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FISH AND WILDLIFE SERVICE, Albert M. Day, *Director*

STUDIES OF GEORGES BANK HADDOCK

Part I: Landings by Pounds, Numbers, and Sizes of Fish

BY HOWARD A. SCHUCK

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Part I: Landings by Pounds, Numbers, and Sizes of Fish

By HOWARD A. SCHUCK, *Fishery Research Biologist*

The haddock, *Melanogrammus aeglefinus*, has been New England's most valuable fishery resource, and one of the most important in the United States, for nearly three decades. In the early days, this fish was little sought and the annual New England catch was small—only about 40-odd million pounds until well into the 1900's. With the development of filleting and freezing methods the market for haddock grew, and during the 1920's New England landings increased greatly. They reached a peak of about 250 million pounds in 1929, but after that production declined rapidly.

From Georges Bank, source of most United States haddock, production dropped from about 223 million pounds in 1929 to 115 million pounds in 1931. In addition, an index of abundance indicates that the size of the stock on Georges Bank declined greatly over these years.

The decline of haddock landings and abundance aroused concern in the fishing industry, and in 1930 funds were made available to the United States Bureau of Fisheries (now the Fish and Wildlife Service) to study the haddock and the haddock fishery. The general purposes of the investigation were to determine (1) what caused the decline of the fishery in waters fished by United States fishermen, (2) what could be done to increase abundance and production, or at least to prevent them from decreasing further, and (3) what predictions of future production were possible.

During the years 1931–48, a large quantity of data was collected, partly at sea but mostly at the important haddock ports (Boston, Gloucester, and New Bedford, Mass., and Portland, Maine) where collectors and interviewers have worked systematically since 1931. These data, the basis of this and other papers, were obtained with the cooperation of fishermen at sea and of boat owners, dealers, and fish handlers—especially those on the Boston Fish Pier (fig. 1).

William C. Herrington, in charge of the Haddock Investigation from 1931 to 1947, planned the collection of these data obtained in various years during the period 1931–48 by many employees of the Fish and Wildlife Service. Among these were H. M. Bearse, F. E. Firth, D. F. Hammack, J. J. Miggins, J. M. Shuval, and J. R. Webster. Assisting in tabulating and summarizing data at various times during the years 1945–49 were E. L. Arnold, Jr., F. A. Dreyer, Dorothy B. Monahan, Elizabeth V. Nugent, E. S. Phillips, S. L. Cogswell, and L. D. Stringer.

At sea, data were collected on commercial fishing vessels; on the *Atlantis*, a research vessel leased from the Woods Hole Oceanographic Institution; and on the fishery-research vessels *Albatross II* (1931 and 1932) and *Albatross III* (beginning in 1948). Most of these data were collected to determine how to protect small haddock, destroyed in large numbers by the otter-trawl (fig. 2) fleet. Line trawlers (fig. 3) were used in the early days of the haddock fishery, but now only two are operating out of Boston, Mass., the major haddock port. Results of these studies on the small haddock situation were reported by Herrington (1933, 1935, 1936, 1941).[1] In addition, a small amount of tagging was done to determine migrations and interdependence of populations. Most of this work remains unreported, but one publication refers to phases of it (Rounsefell 1942). And since the commissioning of the *Albatross III* in 1948, further experiments on mesh sizes, studies of survival of young haddock that escape through larger mesh, some tagging, and a census of the population of all ages of haddock have been undertaken.

At the important haddock ports considerable quantities of data were obtained. These data are largely unreported, although contributions of Herrington (1944, 1948) and Schuck (1949) have presented segments of them and certain conclu-

[1] Publications referred to parenthetically by date are listed in the Literature Cited, p. 176.

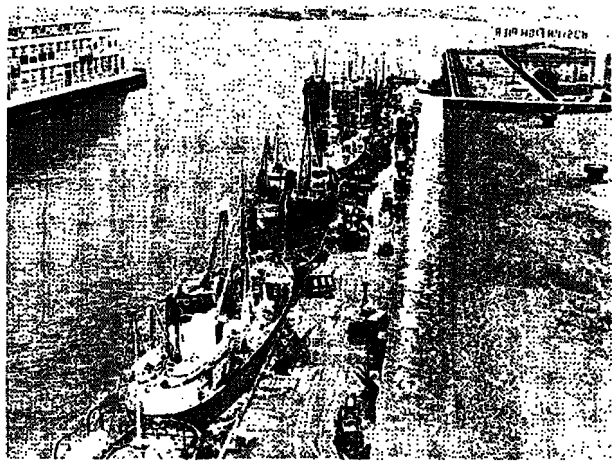


FIGURE 1.—Part of the Boston Fish Pier, where most of the United States production of haddock is landed.

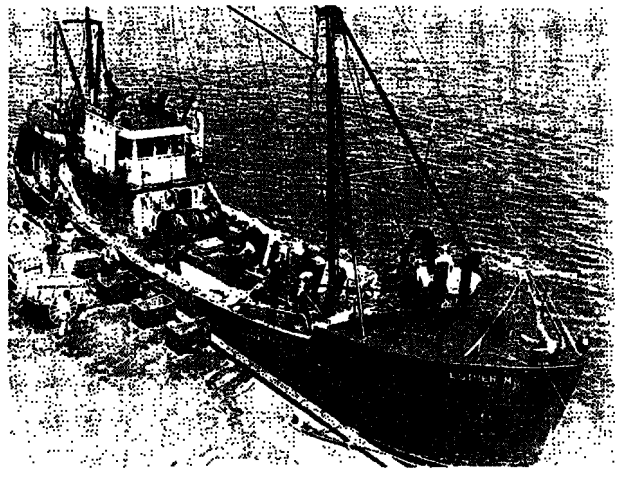


FIGURE 2.—Modern otter trawler: predominant type of vessel in the present-day New England haddock fishery.

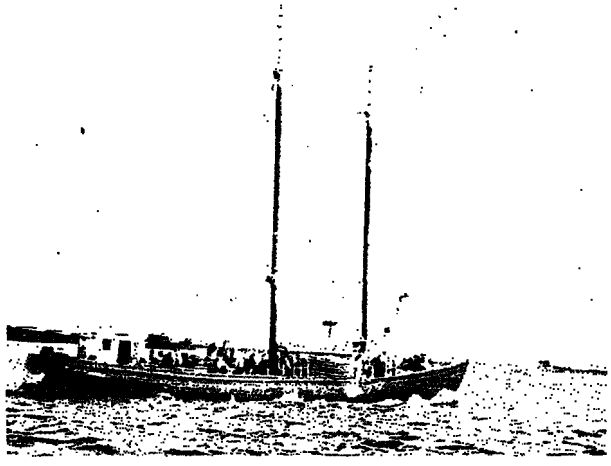


FIGURE 3.—Line trawler: predominant type of vessel in the early years of the New England haddock fishery.

sions regarding the fishery. At the ports, since 1931, the following data have been collected: (1) Almost complete records of the poundages landed from various banks, with records of depths and locations from which the fish were taken, the gear used, and the days actually spent fishing; (2) randomized samples of the lengths of fish in the landings; (3) selected samples of scales; and (4) length-weight data.

FISHING BANKS AND AREAS STUDIED

The United States haddock fishery has depended upon Georges Bank and the Nova Scotian banks. To the north of these banks, haddock are found, but are little fished by United States fishermen. To the south, haddock are not found, except for stragglers.

Georges Bank is the most important area for the United States haddock fishery, with about 67 percent of the total United States landings coming from this area during recent years (1931 to 1948).

The haddock on Georges Bank are apparently a relatively distinct and homogeneous stock. Present knowledge indicates that the Fundian Channel, which separates Georges Bank from the Nova Scotian banks, is a natural barrier to the intermigration of bottom-living stages of haddock. Evidence of this comes from studies of size compositions, growth rates, tagging, and vertebral counts. The size composition of the stock and the sizes of haddock of various ages on Georges Bank are decidedly different from those on Browns Bank across the Fundian Channel (Needler 1930, Schuck and Arnold in press). Although the number of tagged haddock is not large, there is no evidence from the returns that any of them crossed this channel (Needler 1930, Schroeder 1942, United States Fish and Wildlife Service unpublished data). There is a seasonal migration in the spring from Georges Bank north along the coast of Massachusetts and Maine as far as the Bay of Fundy and a return to Georges Bank in the fall, but very few haddock are caught on this northward migration.

Because, first, the Georges Bank area was the most important for the United States haddock fishery and, second, the haddock on Georges Bank formed a relatively distinct population and, third, haddock production from this bank had declined more seriously than production from the Nova Scotian banks, we decided to study first the

Georges Bank haddock—before the Nova Scotian haddock.

The Georges Bank region comprises most of International Area XXII, shown in figure 4. International Area XXII was established by the North American Council on Fishery Investigation when the western North Atlantic Ocean was divided along natural, political, and ecological lines. By Georges Bank we mean specifically the following subareas (fig. 5) of Area XXII:

	International subarea
1. Northern Edge and Northeast Peak	J
2. Southeast Part of Georges	M
3. Southwest Georges	N
4. South Channel and Nantucket Shoals	G, H, O [1]

[1] Data include very small quantities from subareas Q, R, and S.

The manner by which these subareas were established is described by Rounsefell (1948).

ORGANIZATION OF STUDY

Russell (1942) has expressed the dynamics of a fish population by the equation

$$S_1+(G+R)-(C+N)=S_2$$

where

S_1=size of population at the beginning of the year,

G=additions to the population during the year by growth,

R=additions to the population by recruitment of young fish,

C=deductions from the population during the year by fishery,

N=deductions from the population during the year due to natural mortality,

S_2=size of population at the end of the year.

The main problems, as we see them, are (1) to obtain accurate measures of the various quantities expressed in this equation for each year, (2) to determine what effect variations of catch, natural mortality, growth, and recruitment have had on the size of the stock, (3) to determine what effect variations in the size of the stock have had upon each of these factors, and (4) to show what effect other factors in the environment (hydrographic conditions and stocks of other species of competing fishes) have had upon (*a*) the size of the stock and (*b*) the four factors—catch, growth, recruitment, and natural mortality.

With this information at hand, if the relative effects of the fishery and of the environment on the stock are sufficiently clear, it should be possible (1) to predict the abundance and production of haddock, and (2) to determine what measures, if any, would maintain or increase the catch of haddock from the important populations.

Most of the material in this series is devoted to solving these problems. The purpose of the remainder of the present paper is restricted to determining the total landings of Georges Bank haddock for each season and year, 1931 to 1948, in terms of pounds, numbers, average weights, and numbers of each size.

Obtaining "total" values implies adding together not only those portions of the landings of the various ports that originated on Georges Bank, but adding together also data for two artificial market categories, the limits of which vary from season to season, from year to year, and among different areas of the bank.

Where we refer to totals we refer, of course, to our best estimate of such values. All such values are subject to a certain amount of error due to limitations in collecting and assembling statistics and to sampling error.

The values developed in this paper represent landings but not catches because the smallest sizes of haddock are discarded at sea as they lack sufficient marketable value to be brought to port.

DEVELOPMENT OF DATA

Ports of landing

Haddock are caught in North American waters by fishermen from New England, New York, Canada, Newfoundland, and various European countries.

Canadian and Newfoundland landings were excluded from this study, as no records could be found to indicate that any of their haddock were caught in the Georges Bank area. McKenzie (1946) has shown that all Canadian haddock landings for the years 1938 to 1940 came from banks to the north and east of Georges Bank. Herrington (unpublished manuscript) lists all Canadian landings for the years 1918 to 1940 as having originated from banks other than Georges.

European fishermen, mainly interested in cod, frequent the Newfoundland banks and the most easterly of the Nova Scotian banks. Records show that Europeans fished on Georges Bank during early years, but not during the years covered in this summary.

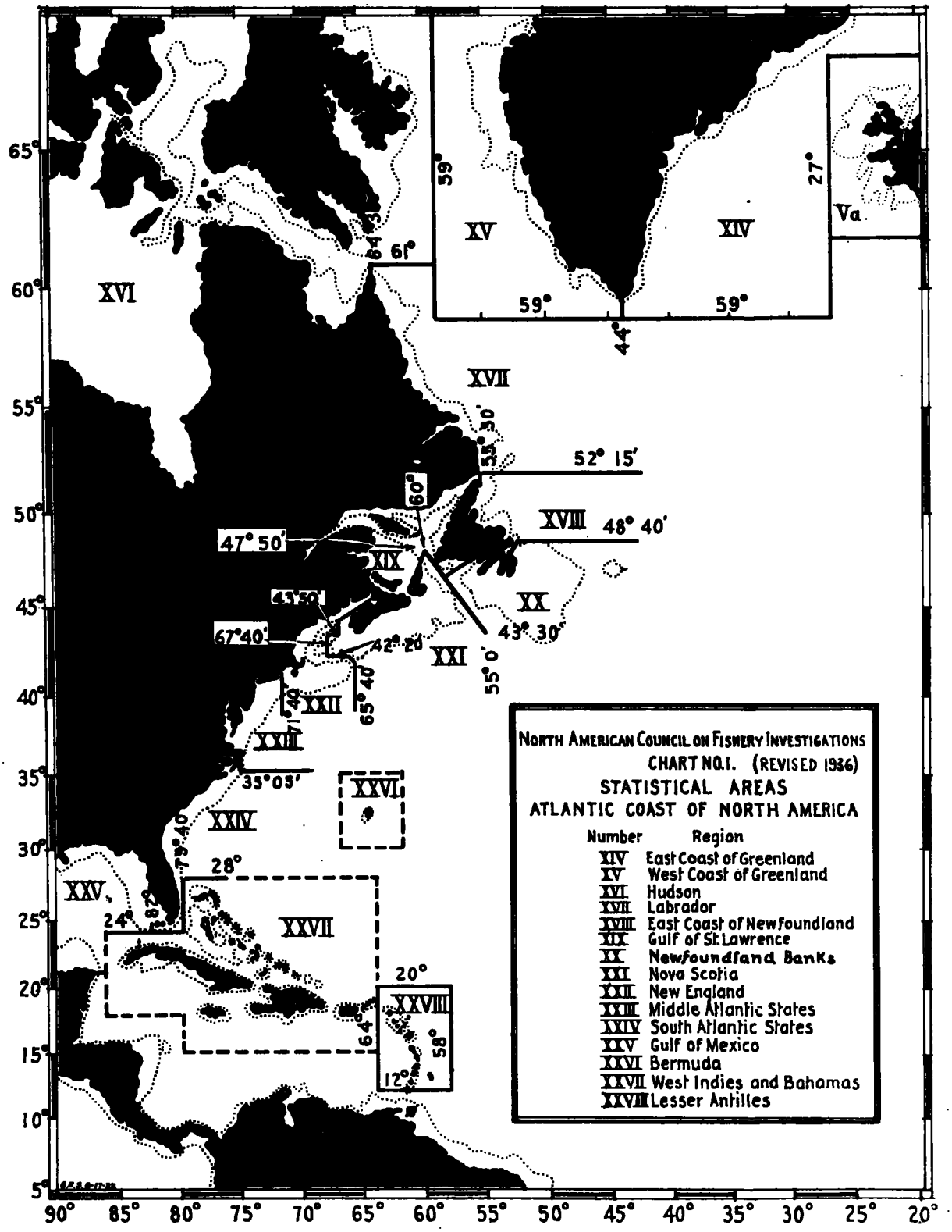


FIGURE 4.—International statistical areas off the Atlantic coast of North America.

