INTERNATIONAL COMMISSION FOR THE NORTHWEST ATLANTIC FISHERIES

Serial No. 1313
(D. a. 63)

Document No. 18

ANNUAL MEETING - JUNE 1964

United States Research Report, 1963

The United States landed fish from Subareas 3, 4 and 5 in 1963 and conducted research in these three subareas as well.

(H W Graham)

SUBAREA 3

A. Status of the Fisheries

I. Redfish

United States landings for Subarea 3 have been mostly from the Grand Bank, Divisions 3N and 3O, with occasional trips from St. Pierre Bank, Division 3P.

Landings in 1963 dropped about 15% over 1962, probably due to decreased effort since abundance in these areas has held steady during the past few years (Table 1).

Table 1. -- U.S. redfish statistics, Subarea 3 (metric tons, round weight)

Year	Landings	Days fished	Catch per day
1954	31,269	1,786	17.51
1955	13,406	1,126	11.91
1956	13,304	943	14.12
1957	4,797	289	16.62
1958	10,859	688	15.79
1959	16,871	1,120	15.07
1960	15,393	1,049	14.67
1961	16,706	1,056	15.83
1962	14,257	---	15.88
1963	12,098	---	---

B. Special Research Studies

I. Environmental Studies

1. Hydrographic. The U.S. Coast Guard, as the agency operating the International Ice Patrol, examined the temperature and salinity distribution from the surface to 1500 m in 4 network surveys of the Grand Banks region. The first survey, 30 March - 8 April, covered the waters over and immediately seaward of the southern and eastern slopes of the Grand Banks from just westward of the Tail of the Banks northward to Section T, approximately 45-40 N. The second survey, 15 April-25 April, covered the area immediately seaward of the eastern and northeastern slope of the Grand Banks from section T northwestward and included Flemish Cap and the Bonavista Triangle. The third and fourth surveys, 14 May-31 May, were combined into a single survey and covered an area similar to the first and second. The postseason survey, 13 July-21 July, occupied the Bonavista Triangle and the Labrador Sea section, (South Wolf Island, Labrador, to Cape Farewell, Greenland) to within 20 miles of shore at Cape Farewell.

The season was characterized by a less than normal amount of sea ice and ice bergs along the east Newfoundland coast. Labrador Current volume

along the eastern slope of the Grand Banks was slightly below normal for the entire season although well defined, was on the average warmer and saltier than normal, but with lower minimum observed temperatures. As the season progressed, conditions tended more toward the normal but still remained below normal. On the postseason survey, the Labrador Current off South Wolf Island had a positive volume anomaly and a negative temperature anomaly while the West Greenland Current off Cape Farewell had a negative volume anomaly and a positive temperature anomaly. The report in toto will be published in the U. S. Coast Guard Bulletin No. 49.

SUBAREA 4

A Status of the Fisheries

I. Haddock

United States landings from Browns Bank and LaHave Bank were about the same in 1963 as in 1962 (Table 2). Total landings for the U. S. and Canada combined will probably also be about the same as in 1962. The abundance was about the same as last year, actually showing a slight drop. Total effort in 1963 will probably show an increase over the relatively low level of 1962.

Table 2. --U. S. haddock statistics, Subarea 4 (metric tons round, fresh)

Year	Landings	Days fished	Landings/day
1956	14,024	1,215	11.540
1957	8,951	1,015	8.818
1958	12,639	1,374	9.199
1959	10,544	1,777	5.933
1960	8,466	1,169	7.239
1961	9,330	1,318	7.076
1962	6,440	739	8.709
1963	7,281	1,013	7.185

The age compositions of landings for 1963 and previous years (Fig. 1) indicates an increased proportion of four and five year olds in 1962 and 1963. The 1963 fishery depended heavily on the 1958 and 1959 year classes as did the Georges Bank fishery. However, because of the slower growth rate in Subarea 4 these year classes should sustain the fishery during 1964, and provide a level of abundance near that of 1963.

A U. S. -Canada cooperative study of the Division 4X haddock fishery for the period 1956-1961, was completed and a manuscript submitted for publication in the new ICNAF research journal. The study describes the general characteristics of the fishery and presents estimates of abundance, growth, year class strength, and total mortality.

Average annual survival rate of Division 4X stocks was approximately 0.50 corresponding to an instantaneous total mortality of 0.70. However, growth and age composition was not uniform in all parts of Division 4X. Bay of Fundy haddock exhibit faster growth and a younger age composition than those from waters off southern Nova Scotia (including Browns Bank). Age composition of the Bay of Fundy haddock is similar to that of Division 5Z (Georges Bank), but growth is still faster in the latter area. Both growth and age composition of haddock off southern Nova Scotia are similar to that for stocks off central Nova Scotia (Divisions 4V-W).

