

1950

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ANNUAL MEETING - JUNE 1970German (FRG) Research Report, 1969

Part I: Subarea 1 and East Greenland

by Arno Meyer and Walter Lenz (Hydrography)

A. Status of the Fisheries

Table 1 gives the nominal catch off West and East Greenland, taken by the fleet of the Federal Republic of Germany in 1962 to 1969. The catch varied during these 8 years between 116 000 and 251 000 t. The considerable decrease in 1969 to 116 000 t was due to less fishing activity in Subarea 1.

I. Subarea 1

The fishing activity of German trawlers off West Greenland in 1969 decreased by 44%, the catch dropped by 49% from 146 000 t to 75 000 t, which makes up only 37% of the maximum output in 1963. 95% of the total catch were caught during the first 7 months, mostly from April to July. 90% consisted of cod. The redfish made up 9% and was mostly caught in the southern Division 1F.

The reasons for this unexpected decrease in effort and catch were the very paying catches off Labrador up to the 10<sup>th</sup> of April (see Part II by J.Messtorff) and the unusual heavy flow of ice northward up to Banana Bank in May to July, blocking the whole coast and often all parts of the banks. Thus there was no possibility to repeat the very profitable pelagic fishery of 1968 on postspawners in the Frederikshaab-Danas Bank area. Several factory trawlers left West Greenland and worked off East Greenland, Iceland, and in the N.E. Atlantic. In July the fishery in Subarea 1 came to an end. The fleet of factory trawlers left for herring fishery in Subarea 4 and 5 (see Part III by K.Schubert). During the last 3 months of the year some fresh fish and freezer trawlers returned to Subarea 1, mostly fishing in the southern divisions, but only with moderate success.

## II. East Greenland

Also off East Greenland ice hampered the fishery, but not in that large scale as off West Greenland. Therefore for the first time several factory trawlers moved to the eastern side of Greenland. Thus the catch off East Greenland increased by 53% to 40 500 t, of which 35% consisted of cod and 61% of redfish. The average daily catch was nearly the same as in 1968.

## III. Forecast for 1970

The output of the German fishery in Subarea 1 in 1970 will depend as in the preceding year on the catching possibilities off Labrador and on the ice conditions off West Greenland. During the first 3 months of 1970 the fishing activity in Subarea 1 was very small due to the exceptional good fishery off Labrador. In April ice hampered again the fishery, which caused the whole fleet to move for a short time to South East Greenland. However it appears, that - as predicted by the German Hydrographic Institute - the quantity of ice, transported by the East Greenland Current in winter 1969/70 is less than in 1968/69. If in May to July the ice will permit to fish with pelagic nets in Division 1E on the shoals of postspawners in May to July there might be a very high output, for the stock of spawners returning from East Greenland and consisting of the still good year-classes of 1961, 1962, and 1963 is in a rather good shape. As in the preceding years the fishery of the German <sup>(trawlers)</sup> probably will end in July with the inset of the slack period. Thus effort and catch in 1970 in Subarea 1 will again be smaller than during the period 1962 to 1968.

The total output of cod and redfish off East Greenland cannot be predicted, for the magnitude of the fishery on the East Greenlandic banks depends first of all on the market demands for fresh iced fish and on the ice situation subject to a great extend to the atmospheric situation. The prospects for the cod fishery during the first 5 months are good, due to the still rather good size of the Eastgreenlandic stock of spawners (year-classes 1961, 1962, and 1963).

Table 1. German nominal catches in tons (industrial fish included) off Greenland, 1962-1969

