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Age, Length and Maturity of Adult Herring in ICNAF Divisions 5Z, 5Y, 4X and Subarea 6, 1971

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Comparisons were made of year-class contribution, length and gonadal development of adult herring collected in 1971 from ICNAF divisions 5Z, 5Y, 4X and subarea 6. Twenty-five samples (1051 herring) from 5Z, 99 samples (9226 herring) from 5Y, 41 samples (3385 herring) from 4X and 21 samples (305 herring) from 6 were obtained for the study. Of the 99 samples obtained from 5Y, 17 (1386 herring) were from Jeffreys Ledge. The above mentioned comparisons were made (similar to ICNAF Res. Doc. 71/101, Boyar and Perkins, "Age, length and maturity of adult herring in ICNAF subareas 4 and 5, 1970") between herring from Jeffreys Ledge and from herring collected in other parts of 5Y.

In this report data on herring of age-groups II through VIII+ from specific locations, namely: Georges Bank (5Z), Jeffreys Ledge (5Y), and subarea 6 have been presented to encompass the entire age-group composition of the samples from the three areas. The samples from 5Y (exclusive of Jeffreys Ledge) and 4X were selected from fisheries for adult herring and include age-groups III through VIII+ (except for the fish of age-group II caught in the offshore waters of 5Y by research vessels).

Various types of trawls were used for the collection of herring in 5Z. The majority of the samples were obtained from the Georges Bank area and were collected primarily from commercial vessels. A few samples were obtained from cruises of research vessels.

Various types of trawls were the principal gear used for the collection of herring in 5Y. Occasionally, samples were obtained from purse seines. Most of the fish were taken in waters beyond the limit of the stop seines and weirs which are fished in the inshore fishery for immature herring. Samples were collected between Cape Cod, Massachusetts and the Eastport, Maine area. Three sites provided the majority of the samples: Boothbay Harbor, Maine area, Middle Bank-Stellwagen Bank area and Gloucester-Jeffreys Ledge area. Additional samples were from the Eastport, Maine area, Isles of Shoals and Provincetown, Massachusetts. The majority of the samples were obtained from commercial vessels. Only a few fish were obtained from research vessels.

Gill nets and purse seines were the gear used for the collection of herring from 4X. A few samples were obtained from weirs designed to fish for adult herring. Samples were collected in the St. Mary's Bay area on the western coast of Nova Scotia to Liverpool on the eastern coast. The majority of the samples were obtained from commercial fishermen. Only a few fish were obtained from research vessels.

In subarea 6 all the fish obtained were from cruises of a research vessel fishing with a bottom trawl.

Gonadal Development

In 5Z, 73.5 percent of herring of age-group III had matured while in 5Y (exclusive of Jeffreys Ledge), Jeffreys Ledge and 4X, 19.9 percent, 5.1 percent and 6.8 percent, respectively, of age-group III had matured. In 5Z, 100.0 percent of herring of age-group IV had matured while in 5Y (exclusive of Jeffreys Ledge), Jeffreys Ledge and 4X, 82.3 percent, 70.0 percent and 79.5 percent, respectively, of fish of this age-group had matured. In 5Z, 100.0 percent of herring of age-group V had matured while in 5Y (exclusive of Jeffreys Ledge), Jeffreys Ledge and 4X, 99.8 percent, 97.6 percent and 99.3 percent, respectively, of fish of age-group V had matured. Fish of age-group III which had matured were approximately 25.8 cm long. Fish of age-group IV which had matured were approximately 27.2 cm long, while fish of the same age-group which had not matured were less than 27.0 cm long.

There were differences in gonadal development of herring from 5Z, 5Y and 4X up to and including August (Figure 1). The data available for 5Z indicate that during the first six months of the year the majority of the fish are maturing or recovering from the previous years spawning. In 5Y the same is true as in 5Z, except that in May and June there were a small percentage of spring spawners. These spawners were collected from the Provincetown, Massachusetts area (previously reported by Boyar, 1968. "Age, length and gonadal stages of herring from Georges Bank and the Gulf of Maine." ICNAF Res. Bull. 5, p. 49-61). In 4X the full, spawning and recovering herring (through August) are dominant over the maturing fish. The majority of the herring obtained in April through August in 4X were from the St. Mary's Bay area of Nova Scotia where spring spawning occurs each year. From September through the remainder of the year the gonadal development in 4X was similar to that of 5Z and 5Y.

