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Size, age and sexual maturity of cod (*Gadus morhua* L.)
from Newfoundland and Nova Scotia fishing grounds, spring 1965

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Introduction

Materials for this report were collected during a cruise of the research ship *Wieczno* (796 BRT, engine 1, 375 HP) from 14 April to 7 June 1965. The investigations were carried out on the fishing grounds off Newfoundland (Divisions 3L, 3M, 3N, 3O, 3P) and Nova Scotia (Divisions 4V, 4W), i. e. from 15 different fishing grounds. The areas of investigation are given in Fig. 1.

The fish were taken from experimental catches made to investigate the selectivity of the bottom otter trawl. The mean mesh size in the codend of the trawl was 40 mm.

A total of 33,943 cod was measured and 5,009 individuals were subject to biological analysis. Numerical data on the material collected from the respective fishing grounds are given in Table 1.

Investigations included the distribution of cod over fishing grounds and the catch per effort, as well as the length composition, age and sexual maturity. The age composition of cod in cases where the number of measured fish exceeded the number of fish for which age-readings were made was determined with the aid of age/length key. Sexual maturity was determined according to Maier's scale.

Occurrence in the catches

The percentage of cod in the catches is shown in Table 2. Percentages varied according to the particular fishing grounds. As a rule the percentage was greater on the fishing grounds off Newfoundland.

Off Newfoundland the catch per effort varied from 28.1 to 311.7 kg per hour. The best catches were obtained at the central (310.5 kg per hour) and eastern part (311.7 kg per hour) of Great Newfoundland Bank (3N, 3O). The poorest results were obtained on southwestern (21.1 kg per hour) and north-eastern slopes (45.0 kg per hour) of the bank (3O, 3L). Occurrence of cod in the catches on fishing grounds off Newfoundland varied from 14.5 to 86.7%.

In the fishing grounds off Nova Scotia best catch per effort was obtained on Scatari Bank (4V). Also weight percentage of cod on this fishing ground (40.6%) was higher than on the other fishing grounds.

Length composition

Length composition of cod taken from the various fishing grounds is shown in Figs. 2 and 3, whereas mean length is given in Table 3.

The data show differences in length composition of cod on particular fishing grounds. For example, on Great Newfoundland Bank (3O), the catches were based on fish of 54-71 cm length (mean 66.0 cm); over southeastern slopes of this bank (3N) 63-74 cm (mean 79.0 cm); on Scatari Bank (4V) - 48-65 cm (mean 58.8 cm) and on Artimon Bank (4V) - 45-68 cm (mean 57.6 cm).

Smaller cod were captured on the eastern slopes of Great Newfoundland Bank (3N), mostly fish of 27-47 cm length (mean 45.7 cm). Particularly small cod were taken on Banquereau Bank (4V) - mostly 21-44 cm (mean 37.5 cm), on Sable Island Bank (4W) - 24-41 cm (mean 46.1 cm), on Middle Ground (4W) - 21-32 cm (mean 37.1 cm) and on Western Bank (4W) - 24-41 cm (mean 47.7 cm).

In general larger cod were found on the fishing grounds off Newfoundland than on fishing grounds of Nova Scotia.

On many fishing grounds cod of over 100 cm in length were captured. Only on Flemish Cap (3M), Middle Ground (4W) and Western Bank (4W) were large cod not encountered. Especially large cod was observed on the south-eastern slopes of Great Newfoundland Bank (3N).

Age composition

Age composition of cod captured in various fishing grounds is given in Figs. 2 and 3.

On Newfoundland fishing grounds cod were mainly 3 to 7 years old (year-classes 1962-1958). On Flemish Cap (3M) the year-class 1958 (7 years old) was particularly abundant, making 39.2% of the catch. Over the eastern slopes of Great Newfoundland Bank (3N) cod of the year-classes 1962 and 1961 (3 and 4 years old) made up 30.4% of the catches. On the middle part of Great Bank (3O) catches were mainly (43.9%) of the year-classes 1959 and 1958 (6 and 7 years old fish). On the other fishing grounds of Newfoundland, mostly 1962-1954 year-classes (3-11 year-old fish) were captured. On some fishing grounds (northwestern slopes of Woolfall Bank, middle part of Great Newfoundland Bank and the eastern slopes of this bank) older fish (more than 10 years old) were dominant.