Certain year classes appeared strong in all Divisions (5Z to 4W) suggesting that factors common to the entire area may often control brood success, or that some stocks mix at a pre-recruit stage.

II. Cod

United States landings of cod from the subarea were up slightly in 1963 but were near the 10 year average (Table 3).

Table 3. --U.S. cod statistics, Subarea 4 (metric tons, round weight)

Year	Landings
1954	2,659
1955	1,371
1956	1,624
1957	1,083
1958	1,147
1959	862
1960	1,605
1961	1,261
1962	1,197
1963	1,336

III. Redfish

The steady decline in U.S. landings from the Gulf of St. Lawrence from a high of 34,739 metric tons in 1955 to 68 metric tons in 1962 was reversed in 1963 when 4,876 tons were landed. This was the result of increased effort (Table 4).

Table 4. --U.S. redfish statistics, Subarea 4 R-S-T (Gulf of St. Lawrence) (metric tons, round weight)

Year	Landings	Days fished	Catch per day
1954	17,228	1,517	11.35
1955	34,739	2,397	14.49
1956	24,825	2,024	12.26
1957	18,319	1,960	9.34
1958	7,535	844	8.93
1959	5,406	572	9.45
1960	1,412	139	10.13
1961	200	20	9.84
1962	68	---	---
1963	4,876	---	---

The catch from Nova Scotian banks decreased about 20% in 1963 also due to change in effort. The abundance has been steady in this area for several years (Table 5).

Table 5. --U.S. redfish statistics, Subarea 4 V-W-X (Nova Scotia Banks) (metric tons, round weight)

Year	Landings	Days fished	Catch per day
1954	20,895	1,900	11.00
1955	9,330	1,100	8.48
1956	16,313	1,461	11.17
1957	21,101	1,896	11.13
1958	30,768	2,556	12.04
1959	25,281	2,448	10.33
1960	36,612	3,352	10.92
1961	28,957	3,000	9.65
1962	29,375	---	10.89
1963	23,278	---	---

B. Special Research Studies

I. Biological Studies

Serology of haddock. Preliminary results with a rabbit anti-haddock serum have revealed statistically significant serological differences between haddock from Cape Cod, Browns Bank, and Emerald Bank. However, the genetic significance of these differences has not yet been established. Haddock blood samples from Nova Scotian waters were obtained through the generous cooperation of Canadian scientists aboard the research vessel "Cameron".

SUBAREA 5

A. Status of the Fisheries

I. Haddock

The U. S. landings of haddock from Georges Bank dropped 5,000 metric tons in 1963 (Table 6). This was due to a decreased abundance of fish, the index of abundance dropping from 6.6 in 1962 to 4.7 metric tons per day in 1963.

Table 6. --U.S. haddock statistics, Subarea 5 (metric tons in round weight)

Year	Landings	Abundance index	Effort days fished
1954	53,539	8.382	5807
1955	50,344	9.491	5059
1956	58,422	7.566	6794
1957	54,702	6.205	7825
1958	44,404	4.790	7836
1959	40,548	4.028	9432
1960	45,341	5.661	7669
1961	51,681	6.858	7192
1962	54,412	6.641	7833
1963 1/	48,963	4.736	---

1/--preliminary

The 1958 and 1959 year classes which have supported the fishery in the past few years are losing their dominance in the age structure of the populations while the following year classes, 1960 to 1962, are weak ones (Fig. 2). Thus the abundance of haddock on Georges Bank is expected to remain relatively low during 1964.

On R/V Albatross IV groundfish survey cruises during the summer and fall of 1963 an unusual abundance of young-of-the-year haddock were found which indicates that the 1963 year class is an unusually large one. On this basis we can expect an abundance of scrod to appear in the fishery early in 1965, and that landings would begin to improve during that year.

Refining abundance index. Relative abundance and total effort for haddock and cod in Subarea 5 have been estimated from a constant, small group of large Boston otter trawlers since about 1920. This index is not entirely satisfactory, and we have begun studies directed towards providing a more appropriate index based on a greater and more representative segment of the fleet. These studies will include a comparison of temporal and spatial variation in catch and effort of the several component fleets, and estimation of relative efficiency of various types of gear and vessel size. These studies involve data covering over 30 years of fishing; hence will require some time for completion.