The onset of spawning in 5Z, 5Y (except for Jeffreys Ledge) and 4X occurred during late August and the peak of spawning occurred in October. Spawning fish were obtained in November from 5Y and 4X and from 5Y in December. The percentage of recovering fish, however, increased considerably during these months.

The only significant difference evident in the gonadal development of herring from Jeffreys Ledge and herring obtained from other sites in 5Y was that the onset of spawning on Jeffreys occurred in September (Figure 2).

Herring from subarea 6 were obtained only in March and April. In March, 77.2 percent of the fish were maturing and 22.8 percent were recovering. In April, 41.4 percent of the fish were maturing and 58.6 percent were recovering.

Year-Class Contribution

The data on year-class contribution are presented by quarters and annually for areas 5Z, 5Y, 4X and 6, in Figure 3 and for 5Y, 5Y (exclusive of Jeffreys Ledge) and Jeffreys Ledge in Figure 4. Differences were evident in the dominant year-class and rank in percentage occurrence in the various areas.

In 5Z fish of age-group III (1968 year-class) dominated the samples for the year. Herring of age-group IV (1967 year-class) ranked second in percentage occurrence followed by age-group V (1966 year-class). In quarters 1 and 3 fish of age-group III (1968 year-class) were dominant. The small number of fish obtained in the second and fourth quarters may account for the dominance of herring of age-group V (1966 year-class) and age-group IV (1967 year-class), respectively. Herring of age-group II (1969 year-class), although few in number, were obtained from various parts of Georges Bank; namely, Southwest Part, Southeast Part, Southwest Corner, Little Georges and the Northeast Peak. They were collected in March, May and August.

In 5Y (exclusive of Jeffreys Ledge), herring of age-group VI (1965 year-class) dominated the samples for the year, followed in percentage occurrence by age-group V (1966 year-class) and age-group VII (1964 year-class). In the second quarter herring of age-group VIII+ (1962 year-class and older) were dominant; in the third quarter fish of age-group VI (1965 year-class) and in quarter four fish of age-group VII (1964 year-class) were dominant. The few herring of age-group II(1969 year-class) in 5Y were obtained in April, 20 miles south of Monhegan Island, Maine.

On Jeffreys Ledge fish of age-group VIII+ (1962 year-class and older) dominated the samples for the year followed in percentage occurrence by herring of age-group VI (1965 year-class) and herring of age-group VII (1964 year-class). There was only a slight difference in percentage between the occurrence of age-groups VIII+ (1962 year-class and older) and VI (1965 year-class). Except for the fourth quarter, fish of the older age-groups dominated the samples in the two other quarters. The abundance of young fish on Jeffreys Ledge in the fourth quarter may be explained on the assumption that, in general, the larger fish of a given population spawn first and are replaced by the smaller fish of the population. A few herring of age-group II (1969 year-class) were obtained from Jeffreys in April and September.

In 4X herring of age-group VI (1965 year-class) dominated the samples for the year, followed in percentage occurrence by age-groups VII (1964 year-class) and age-group VIII+ (1962 year-class and older). In the second quarter herring of age-group VII (1964 year-class) were dominant; in the third quarter herring of age-group VI (1965 year-class) were dominant and in the fourth quarter herring of age-group IV (1967 year-class) were dominant.

In subarea 6 herring of age-group III (1968 year-class) dominated the samples for the year, followed in percentage occurrence by age-group VI (1965 year-class) and age-group II (1969 year-class). It appears that the herring obtained in subarea 6 were migrants from Georges Bank and from the waters off Cape Cod, Massachusetts area and southward. It is also possible that some herring from the extreme part of western 5Y (Nantucket Shoals area) migrate into subarea 6 in late winter. The herring of age-group II (1969 year-class) were obtained in March and April primarily from 25 miles southwest of Montauk Point, Long Island, New York and from 25 miles southwest of Martha's Vineyard Island.