On fishing grounds off Nova Scotia (except Scatari Bank) the age composition of the catch was more uniform. Here, younger fish occurred, mainly 1963-1961 year-classes (2-4 years old). In the region of Banquereau Bank (4V) 1962 year-class (3 years old) were dominant, making up 54.1% of the samples. On the fishing grounds of Sable Island Bank (4W) and Middle Ground (4W) mainly the 1963 and 1962 year-classes (2 and 3 year old fish) were noted, making up 48.8 and 69.8% of samples. On Western Bank (4W) the 1962 and 1961 year-classes (3 and 4 years old) were the main ones captured, totalling 44.6%.

Generally more young fish were taken off Nova Scotia (except Scatari Bank) than off Newfoundland.

Comparing the 1965 results to the results of investigations carried out by Cendrero (1965), Dias (1965) and Figueras (1965) in 1964, it may be noted that the same year-classes occur in greater abundance on the same fishing grounds.

Sexual maturity

The stage of sexual maturity of cod on different fishing grounds is shown in Table 4.

On all the fishing grounds cod in the resting stage (II) predominated. On Scatari Bank (4V) in the middle of May, a large number of cod with gonads in stages IV and V was observed (19.9 and 8.8%). Cod with gonads running (VI and VII) occurred on all the fishing grounds in insignificant numbers. However at the northwestern part of Woolfall Bank (3L) at the beginning of June, 42.2% of the cod were in the running stage. Males were more abundant among the spawning cod.

Conclusions

Cod were more plentiful off Newfoundland than off Nova Scotia.

Differences in length composition of cod were found on different fishing grounds. Generally off Newfoundland cod were larger than off Nova Scotia.

Off Newfoundland, cod of the 1962-1958 year-classes (3-7 years old) were found in the catches, whereas off Nova Scotia - the 1963-1961 year-classes (2-4 year old fish) were found. In general more young cod were captured off Nova Scotia than on the fishing grounds off Newfoundland.

Generally in May and June a small number of fish were captured with gonads in the running stages (VI and VII). Only on the northwestern part of Woolfall Bank (3L) were more than 40% of fish with gonads in the running stage.

References

- Cendrero, O. 1965. Some aspects of the biology of cod from the Newfoundland fishing grounds in 1964. Ann. Meet. ICNAF 1965. Research Doc. No. 22.
- Dias, M. L. 1965. Portuguese Research Report. Ann. Meet. ICNAF 1965. Research Doc. No. 14.
- Figueras, A. 1965. Age and growth of cod caught by the Spanish trawler Aquilon in Subareas 2-4 in 1964. Ann. Meet. ICNAF Research Doc. No. 24.

Table 1. Location, date, depth of areas of cod investigation, spring 1965.

Location of fishing grounds	Date	Depths (m)	Fish measured (no)	Fish analysed (no)
1 Flemish Cap	Apr.16, June 7	180-360	468	278
2 Northeastern slopes of Great Newfoundland Bank	May 31, June 1	88-220	500	400
3 Eastern part of Woolfall Bank	June 2	80-84	1 033	407
4 Northwestern part of Woolfall Bank	June 3-4	120-140	1 453	413
5 Middle part of Great Newfoundland Bank	May 29	68-90	2 110	413
6 Eastern slopes of Great Newfoundland Bank	Apr.17-20	100-180	19 325	715
7 Southeastern slopes of Great Newfoundland Bank	Apr. 24	40-60	137	137
8 Southwestern slopes of Great Newfoundland Bank	Apr.28-29	100-180	235	235
9 St.Pierre Bank	Apr.30 May 1,22 -23	60-330	412	412
10 Scatari Bank	May 18-19	130-180	1 058	429
11 Artimon Bank	May 17	80-140	238	-
12 Banquereau Bank	May 2-3	60-200	6 435	682
13 Sable Island Bank	May 4-12	60-100	279	228
14 Middle Ground	May 27	120-180	141	141
15 Western Bank	May 11	72-108	119	119
Total			33 943	5 009

Table 2. Occurrence of cod in catches.