Estimating pre-recruits. In recent years the United States has conducted fairly regular surveys each fall of the distribution and abundance of otter trawl-caught fish from the Bay of Fundy to the Hudson Canyon off New York. A preliminary analysis was completed of catches of young-of-the-year haddock to determine annual fluctuations free from potential errors due to effects of area, depth, and time of day. A log transformation markedly reduced but did not eliminate the correlation between mean and variance of catches. Nevertheless a preliminary analysis of variance (ignoring interaction terms involving factors of depth, area, and time of day) indicated significant between-year differences in mean catch rate. More important,there is a fairly good correspondence between young-of-the-year haddock abundance indices on Georges Bank, and the subsequent abundance of the same year classes at ages 2 and 3 in the commercial landings (Fig. 3). This suggests not only the potential predictive value of the surveys, but also tends to confirm the long held view that factors determining year class strength operate chiefly in the first few months of life.

Another interesting feature is the correspondence between young-of-the-year indices on Georges Bank and off western Nova Scotia. It appears that strong and weak broods tend to occur in the same years in both areas (Fig. 4). This is further evidence of the correspondence in brood success among New England and Nova Scotian haddock stocks, and lends additional support to the hypothesis that pre-recruit dispersion or environmental factors common to the entire area, may be involved. Finally, it may be noted that the brood index is consistently higher off western Nova Scotia than on Georges Bank. The significance of this feature is not yet known.

II. Cod

U.S. landings of cod dropped about 2,000 metric tons in 1963 after reaching a 10 year high of 18,000 metric tons in 1962 (Table 7). This change is probably related to abundance as the index also reached a 10 year high in 1962. Although we do not have age compositions it appears from length frequencies that the changes in abundance have been due to changes in year class strength. Abundance is expected to remain high for a year or so.

Table 7. --U.S. cod statistics, Subarea 5 (metric tons, round fresh)

Year	Landings	Catch per day	
		Total cod	Scrod cod
1954	12,237	1.143	0.125
1955	12,457	1.393	0.129
1956	13,238	1.477	0.113
1957	13,160	1.313	0.077
1958	16,252	1.072	0.297
1959	16,218	1.402	0.316
1960	14,282	1.407	0.284
1961	17,669	2.071	0.492
1962	18,626	2.268	0.465
1963	16,453	---	---

III. Silver Hake

United States foodfish landings amounted to about 42,000 metric tons, a slight decrease from 1962. The preliminary estimate of abundance, 17.4 metric tons per day-fished is nearly the same as in 1962 (Table 8). However, the U.S. vessels fished more on inshore grounds in 1962 and again in 1963 and thus avoided the principal areas fished by the USSR on Georges Bank.

Table 8. --U.S. silver hake statistics, Subarea 5 (metric tons, round weight)

Year	For Food	For Industrial	For Animal Food	Total	Catch per Day
1954	40,823	9,525	2,722	53,070	---
1955	50,348	10,433	4,536	65,317	---
1956	40,370	13,608	4,989	58,967	---
1957	45,300	17,200	7,200	69,700	---
1958	48,500	10,400	7,700	66,600	---
1959	49,900	11,800	9,100	70,800	---
1960	46,700	2,300	9,100	58,100	17.5
1961	38,100	3,200	4,500	45,800	23.8
1962	37,200	3,200	7,200	47,600	18.5
1963**	42,000	*	*	*	17.4

* Values not yet available
** Preliminary

Examination of length-frequency compositions of port landings and catches aboard fishing vessels has indicated that in 1962 and 1963 fish under 25 cm were rather less abundant than in previous years. This is not reflected in the abundance index because the small sizes are not landed for food in the U.S. If these observations do, in fact, reflect on the population, the combination of weak recruitment and increased fishing effort may cause a decrease in abundance in the next few years.

The majority of fish in the U.S. landings in 1963 is in the 25-40 cm length classes (Fig. 5). The results from ageing studies thus far conducted indicate that these fish are mostly 2 and 3 years old, and that only the largest 10% were over 5 years of age.

IV. Redfish

United States landings of redfish from the Gulf of Maine dropped significantly in 1963 in the face of increased abundance (Table 9). This was due to a decrease in effort. The length frequencies show that small fish are relatively more abundant than they usually are. The increased abundance coupled with the large proportion of small fish indicates that one or more strong year classes are entering the fishery. On this assumption we can expect abundance to hold up for a few years.

Table 9. --U.S. redfish statistics, Subarea 5 (Gulf of Maine) (metric tons, round weight)

Year	Landings	Days fished	Catch per day
1954	12,988	3,859	3.37
1955	13,914	3,089	4.50
1956	14,388	3,267	4.40
1957	16,468	3,862	4.26
1958	16,112	3,636	4.43
1959	14,435	3,329	4.34
1960	10,716	2,799	3.83
1961	14,040	3,077	4.56
1962	12,540	---	4.76
1963	8,873	---	---

Through 1960 it was not possible to discern any trend in the average size of redfish in the Gulf of Maine. With the addition of the 1961 and 1962 data there now appears to have been a long term reduction in average size of fish in both males and females. However, as pointed out above, the recent low average size may bode well for the fishery during the next few years (Figs. 6 and 7).