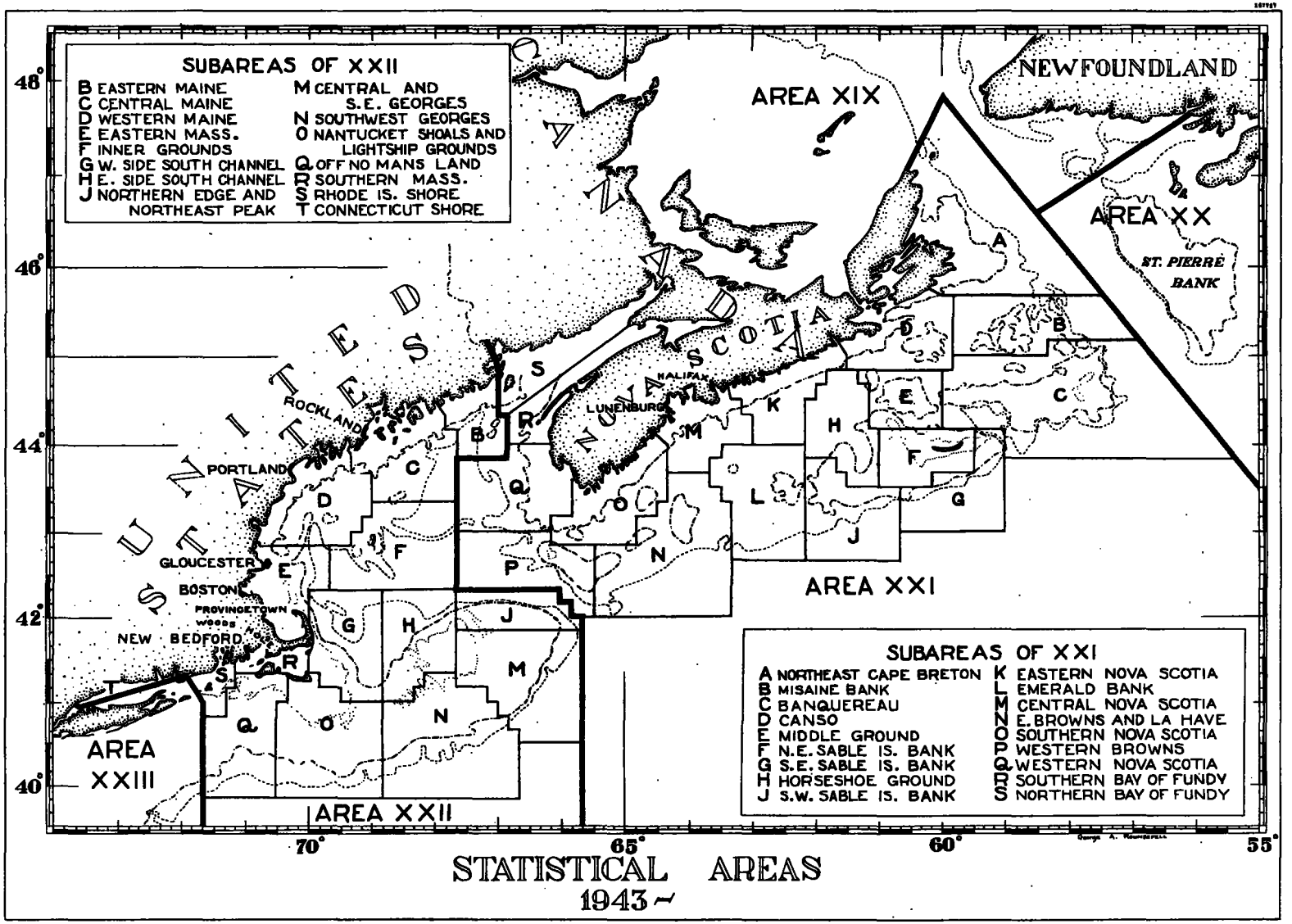


FIGURE 5.—Subareas currently used in International Areas XXI and XXII.

Thus United States fishermen were the only ones to land haddock from Georges Bank. However, we could not use the total of all United States landings of haddock for this study because United States fishermen took varying quantities of haddock from other banks as well as from Georges.

Inasmuch as Georges Bank lies at a considerable distance off shore, it is exploited mainly by large vessels. These vessels land at only a few ports where, for the most part, accurate records have been kept on the origin of haddock landings. Thus for Boston and Gloucester we were able to determine the quantities of haddock landed from Georges Bank each year. We included also in our tabulations the quantities of Georges Bank haddock landed at Portland, Maine, during the years 1931 to 1946. And beginning in 1942, landings of haddock at the port of New Bedford became quite large, so the New Bedford landings of Georges Bank haddock for the years 1942 to 1948 were included. As almost all haddock landed at New York City are taken from the Georges area, the total of that port's landings for all years also were included. We included also the total landings for Groton, Conn. for 1931 and 1932—landings at this port were negligible after 1932. To these quantities, we added the entire amount of haddock landed on Cape Cod, which lies next to Georges Bank. This is the only area where small boats land Georges Bank haddock, and almost all landings there are from Georges.

The sums of these quantities we have accepted as the total poundages [2] of haddock originating in the Georges area that were landed and sold.

Categories of fish

Immediately after capture at sea, haddock are separated into two market categories, scrod and large. This division of the catch makes it necessary to collect complete data on each market category and later to combine the data to obtain total statistics for the species haddock.

As defined by the New England Fish Exchange, scrod haddock (scrod) are those weighing from 1½ to 2½ pounds (gutted weight), and large haddock are those weighing more than 2½ pounds. These definitions are only approximate owing to variations in culling and to a practice of marketing, as scrod, many fish weighing less than 1½ pounds.

We have tabulated records of the landings for both market categories, large and scrod, for all years. Small amounts of "mixed" haddock were added to scrod in New Bedford. When OPA price control regulations were in effect (which allowed a higher price for "large" haddock), New Bedford landings showed an artificial scarcity of scrod and an overabundance of large. For the period July 1943 to June 1946, therefore, we used the percentage that scrod made up of the monthly total of scrod and large for the ports of Boston, Gloucester, and Portland, from any subarea in any month, to estimate the proportion of scrod in the New Bedford landings from these same subareas in that month.

Where we refer to "undersized" haddock we mean those less than 1½ pounds, the lower limit of the market category of scrod, although at present there is no State or Federal regulation that classifies such fish as undersized. When we refer to "total haddock" or merely "haddock", we mean the total of all haddock regardless of market category.

Most haddock are landed as drawn or gutted fish, but some are landed in the "round". Where poundages of fish in the round were obtained, they were reduced by 15 percent. Thus all poundages are in terms of gutted fish.

Landings of large haddock in the round were negligible but landings of round scrod were more numerous and were of two types, (1) regular-sized scrod that were left ungutted because of rough weather or gluts of fish on deck, and (2) unusually small-sized scrod, or baby scrod. Landings of baby scrod became unusually large in the winter of 1940, owing to a scarcity of large haddock and a high abundance of baby haddock (year class 1939).

The landings of baby scrod from the winter of 1940 to the summer of 1943 were considered to be so large that in the initial steps of the analysis they were treated separately from scrod or large haddock. These landings of baby scrod amounted to approximately the following:

[2] Sources of data are the former U. S. Bureau of Fisheries and the present U. S. Fish and Wildlife Service publications, "Current Fishery Statistics" for all years, and unpublished records of various fish companies assembled by William C. Herrington.

	Thousands of pounds
Year 1940:	
Fall	33
Winter	1,097
Year 1941:	
Spring	3,153
Summer	1,683
Fall	913
Winter	339
Year 1942:	
Spring	239
Summer	380
Fall	275
Winter	362
Year 1943:	
Spring	2,212
Summer	429
Fall	25

Seasons

A "haddock year" is the summation of spring, summer, fall, and winter seasons, and differs from a calendar year by one month. These seasons are as follows:

	Months
Spring	February, March, April.
Summer	May, June, July.
Fall	August, September, October.
Winter	November, December, January (of following year).

These seasons agree with the Georges Bank haddock life-cycle better than any other 3-month grouping, for the months of February, March, and April constitute the spawning period. During these months the size and age composition of the catch is considerably different from that of each of the other seasons.

All data were collected initially on a monthly basis, then assembled into seasons, and then into haddock years.

Segregating landings by subareas

Inasmuch as different sizes of haddock are caught on various parts of Georges Bank, we wished in the initial steps of development of the data to segregate the landings by subareas. For the ports of Boston, Gloucester, New Bedford, and Portland, accurate information was obtained on the amounts of haddock landed from each subarea. These ports received the bulk of the total landings (88 percent for all years), thus we allotted the remainder of the landings to subareas on the basis of the subarea contribution at these ports.

The subareas shown in figure 5 were in use from 1939 through 1948. In the years before 1939, there were several different systems of naming and segregating the various sections of Georges Bank. The data from earlier years, therefore, were arranged to conform, as much as possible, to the modern subareas. One exception should be noted, however. During the years 1931 through 1935, published statistics furnished a breakdown by only (1) South Channel and Nantucket Shoals, and (2) the rest of Georges Bank proper—roughly J, M, and N of the modern terminology.

In all tables showing pounds and numbers of fish, values were rounded off to the nearest thousand. Total as well as individual values were rounded off. Thus, individual values do not add up exactly to the totals in some cases.

POUNDS OF HADDOCK LANDED

Table 1 shows the pounds of scrod and large haddock landed from the four subareas of Georges Bank by seasons and years, from 1931 through 1948. Whether particular subareas of Georges Bank contributed more or less haddock in recent years can be studied through this table. Their importance, relative to one another, is shown in table 2 (percent contribution by years, 1936–48 only). The landings are summarized, by seasons, for scrod in table 3, for large in table 4, and for total haddock in table 5. Landings by years only are shown also in tables 3, 4, and 5, and in figure 6.

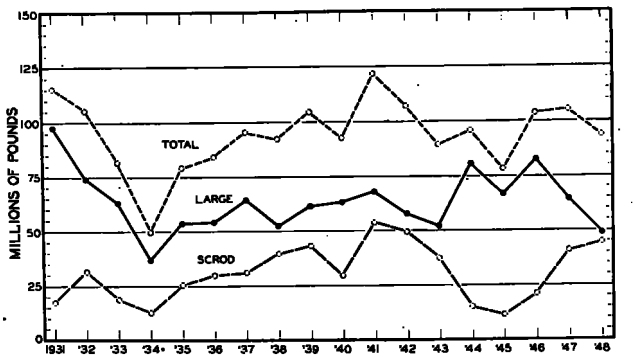


FIGURE 6.—Pounds of scrod, large, and total haddock landed from Georges Bank, 1931 to 1948.

TABLE 1.—*Scrod and large haddock landed, by subareas and by seasons, 1931 to 1948*

[In thousands of pounds]

Season	Scrod				Large			
	Northern Edge	Southeast Part	Southwest Part	South Channel	Northern Edge	Southeast Part	Southwest Part	South Channel
Year 1931:								
Spring		[1]705		189		[1]24,400		5,211
Summer		[1]850		405		[1]18,822		14,788
Fall		[1]3,997		1,269		[1]13,629		10,198
Winter		[1]8,613		1,473		[1]7,637		2,854
Year 1932:								
Spring		[1]4,702		2,253		[1]8,850		9,286
Summer		[1]6,797		1,940		[1]14,006		5,528
Fall		[1]10,808		991		[1]16,126		7,177
Winter		[1]3,226		796		[1]8,420		4,514
Year 1933:								
Spring		[1]3,441		675		[1]14,455		3,912
Summer		[1]3,010		1,510		[1]12,056		8,659
Fall		[1]7,725		906		[1]14,465		5,030
Winter		[1]1,245		286		[1]2,542		1,723
Year 1934:								
Spring		[1]888		717		[1]4,190		3,071
Summer		[1]2,525		963		[1]7,535		6,418
Fall		[1]5,042		996		[1]7,872		4,908
Winter		[1]1,655		190		[1]2,413		501
Year 1935:								
Spring		[1]769		194		[1]4,345		821
Summer		[1]4,802		915		[1]14,861		3,762
Fall		[1]9,509		1,045		[1]13,639		4,402
Winter		[1]8,037		266		[1]11,082		732
Total, 1931–35:								
Spring		[1]10,505		4,028		[1]56,240		22,301
Summer		[1]17,984		5,733		[1]67,280		39,155
Fall		[1]37,081		5,207		[1]65,731		31,715
Winter		[1]22,776		3,011		[1]32,094		10,324
Year 1936:								
Spring	2,478	875	31	488	7,620	3,664	235	2,309
Summer	3,438	4,235	375	1,556	6,440	5,475	293	5,010
Fall	11,368	1,216	0	349	13,382	883	0	2,094
Winter	1,045	1,816	96	584	1,892	2,425	213	2,133
Year 1937:								
Spring	4,489	816	11	198	15,665	2,562	158	1,320
Summer	5,476	1,204	185	1,558	9,326	2,109	506	5,490
Fall	10,207	1,246	44	3,168	10,147	706	18	6,776
Winter	1,114	536	35	797	3,346	1,055	125	5,062
Year 1938:								
Spring	1,680	1,662	151	814	5,853	5,670	566	3,194
Summer	5,260	966	32	1,724	8,162	1,721	156	5,598
Fall	13,086	1,306	20	6,002	6,404	539	13	5,878
Winter	2,313	2,485	173	2,233	2,173	2,077	314	4,162
Year 1939:								
Spring	993	3,611	181	2,739	2,609	7,747	364	5,091
Summer	4,298	2,900	458	4,087	6,831	3,841	978	6,468
Fall	8,592	1,081	0	8,043	8,758	834	0	7,784
Winter	1,843	1,682	295	2,322	2,617	2,294	283	4,911

[1] Pounds shown for 1931 to 1935 are combined for Northern Edge, Southeast Part, and Southwest Edge.

TABLE 1.—*Scrod and large haddock landed, by subareas and by seasons, 1931 to 1948*—Continued

[In thousands of pounds]

Season	Scrod				Large			
	Northern Edge	Southeast Part	Southwest Part	South Channel	Northern Edge	Southeast Part	Southwest Part	South Channel
Year 1940:								
Spring	2,156	1,429	7	3,022	4,634	4,713	63	6,353
Summer	3,165	2,508	639	3,081	6,417	6,062	1,998	7,727
Fall	4,535	1,407	28	3,537	8,146	1,797	33	6,514
Winter	176	1,271	1,532	1,107	498	2,508	2,010	3,572
Year 1941:								
Spring	1,916	4,042	883	4,773	2,597	12,139	866	4,072
Summer	2,200	4,698	1,697	4,983	4,380	7,619	2,738	9,071
Fall	8,553	6,151	421	5,941	7,055	2,602	287	6,017
Winter	210	3,318	1,636	2,342	264	2,343	1,397	4,515
Year 1942:								
Spring	3,445	4,892	138	3,009	3,745	9,531	456	3,138
Summer	8,462	3,780	630	4,154	8,221	4,202	914	6,963
Fall	4,595	3,783	275	5,104	4,947	1,304	181	6,484
Winter	404	2,150	3,390	1,269	519	1,452	2,416	3,138
Year 1943:								
Spring	1,894	8,562	372	790	3,295	8,791	469	1,647
Summer	3,991	4,937	960	4,019	3,769	4,160	1,618	8,232
Fall	3,170	4,083	231	2,548	4,909	2,769	415	7,292
Winter	94	372	1,078	406	160	655	2,082	1,814
Year 1944:								
Spring	732	2,678	278	290	3,262	8,807	1,762	2,479
Summer	2,255	1,289	669	1,272	8,215	3,018	5,616	11,093
Fall	2,285	1,963	39	535	9,811	5,373	172	9,292
Winter	85	423	340	115	509	1,717	5,271	4,347
Year 1945:								
Spring	122	743	52	123	3,778	7,029	776	3,060
Summer	322	1,185	623	853	3,210	2,296	4,511	10,302
Fall	1,801	1,660	990	990	6,934	2,369	1,387	8,570
Winter	7	250	1,469	484	148	866	5,024	6,337
Year 1946:								
Spring	15	681	26	287	2,871	6,707	1,749	1,722
Summer	2,497	1,876	548	2,294	9,238	4,118	2,922	11,547
Fall	2,506	1,546	110	4,985	9,897	3,690	372	14,644
Winter	412	1,560	217	1,560	851	5,302	1,329	5,807
Year 1947:								
Spring	1,105	3,906	288	338	4,884	11,914	1,280	1,615
Summer	2,793	1,242	959	3,343	4,644	2,111	3,147	9,288
Fall	9,935	1,357	63	9,518	7,279	1,148	71	9,170
Winter	1,048	1,866	242	2,902	656	836	461	5,856
Year 1948:								
Spring	2,594	1,692	210	1,680	5,764	3,113	218	3,715
Summer	5,523	1,064	1,432	4,650	3,519	678	1,868	6,733
Fall	9,925	1,998	32	4,027	5,786	1,245	14	7,102
Winter	4,232	3,824	350	1,323	2,874	1,649	488	4,201
Total, 1936–48:								
Spring	23,619	35,589	2,628	18,551	66,577	92,387	8,962	39,715
Summer	49,680	31,884	9,207	36,574	82,372	47,410	27,265	103,522
Fall	90,558	28,797	2,253	54,747	103,455	25,259	2,963	97,617
Winter	12,983	21,553	10,853	17,344	16,507	25,179	21,413	55,855