Year	Days fishing	Cod	Catch per fish.day	% industrial	Redfish	Catch per fish.day	% industrial	Total	Catch per fish.day	% industrial
1962	6,584	133,404	20.3	5.1	57,902	8.8	5.2	200,932	30.5	7.7
1963	7,175	152,934	21.3	4.2	44,355	6.2	4.7	202,923	28.3	8.6
1964	5,639	107,982	19.1	7.7	22,956	4.1	10.0	137,794	24.4	10.9
1965	5,882	107,127	18.2	13.3	18,476	3.1	10.3	131,445	22.3	14.7
1966	4,696	82,928	17.7	12.8	14,911	3.2	6.1	102,029	21.7	13.1
1967	6,305	137,773	21.9	9.1	13,600	2.2	3.0	155,606	24.7	9.4
1968	5,819	132,498	22.8	5.3	11,858	2.0	1.8	146,432	25.2	5.3
1969	3,234	67,431	20.9	4.0	6,964	2.2	5.2	75,293	23.3	4.3
1962	1,660	14,317	8.6	0.5	25,032	15.1	1.2	40,999	24.7	1.2
1963	2,182	13,677	6.3	0.5	31,368	14.4	1.4	47,700	21.9	2.2
1964	3,287	29,400	8.9	0.2	38,154	11.6	2.3	71,364	21.7	2.5
1965	2,734	11,746	4.3	0.6	33,491	12.2	4.5	47,877	17.5	4.4
1966	1,827	7,231	4.0	0.7	23,222	12.7	6.3	32,006	17.5	6.0
1967	2,157	13,025	6.0	0.1	22,879	10.6	4.7	37,803	17.5	4.4
1968	1,361	9,825	7.2	0.2	15,432	11.3	2.0	26,417	19.4	2.0
1969	2,164	14,292	6.6	0.9	24,587	11.4	4.6	40,505	18.7	4.2
1962	8,244	147,721	17.9	4.6	82,934	10.1	4.0	241,931	29.3	6.6
1963	9,357	166,611	17.8	3.9	75,723	8.1	3.3	250,623	26.8	7.4
1964	8,926	137,382	15.4	6.1	61,110	6.8	5.2	209,158	23.4	8.0
1965	8,616	118,873	13.8	12.1	51,967	6.0	6.5	179,322	20.8	11.9
1966	6,523	90,159	13.8	11.8	38,133	5.8	6.2	134,035	20.5	11.4
1967	8,462	150,798	17.8	8.4	36,479	4.3	4.1	193,409	22.9	8.4
1968	7,180	142,323	19.8	4.9	27,290	3.8	1.9	172,849	24.1	4.8
1969	5,398	81,723	15.1	3.5	31,551	5.8	4.8	115,798	21.5	4.3

Table 2. Discarded fish in Subarea 1 in tons, 1969

	Cod	Redfish	Species unknown	Total
1C	134	18	19	171
1D	191	32	34	257
1E	27	20	33	80
1F	3	38	13	54
Total	355	108	99	562

Table 3. Average gross registered tonnage of German trawlers fishing in Subarea 1, 1969

1962	832 G.R.T.	(589 - 1561)
1963	864 G.R.T.	(566 - 1561)
1964	890 G.R.T.	(648 - 1561)
1965	1015 G.R.T.	(651 - 2557)
1966	1094 G.R.T.	(537 - 2557)
1967	1095 G.R.T.	(632 - 2557)
1968	1163 G.R.T.	(640 - 2557)
1969	1319 G.R.T.	(651 - 2684)

## B. Special Research Studies

### I. Environmental Studies

#### 1. Hydrography. (by Walter Lenz)

In March and October 1969 from the German R.V. "Walther Herwig" some hydrographic sections have been worked across the fishing banks off the Greenland coast. Temperature and salinity have been measured by Nansen cast and bathythermograph.

To look at the results one should keep in mind, that in summer 1968 the conditions were highly abnormal with negative temperature and salinity anomalies down to 500 m off the western slopes of the banks. But by summer heating at the surface and by increasing inflow of warm waters from the Irminger Sea the situation became roughly normal in November 1968 (F. Hermann 1969).

#### March 1969:

The hydrographic measurements from March 1969 represent the situation just before the extreme ice period 1969, where all fishing grounds off West Greenland were mostly covered by ice, what did not happen at least since 1925. A trend to this could be already observed in March 1969, because the ice frontier off East Greenland was mostly following the continental slope and around Cape Farewell it had been moved forward to Noname Bank (normally the progress of ice stops off Cape Desolation).

Fig.1 and 2 show the core of the south going Irminger Current as a small but deep reaching band with maximum values of  $6,7^{\circ}\text{C}$  and  $35.12 \text{ }^{\circ}/\text{oo S}$ . A branch of this current can be seen over the East Greenland shelf in Fig.1, overlain by the cold East Greenland Current. This has been found already earlier, so during NORWESTLANT 63. At the slope water appears with the same T-S-characteristic like the Northeast Atlantic Deep Water, which is found below 1000 m (NORWESTLANT - Atlas). But since the water further east has a lower density, the colder water at the slope must have the tendency to sink, so that it comes rather from somewhere north than from the depth. At the slope of the Discord Bank (Fig.2) no indication of this water is found anymore. Off Discord Bank the core of the Irminger Current lies deeper than in the north and its temperature has decreased.