In summary, the dominant year-class in areas 5Z and 6 were 1968 (age-group III); the dominant year-classes from 5Y (exclusive of Jeffreys Ledge), Jeffreys Ledge, and 4X were 1965, 1962 and older, and 1965, respectively. There was little similarity between the areas in regard to the annual occurrence of the second and third dominant year-classes.

Length-frequency Distributions

In 5Z herring (age-groups II-VIII+) ranged in length from 12.7 to 34.7 cm; herring from 5Y (exclusive of Jeffreys Ledge) (age-groups II to VIII+) ranged in length from 19.7 to 36.8 cm; herring from Jeffreys Ledge (age-groups II-VIII+) ranged in length from 11.8 to 40.0 cm; herring from 4X (age-groups III-VIII+) ranged in length from 20.7 to 36.5 cm; and herring from subarea 6 (age-groups II-VIII+) ranged in length from 10.9 to 34.2 cm. The mean lengths of fish of a given age-group of the various year-classes (except for the age-group II) for a particular month did not appear to differ between areas (Table 1).

Table 1. Mean lengths by months of herring of various year-classes from 5Z, 5Y minus Jeffreys Ledge (5Y), Jeffreys Ledge (JL), 4X and 6, 1971.

YEAR CLASS	AGE GROUP	AREA	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
1969	II	5Z	--	--	10.9	--	13.7	--	--	21.7	--	--	--	--
		5Y	--	--	--	11.8	--	--	--	--	--	--	--	--
		JL	--	--	--	12.5	--	--	--	--	20.7	--	--	--
		4X	--	--	--	--	--	--	--	--	--	--	--	--
		6	--	--	15.9	16.3	--	--	--	--	--	--	--	--
1968	III	5Z	22.5	--	21.2	--	23.6	--	25.0	25.2	25.7	25.9	--	--
		5Y	--	--	--	19.7	24.1	24.1	24.9	25.2	25.5	25.2	25.7	--
		JL	--	--	--	--	--	24.8	--	--	25.6	26.1	25.7	--
		4X	--	--	--	22.6	23.2	24.0	25.0	25.2	26.1	26.1	--	--
		6	--	--	22.1	22.4	--	--	--	--	--	--	--	--
1967	IV	5Z	25.3	--	--	--	25.2	--	27.1	27.1	27.3	27.5	--	--
		5Y	--	--	--	--	25.7	26.3	27.1	27.5	27.4	27.2	27.7	27.9
		JL	--	--	--	--	--	26.4	26.8	--	27.5	27.5	27.6	--
		4X	--	--	--	26.0	26.5	26.0	26.6	27.5	27.5	27.6	--	--
		6	--	--	24.7	25.8	--	--	--	--	--	--	--	--
1966	V	5Z	27.5	--	--	--	27.1	--	28.6	28.7	29.0	29.2	--	--
		5Y	--	--	--	--	27.7	28.4	28.8	29.1	29.1	29.3	29.4	29.7
		JL	--	--	--	28.1	--	28.5	29.1	--	29.3	29.2	29.2	--
		4X	--	--	--	27.2	28.0	28.2	28.5	29.1	29.3	29.2	29.9	--
		6	--	--	27.9	27.9	--	--	--	--	--	--	--	--
1965	VI	5Z	29.4	--	--	--	--	--	29.9	30.3	30.5	30.7	--	--
		5Y	--	--	--	--	29.3	29.7	30.3	30.4	30.5	30.9	30.8	31.4
		JL	--	--	--	29.4	--	29.9	30.4	--	30.6	30.8	31.0	--
		4X	--	--	--	29.3	29.4	29.8	29.9	30.5	30.6	30.9	30.9	--
		6	--	--	29.3	29.5	--	--	--	--	--	--	--	--
1964	VII	5Z	30.4	--	--	--	31.0	--	30.1	31.4	32.0	32.1	--	--
		5Y	--	--	--	--	30.8	31.1	31.7	31.8	32.0	32.2	32.2	32.4
		JL	--	--	--	30.8	--	31.3	31.7	--	32.0	32.3	32.1	--
		4X	--	--	--	30.7	31.0	31.3	31.4	31.9	31.9	32.1	32.1	--
		6	--	--	--	30.9	--	--	--	--	--	--	--	--
1963	VIII	5Z	31.9	--	--	--	--	--	--	32.6	32.7	33.1	--	--
		5Y	--	--	--	--	32.0	32.2	32.6	32.4	32.9	33.0	33.2	33.1
		JL	--	--	--	32.0	--	32.3	32.5	--	32.9	33.0	33.2	--
		4X	--	--	--	31.9	32.1	32.4	32.5	32.9	32.9	33.1	33.1	--
		6	--	--	31.6	32.0	--	--	--	--	--	--	--	--
1962 and older	VIII+	5Z	--	--	--	--	32.8	--	--	33.1	33.5	34.0	--	--
		5Y	--	--	--	--	33.8	33.7	34.0	34.2	34.0	34.0	34.3	34.1
		JL	--	--	--	33.4	--	33.7	33.6	--	34.0	34.3	34.5	--
		4X	--	--	--	32.9	33.6	33.7	34.2	34.4	34.5	34.4	34.7	--
		6	--	--	33.5	33.0	--	--	--	--	--	--	--	--