V. Yellowtail Flounder

United States landings of yellowtail flounder reached an all time high of 35,000 tons in 1963 (Table 10). This was due to unusually high abundance caused by three strong consecutive year classes, 1958, 1959, and 1960.

Table 10. --U.S. yellowtail flounder statistics, Subarea 5 (metric tons in round weight)

	South. New England Grounds		Georges Bank		Cape Cod Grounds	
Year	Landings	Landings per day	Landings	Landings per day	Landings	Landings per day
1954	1,515	1.270	2,887	2.086	1,120	1.270
1955	2,180	1.406	2,946	2.404	1,304	1.315
1956	3,542	1.542	1,594	2.041	1,472	1.089
1957	5,441	2.313	2,302	2.812	2,357	1.633
1958	8,907	2.449	4,534	3.220	1,613	1.724
1959	7,738	1.587	4,130	2.086	1,526	1.996
1960	7,843	1.769	4,447	2.222	1,812	1.633
1961	11,632	2.495	4,248	2.359	1,880	2.041
1962	15,669	3.674	7,769	3.583	1,973	1.724
1963 1/	21,500	4.672	10,659	4.173	2,722	1.950

1/ Preliminary

During the coming year the 1959 and 1960 year classes will continue to contribute heavily to the fishery, but the 1961 year class appears to be a weak one. The overall abundance of marketable sizes will probably drop slightly during 1964.

VI. Industrial Fishery

The industrial fishery catches fish primarily for purposes of reduction to meal and oil, and for purposes of supplying animal food products. The fishery began in the late 1940's, reached a peak in 1956 when 111 thousand metric tons were landed. The fishery gradually declined to a level of 24 thousand metric tons in 1960, but is beginning to increase again and 58 thousand metric tons were landed in 1963 (Table 11).

Table 11. --U. S. landings of industrial trawl fish from Subarea 5 (tons in round weight)

Year	Landings
1956	110,786
1957	97,736
1958	88,927
1959	75,706
1960	24,492
1961	32,132
1962	30,094
1963*	58,107

*Preliminary

The fish are caught with small mesh nets, are generally not culled at sea as are the food-fish catches, and provide, therefore, more direct information on size and species composition of the area stocks. This is the only fishery which utilizes red hake, one of the species of major importance in the subarea's biomass.

The landings are not reported by species, and a special sampling program is required to obtain estimates of species composition. The estimated species composition in 1963 (Table 12) indicates red hake and silver hake are the major components of the catch. These estimates apply to catches from the southern part of the subarea, where the fishery was concentrated. The length-frequency of these two main species is presented in Fig. 8.

Table 12. --Species composition of industrial trawl fish caught in southern part of Subarea 5, 1963

Species	Percent	Metric Tons
Red hake	44.7	19,511
Silver hake	29.6	12,920
Sea robins	6.0	2,619
Skates	6.0	2,619
Flounders	6.3	2,750
Other	7.4	3,230
Total	100.0	43,649

VII. Herring

The total Maine catch of herring for 1963 was 66,552 metric tons, a 4% decrease from the 1962 catch of 69,473 metric tons. In 1963 only 46,457 metric tons were processed as sardines and for reduction purposes as compared with 58,302 metric tons in 1962. This change reflects a condition of market inventories and is not related to changes in abundance or availability. The sardine canneries ceased operation in the early autumn of 1963, while the fish supply was still plentiful. The quantities of herring sold for lobster bait in 1963 increased 40% over 1962 and totaled 16,921 metric tons.

In the sardine fishery, the total units of gear decreased from 278 in 1962 to 224 units in 1963, a decrease of 20% as compared with a catch decrease of only 4%. This indicates that the availability of fish may have been greater in 1963 even though the case-pack was much lower. The decrease in gear units was apparent in the three major types: weirs, stop-seines and purse seines.

The age compositions of the herring taken by the sardine fishery were dominated, as usual, by fish in their second year of life. Three-year-olds contributed a relatively greater proportion than usual during June, July and August --accounting for 10,000 of the 50,000 metric tons taken in that period.

VIII. Other Pelagic Fish

An Atlantic tuna purse seine fishery has started in the U. S. and to obtain records pertinent to the catch a log book system was introduced in the fleet in 1962.

IX. Sea Scallops

United States landings of sea scallop meats from Division 5Z have been declining since 1961 while Canadian landings have continued to rise (Fig. 9). Ten years ago, the Canadian fishery accounted for less than 1% of the landings while in 1963 it accounted for almost half of them. The large increase in total landings since 1958 has been a reflection of the expansion of the Canadian fleet coinciding with a real increase in abundance during the years 1959-61 (Fig. 10).

