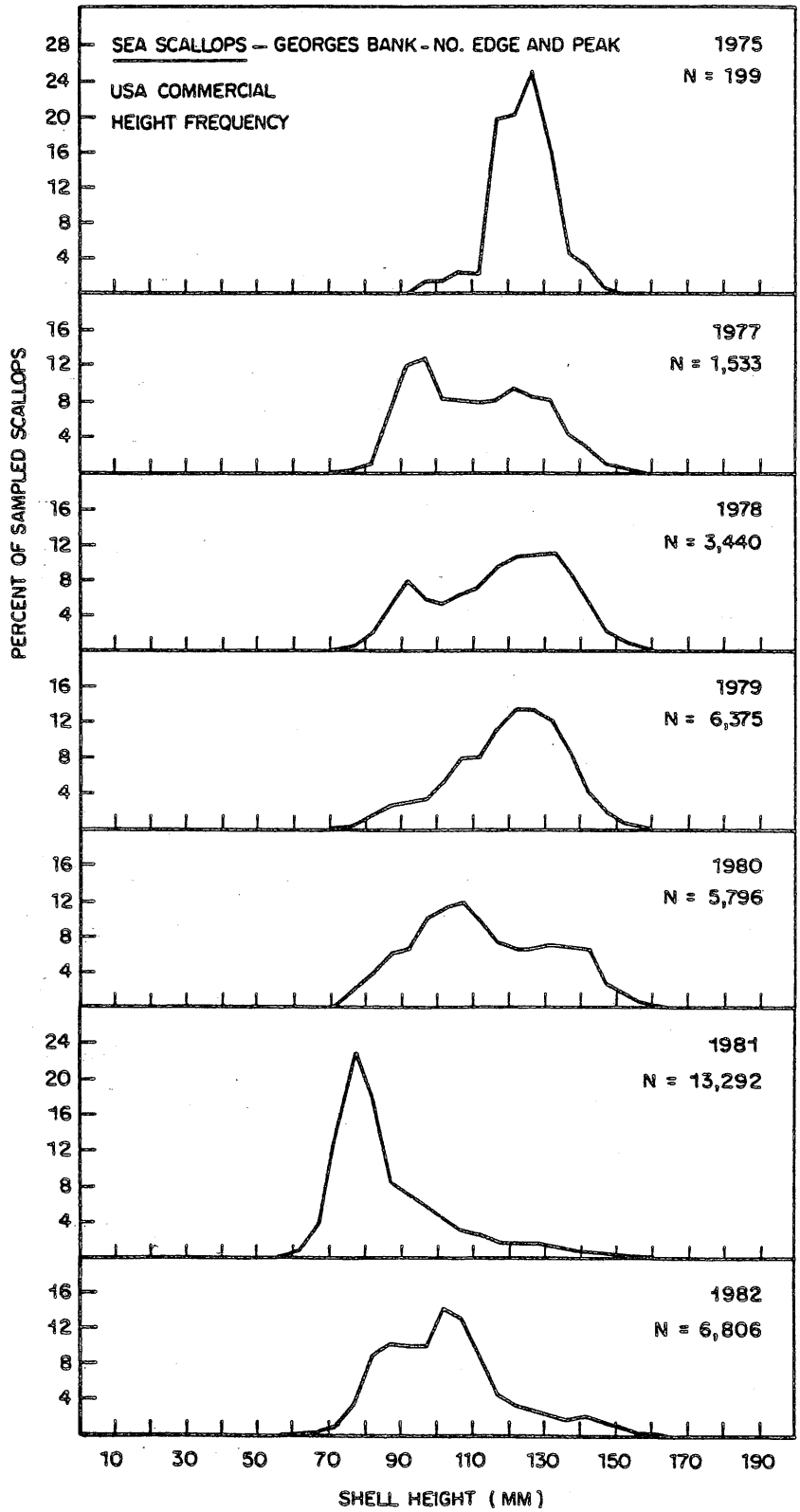

Figure 3. Annual shell height frequency distributions of USA commercial sea scallop samples from the Northern Edge and Peak region (Statistical Areas 523 and 524) of Georges Bank, 1975-1982. No samples were obtained in 1976.