Location of fishing grounds	Catch per effort (kg per hr)	Weight of cod in catches (%)
1 Flemish Cap	69,2	14,5
2 Northeastern slopes of Great Newfoundland Bank	45,0	21,3
3 Eastern part of Woolfall Bank	113,6	70,2
4 Northwestern part of Woolfall Bank	153,7	38,0
5 Middle part of Great Newfoundland Bank	310,5	86,7
6 Eastern slopes of Great Newfoundland Bank	311,7	75,9
7 Southeastern slopes of Great Newfoundland Bank	78,9	36,0
8 Southwestern slopes of Great Newfoundland Bank	28,1	9,1
9 St. Pierre Bank	19,3	8,5
10 Scatari Bank	137,1	40,6
11 Artimon Bank	61,5	25,0
12 Banquereau Bank	80,4	28,9
13 Sable Island Bank	20,0	37,1
14 Middle Ground	12,5	5,7
15 Western Bank	14,0	42,0

Table 3. Mean lengths (cm) of cod in catches

Fishing grounds	Mean length (cm)
1 Flemish Cap	52,8
2 Northeastern slopes of Great Newfoundland Bank	49,9
3 Eastern part of Woolfall Bank	52,8
4 Northwestern part of Woolfall Bank	65,4
5 Middle part of Great Newfoundland Bank	66,0
6 Eastern slopes of Great Newfoundland Bank	45,7
7 Southeastern slopes of Great Newfoundland Bank	79,8
8 Southwestern slopes of Great Newfoundland Bank	54,9
9 St. Pierre Bank	54,1
10 Scatari Bank	58,8
11 Artimon Bank	57,6
12 Banquereau Bank	37,5
13 Sable Island Bank	46,1
14 Middle Ground	37,1
15 Western Bank	47,7



