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Status of the Southwest Newfoundland Herring Stocks, 1965-70

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Introduction

Prior to 1965 the Newfoundland herring fishery was associated largely with the demand for herring as bait for the cod fishery and the sporadic demand for pickled herring products as food, especially during and immediately following World Wars I and II. In 1946 there was a peak landing of 75,000 metric tons, all of which were taken in coastal waters by gillnets and beach seines. Subsequently annual landings decreased to less than 10,000 tons in the early 1960's when the demand for herring as food was very low and most of the herring caught were utilized as bait. Purse-seining was introduced to the south coast of Newfoundland in the autumn of 1964 and landings from that area rapidly increased to 130,000 metric tons in 1968. This report considers the upsurge in herring landings in the light of recent knowledge on the size, distribution, biology, and migratory behaviour of the stocks.

Mobile Fleet Landings

In the autumn and winter of 1964-65 large concentrations of herring were found to overwinter in the fjords along the south coast of Newfoundland between Port aux Basques and Bay D'Espoir (Fig. 1, Areas J1 and J2). From a single fishing vessel in 1964 the seiner fleet participating in the winter fishery increased rapidly to 55 seiners during the 1969-70 season. In addition 10-15 vessels acted as carriers for some of the smaller seiners. Most of the herring are landed at processing plants at Harbour Breton, Burgeo and Isle aux Morts, and seiners account for more than 90% of the Newfoundland herring yield annually.

The southwest Newfoundland fishery begins in November and continues uninterrupted until April (Table 1). In July to October 1969 herring taken in the southwest part of the Gulf of St. Lawrence were landed in Newfoundland for the first time. Annual seiner landings increased from 7000 metric tons in 1965 to nearly 160,000 tons in 1969. The decrease to 148,000 tons in 1970 is largely due to greatly decreased catches in the autumn of that year.

Table 1. Monthly distribution of seiner landings (metric tons) in Newfoundland, 1965-70.

Month	1965	1966	1967	1968	1969	1970
Jan.	395	3,285	16,807	23,379	42,028	51,691
Feb.	763	4,098	11,962	22,870	33,118	30,833
Mar.	303	4,445	10,057	22,814	21,998	31,014
Apr.	313	1,864	11,848	11,294	8,645	14,055
May	392	-	1,375	2,501	2,377	1,963
Jun.	-	-	-	-	-	-
Jul.	-	-	-	-	1,686	477
Aug.	-	-	-	-	3,478	332
Sep.	-	-	-	-	737	31
Oct.	-	-	-	1,057	552	220
Nov.	1,534	4,013	7,247	12,631	11,071	1,873
Dec.	3,264	8,257	22,778	46,438	33,564	15,211
Total	6,964	25,962	82,074	142,984	159,254	147,700

The major winter fishery occurs mostly in the fjords and bays along the south coast in Areas J1 and J2 (Fig. 1, Table 2), which yielded 127,000 tons in 1969 and 119,000 tons in 1970. Up to 1968 the fishery took place largely in Area J1, but during the winter of 1969 and more so in 1970 the western half of the southwest coast (J2) yielded the largest quantity of herring.

Table 2. Area distribution of seiner and midwater trawler landings (metric tons) in Newfoundland, 1965-70.

Area	1965	1966	1967	1968	1969	1970
GH	23	612	1,302	6,278	220	290
I	19	-	4,567	11,662	4,827	7,971
J1	3,331	15,324	57,102	82,918	42,906	30,036
J2	472	4,054	10,408	26,450	84,020	88,612
K	-	492	672	1,793	240	28
M	3,119	5,480	5,452	3,903	2,340	2,946
Nfld.	6,964	25,962	79,503	133,004	134,553	129,883
4T	-	-	2,571	9,633	21,503	14,741
4V	-	-	-	347	3,198	3,076
T+V	-	-	2,571	9,980	24,701	17,817
Total	6,964	25,962	82,074	142,984	159,254	147,700