TABLE 2.—*Percentages of scrod, large, and total Georges Bank haddock landings by subareas and years, 1936 to 1948*

Year	Scrod					Large					Total				
	Northern Edge	Southeast Part	Southwest Part	South Channel	Total	Northern Edge	Southeast Part	Southwest Part	South Channel	Total	Northern Edge	Southeast Part	Southwest Part	South Channel	Total
1936	61.2	27.2	1.7	9.9	100	54.2	23.0	1.4	21.4	100	56.7	24.5	1.5	17.3	100
1937	68.5	12.2	.9	18.4	100	59.8	10.0	1.2	29.0	100	62.8	10.7	1.1	25.5	100
1938	56.0	16.1	.9	27.0	100	43.0	19.1	2.0	35.9	100	48.7	17.8	1.5	32.0	100
1939	36.5	21.5	2.2	39.8	100	33.9	24.0	2.6	39.5	100	35.0	22.9	2.4	39.7	100
1940	33.9	22.3	7.4	36.4	100	31.2	23.9	6.5	38.4	100	32.1	23.4	6.8	37.7	100
1941	24.0	33.8	8.6	33.6	100	21.0	36.4	7.8	34.8	100	22.3	35.2	8.2	34.3	100
1942	34.1	29.5	9.0	27.4	100	30.2	28.6	6.9	34.3	100	32.1	29.0	7.8	31.1	100
1943	24.4	47.9	7.0	20.7	100	23.3	31.4	8.8	36.5	100	23.8	38.3	8.1	29.8	100
1944	35.1	41.7	8.7	14.5	100	27.0	23.4	15.9	33.7	100	28.3	26.3	14.7	30.7	100
1945	19.3	32.9	26.8	21.0	100	21.1	18.8	17.6	42.5	100	20.8	21.0	18.9	39.3	100
1946	25.7	26.8	4.3	43.2	100	27.6	23.9	7.7	40.8	100	27.2	24.5	7.0	41.3	100
1947	36.4	20.5	3.8	39.3	100	27.1	24.9	7.7	40.3	100	30.7	23.2	6.2	39.9	100
1948	50.0	19.2	4.5	26.2	100	36.6	13.6	5.3	44.6	100	43.0	16.3	4.9	35.8	100
Weighted average	39.5	26.3	5.6	28.6	100	32.9	23.3	7.4	36.4	100	35.2	24.4	6.8	33.6	100
Unweighted average	38.8	27.0	6.6	27.5	100	33.5	23.2	7.0	36.3	100	35.6	24.1	6.8	33.5	100

TABLE 3.—*Scrod haddock landed, by seasons and years*

[In thousands of pounds]

Year	Spring	Summer	Fall	Winter	Total
1931	894	1,255	5,266	10,086	17,501
1932	6,955	8,737	11,799	4,022	31,513
1933	4,116	4,520	8,631	1,531	18,798
1934	1,605	3,488	6,038	1,845	12,976
1935	963	5,717	10,554	8,303	25,537
1936	3,872	9,604	12,933	3,541	29,950
1937	5,514	8,423	14,665	2,482	31,084
1938	4,307	7,982	20,414	7,204	39,907
1939	7,524	11,743	17,716	6,142	43,125
1940	6,614	9,393	9,507	4,086	29,600
1941	11,614	13,578	21,066	7,506	53,764
1942	11,484	17,026	13,757	7,213	49,480
1943	11,618	13,907	10,032	1,950	37,507
1944	3,978	5,485	4,822	963	15,248
1945	1,040	2,983	5,441	2,210	11,674
1946	1,009	7,215	9,147	3,749	21,120
1947	5,637	8,337	20,873	6,058	40,905
1948	6,176	12,669	15,982	9,729	44,556
Total	94,920	152,062	218,643	88,620	554,245
Average	5,273	8,448	12,147	4,923	30,791

TABLE 4.—*Large haddock landed, by seasons and years*

[In thousands of pounds]

Year	Spring	Summer	Fall	Winter	Total
1931	29,611	33,610	23,827	10,491	97,539
1932	18,136	19,534	23,303	12,934	73,907
1933	18,367	20,715	19,495	4,265	62,842
1934	7,261	13,953	12,780	2,914	36,908
1935	5,166	18,623	18,041	11,814	53,644
1936	13,828	17,218	16,359	6,663	54,068
1937	19,705	17,431	17,647	9,588	64,371
1938	15,283	15,637	12,834	8,726	52,480
1939	15,811	18,118	17,376	10,105	61,410
1940	15,763	22,204	16,490	8,588	63,045
1941	19,674	23,808	15,961	8,519	67,962
1942	16,870	20,300	12,916	7,525	57,611
1943	14,202	17,779	15,385	4,711	52,077
1944	16,310	27,942	24,648	11,844	80,744
1945	14,643	20,319	19,260	12,375	66,597
1946	13,049	27,825	28,603	13,289	82,766
1947	19,693	19,190	17,668	7,809	64,360
1948	12,810	12,798	14,147	9,212	48,967
Total	286,182	367,004	326,740	161,372	1,141,298
Average	15,899	20,389	18,152	8,965	63,405

TABLE 5.—*Total haddock landed, by seasons and years*

[In thousands of pounds]

Year	Spring	Summer	Fall	Winter	Total
1931	30,505	34,865	29,093	20,577	115,040
1932	25,091	28,271	35,102	16,956	105,420
1933	22,483	25,235	28,126	5,796	81,640
1934	8,866	17,441	18,818	4,759	49,884
1935	6,129	24,340	28,595	20,117	79,181
1936	17,700	26,822	29,292	10,204	84,018
1937	25,219	25,854	32,312	12,070	95,455
1938	19,590	23,619	33,248	15,930	92,387
1939	23,335	29,861	35,092	16,247	104,535
1940	22,377	31,597	25,997	12,674	92,645
1941	31,288	37,386	37,027	16,025	121,726
1942	28,354	37,326	26,673	14,738	107,091
1943	25,820	31,686	25,417	6,661	89,584
1944	20,288	33,427	29,470	12,807	95,992
1945	15,683	23,302	24,701	14,585	78,271
1946	14,058	35,040	37,750	17,038	103,886
1947	25,330	27,527	38,541	13,867	105,265
1948	18,986	25,467	30,129	18,941	93,523
Total	381,102	519,066	545,383	249,992	1,695,543
Average	21,172	28,837	30,299	13,888	94,196

AVERAGE WEIGHTS OF HADDOCK LANDED

Average weights of fish landed, in each season, year, subarea, and market category, were computed by combining length samples of haddock landed with seasonal length-weight relations. This procedure is described in the following paragraphs.

At the Boston Fish Pier, lengths of representative samples of the haddock landed were obtained from 1931 through 1948. In general, 50 scrod and 100 large haddock were measured from a "trip" when a vessel had fished in only one subarea of Georges Bank, and as many vessels were sampled as time permitted.

Each fish was measured from the tip of the snout to the fork of the tail. Lengths were recorded by centimeter groups, that is, fish measuring from 40.0 centimeters to and including 40.9 centimeters were recorded as 40 centimeters, fish from 41.0 centimeters to and including 41.9 centimeters as 41 centimeters, and so on. No distinction as to sex was possible as most haddock, when landed, are already dressed.

The numbers of Georges Bank haddock that were measured, by years, seasons, and market categories are shown in table 6. In all, measurements of 627,996 haddock from Georges Bank were utilized in this analysis.

Table 7 illustrates the general method used to compute the average weight of haddock landed. The steps of this method are as follows: (1) The number of fish of each centimeter size group in the total sample for the season was entered in column II; (2) the length-weight relation was available by seasons (table 8 and figure 7) and the average weights for each centimeter size group were listed in column III, the total weight of all fish measured of each centimeter size group was computed in column IV, and the total weight of *all sizes* in the season's sample was entered at the bottom of column IV; and finally (3) the total weight of the sample was divided by the number of fish in the sample to give the average weight of the fish in the sample. We used this same general method for each season, year, subarea, and market category.

Summaries of average weights are given in table 9 and figure 8; to save space, values for the various subareas are not shown.

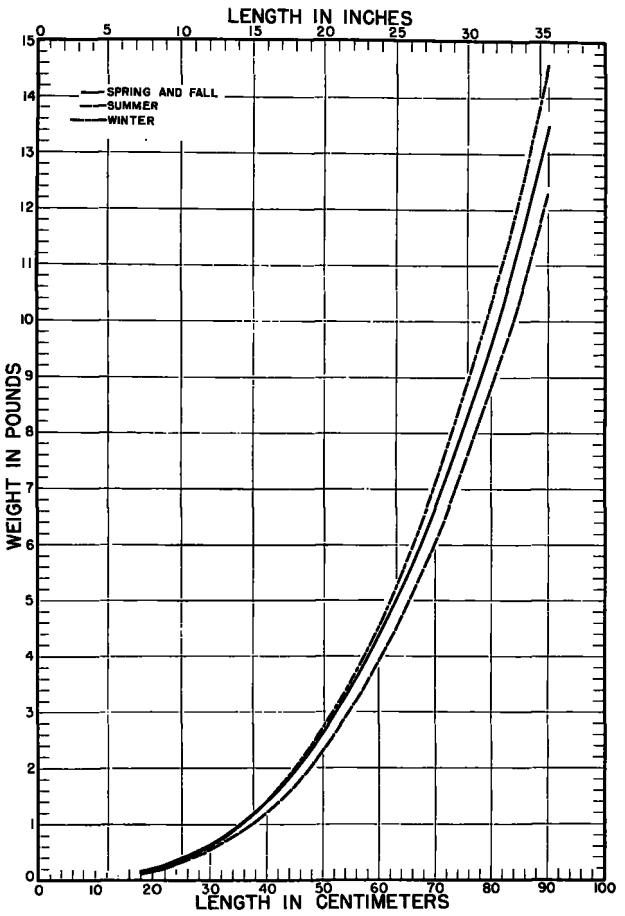


FIGURE 7.—Relation between length and weight for Georges Bank haddock, by seasons.

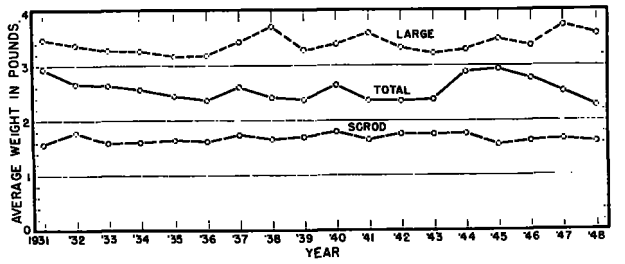


FIGURE 8.—Average weights of scrod, large, and total haddock landed from Georges Bank, by years.

TABLE 6.—*Numbers of haddock measured for length, by seasons and years*

Season	Scrod	Large	Total
Year 1931:			
Spring	513	5,042	5,555
Summer	1,194	4,054	5,248
Fall	3,285	4,577	7,862
Winter	4,102	2,562	6,664
Total	9,094	16,235	25,329
Year 1932:			
Spring	2,913	3,484	6,397
Summer	2,445	6,245	8,690
Fall	4,849	8,558	13,407
Winter	3,741	3,662	7,403
Total	13,948	21,949	35,897
Year 1933:			
Spring	3,082	3,834	6,914
Summer	1,702	3,775	5,477
Fall	2,455	5,349	7,804
Winter	911	2,157	3,068
Total	18,150	15,115	23,265
Year 1934:			
Spring	675	3,326	4,001
Summer	2,014	3,341	5,355
Fall	2,588	3,924	6,512
Winter	2,691	1,831	4,522
Total	7,968	12,422	20,390
Year 1935:			
Spring	1,440	3,398	4,838
Summer	4,582	7,357	11,939
Fall	7,199	6,462	13,661
Winter	3,318	2,981	6,299
Total	16,539	20,198	36,737
Year 1936:			
Spring	3,643	6,914	10,557
Summer	9,533	11,089	20,622
Fall	9,740	9,997	19,737
Winter	3,849	5,595	9,444
Total	26,765	33,595	60,360
Year 1937:			
Spring	3,383	8,781	12,164
Summer	5,394	8,777	14,171
Fall	5,129	5,296	10,425
Winter	4,055	5,387	9,442
Total	17,961	28,241	46,202
Year 1938:			
Spring	4,419	7,574	11,993
Summer	4,592	6,520	11,112
Fall	5,250	4,668	9,918
Winter	3,860	3,716	7,576
Total	18,121	22,478	40,599
Year 1939:			
Spring	2,540	4,002	6,542
Summer	5,244	6,835	12,079
Fall	4,448	7,712	12,160
Winter	3,043	4,141	7,184
Total	15,275	22,690	37,965

TABLE 6.—*Numbers of haddock measured for length, by seasons and years*—Continued

Season	Scrod	Large	Total
Year 1940:			
Spring	4,219	9,324	13,543
Summer	4,085	8,588	12,674
Fall	3,356	4,784	8,140
Winter	4,501	4,379	8,880
Total	16,162	27,075	43,237
Year 1941:			
Spring	6,080	8,145	14,225
Summer	5,287	6,069	11,356
Fall	8,167	6,179	14,346
Winter	4,853	3,334	8,187
Total	24,387	23,727	48,114
Year 1942:			
Spring	4,516	6,380	10,896
Summer	7,163	8,453	15,616
Fall	6,247	6,186	12,433
Winter	3,933	4,345	8,278
Total	21,859	25,364	47,223
Year 1943:			
Spring	6,082	6,644	12,726
Summer	4,796	4,834	9,630
Fall	3,237	6,420	9,657
Winter	644	2,304	2,948
Total	14,759	20,202	34,961
Year 1944:			
Spring	1,471	3,295	4,766
Summer	1,532	5,183	6,715
Fall	1,984	5,262	7,246
Winter	200	1,890	2,090
Total	5,187	15,630	20,817
Year 1945:			
Spring	250	1,644	1,894
Summer	649	1,797	2,446
Fall	950	3,150	4,100
Winter	699	3,266	3,965
Total	2,548	9,857	12,405
Year 1946:			
Spring	750	2,800	3,550
Summer	2,600	6,147	8,747
Fall	3,250	6,660	9,910
Winter	2,234	3,387	5,621
Total	8,834	18,994	27,828
Year 1947:			
Spring	2,230	3,651	5,881
Summer	2,037	2,870	4,907
Fall	3,776	7,861	11,637
Winter	3,205	4,468	7,673
Total	11,248	18,850	30,098
Year 1948:			
Spring	3,507	4,181	7,688
Summer	3,480	2,217	5,697
Fall	7,101	7,417	14,518
Winter	4,763	3,903	8,666
Total	18,851	17,718	36,569
All years:			
Spring	51,713	92,419	144,132
Summer	68,330	104,151	172,481
Fall	83,011	110,462	193,473
Winter	54,602	63,308	117,910
Total	257,656	370,340	627,996

TABLE 7.—*Method used to compute average weight of haddock*

Example used: 1948, Spring, Southeast Part, Scrod

Length group [1] (I)	Number in sample (II)	Average weight (III)	Total weight of sample (IV)
		Pounds	*Pounds*
29 cm	1	0.58	0.58
30 cm	5	.64	3.20
31 cm	11	.70	7.70
32 cm	17	.76	12.92
33 cm	29	.83	24.07
34 cm	36	.90	32.40
35 cm	40	.98	39.20
36 cm	44	1.06	46.64
37 cm	45	1.14	51.30
38 cm	41	1.23	50.43
39 cm	31	1.32	40.92
40 cm	53	1.4	74.2
41 cm	54	1.5	81.0
42 cm	82	1.6	131.2
43 cm	133	1.7	226.1
44 cm	142	1.8	255.6
45 cm	188	2.0	376.0
46 cm	188	2.1	394.8
47 cm	183	2.2	402.6
48 cm	160	2.4	384.0
49 cm	160	2.5	400.0
50 cm	93	2.6	241.8
51 cm	62	2.8	173.6
52 cm	38	2.9	110.2
53 cm	17	3.1	52.7
54 cm	11	3.2	35.2
55 cm	6	3.4	20.4
56 cm	2	3.6	7.2
57 cm		3.8	
58 cm		4.0	
59 cm	1	4.2	4.2
Total	1,873	[2] 1.965	3,680.16

[1] By 1-cm. intervals.