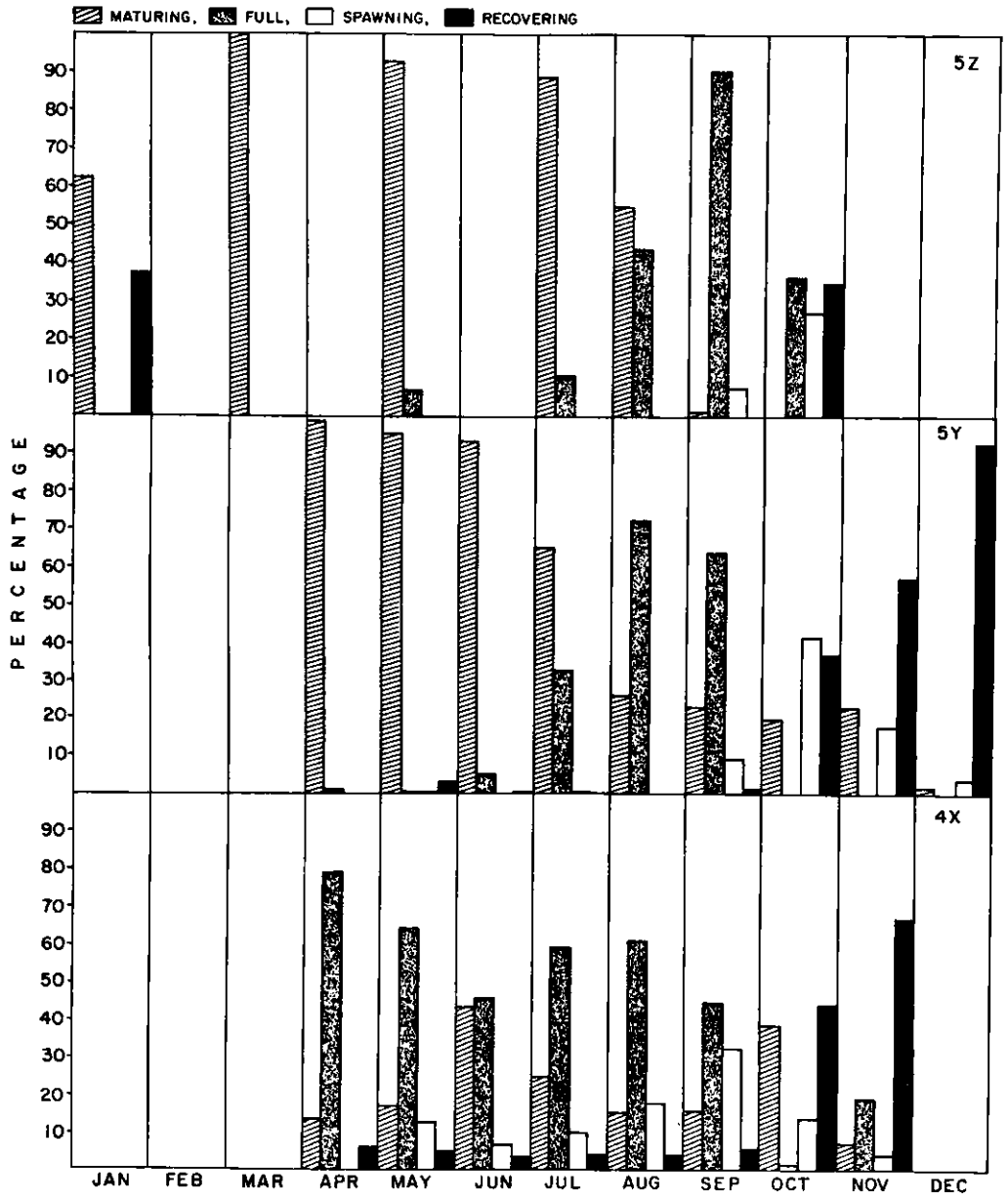

Figure 1. Gonadal development of herring from divisions 5Z, 5Y and 4X, 1971.