Seiner landings from catches in other parts of the Newfoundland area have been relatively small and the fisheries based on localized stocks. Along the west coast of Newfoundland (Areas K and M) seiner landings ranged between 3000 and 6000 tons annually with most of the herring taken in November and December in or near Bonne Bay up to 1968 and more recently in Hawke's Bay. The small Fortune Bay stock (Area I), which yielded nearly 12,000 tons to seiners in 1968 but less than 5000 tons in 1969, showed some improvement in the winter of 1970 with a yield of 8000 tons (Table 2). However, the small stock in Areas G and H, which yielded over 6000 tons to seiners in the spring of 1968 remained at a very low level of abundance in 1969 and 1970. This stock was greatly affected by phosphorus poisoning in Placentia Bay (H) during the winter and spring of 1969 when a high proportion of the adult population (estimated at more than 80%) died.

In recent years the seiners (and occasionally midwater trawlers) landing at Newfoundland ports have enlarged their sphere of fishing activity to the southern Gulf of St. Lawrence (4T) and northeastern Nova Scotia (4V). Division 4T catches (Table 2) came mostly from the Magdalen Islands (Bird Rocks) and northern Cape Breton (St. Paul Island), and the 4V catches from Sydney Bight and Chedabucto Bay. In 1969 Newfoundland herring landings from these regions totalled 25,000 tons, taken mostly in November and April, but in 1970 the yield was substantially less due to a poor fishery at Magdalen Islands in the fall.

Catch statistics for the 1971 winter fishery along southwest Newfoundland (Areas J1 and J2) are not yet fully available, but information from plant officials and seiner captains indicate that the herring yield may not exceed one-half of that recorded for the winter of 1970.

Status of the Southwest Newfoundland Herring Stock

Investigations began in 1965 to elucidate the size, distribution, biology and migratory behaviour of the herring stocks which support the winter purse seine fishery (Hodder, 1967; Hourston, 1968). These were intensified in 1969. Efforts were continued to improve the collection of information on area of capture through log book records and port interviews. The sampling of seiner landings was carried out at the major ports of landing and several thousand herring were examined annually for information on their biology. During the past 2 years the seasonal migratory behaviour of the stock has been determined by meristic studies and tagging.

There has been a gradual increase in the average size of herring taken along southwestern Newfoundland since the purse seine fishery began in 1965 (Fig. 2). The modal size (total length to the 0.5 cm below) increased from 32 cm in the winter of 1966 to 34 cm in the autumn and winter of 1970-71. Similarly the average length increased by about 2 cm over the 6-year period. More than 95% of the herring were in the 30-36 cm length range.

The composition of the samples by maturity stages indicates a mixture of spring and autumn spawners, the latter comprising two-thirds or more of the seiner catches. Immature herring were rare in the samples. The relative proportions of spring and autumn spawners in the samples taken for ageing are given in Fig. 3.

Age determinations, based on otolith readings, reveal that the southwest Newfoundland winter fishery since its inception has been largely dependent on a very abundant 1958 year-class of autumn spawners and a smaller 1959 year-class of spring spawners (Fig. 3). Both the length and age frequencies indicate a lack of substantial recruitment to the adult stock.

The predominance of autumn-spawning herring in the great concentrations which arrive in southwestern Newfoundland in November indicate that autumn spawning must be very extensive in Northwest Atlantic waters. However, no extensive autumn-spawning areas in Newfoundland waters were known prior to the development of the purse-seine fishery. In the autumns of 1968 and 1969 surveys along southern Newfoundland for recently hatched herring larvae produced no evidence of extensive spawning, despite the large numbers of autumn spawners which overwinter in the fjords there.

The distribution of seiner catches at the start of each season indicate that herring arrive from the westward in late November and within a few days are distributed widely in the fjords along the southwest coast. After January the fishery gradually shifts westward and the last catches for the season are usually made off the southwest corner of Newfoundland in April (Fig. 4). For about 3-4 weeks prior to the appearance of herring in southwest Newfoundland waters in late November, there is a fairly intense fishery at Magdalen Islands. Also, about a week after the herring leave Newfoundland in April, a short spring fishery again occurs in an area between St. Paul Island and Magdalen Islands, followed by a substantial summer fishery in the southwestern part of the Gulf of St. Lawrence during June to September.