[2] $\frac{3,680.16 \text{ pounds}}{1,873 \text{ fish}} = 1.965$ pounds.

TABLE 8.—*Length-weight relation by seasons, in terms of centimeter size groups and drawn weight in pounds*

Length [1]	Drawn weight in pounds			
	Spring	Summer	Fall	Winter
18 cm	0.15	0.12	0.15	0.14
19 cm	.17	.14	.17	.16
20 cm	.20	.17	.20	.19
21 cm	.23	.20	.23	.21
22 cm	.27	.23	.26	.25
23 cm	.30	.26	.30	.28
24 cm	.34	.29	.33	.32
25 cm	.38	.33	.38	.36
26 cm	.43	.36	.42	.40
27 cm	.47	.41	.47	.45
28 cm	.52	.45	.52	.50
29 cm	.58	.50	.57	.55
30 cm	.64	.55	.63	.61
31 cm	.70	.60	.69	.67
32 cm	.76	.66	.75	.73
33 cm	.83	.72	.82	.80
34 cm	.90	.79	.89	.88
35 cm	.98	.85	.96	.95
36 cm	1.06	.92	1.05	1.04
37 cm	1.14	1.00	1.13	1.12
38 cm	1.23	1.08	1.22	1.21
39 cm	1.32	1.16	1.31	1.31
40 cm	1.4	1.2	1.4	1.4
41 cm	1.5	1.3	1.5	1.5

See footnote at end of table.

TABLE 8.—*Length-weight relation by seasons, in terms of centimeter size groups and drawn weight in pounds*—Con.

Length [1]	Drawn weight in pounds			
	Spring	Summer	Fall	Winter
42 cm	1.6	1.4	1.6	1.6
43 cm	1.7	1.5	1.7	1.7
44 cm	1.8	1.6	1.8	1.8
45 cm	2.0	1.7	2.0	2.0
46 cm	2.1	1.8	2.1	2.1
47 cm	2.2	2.0	2.2	2.2
48 cm	2.4	2.1	2.3	2.4
49 cm	2.5	2.2	2.5	2.5
50 cm	2.6	2.3	2.6	2.7
51 cm	2.8	2.5	2.8	2.8
52 cm	2.9	2.6	2.9	3.0
53 cm	3.1	2.8	3.1	3.2
54 cm	3.2	2.9	3.2	3.4
55 cm	3.4	3.1	3.4	3.5
56 cm	3.6	3.2	3.6	3.7
57 cm	3.8	3.4	3.8	3.9
58 cm	4.0	3.6	4.0	4.1
59 cm	4.2	3.8	4.1	4.3
60 cm	4.4	3.9	4.3	4.5
61 cm	4.6	4.1	4.5	4.8
62 cm	4.8	4.3	4.8	5.0
63 cm	5.0	4.5	5.0	5.2
64 cm	5.2	4.7	5.2	5.5
65 cm	5.4	4.9	5.4	5.7
66 cm	5.7	5.1	5.6	6.0
67 cm	5.9	5.4	5.9	6.2
68 cm	6.2	5.6	6.1	6.5
69 cm	6.4	5.8	6.4	6.8
70 cm	6.7	6.1	6.7	7.1
71 cm	7.0	6.3	6.9	7.4
72 cm	7.2	6.6	7.2	7.7
73 cm	7.5	6.8	7.5	8.0
74 cm	7.8	7.1	7.8	8.3
75 cm	8.1	7.4	8.1	8.7
76 cm	8.4	7.7	8.4	9.0
77 cm	8.7	7.9	8.7	9.4
78 cm	9.0	8.2	9.0	9.7
79 cm	9.3	8.6	9.3	10.1
80 cm	9.7	8.9	9.6	10.4
81 cm	10.0	9.2	10.0	10.8
82 cm	10.3	9.5	10.3	11.1
83 cm	10.6	9.8	10.6	11.5
84 cm	10.9	10.1	10.9	11.8
85 cm	11.4	10.3	11.4	12.3
86 cm	11.7	10.7	11.7	12.7
87 cm	12.2	11.2	12.2	13.1
88 cm	12.6	11.5	12.6	13.6
89 cm	12.9	11.8	12.9	14.1
90 cm	13.5	12.3	13.5	14.6

[1] Size groups by 1-cm. intervals.

See footnote at end of table.

TABLE 9.—*Average weights in pounds of scrod, large, and total haddock, by seasons and years*

Year	Scrod					Large					Total				
	Spring	Summer	Fall	Winter	Total	Spring	Summer	Fall	Winter	Total	Spring	Summer	Fall	Winter	Total
1931	1.817	1.540	1.653	1.541	1.585	3.648	3.112	3.866	3.490	3.473	3.543	3.079	3.112	2.154	2.940
1932	1.654	1.679	1.942	1.921	1.793	3.732	3.350	3.184	3.322	3.374	2.769	2.562	2.621	2.832	2.670
1933	1.938	1.248	1.714	1.636	1.604	3.607	3.062	3.171	3.639	3.277	3.116	2.429	2.515	2.750	2.643
1934	1.890	1.648	1.614	1.402	1.617	3.580	3.126	3.271	3.195	3.263	3.082	2.650	2.460	2.136	2.580
1935	1.874	1.594	1.705	1.624	1.658	3.706	3.014	3.044	3.476	3.174	3.212	2.492	2.360	2.363	2.451
1936	1.905	1.456	1.710	1.586	1.626	3.602	3.009	3.025	3.343	3.187	3.014	2.177	2.267	2.415	2.374
1937	1.950	1.528	1.820	1.793	1.748	3.580	3.160	3.289	4.051	3.432	3.027	2.344	2.407	3.218	2.613
1938	1.972	1.510	1.709	1.656	1.679	4.902	3.199	3.348	3.519	3.716	3.692	2.322	2.107	2.401	2.438
1939	1.890	1.633	1.718	1.674	1.715	3.955	3.083	2.933	3.492	3.285	2.925	2.285	2.161	2.475	2.384
1940	1.989	1.748	1.867	1.558	1.803	3.434	3.218	3.357	3.998	3.399	2.827	2.575	2.598	2.656	2.650
1941	1.688	1.541	1.681	1.823	1.662	3.991	3.330	3.377	4.030	3.592	2.650	2.342	2.145	2.572	2.375
1942	2.012	1.690	1.701	1.742	1.766	3.644	3.195	3.121	3.536	3.340	2.743	2.272	2.182	2.351	2.366
1943	1.924	1.586	1.837	1.809	1.757	3.495	3.138	3.306	2.774	3.239	2.555	2.195	2.513	2.400	2.393
1944	1.926	1.617	1.800	2.049	1.772	3.464	3.031	3.231	3.965	3.290	2.995	2.651	2.859	3.705	2.896
1945	1.940	1.296	1.644	1.736	1.573	3.678	3.157	3.548	3.766	3.481	3.472	2.667	2.827	3.199	2.948
1946	1.065	1.449	1.770	1.778	1.642	3.630	3.077	3.406	3.924	3.377	3.346	2.499	2.782	3.052	2.780
1947	1.876	1.481	1.580	2.291	1.670	3.725	3.635	3.622	4.194	3.719	3.055	2.524	2.130	3.077	2.519
1948	1.842	1.493	1.661	1.592	1.623	3.959	3.251	3.472	3.743	3.572	2.852	2.050	2.218	2.209	2.272
Weighted average	1.871	1.556	1.719	1.697	1.691	3.718	3.163	3.306	3.661	3.398	2.984	2.430	2.413	2.596	2.554

NUMBERS OF HADDOCK LANDED

Dividing poundage by average weight gave the number of fish landed—for each season, subarea, market category, and year. Excepting subarea values, all of these numbers are shown in the following tables.

Tables 10, 11, and 12 show the numbers of scrod, large, and total haddock landed, by seasons and years. Relative contributions of scrod and large haddock to the total, by seasons, are shown in figure 9. Figure 10 shows the yearly trends, and here it can be seen that much of the variation in total landings by years is due to variations in scrod landings. The importance of these small-sized haddock to the present fishery is thus evident.

SIZE COMPOSITIONS OF HADDOCK LANDED

Now having available the number of haddock that were landed (in each season, year, subarea, and market category), and having also the lengths of samples of haddock (in each similar subdivision), we estimated how many haddock of each size were landed. This was accomplished by multiplying the number of fish measured in each centimeter size group by the proportion of the number landed to the number measured. This

calculation assumes that the fish measured were representative samples of the landings. Precautions had been taken to avoid bias in sampling, and many uniformity trials showed that the samples could be considered as representative of the landing.

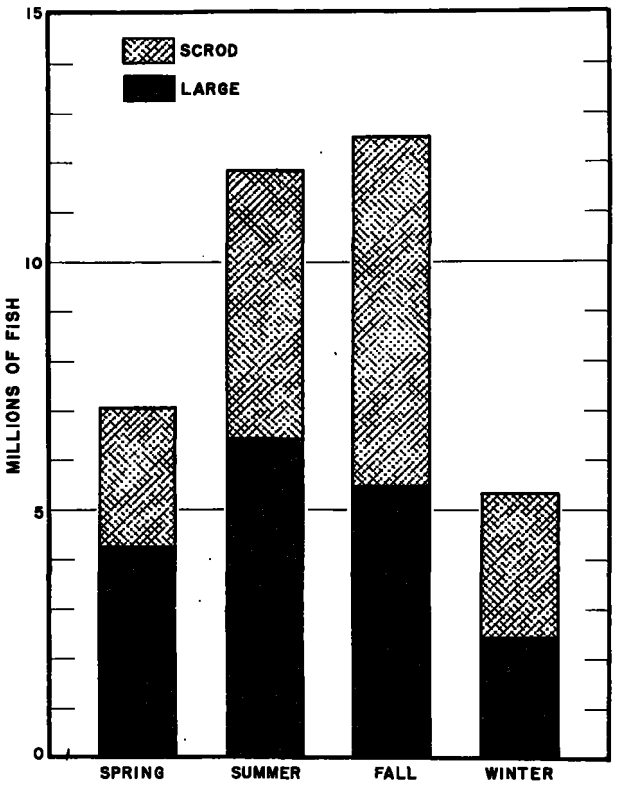


FIGURE 9.—Numbers of scrod, large, and total haddock landed from Georges Bank in the average year, by seasons.

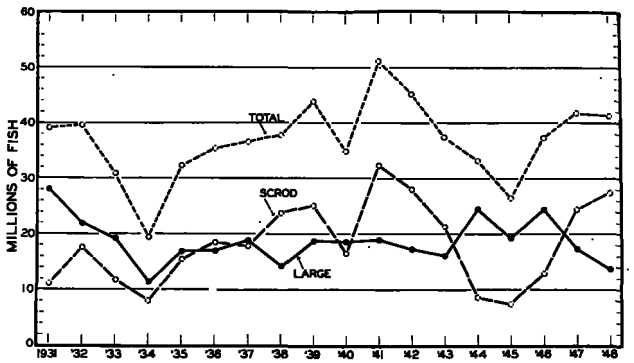


FIGURE 10.—Numbers of scrod, large, and total haddock landed from Georges Bank, by years.

TABLE 10.—*Numbers of scrod haddock landed, by seasons and years*

[In thousands of fish]

Year	Spring	Summer	Fall	Winter	Total
1931	492	816	3,186	6,547	11,041
1932	4,204	5,206	6,075	2,094	17,579
1933	2,124	3,623	5,035	936	11,718
1934	849	2,117	3,742	1,316	8,024
1935	514	3,587	6,190	5,113	15,404
1936	2,033	6,598	7,561	2,232	18,424
1937	2,828	5,512	8,056	1,384	17,780
1938	2,193	5,285	11,945	4,350	23,773
1939	3,980	7,190	10,313	3,670	25,153
1940	3,325	5,373	5,093	2,623	16,414
1941	6,879	8,811	12,535	4,117	32,342
1942	5,708	10,077	8,088	4,140	28,013
1943	6,040	8,771	5,460	1,078	21,349
1944	2,065	3,393	2,679	470	8,607
1945	536	2,301	3,310	1,273	7,420
1946	606	4,978	5,169	2,108	12,861
1947	3,004	5,628	13,213	2,644	24,489
1948	3,352	8,484	9,510	6,113	27,459
Total	50,732	97,750	127,160	52,208	327,850
Average	2,818	5,431	7,065	2,900	18,214

TABLE 11.—*Numbers of large haddock landed, by seasons and years*

[In thousands of fish]

Year	Spring	Summer	Fall	Winter	Total
1931	8,117	10,799	6,164	3,006	28,086
1932	4,859	5,831	7,318	3,894	21,902
1933	5,092	6,765	6,147	1,172	19,176
1934	2,028	4,464	3,907	912	11,311
1935	1,394	6,179	5,927	3,399	16,899
1936	3,839	5,723	5,408	1,993	16,963
1937	5,504	5,517	5,366	2,367	18,754
1938	3,118	4,888	3,833	2,285	14,124
1939	3,998	5,876	5,924	2,894	18,692
1940	4,590	6,899	4,912	2,148	18,549
1941	4,930	7,150	4,726	2,114	18,920
1942	4,630	6,353	4,138	2,128	17,249
1943	4,064	5,665	4,653	1,698	16,080
1944	4,708	9,218	7,629	2,987	24,542
1945	3,981	6,436	5,428	3,287	19,132
1946	3,595	9,043	8,399	3,475	24,512
1947	5,287	5,279	4,878	1,862	17,306
1948	3,236	3,937	4,075	2,461	13,709
Total	76,970	116,022	98,832	44,082	335,906
Average	4,276	6,445	5,491	2,449	18,661

TABLE 12.—*Numbers of total haddock landed, by seasons and years*

[In thousands of fish]

Year	Spring	Summer	Fall	Winter	Total
1931	8,609	11,615	9,350	9,553	39,127
1932	9,063	11,037	13,393	5,988	39,481
1933	7,216	10,388	11,182	2,108	30,894
1934	2,877	6,581	7,649	2,228	19,335
1935	1,908	9,766	12,117	8,512	32,303
1936	5,872	12,321	12,969	4,225	35,387
1937	8,332	11,029	13,422	3,751	36,534
1938	5,311	10,173	15,778	6,635	37,897
1939	7,978	13,066	16,237	6,564	43,845
1940	7,915	12,272	10,005	4,771	34,963
1941	11,809	15,961	17,261	6,231	51,262
1942	10,338	16,430	12,226	6,268	45,262
1943	10,104	14,436	10,113	2,776	37,429
1944	6,773	12,611	10,308	3,457	33,149
1945	4,517	8,737	8,738	4,560	26,552
1946	4,201	14,021	13,568	5,583	37,373
1947	8,291	10,907	18,091	4,506	41,795
1948	6,588	12,421	13,585	8,574	41,168
Total	127,702	213,772	225,992	96,290	663,756
Average	7,095	11,876	12,555	5,349	36,875

The size compositions for subareas were combined, and thus we obtained a size composition representing all of Georges Bank, for each season, year, and market category. A certain amount of irregularity in these curves was due to sampling variations, inasmuch as only a limited sample from a very large population of fish had been obtained. To eliminate some of this irregularity we smoothed each distribution by a moving average of three.

Scrod haddock

Tables 13, 14, 15, and 16 show the size compositions [3] of the landings of scrod, in each of the 72 seasons, from 1931 through 1948. Table 17 shows the size compositions of scrod by years. Table 18 and figure 11 show the average size compositions of scrod for each season in all of the 18 years, and table 19 shows the size composition of scrod that were landed in the average year, and also the percentage size composition.

Large haddock

Tables 20, 21, 22, and 23 show the size compositions of large haddock in each of the 72 seasons over the 18-year period. Table 24 shows the size composition of large haddock by years. Table 25 and figure 11 show, by seasons, the average size composition of large haddock that were landed in all 18 years, and table 26 shows the size composition of large haddock that were landed in the average year, and also the percentage size composition.