This increase was caused by the recruitment of a dominant year class to the fishery in 1959. Although the phenomenon of occasional dominant year classes is well-known in other fisheries, this is the first record of it having occurred in the sea scallop fishery. This single year class has supplied a large fraction of the catch for the past few years. It is largely fished out now and there is no evidence to suggest that it has or will be replaced with an equally large one.

We can also estimate relative abundance from quantitative samples collected on research vessel cruises. In May of 1961 our data showed an average catch of 106.6 scallops over 70 mm in length per 10,000 square feet dredged. Returning to the same areas in May of 1962 we found concentrations of 97.6 per 10,000 square feet, an 8% decline. Similar cruises were carried out in September of both years. Comparing these samples we found a 40% decline.

These figures cannot be accepted as strictly valid measures of change in abundance with time since the cruises did not cover all of Georges Bank and the sampling density was something less than satisfactory. They do, however, indicate a trend downward and coupled with the drop in the landings per day fished during 1962-63 as compared with 1960-61 suggest that perhaps the level of abundance on Georges Bank is returning to that which prevailed during 1950-58.

B. Special Research Studies

I. Environmental Studies.

1. Hydrographic. The BCF Biological Laboratory at Boothbay Harbor continued their environmental surveys in the nearshore waters from Cape Ann to Grand Manan. The surveys were designed to study prerecruit herring and involved measures of herring abundance and availability and environmental factors controlling their recruitment to the coastal sardine fishery. Hydrographic observations obtained concurrently with larval herring collections were concerned with detecting seasonal and areal changes in the environment. Temperature, salinity, transparency, density, and nontidal drift (drift bottles and sea-bed drifters) were monitored along the coast and inshore. Analyses of these observations suggest: (1) that the movement of larval herring into some estuaries and embayments along the coast is not dependent upon a nontidal two layer current system, but rather a lateral system or merely inshore and upstream stranding of the larvae by tides, (2) that there are differences in the physical oceanic characteristics along the Gulf of Maine coast and these differences divide the eastern and western sectors of the coast, (3) that monitored inshore stations show appreciable differences in their salinity and density distributions from year to year dependent upon river discharge and runoff.

Bathythermograph traces were collected routinely by BCF research vessels ALBATROSS IV and DELAWARE.

2. Benthic. United States benthic studies of the Gulf of Maine, Georges Bank, and southern New England waters were continued. More than 1000 samples were collected, 505 of which were analyzed during the year. The biomass in the Gulf of Maine is, on the average, about half of that on Georges Bank. South of Nantucket Island, where the biomass is generally comparable to that on Georges Bank, there appear to be five macrobenthic faunal communities.

II. Biological Studies.

1. Cod. Analysis of tag returns showed that growth of cod is not inhibited with either the Petersen disc or Lea hydrostatic capsules with coelomic anchors.

2. Silver Hake. Studies of methods of ageing silver hake were carried out in 1963 with the examination of otoliths collected in previous years. The otoliths had been stored in alcohol and lacked the clarity necessary for consistent detection of differential growth zones. We have, therefore, initiated the collection and analysis of fresh otoliths over a year's time to permit more consistent interpretation and validation of annual growth zones.

3. Redfish. Further studies of Eastport redfish corroborated earlier findings that different types of tags have quite different effects on the growth rate of the fish.

Analysis of the records of incidence of the parasite Sphyrion lumpi (Krøyer) collected continuously since 1942 was completed. Parasite increase during the period 1957-1962 was more than double the incidence during the period 1942-1947. There are indications that Sphyrion infestation is important in the natural mortality of redfish in the Gulf of Maine.

4. Yellowtail Flounder. A study of the relation of abundance to fishing effort over the past 20 years for the three separate New England stocks was completed. It was concluded that the fluctuations in abundance which occurred were unrelated to fishing effort.

5. Herring. Samples of adult herring were collected whenever possible on a monthly basis from Georges Bank and the Gulf of Maine to compare spawning time, age-length data, meristic characters, and blood groups. Analysis of maturity stages indicated that spawning occurred principally from late September to early November. Some evidences of spawning was recorded during late July in the Gulf of Maine and late August on Georges Bank. December spawning in both areas was more evident in 1963 than in past years. There was no evidence of spring spawning on the Bank, while a few full and recently spent herring were taken in May and June in the Gulf of Maine. Spawning herring were principally 22 cm (standard length) at their first spawning, generally during the fourth year of life, though occasional three-year-old herring were found spawning on the Bank. Immature fish were found on occasion from January through October and their numbers increased in the November and December samples.