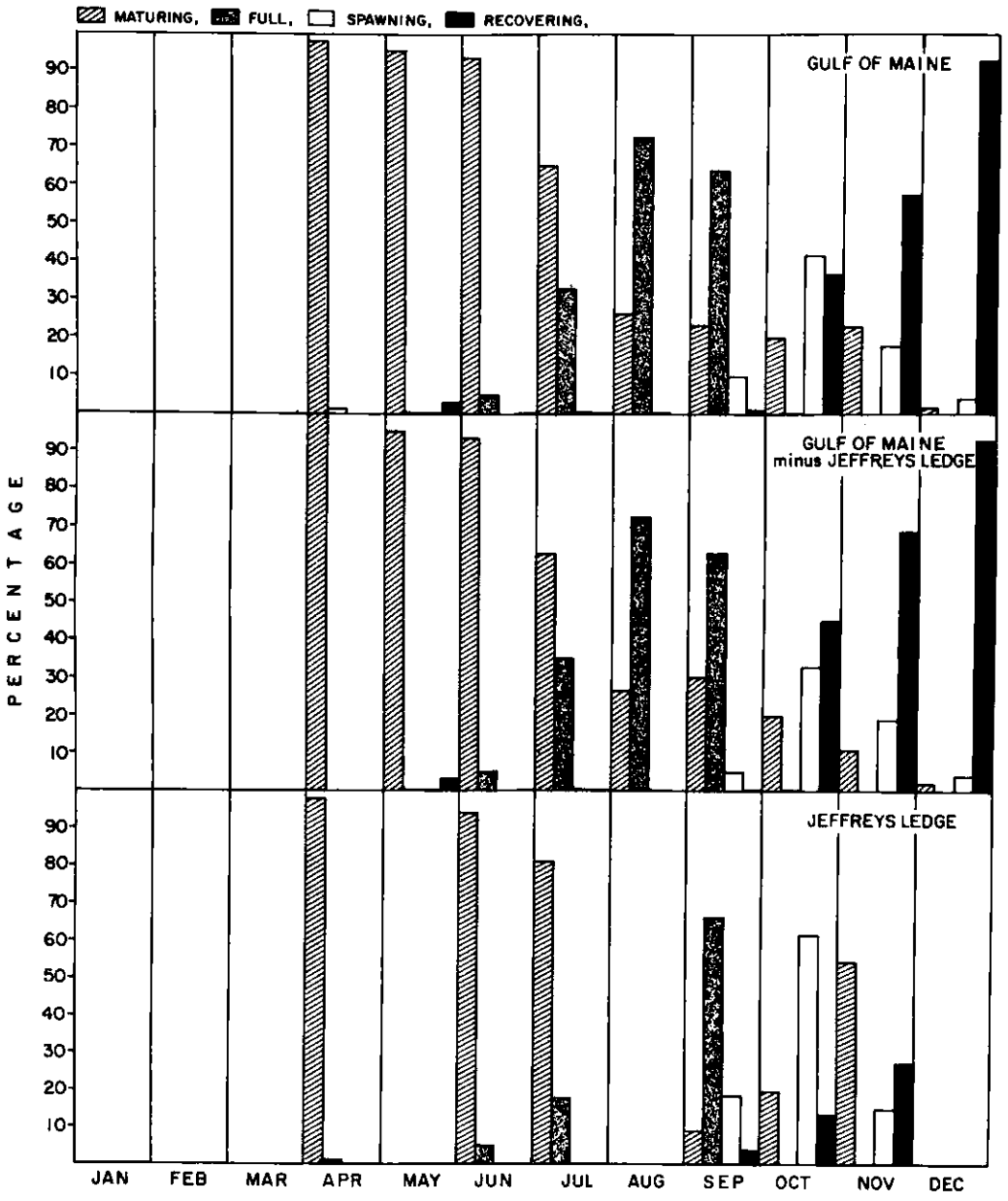

Figure 2. Gonadal development of herring from 5Y, 5Y minus Jeffreys Ledge and Jeffreys Ledge, 1971.