From Noname to Little Halibut Bank four sections were worked in the first half of March (Fig.3 - 6). Comparable measurements in previous years are done usually about 4 weeks later in the year (J. Blindheim 1967, F. Hermann 1969). Nevertheless, the temperature in the surface layer is similar to spring 1968, namely below  $0^{\circ}\text{C}$  with a salinity of less than  $33.6 \text{ }^{\circ}/\text{oo}$  down to 50 m. In the Irminger component of the West Greenland Current off the slope the temperature exceeds  $5^{\circ}\text{C}$  from Noname to Little Halibut Bank,

which is half a degree higher than in April 1968 and off Little Halibut Bank even more than one degree. If this is the result of the high values found in November 1968, then there has been warm water with high salinities throughout the whole winter, which caused a decrease of vertical convection and brought the temperatures at the surface to below  $-1^{\circ}\text{C}$  specially in the north by winter cooling. This can also be the reason why the  $0^{\circ}$ -isotherm goes deeper to the north.

In the trough between the banks and the coast the waters show the same T-S-characteristics as the waters off the slope, but at slightly greater depths.

#### October 1969:

When "Walther Herwig" worked five sections from Cape Farewell to Holsteinsborg (Fig.7-11) in October 1969 a lot of icebergs were seen at all banks south of Fyllas Bank, off the southwest coast sometimes more than a hundred, a residue of the extreme ice situation in spring and summer.

As the consequence of the continuous melting of ice temperatures below  $0^{\circ}\text{C}$  were found up to Fyllas Bank. The corresponding salinities decrease from  $32^{\circ}/\text{oo}$  at Cape Farewell to  $31^{\circ}/\text{oo}$  above the Fyllas Bank. From October 1968 no sub zero values of temperature are reported (F.Hermann 1969). These abnormal surface conditions in 1969 have also influenced the temperature on the banks; on Frederikshaab and Fyllas Bank they are below  $1^{\circ}\text{C}$ .

The Irminger component off the western slope is again well developed like in fall 1968. Off Holsteinsborg however temperatures and salinities are much lower than off Fyllas Bank, by two degrees and two tenth  $^{\circ}/\text{oo}$  in the core. It can be assumed that temperature and salinity will soon increase on the northern banks.

In general it might be said, that in the winter 1969/1970 the situation off West Greenland will be normalized, since off Cape Farewell temperature and salinity are already similar to earlier years, except just off the coast. While the temperature exceeds  $6^{\circ}\text{C}$  ( $6.4^{\circ}$  in the core), the salinity does not reach  $35^{\circ}/\text{oo}$ . If this water with lower salinity will continue to flow northwards, it can result in an increase of vertical mixing with surface waters.

In March 1970 "Walther Herwig" worked again off West Greenland. Temperature measurements from the Fyllas Bank show the following differences to March 1969:

While the surface waters are slightly warmer (above  $-1^{\circ}\text{C}$ , except near the coast), the  $0^{\circ}$ -isotherm lies about 100 m and the  $2^{\circ}$ -isotherm 150 m deeper. Indeed, this can be a result of the predicted increase in vertical mixing.

The core of the Irminger component is found in the same depth with the same temperatures of just above  $5^{\circ}\text{C}$ .

Like October 1967 (only 6 days earlier in the month) again a northsouth section through the Davis Strait has been worked along  $58^{\circ}00'\text{W}$  by "Walther Herwig" (Fig.12). From 300 m to the bottom the same front is found at exactly the same position ( $65^{\circ}00'\text{N}$ ) like in 1967; but the horizontal gradients are slightly smaller. For the interpretation of this section it has to be said, that this section cuts the front in an acute angle, because the general direction of the front is NNE to SSW in that latitude; further north the front turns to the left. The west going branch of the West Greenland Current looks quite similar in 1969 as in 1967, although the upper 250 m show more complicated mixing processes. The horizontal stratification of the salinity in the surface layer might not be valid, since the salinities have not been measured continuously with depth like the temperatures have with the bathythermograph. Between 250 and 400 m a layer of warmer water (greater than  $2^{\circ}\text{C}$ ) leads from the west going branch to the north going branch (see Fig.11) of the West Greenland Current, i.e. the separation of the two branches has not full taken place yet.