Age composition of samples from January through October from Georges Bank indicated that 1958 was the dominant year class; followed in rank of percentage occurrence by the 1960, 1959, 1957, 1956 and 1955 year classes. In November and December over seventy percent of the herring sampled were of the 1960 year class. In the Gulf of Maine, the 1958 year class was dominant in samples obtained from January through June; followed in rank of percentage occurrence by the 1960, 1957, 1959, 1956, and 1954 year classes. From July through October, the 1959 year class dominated the samples. In November and December, 1960 was the dominant year class. In November representatives of the 1961 year class were obtained.

Studies of the seasonal and areal changes in the distribution and abundance of herring larvae along the Gulf of Maine coast were continued during the past year. An abundance of yolk-sac herring larvae were obtained for the first time in an inshore area, documenting the existence of coastal spawning. Larval herring were "tracked" throughout the winter by utilizing newly developed high speed trawls and anchored nets. Results of this study have added to our knowledge of herring larval growth, distribution, and abundance in the inshore habitat. Analyses of previously collected data and the results of exploration during the past year demonstrate that herring larvae significantly utilize estuaries and embayments along the coast of the Gulf of Maine.

6. Other Pelagic Fish. The research vessel Delaware conducted exploratory fishing operations in the area during which 29 bluefin tuna were tagged. Four fish have already been recovered by the purse seine fishery.

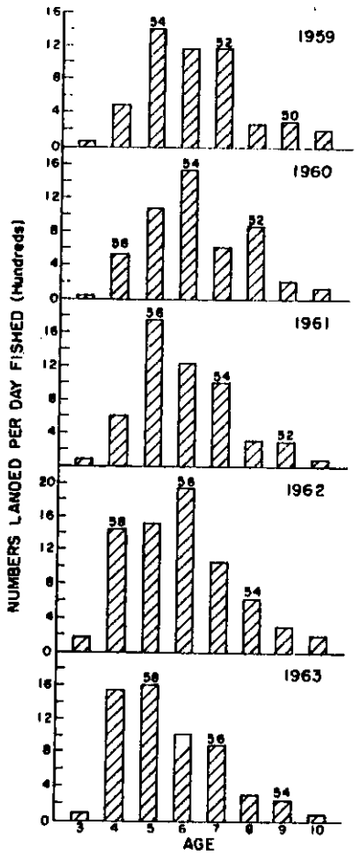

Figure 1. Browns Bank Haddock age composition

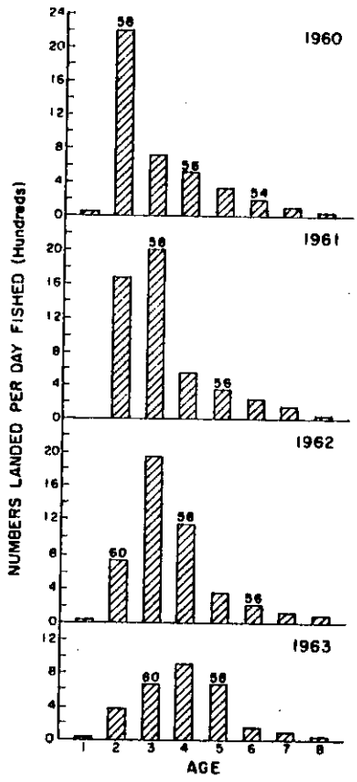

Figure 2. Georges Bank Haddock age compositions.

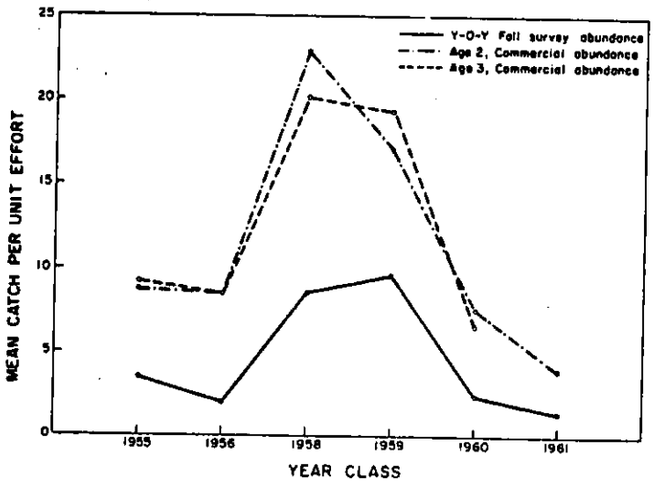

Figure 3 Comparison of Haddock year class abundance indices on Georges Bank. (Y-O-Y based on Fall surveys, ages 2 and 3 based on annual catch per day in numbers in commercial landings)