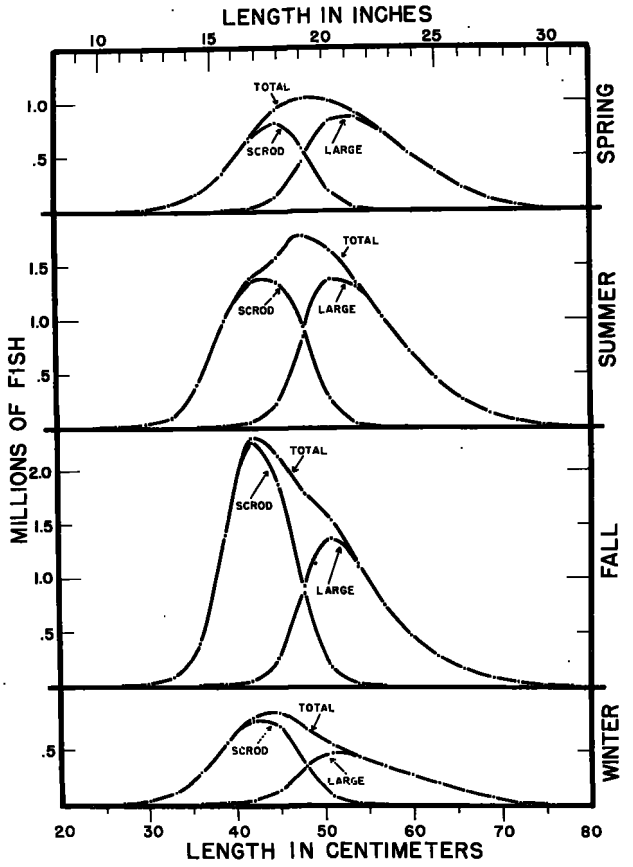


FIGURE 11.—Size compositions of scrod, large, and total haddock landed from Georges Bank in the average year, by seasons.

Total haddock

Tables 27, 28, 29, and 30, and figures 12a, 12b, and 12c show the size compositions of total haddock (scrod and large combined) in each of the 72 seasons over the 18-year period.

The presence of modes (figures 12a, 12b, and 12c), at slightly increasing sizes of fish in succeeding seasons, suggests that each series of modes may be composed largely of the same year class of haddock. In some instances these year classes (if they are year classes) apparently were the chief source of supply of the fishery for several succeeding seasons, and even for succeeding years.

These modes are more obvious if one season (spring, for example) in a particular year is com-

[3] For convenience in handling the large mass of data, we grouped all length frequencies by 3-centimenter groups: Fish of the 29-, 30-, and 31-centimeter groups were recorded as 30 centimeters, fish of the 32-, 33-, and 34-centimeter groups as 33 centimeters, and so on. In graphs and tables where centimeters are shown, they are shown as 30, 33, and 36 rather than 30.5, 33.5, and 36.5 (the true midpoints of the groups) inasmuch as the original centimeter measurements were recorded as 29 when the midpoint was 29.5, 30 instead of 30.5, 31 instead of 31.5, etc. Where inches are shown in graphs, they represent actual values: The inch equivalents opposite 30.5 rather than 30, opposite 31.5 rather than 31, and so on.

The sizes in inches corresponding to the true midpoints of the 3-centimeter groups are as follows:

3-centimeter groups:	*Inches*
18 cm	7.3
21 cm	8.5
24 cm	9.6
27 cm	10.8
30 cm	12.0
33 cm	13.2
36 cm	14.4
39 cm	15.6
42 cm	16.7
45 cm	17.9
48 cm	19.1
51 cm	20.3
54 cm	21.6
57 cm	22.6
60 cm	23.8
63 cm	25.0
66 cm	26.2
69 cm	27.4
72 cm	28.5
75 cm	29.7
78 cm	30.9
81 cm	32.1
84 cm	33.3
87 cm	34.4

pared with the average of that season for all years. Figures 13a, 13b, and 13c show such contrasts in terms of deviations from seasonal means.

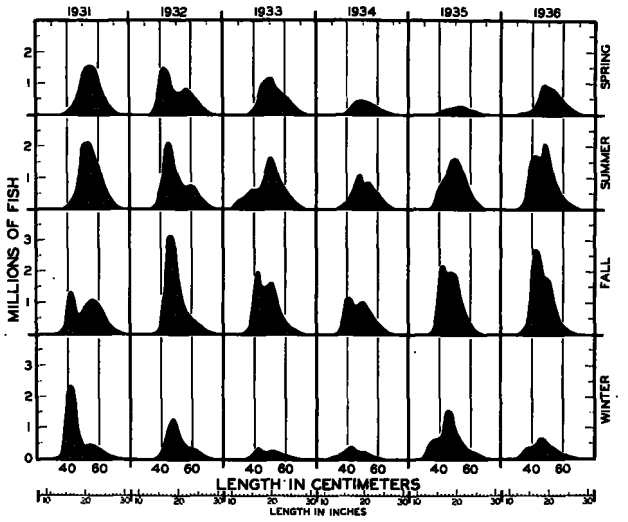


FIGURE 12a.—Size compositions of total haddock landings from Georges Bank, by seasons and years, 1931 to 1936.

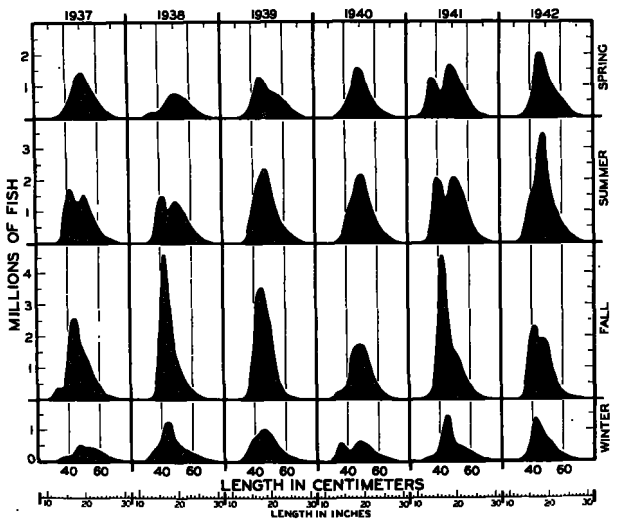


FIGURE 12b.—Size compositions of total haddock landings from Georges Bank, by seasons and years, 1937 to 1942.

Table 31 and figure 14 show the yearly size compositions for total haddock. Table 32 shows the four seasonal size compositions for the average of all 18 years. These values are shown also in figure 11.

In figure 14, it can be seen that there was considerable variation in the relative numbers of various sizes in different years. To study these differences more readily, we plotted (fig. 15) devia-

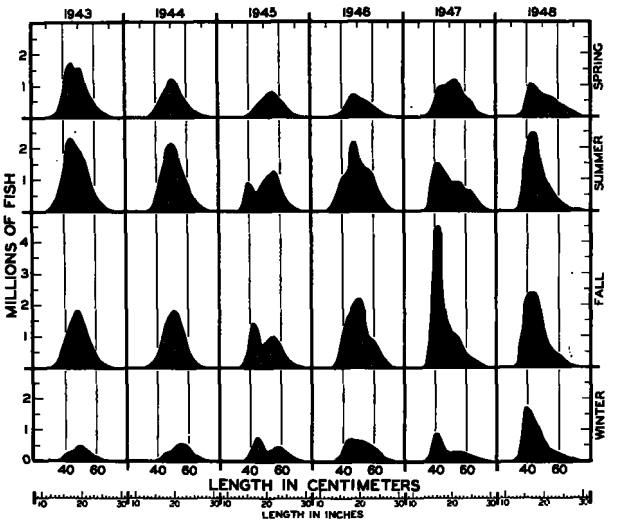


FIGURE 12c.—Size compositions of total haddock landings from Georges Bank, by seasons and years, 1943 to 1948.

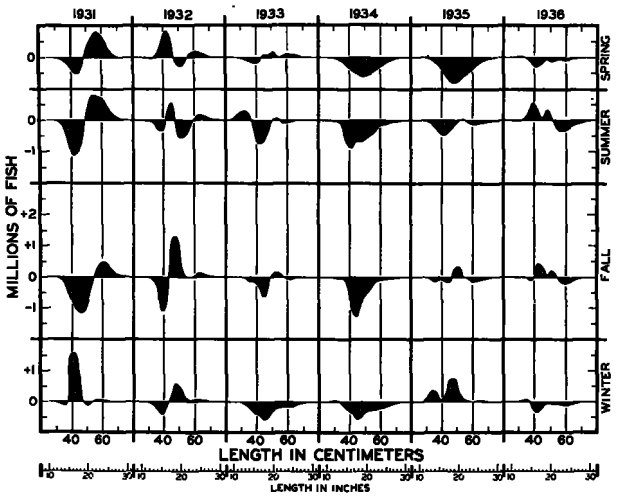


FIGURE 13a.—Deviations from the average size compositions, by seasons, 1931 to 1936.

tions from the average year. Here, it can be seen that a scarcity of small-sized fish characterized some years such as 1931, 1940, 1944, 1945, and 1946. In other years, such as 1943 and 1948, a scarcity of large-sized fish occurred. In still others, an abundance of either small-sized or large-sized haddock occurred, or a scarcity or an abundance of both—the scarce years of 1933, 1934, and 1935, and the abundant year of 1941 demonstrate this. In other years, such as 1937, all sizes were taken in approximately average numbers.

The differences in size composition help to explain how different average weights (shown in table 9) occurred. As one example, the years 1936

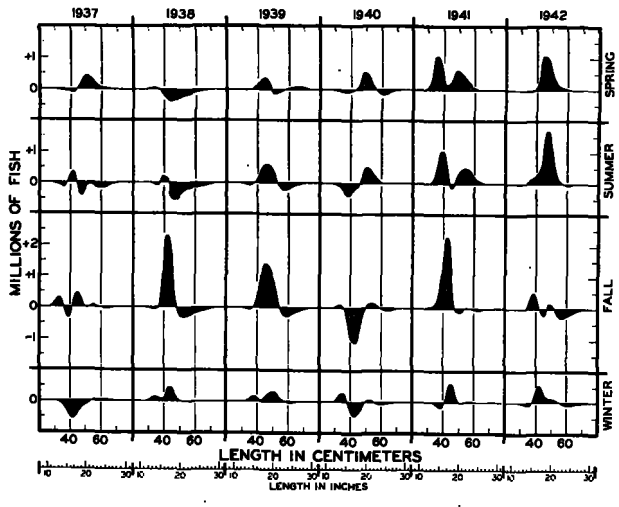


FIGURE 13b.—Deviations from the average size compositions, by seasons, 1937 to 1942.

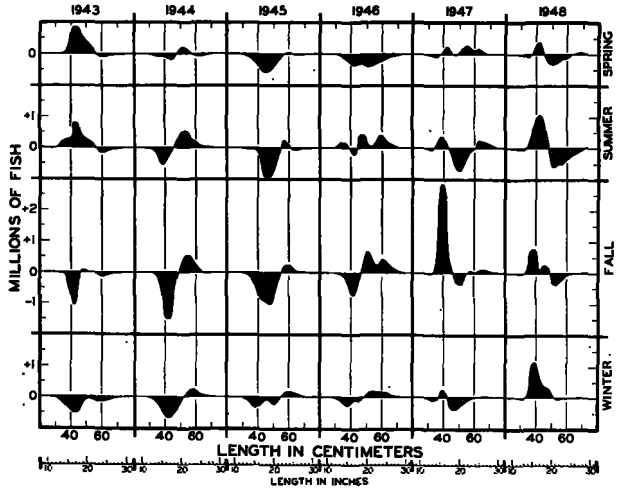


FIGURE 13c.—Deviations from the average size compositions, by seasons, 1943 to 1948.

and 1941 had an identical, low average weight of 2.37 pounds. In 1936, this low average weight was associated with a slight abundance of small-sized and a scarcity of large-sized haddock, while in 1941 it was associated with factors entirely different—an abundance of all sizes, but with small haddock much more abundant than large-sized haddock.

It is obvious that average weight is dependent upon the relative numbers of the various sizes and not upon the actual numbers of fish of various sizes.

In table 33 are shown the size composition of the average year and the percent size composition.

Undersized haddock

The New England Fish Exchange defines scrod haddock as 1½ to 2½ pounds. The average length

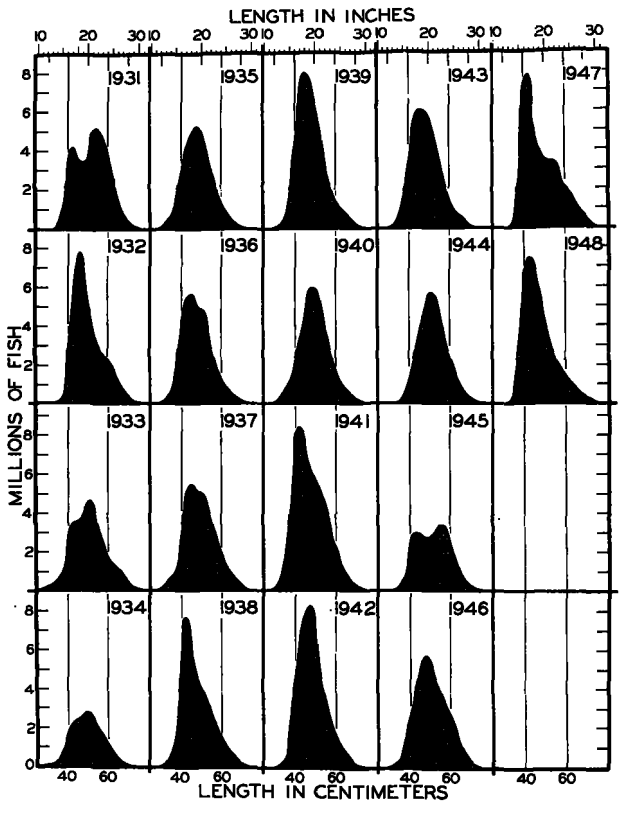


FIGURE 14.—Size compositions of total haddock landings from Georges Bank, by years.

of 1½ pound haddock is about 41 centimeters. Thus, most fish up to and including the 39-centimeter size group could be considered as undersized. From table 33, we see that in the average year about 4,974,000 undersized fish were landed, or 13.5 percent of the total. In all years the total number of undersized haddock landed was about 89,513,000. The numbers of undersized haddock that were landed in each year are shown in table 34.

Scrod versus large haddock

Table 35 shows the percentages of each size group that were scrod and large haddock; figure 16 shows the actual size compositions of scrod and large haddock.

The dividing line between scrod and large haddock for the average of the 18-year period was about 48 centimeters. Below 48 centimeters most fish landed were classified as scrod; above 48 most were classified as large haddock.