Table 4. Sexual maturity of cod according to Maier's scale

Fishing grounds	Date	Sex	% of fish in particular stage of sexual maturity							Total
			I-II	III	IV	V	VI	VII	VIII	
1 Flemish Cap	Apr. 16 Jun 7	♂	20,5	-	-	-	0,3	0,4	31,3	52,5
		♀	47,1	-	-	0,4	-	-	-	47,5
		♂ + ♀	67,6	-	-	0,4	0,3	0,4	31,3	100,0
2 Northeastern slopes of Great Newfoundland Bank	May 31 June 1	♂	35,8	-	-	-	1,8	2,2	9,7	49,5
		♀	48,0	-	1,7	0,5	0,3	-	-	50,5
		♂ + ♀	83,8	-	1,7	0,5	2,1	2,2	9,7	100,0
3 Eastern part of Woolfall Bank	June 2	♂	39,1	-	-	0,3	1,7	1,2	7,1	49,4
		♀	47,4	-	1,2	2,0	-	-	-	50,6
		♂ + ♀	86,5	-	1,2	2,3	1,7	1,2	7,1	100,0
4 Northwestern part of Woolfall Bank	June 3-4	♂	15,9	-	0,5	0,5	24,1	14,2	4,8	60,0
		♀	19,0	-	5,3	11,1	3,4	0,5	0,7	40,0
		♂ + ♀	34,9	-	5,8	11,6	27,5	14,7	5,5	100,0
5 Middle part of Great Newfoundland Bank	May 29	♂	30,0	1,2	-	0,2	7,8	3,9	7,3	50,4
		♀	38,7	-	5,8	3,4	1,0	0,2	0,5	49,6
		♂ + ♀	68,7	1,2	5,8	3,6	8,8	4,1	7,8	100,0
6 Eastern slopes of Great Newfoundland Bank	Apr. 17-20	♂	37,5	0,1	0,4	2,8	1,8	0,3	0,3	43,2
		♀	50,7	0,1	5,4	0,6	-	-	-	56,8
		♂ + ♀	88,2	0,2	5,8	3,4	1,8	0,3	0,3	100,0
7 Southeastern slopes of Great Newfoundland Bank	Apr. 24	♂	11,0	0,7	0,7	15,3	27,7	0,7	2,2	58,3
		♀	18,3	-	21,9	1,5	-	-	-	41,7
		♂ + ♀	29,3	0,7	22,6	16,8	27,7	0,7	2,2	100,0
8 Southwestern slopes of Great Newfoundland Bank	Apr. 28-29	♂	45,5	0,4	-	4,3	1,3	1,3	1,7	54,5
		♀	36,6	-	8,5	0,4	-	-	-	45,5
		♂ + ♀	82,1	0,4	8,5	4,7	1,3	1,3	1,7	100,0
9 St. Pierre Bank	Apr. 30 May 1, " 22-23	♂	33,1	-	0,7	0,7	9,3	1,2	1,9	46,9
		♀	46,8	0,7	4,4	0,7	0,5	-	-	53,1
		♂ + ♀	79,9	0,7	5,1	1,4	9,8	1,2	1,9	100,0
10 Scatari Bank	May 18-19	♂	14,0	-	1,2	7,2	9,1	3,5	7,0	42,0
		♀	36,1	0,7	18,7	1,6	0,9	-	-	58,0
		♂ + ♀	50,1	0,7	19,9	8,8	10,0	3,5	7,0	100,0
11 Artimon Bank	No sexual determination									
12 Banquereau Bank	May 2-3	♂	37,0	1,5	0,3	1,3	8,8	3,6	5,0	57,5
		♀	35,3	0,3	3,4	1,7	0,9	0,6	0,3	42,5
		♂ + ♀	72,3	1,8	3,7	3,0	9,7	4,2	5,3	100,0
13 Sable Island Bank	May 4-12	♂	23,3	0,9	-	0,4	6,6	7,0	14,0	52,2
		♀	41,2	-	0,4	3,5	0,5	0,9	1,3	47,8
		♂ + ♀	64,5	0,9	0,4	3,9	7,1	7,9	15,3	100,0
14 Middle Ground	May 27	♂	41,9	-	-	-	1,4	2,1	-	45,4
		♀	52,5	-	0,7	0,7	0,7	-	-	54,6
		♂ + ♀	94,4	-	0,7	0,7	2,1	2,1	-	100,0
15 Western Bank	May 11	♂	31,9	0,8	-	0,8	1,7	3,4	11,8	50,4
		♀	48,8	-	-	-	-	-	0,8	49,5
		♂ + ♀	80,7	0,8	-	0,8	1,7	3,4	12,6	100,0