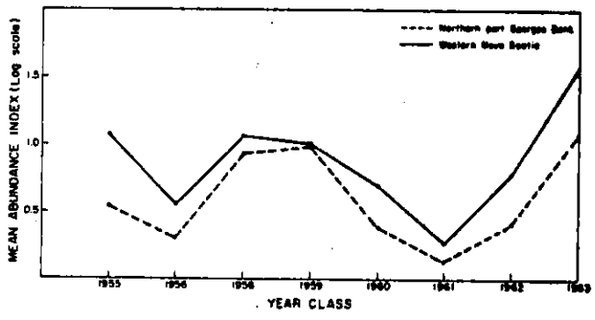

Figure 4 Comparison of Y-O-Y Haddock abundance indices of Western Nova Scotia and Northern part of Georges Bank

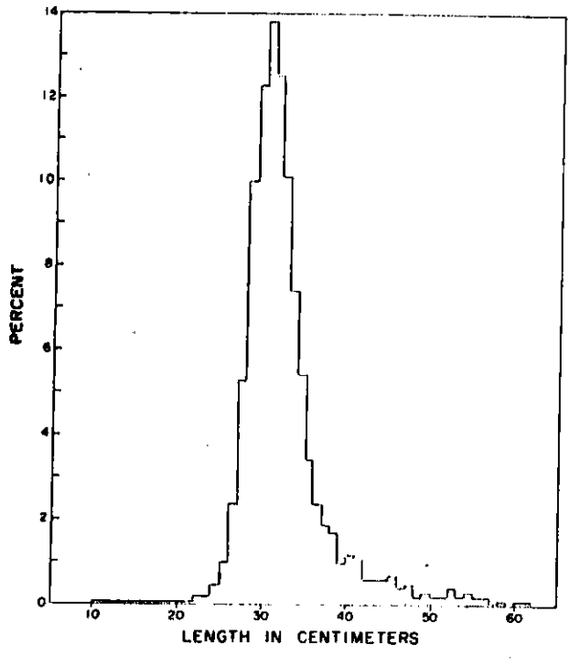

Figure 5. Length-frequency of Silver Hake, U.S. landings for food in 1963.