This dividing line has varied from year to year, owing to differences in relative abundance of fish of difference sizes and to market conditions. Such

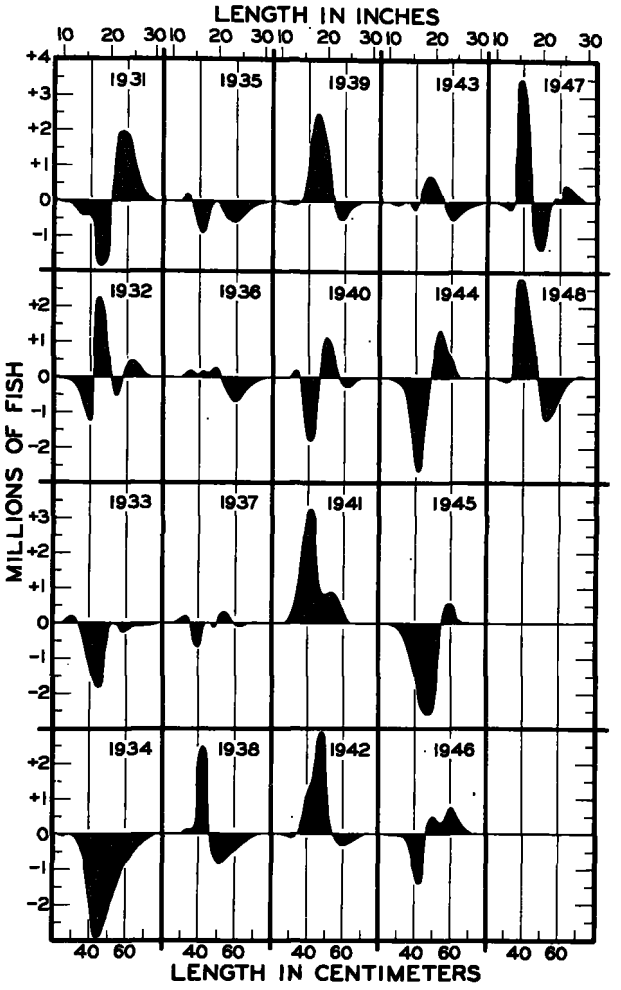
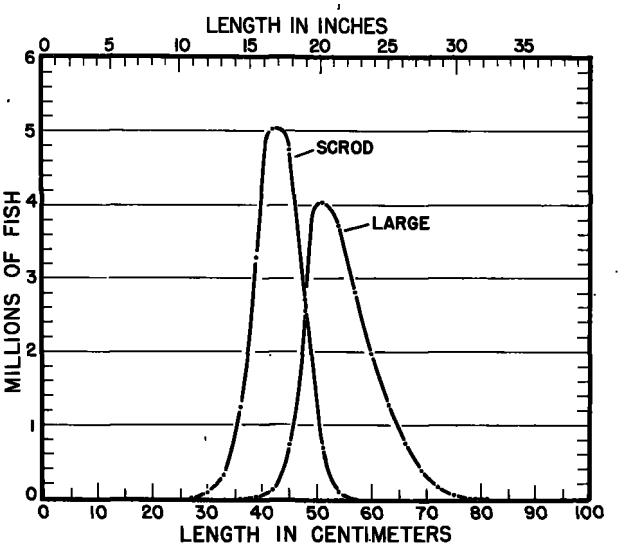


FIGURE 15.—Deviations from average size compositions, by years.



FIGURES 16.—Size compositions of scrod and large haddock landings from Georges Bank in average year.

variation made it necessary to measure samples of each category in every year for which we desired an accurate measurement of size composition of the total haddock landings.

The amount of overlap in length between the two market categories has been considerable. For instance, haddock as long as 63 centimeters were occasionally landed as scrod, and fish as small as 36 centimeters were landed as large haddock. This was due to difficulties and mistakes in sorting haddock into two arbitrary categories at sea under varying conditions of weather, haste, and so on.

TABLE 13.—*Size compositions of scrod haddock, spring seasons*

[In thousands of fish]

Length [1]	1931	1932	1933	1934	1935	1936	1937	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947	1948
21 cm.							1				1							
24 cm.							1				3							
27 cm.						1		2			13		1			8		
30 cm.	1	7				28	9	30	9		108	5	12	2		15	10	2
33 cm.	1	31	2	2	1	74	40	113	37	16	555	33	63	11		15	10	2
36 cm.	15	292	44	14	13	98	105	173	162	101	1,211	125	208	62	2	38	75	87
39 cm.	56	927	172	62	68	152	278	185	460	295	1,121	385	774	250	30	97	382	531
42 cm.	160	1,464	491	242	144	370	554	314	962	654	819	1,117	1,536	480	144	198	892	1,036
45 cm.	175	1,111	828	348	163	650	866	520	1,231	989	1,184	1,948	1,667	614	230	188	899	925
48 cm.	68	331	478	156	94	520	726	542	851	911	1,249	1,530	1,155	481	112	57	549	574
51 cm.	14	39	102	24	28	117	215	253	234	311	533	493	441	145	13	5	171	173
54 cm.	2	2	7	1	3	17	29	45	31	43	78	71	116	17	3		26	24
57 cm.						6	4	11	2	5	4	1	36	3	2			
60 cm.								4	1				18					
63 cm.								1					8					
66 cm.													3					
69 cm.													1					
72 cm.													1					
Total	492	4,204	2,124	849	514	2,033	2,828	2,193	3,980	3,325	6,879	5,708	6,040	2,065	536	606	3,004	3,352

[1] Size groups by 3-cm. intervals.

TABLE 14.—*Size compositions of scrod haddock, summer seasons*

[In thousands of fish]

Length [1]	1931	1932	1933	1934	1935	1936	1937	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947	1948
21 cm						1												
24 cm			14			2		1			2							
27 cm			152			5		3			4	1	1			11		
30 cm		1	290	2	1	19		16	1		15	10	24	4		29		
33 cm		16	373	12	13	128	17	62	25	9	163	106	214	10	29	210	17	52
36 cm	8	114	524	103	189	635	265	306	345	134	949	531	655	85	333	555	556	696
39 cm	74	659	636	225	623	1,550	1,119	1,275	1,059	587	2,046	1,230	1,276	442	868	940	1,366	1,758
42 cm	240	1,594	592	472	899	1,702	1,722	1,477	1,768	1,176	1,925	1,758	2,166	996	688	1,033	1,515	2,420
45 cm	324	1,807	593	750	1,028	1,365	1,343	980	2,048	1,427	1,402	2,724	2,254	1,100	261	1,372	1,249	2,341
48 cm	152	842	347	463	656	900	718	769	1,502	1,416	1,491	2,706	1,575	636	104	714	732	1,068
51 cm	17	159	92	83	154	258	218	267	405	564	693	885	539	112	17	104	177	135
54 cm	1	14	9	5	20	29	54	33	31	56	107	116	57	8	1	8	16	12
57 cm			1	1	4	3	36	5	6	4	14	10	8					
60 cm				1		1	18	1					2			1		2
63 cm							2									1		
Total	816	5,206	3,623	2,117	3,587	6,598	5,512	5,285	7,190	5,373	8,811	10,077	8,771	3,393	2,301	4,978	5,628	8,484

[1] Size groups by 3-cm. intervals.

TABLE 15.—*Size compositions of scrod haddock, fall seasons*

[In thousands of fish]

Length [1]	1931	1932	1933	1934	1935	1936	1937	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947	1948
24 cm							2				1							
27 cm			1			4	30			6	10	1			1	1		
30 cm	1		17	2	1	17	166	1	1	48	59	5	3	3	6	8	4	4
33 cm	7	1	44	41	24	103	383	40	43	183	136	58	41	50	12	36	54	104
36 cm	127	29	254	362	256	345	385	370	354	242	664	648	337	139	174	267	1,122	1,076
39 cm	736	318	1,228	1,094	1,310	1,298	1,050	2,291	1,591	414	2,519	1,901	836	315	812	884	4,250	2,158
42 cm	1,299	1,547	1,943	1,096	2,173	2,690	2,444	4,587	3,262	1,191	4,546	2,294	1,221	732	1,244	1,496	4,482	2,389
45 cm	777	2,592	1,121	693	1,648	2,172	2,395	3,359	3,178	1,535	3,180	1,785	1,553	929	798	1,504	2,205	2,262
48 cm	203	1,362	373	385	660	776	994	1,092	1,546	1,076	1,106	1,095	1,162	418	213	798	921	1,241
51 cm	28	203	53	67	111	140	188	177	308	347	277	264	281	77	32	164	147	236
54 cm	7	21	1	1	7	14	19	25	27	47	35	34	24	14	16	11	24	32
57 cm	1	2		1		2		3	3	3	2	3	2	2	2		4	6
60 cm										1								2
Total	3,186	6,075	5,035	3,742	6,190	7,561	8,056	11,945	10,313	5,093	12,535	8,088	5,460	2,679	3,310	5,169	13,213	9,510

[1] Size groups by 3-cm. intervals.

TABLE 16.—*Size compositions of scrod haddock, winter seasons*

[In thousands of fish]

Length [1]	1931	1932	1933	1934	1935	1936	1937	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947	1948
24 cm					2													
27 cm				16	11	5	2	4	2	1	7	1						
30 cm	1			80	140	37	18	67	28	63	55	10				3		4
33 cm	34	1	14	109	485	168	74	243	135	321	114	49	5	5	7	24	32	105
36 cm	694	19	68	176	632	343	149	415	434	566	169	204	63	28	37	107	254	893
39 cm	2,054	152	189	292	643	362	155	644	719	419	403	779	199	52	192	330	813	1,712
42 cm	2,264	567	362	389	989	460	210	1,199	826	288	1,076	1,351	274	79	448	661	878	1,537
45 cm	1,205	845	231	204	1,345	565	395	1,176	887	450	1,412	1,076	281	191	457	595	444	1,132
48 cm	274	445	63	44	718	250	292	481	510	384	698	523	208	107	120	296	177	576
51 cm	19	59	8	6	136	36	79	105	116	113	156	132	40	8	11	74	42	134
54 cm	1	6	1		11	5	9	11	12	17	26	14	7		1	14	3	17
57 cm	1				1	1	1	2	1	1	1	1	1			3	1	3
60 cm																1		
Total	6,547	2,094	936	1,316	5,113	2,232	1,384	4,350	3,670	2,623	4,117	4,140	1,078	470	1,273	2,108	2,644	6,113

[1] Size groups by 3-cm. intervals.

TABLE 17.—*Size composition, scrod haddock, in each of the 18 years*

[In thousands of fish]

Length [1]	1931	1932	1933	1934	1935	1936	1937	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947	1948
21 cm						1	1				1							
24 cm			14		2	2	3	1			6							
27 cm			153	16	11	15	32	9	2	7	34	3	2		1	12		
30 cm	3	8	307	84	142	101	193	114	39	111	237	30	39	9	6	48	4	8
33 cm	42	49	433	164	523	473	514	458	240	529	968	246	323	76	48	285	113	263
36 cm	844	454	890	655	1,090	1,421	904	1,357	1,295	1,043	2,993	1,508	1,263	314	546	967	2,007	2,752
39 cm	2,920	2,056	2,225	1,673	2,644	3,362	2,602	4,395	3,829	1,715	6,089	4,295	3,085	1,059	1,902	2,251	6,811	6,159
42 cm	3,963	5,172	3,368	2,199	4,205	5,222	4,930	7,577	6,818	3,309	8,366	6,520	5,197	2,287	2,524	3,388	7,767	7,382
45 cm	2,481	6,355	2,773	1,995	4,184	4,752	4,999	6,035	7,344	4,401	7,178	7,533	5,755	2,834	1,746	3,659	4,797	6,660
48 cm	697	2,980	1,261	1,048	2,128	2,446	2,730	2,884	4,409	3,787	4,544	5,854	4,100	1,642	549	1,865	2,379	3,459
51 cm	78	460	255	180	429	551	700	802	1,063	1,335	1,659	1,774	1,301	342	73	347	537	678
54 cm	11	43	18	7	41	65	111	114	101	163	246	235	204	39	21	33	69	85
57 cm	2	2	1	2	5	12	41	21	12	13	21	15	47	5	4	3	5	9
60 cm				1		1	18	5	1	1			20			2		4
63 cm							2	1					8			1		
66 cm													3					
69 cm													1					
72 cm													1					
Total	11,041	17,579	11,718	8,024	15,404	18,424	17,780	23,773	25,153	16,414	32,342	28,013	21,349	8,607	7,420	12,861	24,489	27,459

[1] Size groups by 3-cm. intervals.

TABLE 18.—*Average size composition of scrod haddock, in each of the seasons*

[In thousands of fish]

Length [1]	Spring	Summer	Fall	Winter
24 cm		1		
27 cm	1	10	3	3
30 cm	12	23	19	28
33 cm	56	81	76	107
36 cm	157	393	397	292
39 cm	346	985	1,389	562
42 cm	643	1,341	2,258	770
45 cm	808	1,354	1,871	716
48 cm	577	933	857	342
51 cm	184	271	172	71
54 cm	29	32	20	9
57 cm	4	5	2	1
60 cm	1	1		
63 cm	1			
Total	2,819	5,430	7,064	2,901

[1] Size groups by 3-cm. intervals.

TABLE 19.—*Size composition of scrod haddock in the average year*

[In thousands of fish]

Length [1]	Average number	Percent of total
24 cm	1	
27 cm	17	0.1
30 cm	82	.4
33 cm	320	1.8
36 cm	1,240	6.8
39 cm	3,281	18.0
42 cm	5,012	27.5
45 cm	4,747	26.1
48 cm	2,710	14.9
51 cm	699	3.8
54 cm	89	.5
57 cm	12	.1
60 cm	3	
63 cm	1	
Total	18,214	100.0

[1] Size groups by 3-cm. intervals.

TABLE 20.—*Size compositions of large haddock, spring seasons*

[In thousands of fish]

Length [1]	1931	1932	1933	1934	1935	1936	1937	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947	1948
30 cm																1		
33 cm																		
36 cm								1						1		4	1	
39 cm	6	1		1		1	2	4	2	1		1	4	7	3	20	3	
42 cm	36	40	16	5	4	9	8	7	7	9	3	10	15	36	25	118	16	11
45 cm	256	279	181	67	44	89	118	38	36	112	51	75	73	148	112	444	96	45
48 cm	825	548	637	276	132	450	636	192	282	647	395	462	416	596	395	663	461	206
51 cm	1,398	684	1,074	410	240	777	1,225	526	652	1,171	1,025	945	958	1,068	673	608	946	526
54 cm	1,567	753	897	394	289	798	1,171	658	778	1,018	1,169	992	978	1,045	791	551	1,139	627
57 cm	1,537	834	753	317	233	668	897	599	715	683	940	824	686	732	728	453	971	590
60 cm	1,185	714	632	231	178	435	608	444	560	402	604	586	416	477	585	322	641	410
63 cm	742	497	450	153	140	306	412	306	416	241	363	382	252	283	350	228	545	346
66 cm	364	300	282	99	76	174	232	183	266	160	198	197	162	172	185	109	275	228
69 cm	132	148	118	47	38	87	122	92	167	88	101	94	67	84	87	46	122	162
72 cm	51	43	41	18	17	34	54	44	78	42	52	44	25	39	32	19	63	64
75 cm	18	16	7	6	3	10	17	19	26	10	23	14	8	16	15	9	7	19
78 cm		2	4	4		1	2	5	10	5	5	4	4	4			1	1
81 cm									2	1	1							1
84 cm									1									
Total	8,117	4,859	5,092	2,028	1,394	3,839	5,504	3,118	3,998	4,590	4,930	4,630	4,064	4,708	3,981	3,595	5,287	3,236

[1] Size groups by 3-cm. intervals.

TABLE 21.—*Size compositions of large haddock, summer seasons*

[In thousands of fish]

Length [1]	1931	1932	1933	1934	1935	1936	1937	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947	1948
33 cm																1		
36 cm						1		1						1	11	15		
39 cm	1	2	14	3	2	11	4	6	5	2	6	2	6	19	49	49		1
42 cm	46	27	44	23	18	33	19	20	23	12	14	12	16	95	119	140	11	19
45 cm	291	318	280	143	210	315	127	85	129	97	56	105	65	457	362	604	104	147
48 cm	1,191	876	1,065	629	938	1,215	650	486	848	676	461	767	550	1,444	782	1,480	394	675
51 cm	2,099	936	1,555	971	1,457	1,458	1,352	1,054	1,562	1,589	1,378	1,517	1,370	2,043	1,049	1,624	739	905
54 cm	2,138	789	1,374	869	1,351	1,090	1,227	1,107	1,223	1,644	1,726	1,349	1,448	1,862	1,203	1,411	901	813
57 cm	1,784	758	932	689	983	698	859	868	798	1,176	1,458	1,036	993	1,306	1,264	1,332	906	521
60 cm	1,427	773	628	542	607	409	550	583	520	722	927	669	560	913	806	1,107	686	354
63 cm	910	630	424	327	344	257	316	354	380	451	552	439	332	521	411	651	672	238
66 cm	507	389	242	160	175	146	190	179	202	273	291	249	187	291	216	359	439	117
69 cm	255	209	128	74	66	60	116	90	112	149	153	111	87	172	108	181	260	52
72 cm	103	82	56	25	22	24	67	39	54	65	86	59	38	60	37	66	114	75
75 cm	36	32	13	9	5	5	28	12	13	28	30	27	10	22	14	14	34	12
78 cm	7	7	8		1	1	11	4	5	13	10	10	2	10	5	8	17	8
81 cm	2	2	2				1		2	2	2	1	1	2		1	2	
84 cm	1	1																
87 cm	1																	
Total	10,799	5,831	6,765	4,464	6,179	5,723	5,517	4,888	5,876	6,899	7,150	6,353	5,665	9,218	6,436	9,043	5,279	3,937

[1] Size groups by 3-cm. intervals.