In 1969 herring samples from seiner catches at Magdalen Islands in November were compared with samples taken from catches in the coastal waters of southwestern Newfoundland in late November and early December (Hodder and Parsons, 1970). In summary the study showed that there was no significant difference between areas for all of the biological characters examined (length, age, maturity condition, vertebral numbers, pectoral, dorsal and anal fin ray numbers, and *Anisakis* nematodes), although for nearly all of the characters very significant differences were apparent between spring and autumn spawners which were present in the samples from both areas in about the same proportion. The analysis thus supported the hypothesis that the winter fishery along southwest Newfoundland is largely dependent on herring schools which migrate eastward from the southern part of the Gulf of St. Lawrence in the autumn.

Both the eastward movement of herring from the southwestern Gulf of St. Lawrence to southern Newfoundland in the autumn and the westward movement in the spring have recently been confirmed by tag recaptures from more than 80,000 tagged herring which were released in March, May and August 1970 in southwest Newfoundland, at Magdalen Islands and near the Gaspé Peninsula respectively (Hodder and Winters, 1970; Winters, 1971a; Beckett, 1971). The absence of tag recaptures from a substantial purse seine fishery in Chedabucto Bay during the winter of 1971 (J. S. Beckett, 1971) and the recovery of only 2 tags during the 1971 winter fishery along southwest Newfoundland from the liberation of 3400 tagged herring in the northeastern part of the Gulf of St. Lawrence in early December 1970 (G. H. Winters, personal communication) suggest that the southern Gulf of St. Lawrence-southwest Newfoundland stock complex of adult herring does not deviate significantly from its seasonal east-west migration route, nor does it appear that the stock, at least when it is in southwest Newfoundland waters, is supplemented by a significant influx of herring from other areas.

Preliminary estimates from tagging data indicate that the stock size of the southwest Newfoundland herring population was about 400,000 tons at the start of the 1969-70 winter fishery and about 250,000 tons at the beginning of the 1970-71 season (Winters, 1971b). The "exploitation rate" was estimated at 4-5% per month. If a similar rate applies for the summer fisheries in the southern Gulf of St. Lawrence, the annual rate for the stock as a whole would be about 40-50%.

Conclusions

The recent increase in Newfoundland herring landings is due to the development of a substantial autumn and winter purse seine fishery in the fjords along the western part of the south coast. Concurrent with the development of this fishery was a rapid expansion of the summer fishery in the southern part of the Gulf of St. Lawrence. Consequently, the question arises as to whether or not these fisheries can continue successfully if the same stocks are being fished almost continuously at different times and places along their migratory route.

Recent studies show that herring samples taken during the autumn along southwestern Newfoundland differ in certain biological features from samples taken in other areas of Newfoundland and Labrador and on the northern part of the Scotian Shelf, but are very similar to those taken at Magdalen Islands just prior to the start of the Newfoundland autumn and winter fishery. In the spring the herring schools migrate westward to Magdalen Islands and later in June and July to the Gaspé Peninsula-Chaleur Bay region of the Gulf of St. Lawrence.

About the time that the herring leave the Newfoundland coast in the spring some separation of spring- and autumn-spawning herring is evident from samples taken from seiner catches near the end of the season in early April. The short fishery at Magdalen Islands in late April and early May is based mostly on herring schools heading for shallow water to spawn, but a few catches consist mostly of autumn spawners. However, the latter probably disperse to a large extent and ultimately move westward to the southwestern part of the Gulf, where they feed during the summer and spawn in late summer and early autumn.

The winter fishery along southwest Newfoundland is almost entirely on adult herring, that is, herring with gonads well-developed for spawning in the spring and herring which have only begun to recover from autumn spawning, the latter being dominant in the catches. The average size and age of these 2 spawning groups have gradually increased over the past 5-6 years, and the fisheries have been maintained over the period by the abundance of pre-1960 year-classes (1958 year-class of autumn spawners and 1969 year-class of spring spawners). The scarcity of immature herring in the southwest Newfoundland catches suggests that annual recruitment to the stock occurs possibly during the summer in the Gulf of St. Lawrence. Age composition data indicate that recruitment has been relatively poor in recent years.