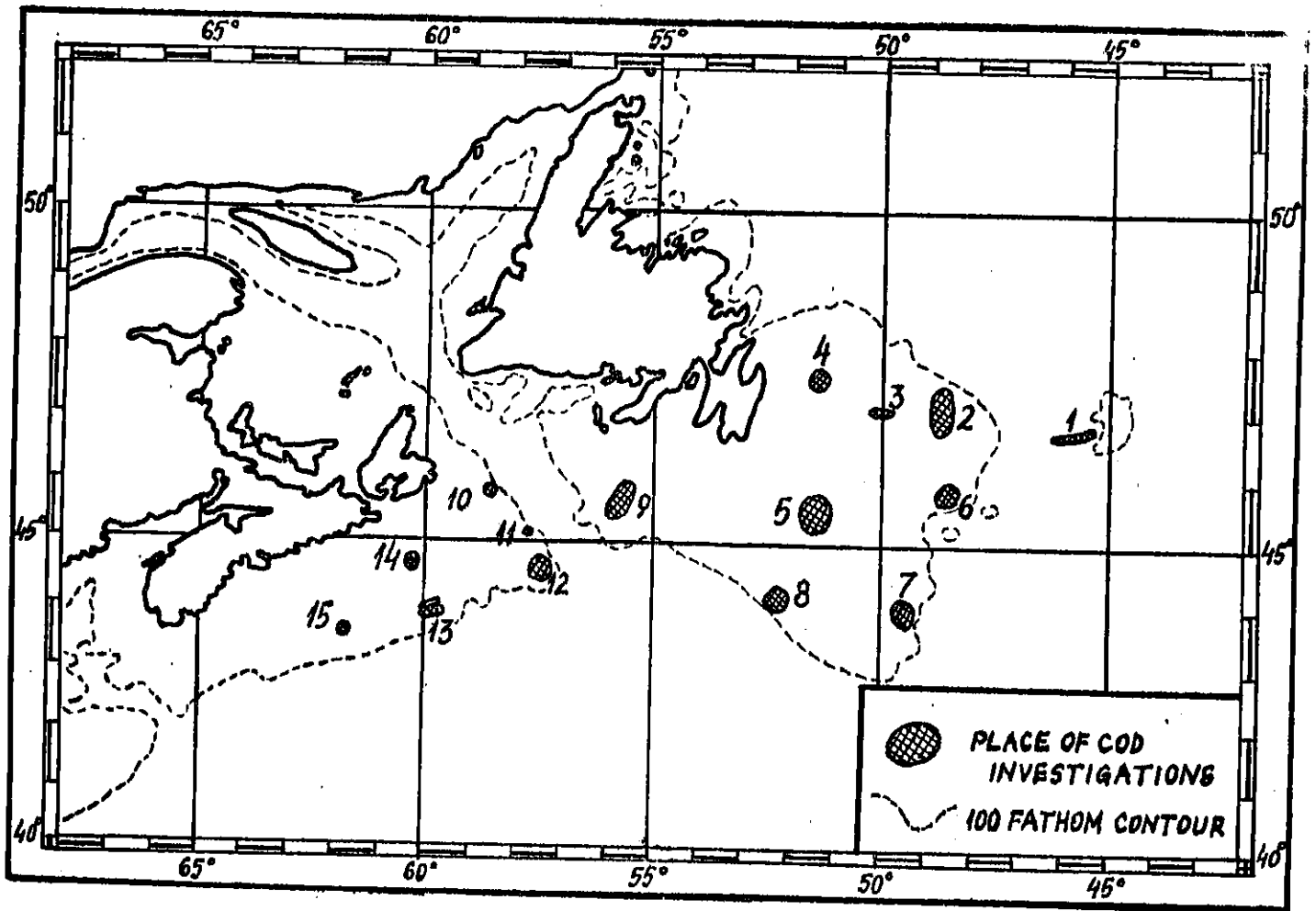


Fig. 1. Localities of cod investigations, Spring 1965. Demarcation of the places of investigations:

- 1 - Flemish Cap
- 2 - Northeastern slopes of Great Newfoundland Bank
- 3 - Eastern part of Woolfall Bank
- 4 - Northwestern part of Woolfall Bank
- 5 - Middle part of Great Newfoundland Bank
- 6 - Eastern slopes of Great Newfoundland Bank
- 7 - Southeastern slopes of Great Newfoundland Bank
- 8 - Southwestern slopes of Great Newfoundland Bank
- 9 - St. Pierre Bank
- 10 - Scatari Bank
- 11 - Artimon Bank
- 12 - Banquereau Bank
- 13 - Sable Island Bank
- 14 - Middle Ground
- 15 - Western Bank