TABLE 22.—*Size compositions of large haddock, fall seasons*

[In thousands of fish]

Length [1]	1931	1932	1933	1934	1935	1936	1937	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947	1948
36 cm		1				1						1			6	3		
39 cm	14	4	6	4	1	12	4	2	5	1	6	4	3	6	49	22	3	2
42 cm	59	43	48	44	19	44	21	19	26	10	30	11	16	62	181	74	23	14
45 cm	233	545	401	213	324	337	203	199	362	90	156	129	109	436	406	346	126	132
48 cm	463	1,726	1,173	617	1,320	1,081	913	729	1,451	640	601	825	684	1,248	554	1,316	559	694
51 cm	852	1,802	1,585	944	1,770	1,605	1,327	1,043	1,978	1,326	1,145	1,361	1,267	1,771	820	2,047	1,005	959
54 cm	1,029	1,158	1,277	777	1,174	1,182	1,179	805	1,196	1,242	1,122	883	1,109	1,671	984	1,521	1,023	729
57 cm	1,089	716	762	584	712	600	788	486	505	776	752	438	713	1,217	936	996	797	531
60 cm	956	514	405	372	336	274	468	282	195	413	449	229	356	671	706	878	494	413
63 cm	722	392	223	210	166	138	228	149	116	210	221	124	193	327	387	613	360	272
66 cm	410	244	156	90	63	78	121	64	55	113	143	71	115	128	194	343	255	156
69 cm	171	110	67	37	24	38	70	28	19	53	54	42	50	55	118	164	131	93
72 cm	103	48	28	9	11	12	27	17	6	25	24	14	20	25	60	52	80	52
75 cm	49	12	10	5	6	5	11	7	8	10	16	5	12	9	23	20	16	20
78 cm	11	2	2	1	1	1	5	2	2	3	6	1	4	3	2	2	4	7
81 cm	2	1	3				1	1			1		2		1	2	2	1
84 cm	1		1												1			
Total	6,164	7,318	6,147	3,907	5,927	5,408	5,366	3,833	5,924	4,912	4,726	4,138	4,653	7,629	5,428	8,399	4,878	4,075

[1] Size groups by 3-cm. intervals.

TABLE 23.—*Size compositions of large haddock, winter seasons*

[In thousands of fish]

Length [1]	1931	1932	1933	1934	1935	1936	1937	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947	1948
30 cm															2			
33 cm		1													4			
36 cm		1								5				1	25			1
39 cm	6	2	1	1	1	1	1	4	2	18	1	1	2	7	48	5		3
42 cm	96	36	4	10	12	13	7	16	16	41	2	10	14	29	138	38	5	7
45 cm	410	276	39	87	216	119	49	90	124	64	36	55	68	90	314	137	51	94
48 cm	404	837	157	191	734	384	220	315	474	232	148	307	289	193	446	394	145	420
51 cm	420	911	257	229	748	431	355	451	734	448	356	536	432	459	322	598	257	486
54 cm	459	557	240	161	526	364	439	416	564	470	439	470	346	561	380	624	318	389
57 cm	422	396	179	98	376	265	406	318	374	310	371	298	219	569	461	528	310	326
60 cm	332	341	118	64	276	170	322	249	229	220	303	197	145	470	451	444	258	256
63 cm	229	258	86	36	222	116	249	182	165	146	201	118	86	279	327	354	198	198
66 cm	121	167	50	18	160	71	155	124	111	104	122	69	46	174	200	188	148	136
69 cm	67	67	26	10	82	37	90	71	57	51	70	36	30	99	101	100	101	81
72 cm	32	32	9	3	36	16	48	35	31	18	42	17	12	43	40	44	47	44
75 cm	8	9	5	4	8	5	20	12	10	12	18	11	6	12	19	16	17	15
78 cm		2	1		2	1	5	2	2	6	3	2	1	1	8	4	6	4
81 cm		1					1		1	2	2	1	2		1	1	1	1
84 cm										1								
Total	3,006	3,894	1,172	912	3,399	1,993	2,367	2,285	2,894	2,148	2,114	2,128	1,698	2,987	3,287	3,475	1,862	2,461

[1] Size groups by 3-cm. intervals.

TABLE 24.—*Size composition of large haddock, in each of the 18 years*

[In thousands of fish]

Length [1]	1931	1932	1933	1934	1935	1936	1937	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947	1948
30 cm															2	1		
33 cm		1													4	1		
36 cm		2				2		2		5		1		3	42	22	1	1
39 cm	27	9	21	9	4	25	11	16	14	22	13	8	15	39	149	96	6	6
42 cm	237	146	112	82	53	99	55	62	72	72	49	43	61	222	463	370	55	51
45 cm	1,190	1,418	901	510	794	860	497	412	651	363	299	364	315	1,131	1,194	1,531	377	418
48 cm	2,883	3,987	3,032	1,713	3,124	3,130	2,419	1,722	3,055	2,195	1,605	2,361	1,939	3,481	2,177	3,853	1,559	1,995
51 cm	4,769	4,333	4,471	2,554	4,215	4,271	4,259	3,074	4,962	4,534	3,904	4,359	4,027	5,341	2,864	4,877	2,947	2,876
54 cm	5,193	3,257	3,788	2,201	3,340	3,434	4,016	2,986	3,761	4,374	4,456	3,694	3,881	5,139	3,358	4,107	3,351	2,558
57 cm	4,832	2,704	2,626	1,688	2,304	2,231	2,950	2,271	2,392	2,945	3,521	2,596	2,611	3,824	3,389	3,309	2,984	1,968
60 cm	3,900	2,342	1,783	1,209	1,397	1,288	1,948	1,558	1,504	1,757	2,283	1,681	1,477	2,531	2,545	2,751	2,079	1,433
63 cm	2,603	1,777	1,183	726	872	817	1,205	991	1,077	1,048	1,337	1,063	863	1,410	1,475	1,846	1,775	1,054
66 cm	1,402	1,100	730	367	474	469	698	550	634	650	754	586	510	765	795	999	1,117	637
69 cm	625	534	339	168	210	222	398	281	355	341	378	283	234	410	414	491	614	388
72 cm	289	205	134	55	86	86	196	135	169	150	204	134	95	167	169	181	304	235
75 cm	111	69	35	24	22	25	76	50	57	60	87	57	36	59	71	59	74	66
78 cm	18	13	15	5	4	4	23	13	19	27	24	17	11	18	15	14	28	20
81 cm	4	4	5				3	1	5	5	6	2	5	2	2	4	5	3
84 cm	2	1	1						1	1					1			
87 cm	1																	
Total	28,086	21,902	19,176	11,311	16,899	16,963	18,754	14,124	18,692	18,549	18,920	17,249	16,080	24,542	19,132	24,512	17,306	13,709

[1] Size groups by 3-cm. intervals.

TABLE 25.—*Average size composition of large haddock, in each of the seasons*

[In thousands of fish]

Length [1]	Spring	Summer	Fall	Winter
36 cm		2	1	2
39 cm	3	10	8	6
42 cm	21	38	41	27
45 cm	126	216	264	129
48 cm	457	840	922	349
51 cm	828	1,370	1,367	468
54 cm	868	1,307	1,114	429
57 cm	731	1,020	744	346
60 cm	524	710	467	269
63 cm	356	456	281	192
66 cm	203	256	156	120
69 cm	100	132	74	65
72 cm	42	60	34	31
75 cm	14	19	14	12
78 cm	3	7	3	3
81 cm		1	1	1
Total	4,276	6,444	5,491	2,449

[1] Size groups by 3-cm. intervals.

TABLE 26.—*Size composition of large haddock in the average year*

[In thousands of fish]

Length [1]	Average number	Percent
36 cm	4	
39 cm	27	0.1
42 cm	128	.7
45 cm	735	3.9
48 cm	2,569	13.8
51 cm	4,032	21.7
54 cm	3,718	19.9
57 cm	2,841	15.2
60 cm	1,970	10.6
63 cm	1,285	6.9
66 cm	736	3.9
69 cm	371	2.0
72 cm	167	.9
75 cm	59	.3
78 cm	16	.1
81 cm	3	
Total	18,661	100.0

[1] Size groups by 3-cm. intervals.

TABLE 27.—*Size compositions of total haddock, spring seasons*

[In thousands of fish]

Length [1]	1931	1932	1933	1934	1935	1936	1937	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947	1948
21 cm							1				1							
24 cm							1				3							
27 cm						1		2			13		1					
30 cm	1	7				28	9	30	9		108	5	12	2		9		
33 cm	1	31	2	2	1	74	40	113	37	16	555	33	63	11		15	10	2
36 cm	15	292	44	14	13	98	105	174	162	101	1,211	125	208	63	2	42	76	87
39 cm	62	928	172	63	68	153	280	189	462	296	1,121	386	778	257	33	117	385	531
42 cm	196	1,504	507	247	148	379	562	321	969	663	822	1,127	1,551	516	169	316	908	1,047
45 cm	431	1,390	1,009	415	207	739	984	558	1,267	1,101	1,235	2,023	1,740	762	342	632	995	970
48 cm	893	879	1,115	432	226	970	1,362	734	1,133	1,558	1,644	1,992	1,571	1,077	507	720	1,010	780
51 cm	1,412	723	1,176	434	268	894	1,440	779	886	1,482	1,558	1,438	1,399	1,213	686	613	1,117	699
54 cm	1,569	755	904	395	292	815	1,200	703	809	1,061	1,247	1,063	1,094	1,062	794	551	1,165	651
57 cm	1,537	834	753	317	233	674	901	610	717	688	944	825	722	735	730	453	971	590
60 cm	1,185	714	632	231	178	435	608	448	561	402	604	586	434	477	585	322	641	410
63 cm	742	497	450	153	140	306	412	307	416	241	363	382	260	283	350	228	545	346
66 cm	364	300	282	99	76	174	232	183	266	160	198	197	165	172	185	109	275	228
69 cm	132	148	118	47	38	87	122	92	167	88	101	94	68	84	87	46	122	162
72 cm	51	43	41	18	17	34	54	44	78	42	52	44	26	39	32	19	63	64
75 cm	18	16	7	6	3	10	17	19	26	10	23	14	8	16	15	9	7	19
78 cm		2	4	4		1	2	5	10	5	5	4	4	4			1	1
81 cm									2	1	1							1
84 cm									1									
Total	8,609	9,063	7,216	2,877	1,908	5,872	8,332	5,311	7,978	7,915	11,809	10,338	10,104	6,773	4,517	4,201	8,291	6,588

[1] Size groups by 3-cm. intervals.

TABLE 28.—*Size compositions of total haddock, summer seasons*

[In thousands of fish]

Length [1]	1931	1932	1933	1934	1935	1936	1937	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947	1948
21 cm						1												
24 cm			14			2		1			2							
27 cm			152			5		3			4	1	1			11		
30 cm		1	290	2	1	19		16	1		15	10	24	4		29		
33 cm		16	373	12	13	128	17	62	25	9	163	106	214	10	29	211	17	52
36 cm	8	114	524	103	189	636	265	397	345	134	949	531	655	86	344	570	556	696
39 cm	75	661	650	228	625	1,561	1,123	1,281	1,064	589	2,052	1,232	1,282	461	917	989	1,366	1,759
42 cm	286	1,621	636	495	917	1,735	1,741	1,497	1,791	1,188	1,939	1,770	2,182	1,091	807	1,173	1,526	2,439
45 cm	615	2,125	873	893	1,238	1,680	1,470	1,065	2,177	1,524	1,458	2,829	2,319	1,557	623	1,976	1,353	2,488
48 cm	1,343	1,718	1,412	1,092	1,594	2,115	1,368	1,255	2,350	2,092	1,952	3,473	2,125	2,080	886	2,194	1,126	1,743
51 cm	2,116	1,095	1,647	854	1,611	1,716	1,570	1,321	1,967	2,153	2,071	2,402	1,909	2,155	1,066	1,728	916	1,040
54 cm	2,139	803	1,383	874	1,371	1,119	1,281	1,140	1,254	1,700	1,833	1,465	1,505	1,870	1,204	1,419	917	825
57 cm	1,784	758	933	690	987	701	895	873	804	1,180	1,472	1,046	1,001	1,306	1,264	1,332	906	521
60 cm	1,427	773	628	543	607	410	568	584	520	722	927	669	562	913	806	1,108	686	356
63 cm	910	630	424	327	344	257	318	354	380	451	552	439	332	521	411	652	672	238
66 cm	507	389	242	160	175	146	190	179	202	273	291	249	187	291	216	359	439	117
69 cm	255	209	128	74	66	60	116	90	112	149	153	111	87	172	108	181	260	52
72 cm	103	82	56	25	22	24	67	39	54	65	86	59	38	60	37	66	114	75
75 cm	36	32	13	9	5	5	28	12	13	28	30	27	10	22	14	14	34	12
78 cm	7	7	8		1	1	11	4	5	13	10	10	2	10	5	8	17	8
81 cm	2	2	2				1		2	2	2	1	1	2		1	2	
84 cm	1	1																
87 cm	1																	
Total	11,615	11,037	10,388	6,381	9,766	12,321	11,029	10,173	13,066	12,272	15,961	16,430	14,436	12,611	8,737	14,021	10,907	12,421

[1] Size groups by 3-cm. intervals.

TABLE 29.—*Size compositions of total haddock, fall seasons*

[In thousands of fish]

Length [1]	1931	1932	1933	1934	1935	1936	1937	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947	1948
24 cm							2				1							
27 cm			1			4	30			6	10	1			1	1		
30 cm	1		17	2	1	17	166	1	1	48	59	5	3	3	6	8	4	4
33 cm	7	1	44	41	24	103	383	40	43	183	136	58	41	50	12	36	54	104
36 cm	127	30	254	362	256	346	385	370	354	242	664	649	337	139	180	270	1,122	1,076
39 cm	750	322	1,234	1,098	1,311	1,310	1,054	2,293	1,596	415	2,525	1,905	839	321	861	906	4,253	2,160
42 cm	1,358	1,590	1,991	1,140	2,192	2,734	2,465	4,606	3,288	1,201	4,576	2,305	1,237	794	1,425	1,570	4,505	2,403
45 cm	1,010	3,137	1,522	906	1,972	2,509	2,598	3,558	3,540	1,625	3,336	1,914	1,662	1,365	1,204	1,850	2,331	2,394
48 cm	666	3,088	1,546	1,002	1,980	1,857	1,907	1,821	2,997	1,716	1,707	1,920	1,846	1,666	767	2,114	1,480	1,935
51 cm	880	2,005	1,638	1,011	1,881	1,745	1,515	1,220	2,286	1,673	1,422	1,625	1,548	1,848	852	2,211	1,152	1,195
54 cm	1,036	1,179	1,278	778	1,181	1,196	1,198	830	1,223	1,289	1,157	917	1,133	1,685	1,000	1,532	1,047	761
57 cm	1,090	718	762	585	712	602	788	489	508	779	754	441	715	1,219	938	996	801	537
60 cm	956	514	405	372	336	274	468	282	195	414	449	229	356	671	706	878	494	415
63 cm	722	392	223	210	166	138	228	149	116	210	231	124	193	327	387	613	360	272
66 cm	410	244	156	90	63	78	121	64	55	113	143	71	115	128	194	343	255	156
69 cm	171	110	67	37	24	38	70	28	19	53	54	42	50	55	118	164	131	93
72 cm	103	48	28	9	11	12	27	17	6	25	24	14	20	25	60	52	80	52
75 cm	49	12	10	5	6	5	11	7	8	10	16	5	12	9	23	20	16	20
78 cm	11	2	2	1	1	1	5	2	2	3	6	1	4	3	3	2	4	7
81 cm	2	1	3				1	1			1		2		1	2	2	1
84 cm	1		1												1			
Total	9,350	13,393	11,182	7,649	12,117	12,969	13,422	15,778	16,237	10,005	17,261	12,226	10,113	10,308	8,738	13,568	18,091	13,585

[1] Size groups by 3-cm. intervals.