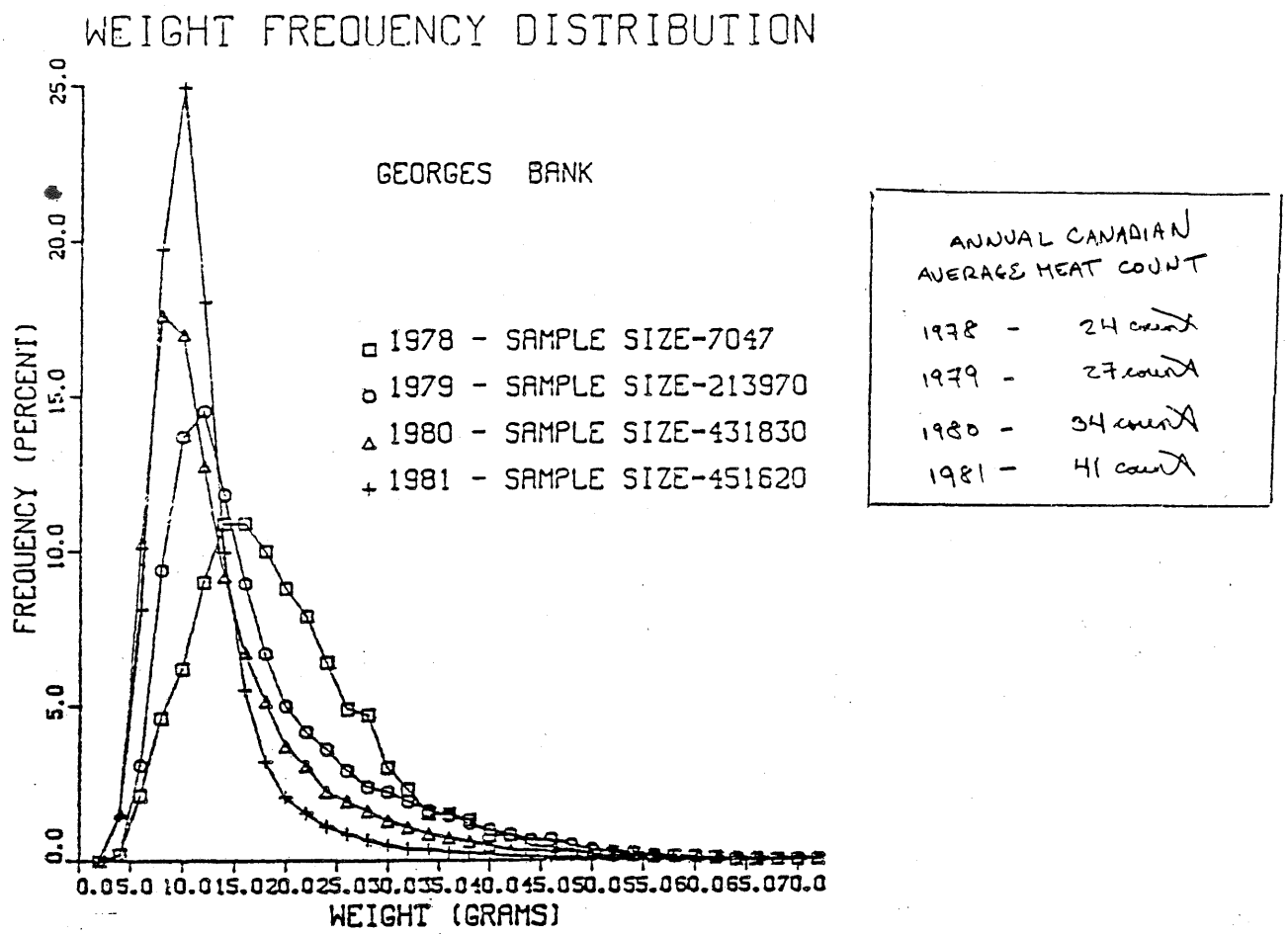

Figure 4. Weight frequency distributions of Canadian Georges Bank commercial sea scallop meat weight samples (from Robert et al. 1982, Profile of the Canadian offshore scallop fishery on Georges Bank, 1978-1981. CAFSAC Res. Doc. 82/15).