SUBAREA 3

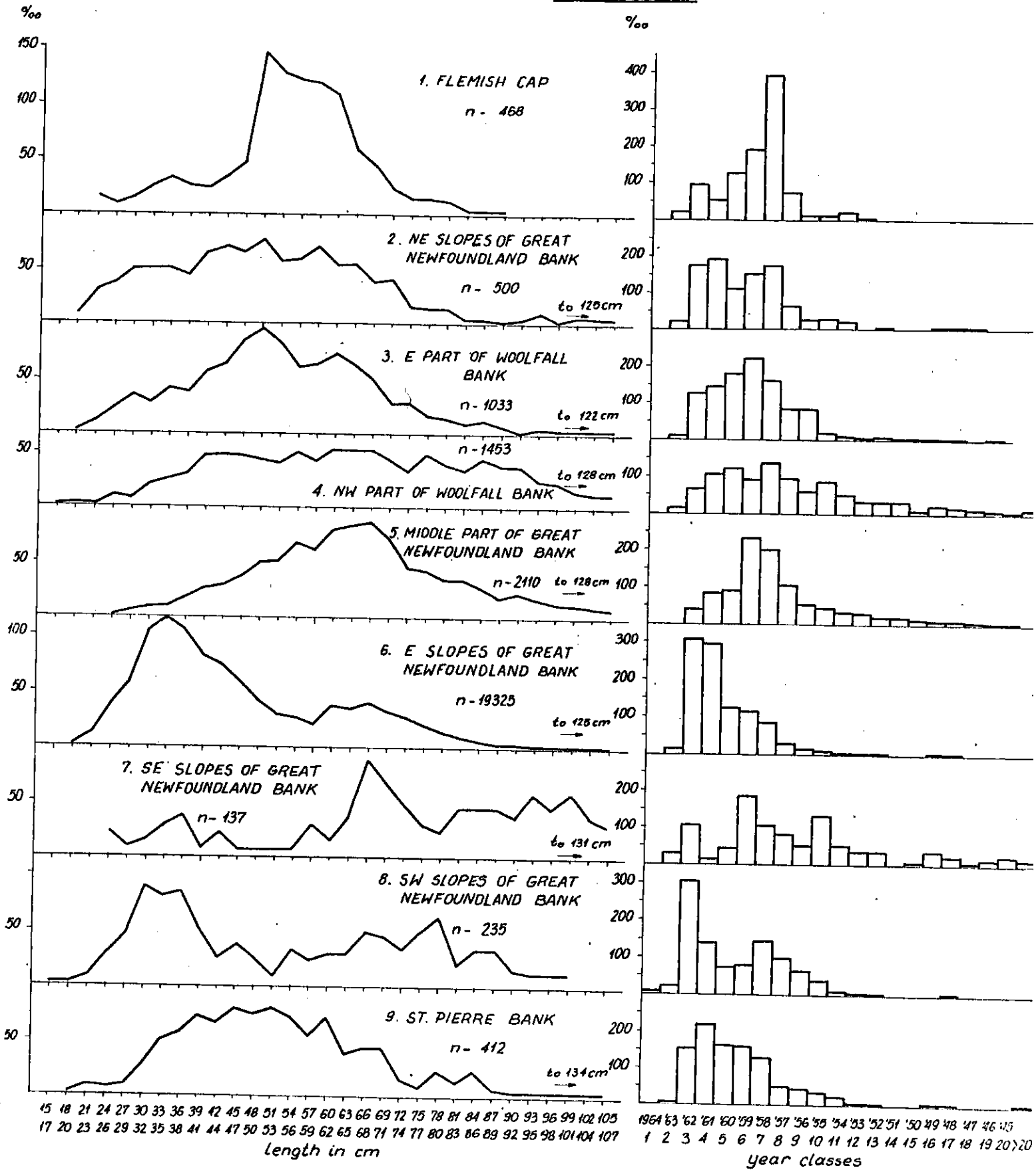


Fig. 2. Length and age composition of cod caught on the Newfoundland fishing grounds (Subarea 3), Spring 1965.