TABLE 30.—*Size compositions of total haddock, winter seasons*

[In thousands of fish]

Length [1]	1931	1932	1933	1934	1935	1936	1937	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947	1948
24 cm					2													
27 cm				16	11	5	2	4	2	1	7	1						
30 cm	1			80	140	37	18	67	28	63	55	10			2	3		4
33 cm	34	2	14	109	485	168	74	243	135	321	114	49	5	5	11	24	32	105
36 cm	694	20	68	176	632	343	149	418	434	571	169	204	63	29	62	107	254	894
39 cm	2,060	154	190	293	644	363	156	648	721	437	404	780	201	59	240	335	813	1,715
42 cm	2,360	603	366	399	1,001	473	217	1,215	842	329	1,078	1,361	288	108	586	699	883	1,544
45 cm	1,615	1,121	270	291	1,561	684	444	1,266	1,011	514	1,448	1,131	349	281	771	732	495	1,226
48 cm	678	1,282	220	235	1,452	634	512	796	984	616	846	830	497	300	566	690	322	996
51 cm	439	970	265	235	884	467	434	556	850	561	512	668	472	467	333	672	299	620
54 cm	460	563	241	161	537	369	448	427	576	487	465	484	353	561	381	638	321	406
57 cm	423	396	179	98	377	266	407	320	375	311	372	299	220	569	461	531	311	329
60 cm	332	341	118	64	276	170	322	249	229	220	303	197	145	470	451	445	258	256
63 cm	229	258	86	36	222	116	249	182	165	146	201	118	86	279	327	354	198	198
66 cm	121	167	50	18	160	71	155	124	111	104	122	69	46	174	200	188	148	136
69 cm	67	67	26	10	82	37	90	71	57	51	70	36	30	99	101	100	101	81
72 cm	32	32	9	3	36	16	48	35	31	18	42	17	12	43	40	44	47	44
75 cm	8	9	5	4	8	5	20	12	10	12	18	11	6	12	19	16	17	15
78 cm		2	1		2	1	5	2	2	6	3	2	1	1	8	4	6	4
81 cm		1					1		1	2	2	1	2		1	1	1	1
84 cm										1								
Total	9,553	5,988	2,108	2,228	8,512	4,225	3,751	6,635	6,564	4,771	6,231	6,268	2,776	3,457	4,560	5,553	4,506	8,574

[1] Size groups by 3-cm. intervals.

TABLE 31.—*Size composition of landings of total haddock, in each of the 18 years*

[In thousands of fish]

Length [1]	1931	1932	1933	1934	1935	1936	1937	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947	1948
21 cm						1	1				1							
24 cm			14		2	2	3	1			6							
27 cm			153	16	11	15	32	9	2	7	34	3	2		1	12		
30 cm	3	8	307	84	142	101	193	114	39	111	237	30	39	9	8	49	4	8
33 cm	42	50	433	164	523	473	514	458	240	529	968	246	323	76	52	286	113	263
36 cm	844	456	890	655	1,090	1,423	904	1,359	1,295	1,048	2,993	1,509	1,263	317	588	989	2,008	2,753
39 cm	2,947	2,065	2,246	1,682	2,648	3,387	2,613	4,411	3,843	1,737	6,102	4,303	3,100	1,098	2,051	2,347	6,817	6,165
42 cm	4,200	5,318	3,500	2,281	4,258	5,321	4,985	7,639	6,890	3,381	8,415	6,563	5,258	2,509	2,987	3,758	7,822	7,433
45 cm	3,671	7,773	3,674	2,505	4,978	5,612	5,496	6,447	7,995	4,764	7,477	7,897	6,070	3,965	2,940	5,190	5,174	7,078
48 cm	3,580	6,967	4,293	2,761	5,252	5,576	5,149	4,606	7,464	5,982	6,149	8,125	6,039	5,123	2,726	5,718	3,938	5,454
51 cm	4,847	4,793	4,726	2,734	4,644	4,822	4,959	3,876	5,989	5,869	5,563	6,133	5,328	5,683	2,937	5,224	3,484	3,554
54 cm	5,204	3,300	3,806	2,208	3,381	3,499	4,127	3,100	3,862	4,537	4,702	3,929	4,085	5,178	3,379	4,140	3,450	2,643
57 cm	4,834	2,706	2,627	1,690	2,309	2,243	2,991	2,292	2,404	2,958	3,542	2,611	2,658	3,829	3,393	3,312	2,989	1,977
60 cm	3,900	2,342	1,783	1,210	1,397	1,289	1,966	1,563	1,505	1,758	2,283	1,681	1,497	2,531	2,548	2,753	2,079	1,437
63 cm	2,603	1,777	1,183	726	872	817	1,207	992	1,077	1,048	1,337	1,063	871	1,410	1,475	1,847	1,775	1,054
66 cm	1,402	1,100	730	367	474	469	698	550	634	650	754	586	513	765	795	999	1,117	637
69 cm	625	534	339	168	210	222	398	281	355	341	378	283	235	410	414	491	614	388
72 cm	289	205	134	55	86	86	196	135	169	150	204	134	96	167	169	181	304	235
75 cm	111	69	35	24	22	25	76	50	57	60	87	57	36	59	71	59	74	66
78 cm	18	13	15	5	4	4	23	13	19	27	24	17	11	18	15	14	28	20
81 cm	4	4	5				3	1	5	5	6	2	5	2	2	4	5	3
84 cm	2	1	1						1	1					1			
87 cm	1																	
Total	39,127	39,481	30,894	19,335	32,303	35,387	36,534	37,897	43,845	34,963	51,262	45,262	37,429	33,149	26,552	37,373	41,795	41,168

[1] Size groups by 3-cm. intervals.

TABLE 32.—*Average size composition of total [1] haddock, in each of the seasons*

[In thousands of fish]

Length [2]	Spring	Summer	Fall	Winter
24 cm		1		
27 cm	1	10	3	3
30 cm	12	23	19	28
33 cm	56	81	76	107
36 cm	157	395	398	294
39 cm	349	995	1,397	567
42 cm	664	1,380	2,299	797
45 cm	933	1,570	2,135	844
48 cm	1,035	1,773	1,779	692
51 cm	1,012	1,641	1,539	539
54 cm	896	1,339	1,134	438
57 cm	735	1,025	746	347
60 cm	525	712	467	269
63 cm	357	456	281	192
66 cm	204	256	156	120
69 cm	100	132	74	65
72 cm	42	60	34	31
75 cm	14	19	14	12
78 cm	3	7	3	3
81 cm		1	1	1
Total	7,095	11,876	12,555	5,349

[1] All values calculated by dividing 18-year total for total haddock by 18 rather than by summing 18-year averages of scrod plus large.
[2] Size groups by 3-cm. intervals.

TABLE 33.—*Size composition of total haddock in the average year*

[In thousands of fish]

Length [1]	Average number	Percent
24 cm	1	
27 cm	17	0.1
30 cm	82	.2
33 cm	320	.9
36 cm	1,244	3.4
39 cm	3,308	9.0
42 cm	5,140	13.9
45 cm	5,482	14.9
48 cm	5,279	14.3
51 cm	4,731	12.8
54 cm	3,807	10.3
57 cm	2,853	7.7
60 cm	1,973	5.4
63 cm	1,286	3.5
66 cm	736	2.0
69 cm	371	1.0
72 cm	167	.4
75 cm	59	.2
78 cm	16	
81 cm	3	
Total	36,875	100.0

[1] Size groups by 3-cm. intervals.

TABLE 34.—*Undersized haddock landed, by years*

[In thousands of fish]

Year	Number of fish
1931	3,836
1932	2,579
1933	4,043
1934	2,601
1935	4,416
1936	5,402
1937	4,260
1938	6,352
1939	5,419
1940	3,432
1941	10,341
1942	6,091
1943	4,727
1944	1,500
1945	2,700
1946	3,683
1947	8,942
1948	9,189
Total	89,513
Average	4,974

TABLE 35.—*Division of landings for each size*

Length [1]	Percent of landings	
	Scrod	Large
33 cm. and under	100.0	
36 cm	99.7	0.3
39 cm	99.2	.8
42 cm	97.5	2.5
45 cm	86.6	13.4
48 cm	51.3	48.7
51 cm	14.8	85.2
54 cm	2.3	97.7
57 cm	.4	99.6
60 cm	.2	99.8
63 cm	.1	99.9
66 cm. and over		100.0
All sizes	49.4	50.6

[1] Size groups by 3-cm. intervals.

DISCUSSION AND SUMMARY

1. Presented in this paper is an outline of a study of Georges Bank haddock and also details of landings for the years of 1931 to 1948. Pounds, numbers, and average weights of fish, and size compositions of landings are given for scrod, for large, and for total haddock. While these data are presented primarily as background for further studies, the averages and ranges are informative. The values presented, in our opinion, are as nearly complete a record of the quantities of Georges Bank haddock that were landed and sold as can be readily assembled. They are more nearly complete than values previously given (Schuck 1949), which represent only Georges Bank haddock landed at the ports of Boston, Gloucester, and New Bedford, Mass., and Portland, Maine.

2. The industry is most affected, not by the average or ordinary condition of the fishery, but by deviations from the normal, be it in terms of pounds of fish, of numbers of fish, of numbers of certain sizes as compared with previous years, or of a change in the seasonal cycle of the above. But, in order to measure deviations, it is first necessary to determine the norm from which they deviate. We can define the average year as follows: In the average year (during the period 1931–1948) there were 94,196,000 pounds of haddock (30,791,000 pounds of scrod and 63,405,000 pounds of large) landed from Georges Bank. The average weight of these fish was 2.55 pounds (1.69 for scrod, 3.40 for large) and 36,875,000 individual fish (18,214,000 scrod and 18,661,000 large) were landed. Of these numbers landed, there were practically none less than 27 centimeters (9.6 inches), and none more than 81 centimeters (32.1 inches) in length. The 45-centimeter (17.9-inch)

group contained the most fish and over 66 percent of all haddock landed were between the 42-centimeter (16.2-inch) group and the 54-centimeter (22.1-inch) group in length.

Also in the average year about 4,974,000 fish or 13.5 percent of the total number landed were smaller than the established minimum market size of 1½ pounds.

3. So far as subareas of Georges Bank are concerned, in the average year (1936 to 1948 only) the Northern Edge, though not the largest area, has been the largest producer, with 35 percent of the total poundage.

Percentages for scrod, large, and total haddock from the four areas are as follows:

	Scrod	*Large*	*Total haddock*
Northern Edge	39. 5	32. 9	35. 2
Southeast Part	26. 3	23. 3	24. 4
South Channel	28. 6	36. 4	33. 6
Southwest Part	5. 6	7. 4	6. 8
	100. 0	100. 0	100. 0

4. The seasonal landings, for the average year, are shown in table 36 by pounds, numbers, and average weights.

TABLE 36.—*Seasonal average weights and quantities landed*

	Pounds of fish (thousands)	Number of fish (thousands)	Average weight per fish (pounds)
Spring:			
Scrod	5, 273	2, 819	1. 871
Large	15, 899	4, 276	3. 718
Total	21, 172	7, 095	2. 984
Summer:			
Scrod	8, 448	5, 430	1. 556
Large	20, 389	6, 444	3. 163
Total	28, 837	11, 876	2. 430
Fall:			
Scrod	12, 147	7, 064	1. 719
Large	18, 152	5, 491	3. 306
Total	30, 299	12. 555	2. 413
Winter:			
Scrod	4, 923	2, 901	1. 697
Large	8, 965	2, 449	3. 661
Total	13, 888	5, 349	2. 596
Year:			
Scrod	30, 791	18, 214	1. 691
Large	63, 405	18, 660	3. 398
Total	94, 196	36, 875	2. 554

From table 36, we have computed the percent by weight and the percent by number for scrod, large, and total haddock of the year's landings. They are as follows:

	By weight	*By number*
Scrod:		
Spring	17. 1	15. 5
Summer	27. 4	29. 8
Fall	39. 5	38. 8
Winter	16. 0	15. 9
Total year	100. 0	100. 0
Large:		
Spring	25. 1	22. 9
Summer	32. 2	34. 6
Fall	28. 6	29. 4
Winter	14. 1	13. 1
Total year	100. 0	100. 0
Total haddock:		
Spring	22. 5	19. 2
Summer	30. 6	32. 2
Fall	32. 2	34. 1
Winter	14. 7	14. 5
Total year	100. 0	100. 0

Landings of undersized haddock were greatest in the fall season, when 38 percent of the yearly average landings of undersized fish occurred. The summer season accounted for 30 percent, the winter season for 20 percent, and the spring season for the least quantity, 12 percent. Considering each season separately, the percentages of haddock landed that were undersized are as follows:

	Percent undersized
Spring	8. 1
Summer	12. 7
Fall	15. 1
Winter	18. 7
Total year	13. 5

5. Having thus developed average values of important characteristics of the landings, each individual year can be evaluated by comparing it with these norms. For instance, considering 1934 (the poorest year of haddock production), we see that only 12,976,000 pounds of scrod as compared with the average of 30,791,000 pounds were landed; only 36,908,000 pounds of large haddock as compared with the average of 63,405,000; and only 49,884,000 pounds of all haddock as compared with the average of 94,196,000. Average weights for 1934 as compared to the average year were:

	1934	*Average year*
Scrod	1. 62	1. 69
Large	3. 26	3. 40
Total haddock	2. 58	2. 55

The numbers of fish landed in 1934 as compared with 18-year averages were: scrod 8,024,000 (18,214,000), large 11,311,000 (18,661,000), total haddock 19,335,000 (36,875,000).

In addition to such yearly deviations, seasonal deviations for 1934 can be compared with average seasonal values, and subarea contributions can be evaluated in terms of average subarea contributions.

6. For a rapid evaluation of how each of the 18 years deviate in the more important characteristics from the average year, table 37 has been prepared. Shown are the percentages that the individual years are above or below the 18-year average; pounds, numbers, and average weights are treated, for large, scrod and total haddock.

7. The data in this paper serve (1) as a record of the total landings of haddock from Georges Bank in terms of pounds, average weights, numbers and sizes of scrod, large, and total haddock, by seasons and years over the 18-year period, 1931 to 1948; and (2) as a basis for developing other data, among which will be the age composition of the landings; the size of various ages; year class contributions; and estimates of the relative size of the stock on the banks, of rates of decline of year classes, and of mortality rates.

TABLE 37.—*Percentage deviations of quantities and average weights from the average year*

	1931	1932	1933	1934	1935	1936	1937	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947	1948
Pounds:																		
Scrod	−43.2	2.3	−38.9	−57.9	−17.1	−2.7	1.0	29.6	40.1	−3.9	74.6	60.7	21.8	−50.5	−62.1	−31.4	32.8	44.7
Large	53.8	16.6	−.9	−41.8	−15.4	−14.7	1.5	−17.2	−3.2	−.6	7.2	−9.1	−17.9	27.4	5.0	30.5	1.5	−22.8
Total	22.1	11.9	−13.3	−47.0	−15.9	−10.8	1.3	−1.9	11.0	−1.6	29.2	13.7	−4.9	1.9	−16.9	10.3	11.8	−.7
Numbers:																		
Scrod	−39.4	−3.5	−35.7	−55.9	−15.4	1.2	−2.4	30.5	38.1	−9.9	77.6	53.8	17.2	−52.8	−59.3	−29.4	34.4	50.8
Large	50.5	17.4	2.8	−39.4	−9.4	−9.1	.5	−24.3	.2	−.6	1.4	−7.6	−13.8	31.5	2.5	31.4	−7.3	−26.5
Total	6.1	7.1	−16.2	−47.6	−12.4	−4.0	−.9	2.8	18.9	−5.2	39.0	22.7	1.5	−10.1	−28.0	1.4	13.3	11.6
Average weights (pounds):																		
Scrod	−6.2	6.0	−5.1	−4.3	−1.9	−3.8	3.4	−.7	1.4	6.7	−1.7	4.5	3.9	4.8	−6.9	−2.9	−1.2	−4.0
Large	2.2	−.7	−3.6	−4.0	−6.6	−6.2	1.0	9.4	−3.3	0	5.7	−1.7	−4.7	−3.2	2.5	−.6	9.4	5.1
Total	15.1	4.5	3.4	1.0	−4.0	−7.1	2.3	−4.5	−5.7	3.7	−7.0	−7.4	−6.3	13.4	15.4	8.8	−1.4	−11.1

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