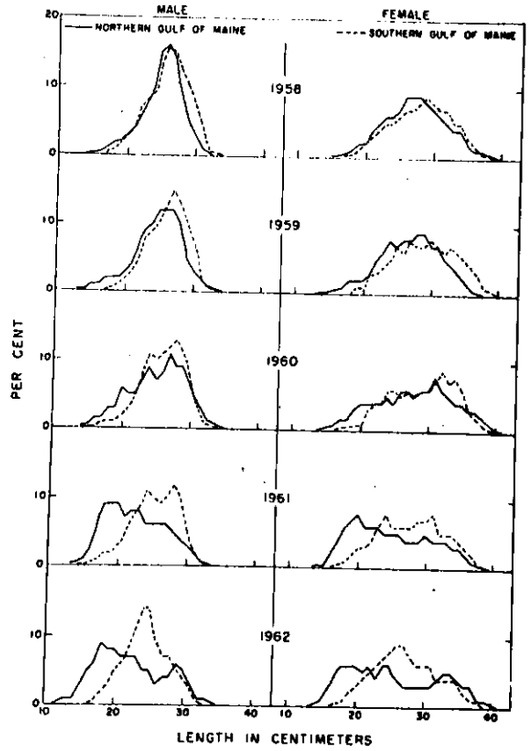

Figure 6 Redfish length-frequencies, Gulf of Maine

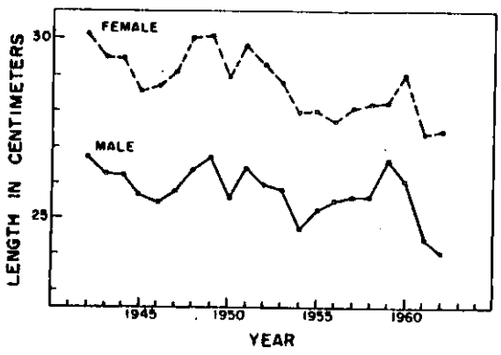

Figure 7. Average length of landed Redfish from the Gulf of Maine, 1942-1962

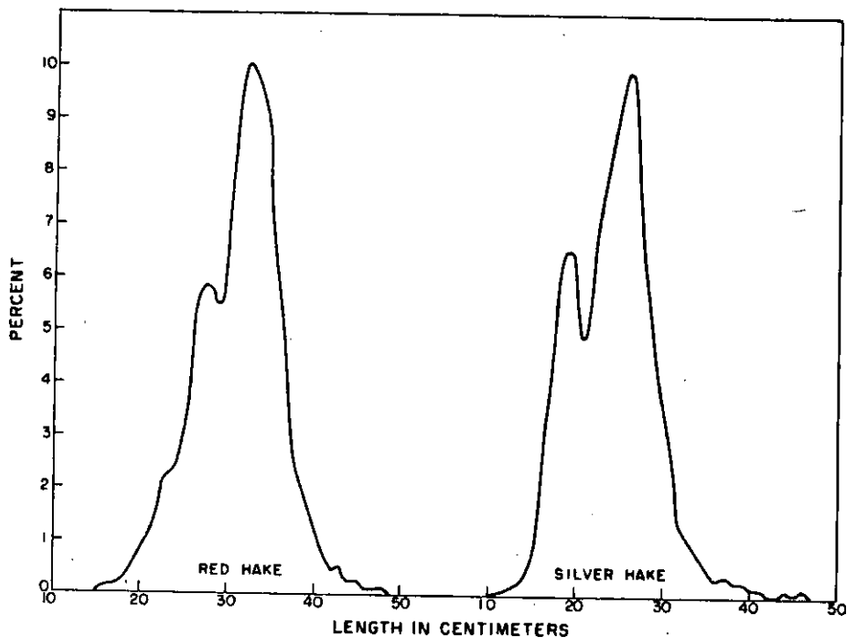

Figure 8. Length frequencies of Silver and Red Hake in industrial catches from southern Subarea 5, 1963.

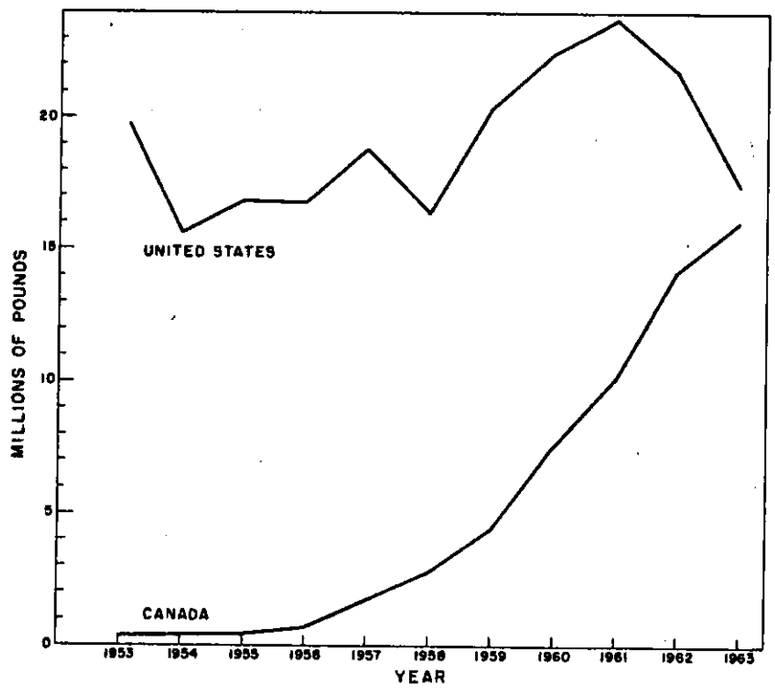

Figure 9. Landings of sea scallop meats by the United States and Canada, 1953-1963.

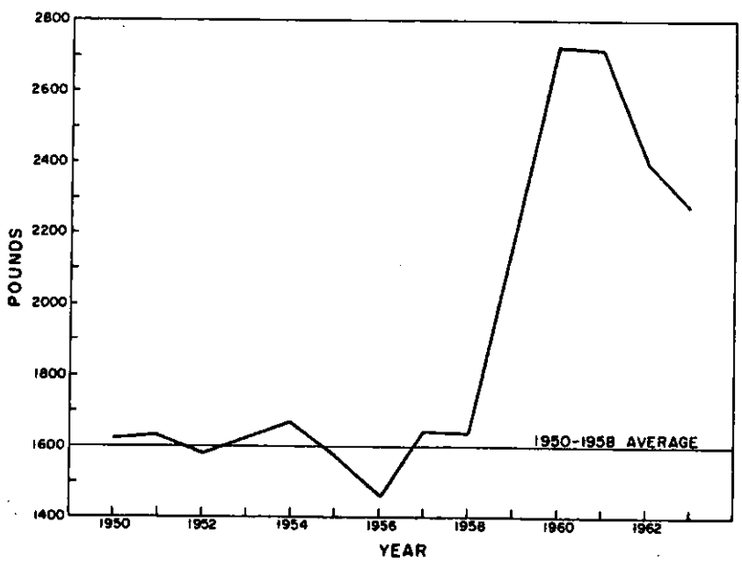

Figure 10. Relative abundance of sea scallops from Georges Bank (catch per day of U.S. fleet).