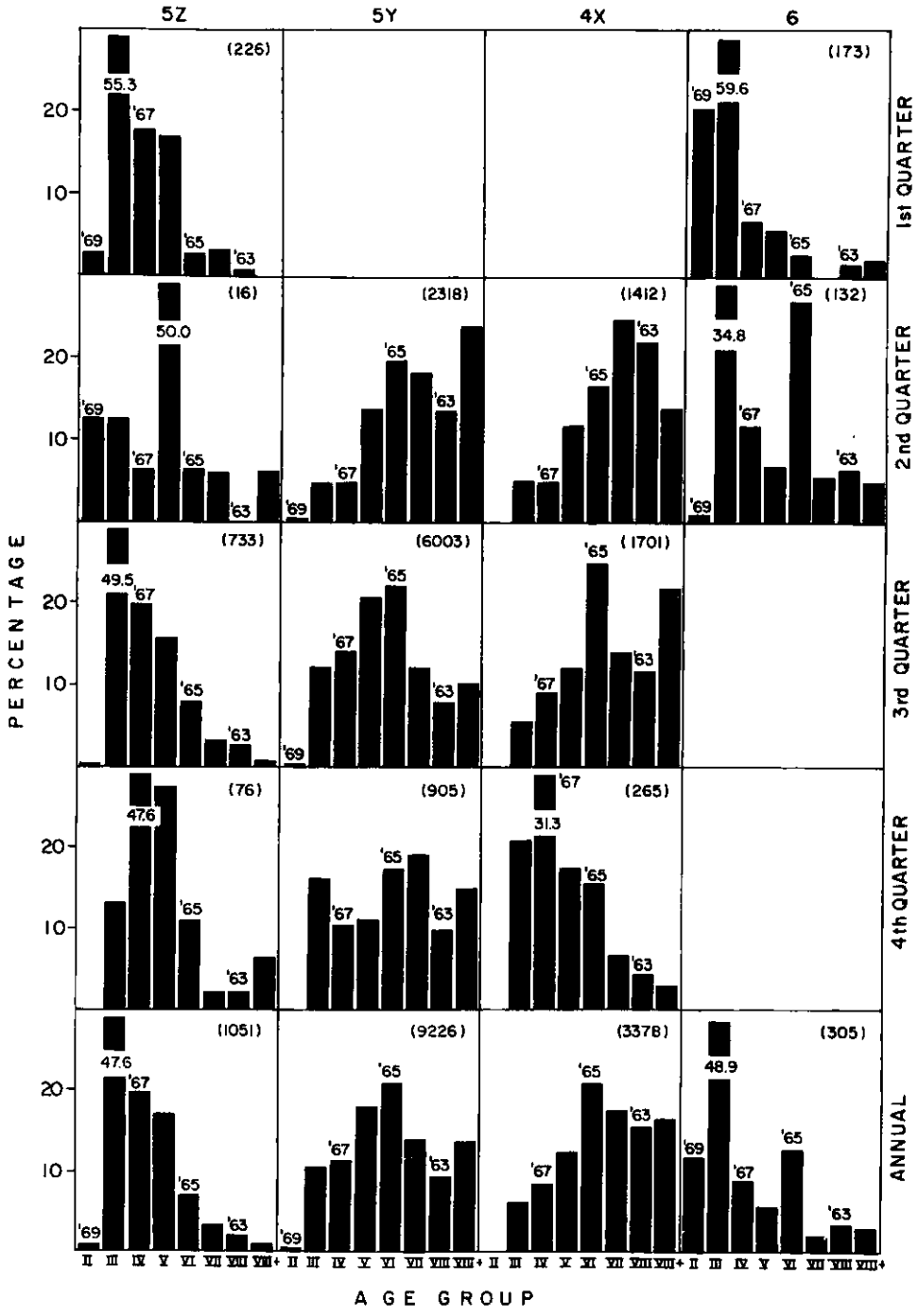

Figure 3. Age composition of herring from divisions 5Z, 5Y,4X and subarea 6, 1971. The total number of fish sampled are indicated in parentheses.