#### References

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- Hermann, F. Danish hydrographic investigations in West Greenland waters, 1968. ICNAF Res.Doc. 69/59
- NORWESTLANT 1 - 3, 1963. ICNAF - Spec.Publ. No.7, 1968

## II. Biological Studies

The increased fishing in the two most southern Divisions 1E and 1F is a new trend in the German fishery in Subarea 1. The output from these regions increased from 27% of the total catch in Subarea 1 in 1967 to 42% in 1968 and 50% in 1969, and this inspite for all that the fishery <sup>just</sup> on the southern ground was much more hampered by ice during the last two years than <sup>on the northern grounds</sup> ~~ever before~~.

The greater availability of cod in the southern divisions is due to the fact, that since 1956 a considerable increase of the East Greenlandic stock of cod could be ascertained. Whilst from 1945 to 1955 off East Greenland only in 1945 one good year-class appeared, several moderate to rich year-classes were born in the following eight years, namely in 1956, 1958, 1961, 1962, and 1963. Of these year-classes those from 1956 and above all from 1961 achieved great commercial importance. After having reached maturity these rich year-classes also affected the fishery on the Icelandic spawning grounds (in 1964, 1968, and 1969). A substantial part of the East Greenlandic year-classes is transported as brood by the Irminger and East Greenland Current to Subarea 1 and grows up off South and Southwest Greenland. The northern boundary seems to lie at round about  $64^{\circ}\text{N}$  (Fyllas Bank), whilst the West Greenlandic year-classes, born on the western slopes of the banks from about  $62^{\circ}$  to  $64^{\circ}30'\text{N}$  are mostly growing up on Fyllas, Little and Great Halibut Bank. Good West Greenlandic year-classes appeared nearly every 3 years (1947, 1950, 1953, 1957, 1960). But since 1960 only the probably moderate year-class of 1965 was born. An interesting question - and important for the future of the Greenlandic fishery - is whether the increase in East Greenlandic year-classes and a possible decrease in West Greenlandic year-classes is a new trend, a trend which could be connected with the increase of atmospheric circulation in the Greenland area.

In 1969 20 092 measurements and 5456 otoliths were treated. They showed that the 1961 year-class during its migration to the spawning places off East Greenland and during and after spawning was of greatest commercial importance in Division 1E and 1F in January and February and off East Greenland in March to June (see Table 4). From May to July very little of this rich year-class could be fished as returning postspawners off S.W.Greenland. From the very successful pelagic fishery in 1968 on Frederikshaab and Danas Bank we know, that the postspawners mostly migrate over the