Between the autumns of 1969 and 1970 the stock size in southwest Newfoundland waters is estimated to have declined by about 40%. The 1971 winter catch of herring in the same area is estimated to be about 50% of that recorded for 1970. Part of the decline in catch can be attributed to rather severe weather conditions during the past winter, but part is undoubtedly due to poor recruitment of young and to reduced abundance of older fish. Also the estimated exploitation rate of 40-50% is dangerously close to the level at which the Atlanto-Scandian stock began to collapse according to the report of the Atlanto-Scandian herring working group.

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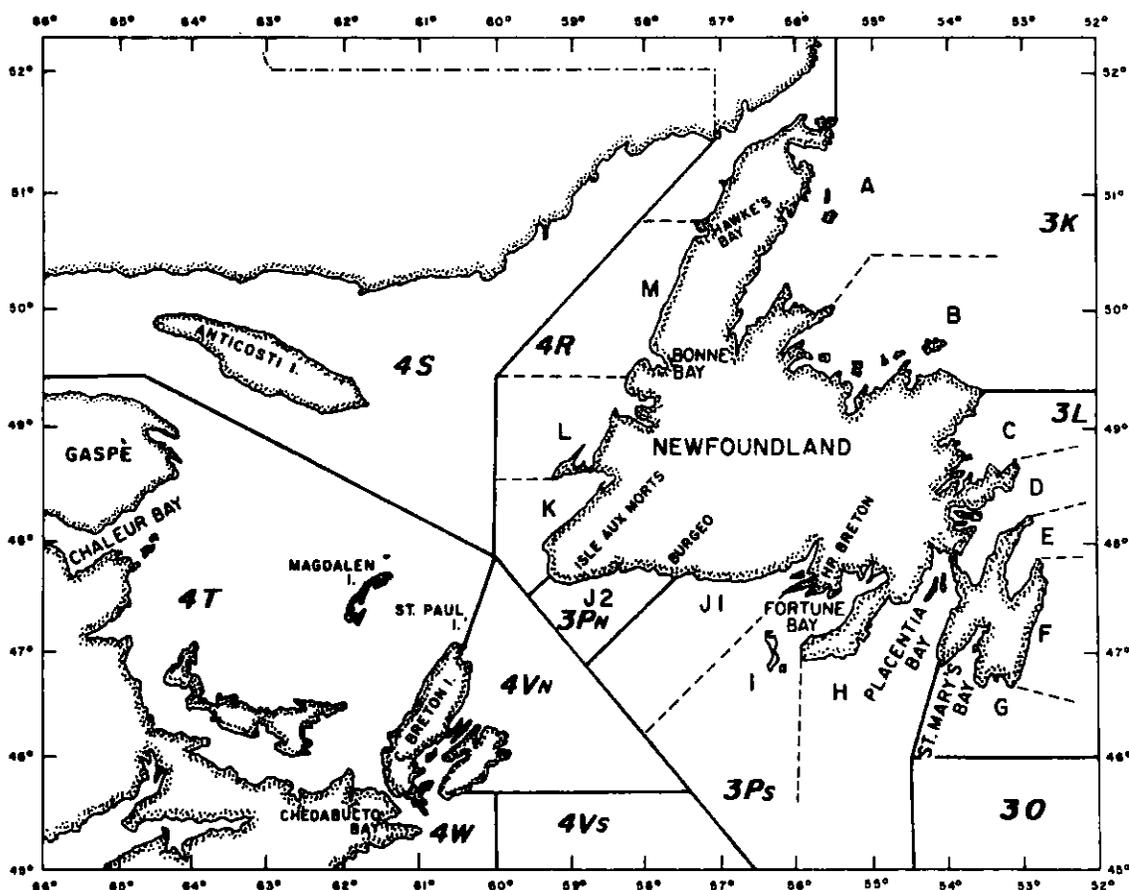


Fig. 1. Map of the Gulf of St. Lawrence–Newfoundland area for reference to place names and statistical areas mentioned in the text.