SUBAREA 4

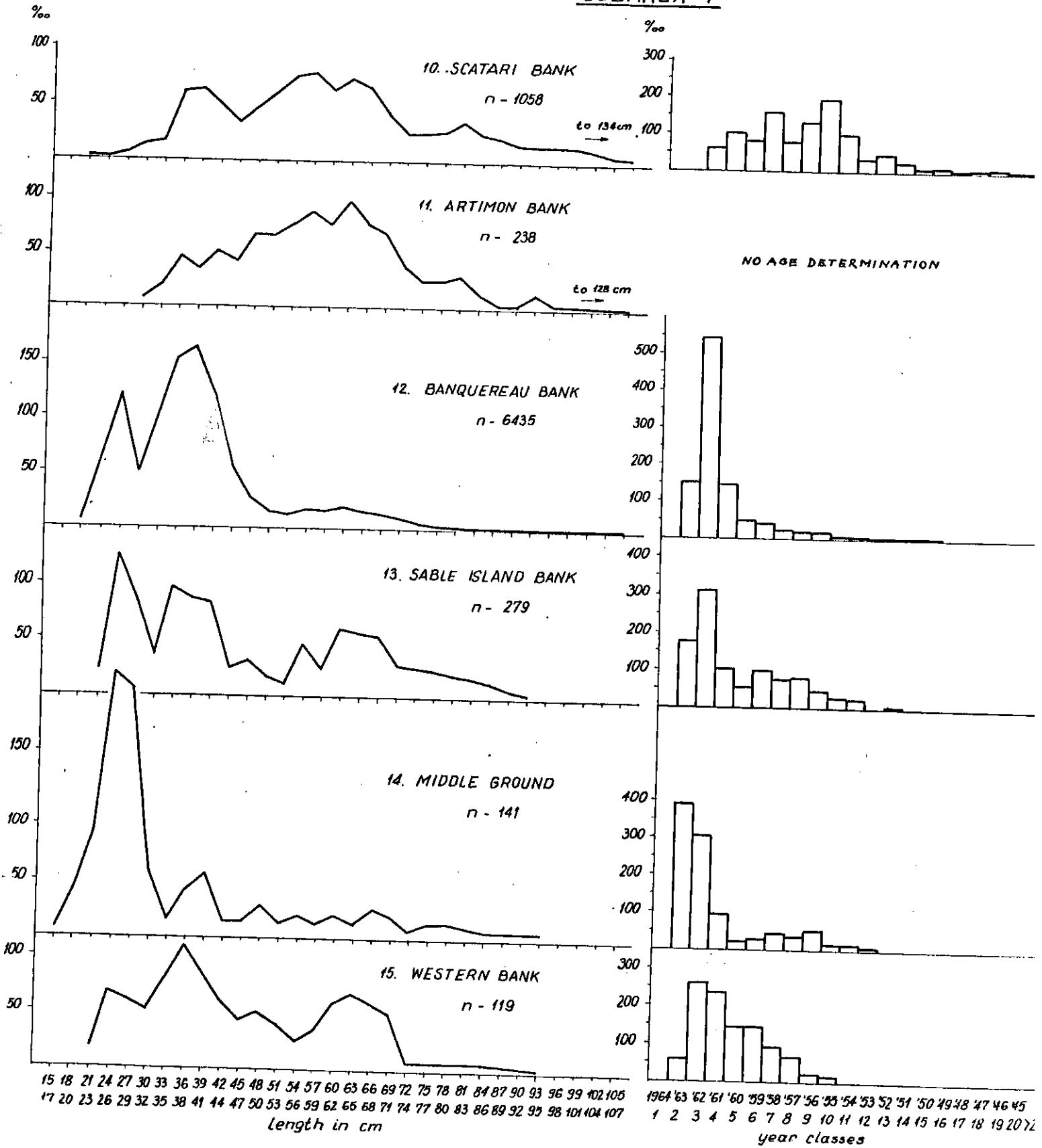


Fig. 3. Length and age composition of cod caught on the Nova Scotia fishing grounds (Subarea 4), Spring 1965.