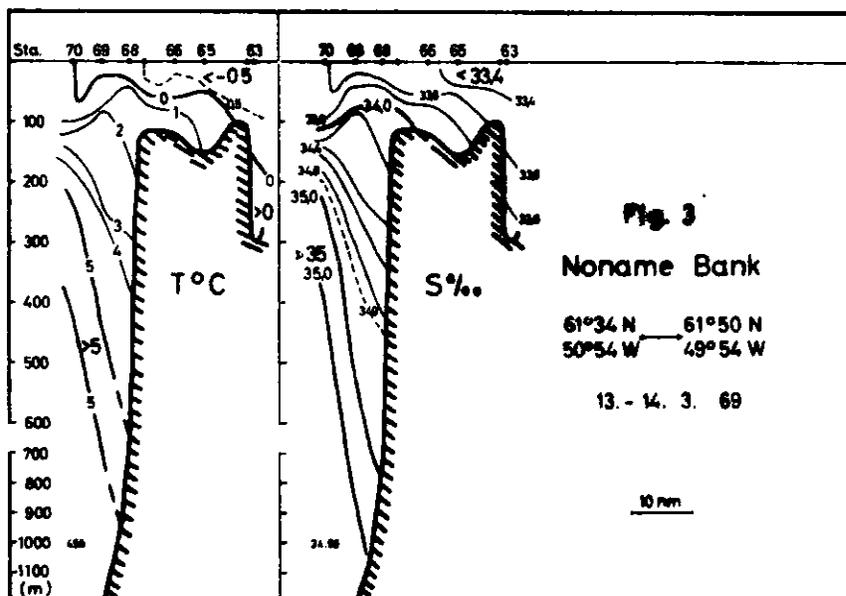
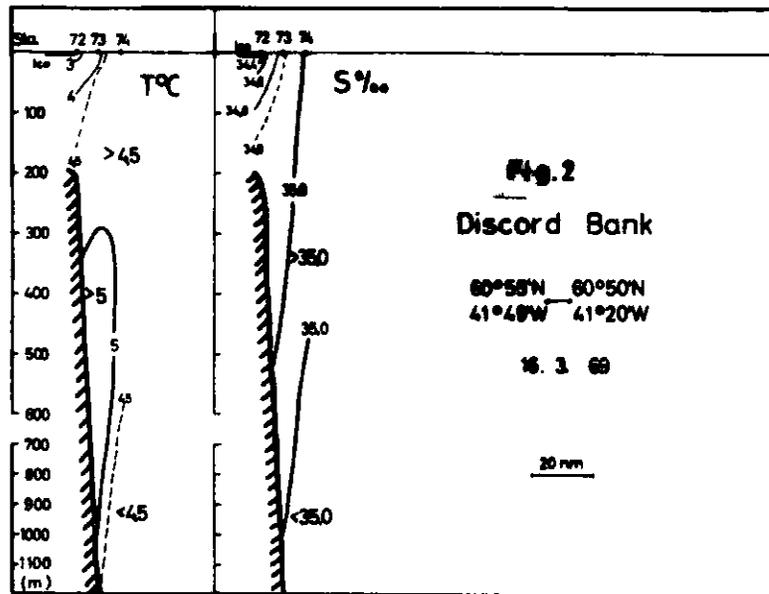
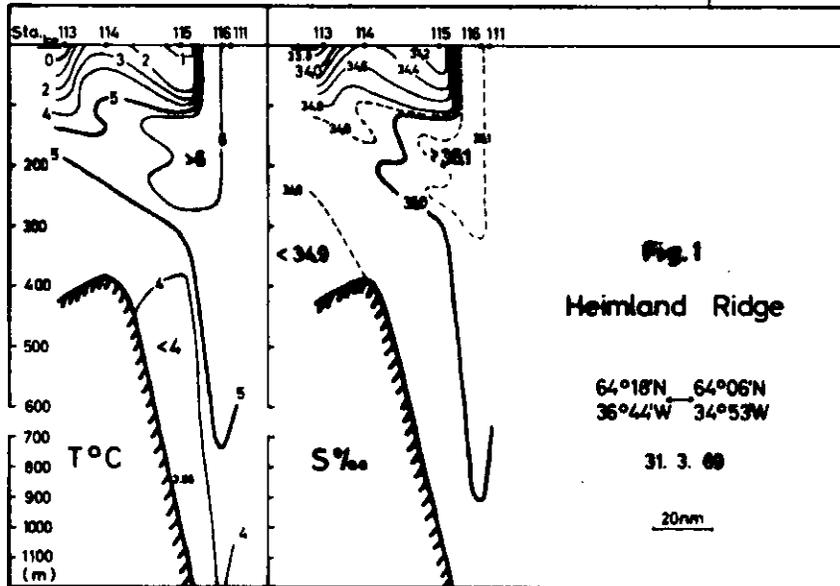
coastal side of the banks which in 1969 all were covered by ice. Thus the 1969 ice situation reduced considerably the effort on the mature part of the stock. The catches of the fleet (as observed on board of a factory trawler and from samples) on the western slopes of the banks mostly consisted of juvenile fish of the year-classes 1963 and 1962.