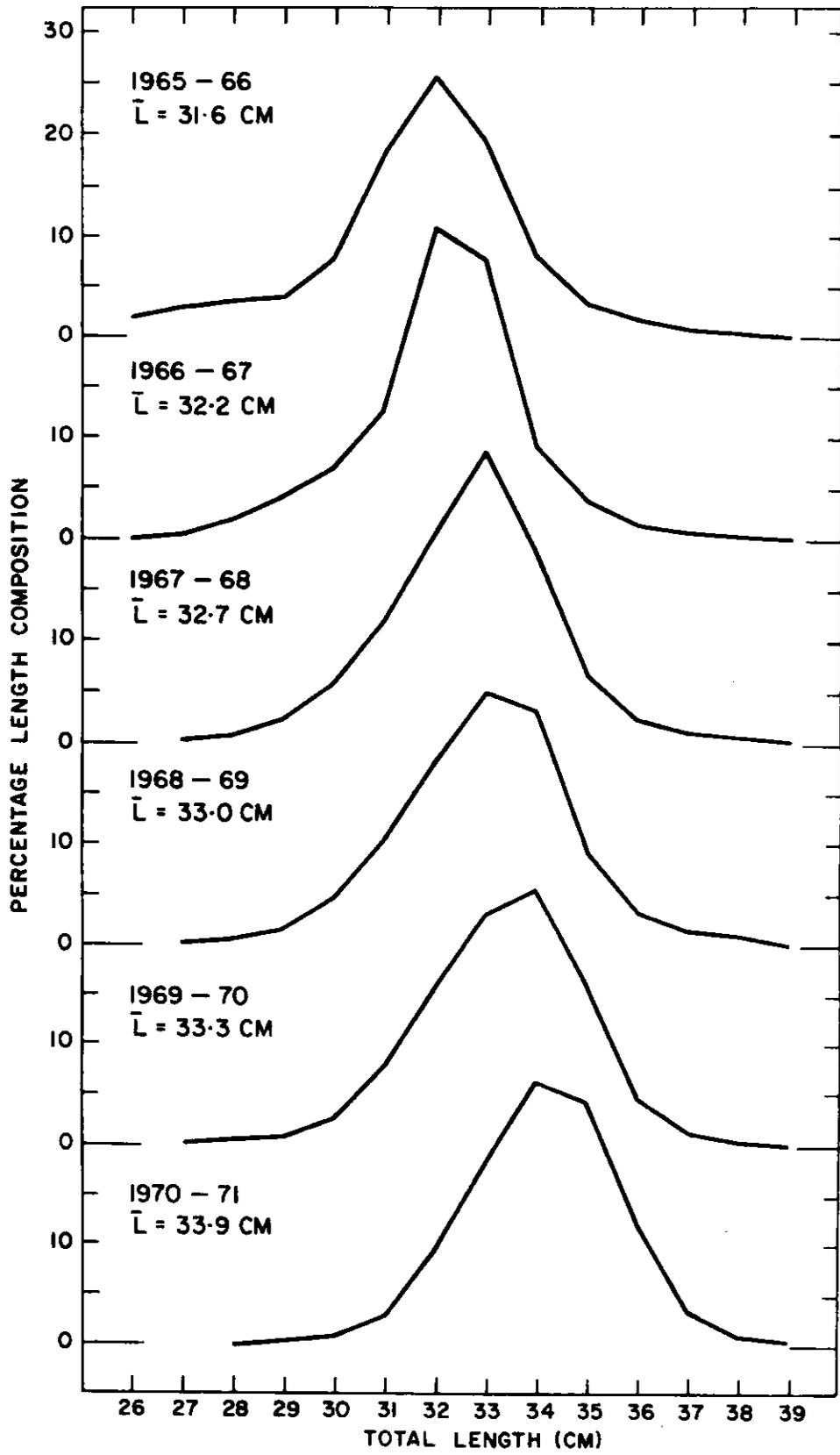


Fig. 2. Length composition of herring sampled from the southwest Newfoundland fishery, 1965-66 to 1970-71 seasons.