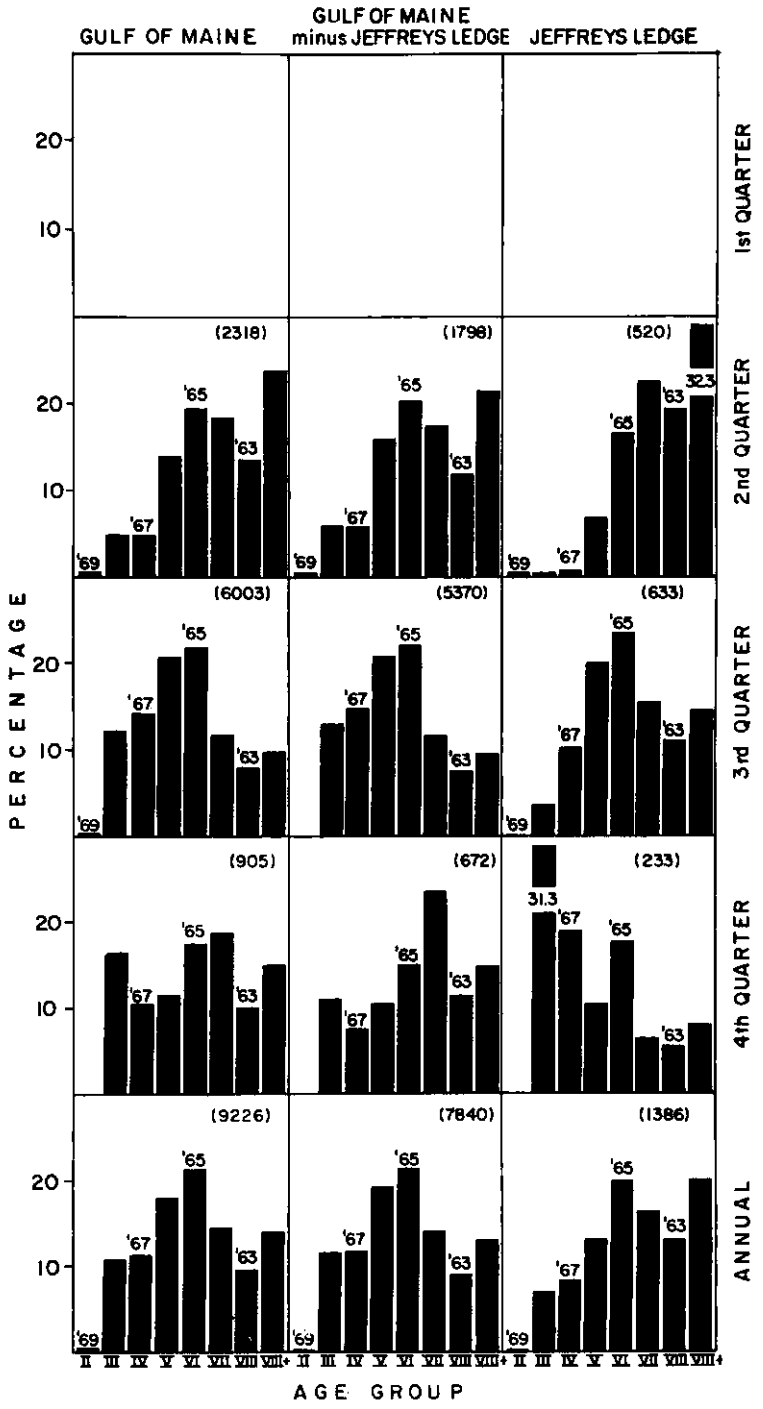

Figure 4. Age composition of herring from 5Y, 5Y minus Jeffreys Ledge and Jeffreys Ledge, 1971. The total number of fish sampled are indicated in parentheses.