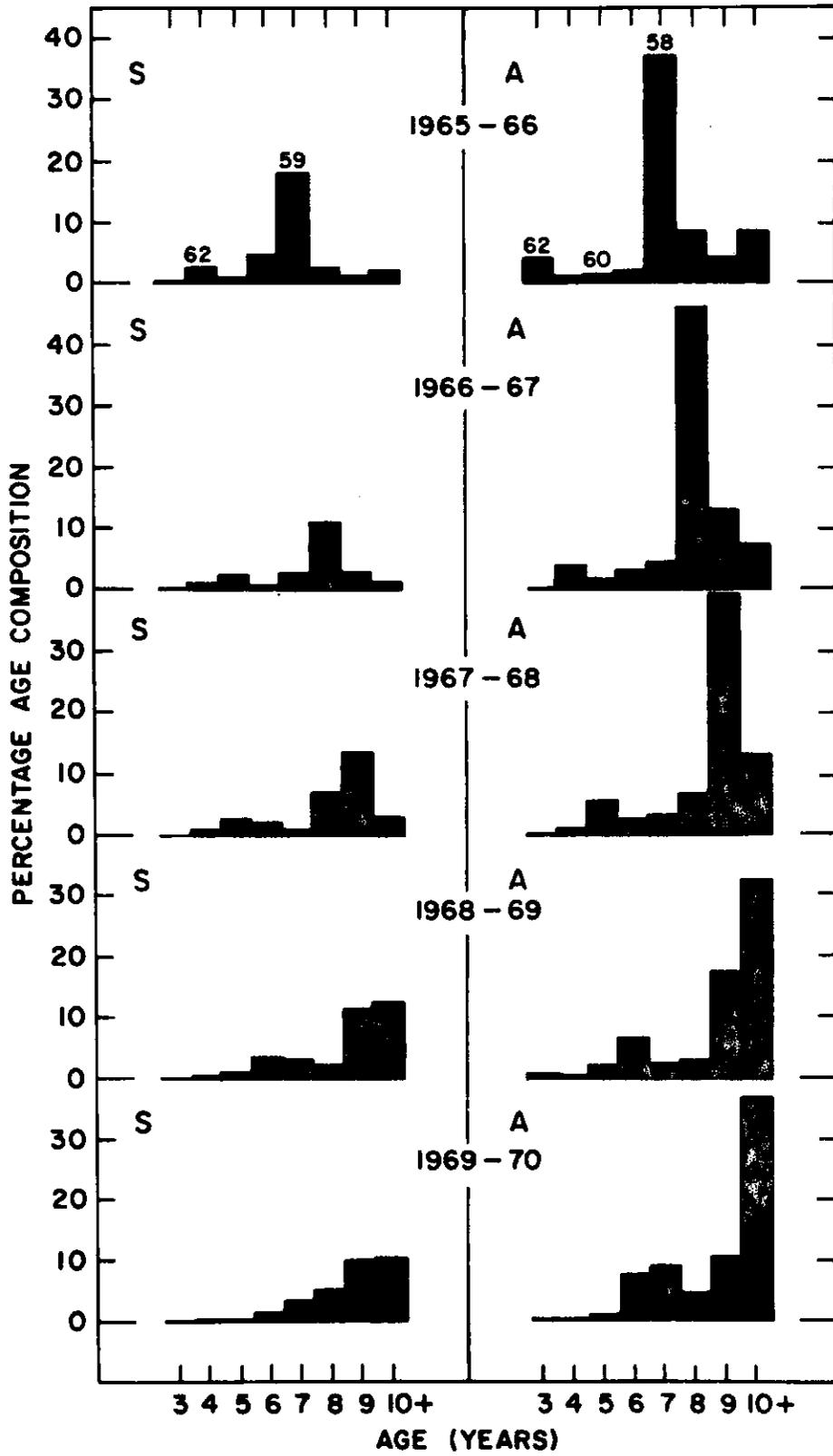


Fig. 3. Relative age composition of spring (S) and autumn (A) spawning herring sampled from the southwest Newfoundland fishery, 1965-66 to 1969-70 seasons.