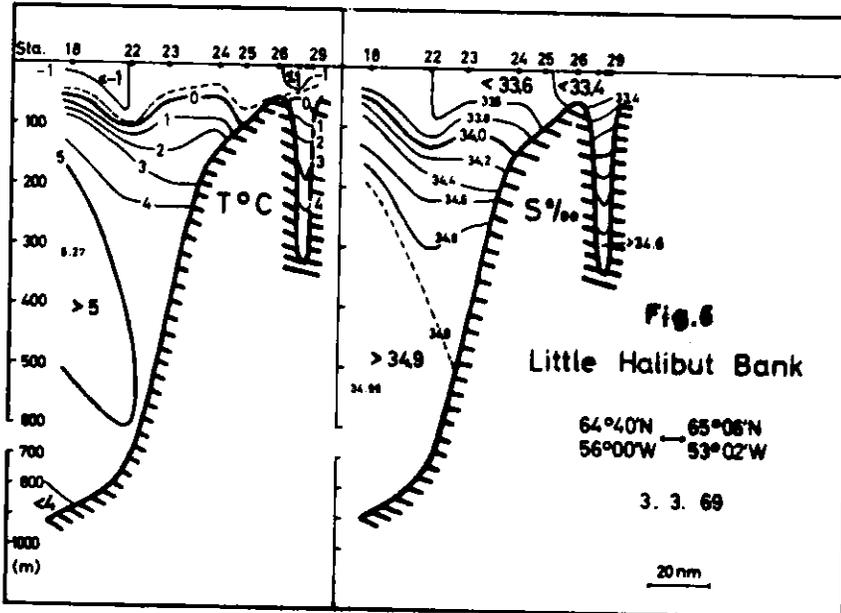
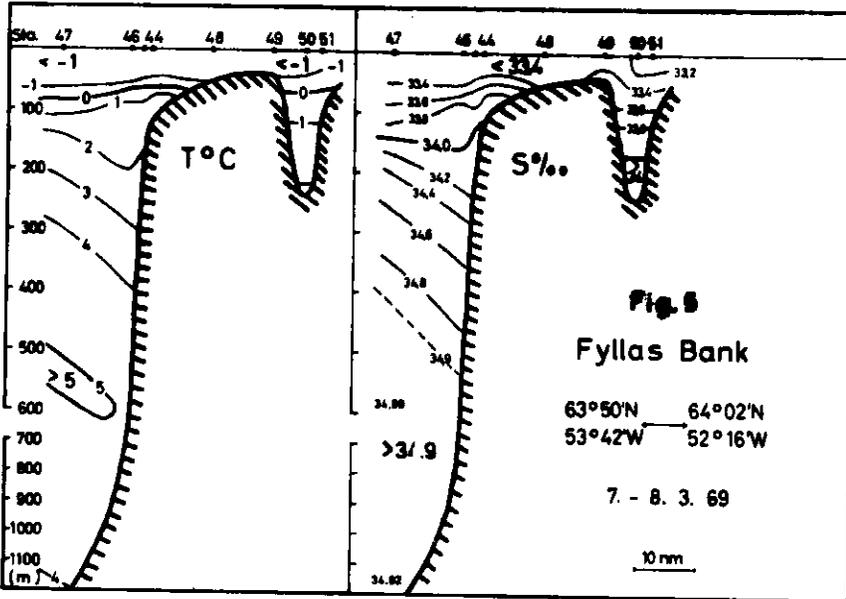
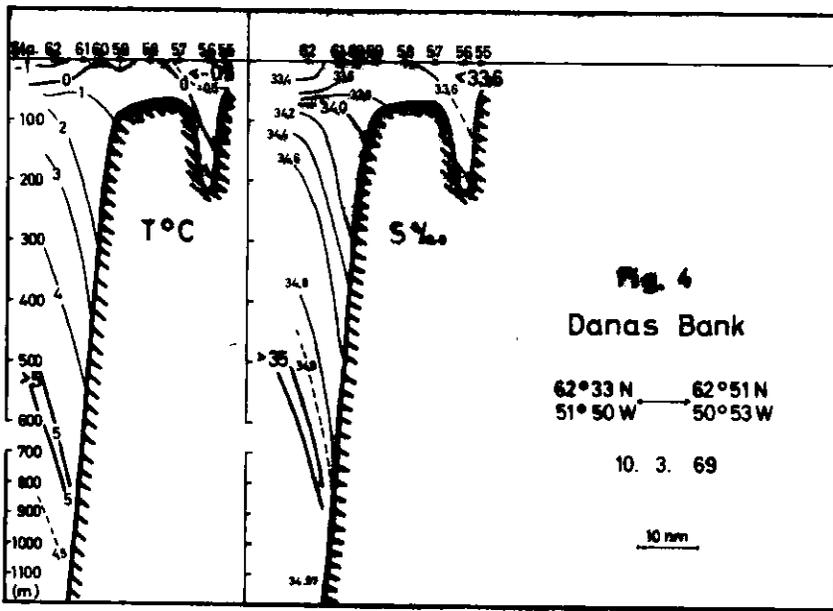
R.V. "Walther Herwig" made 2 trips to Greenland in March and October. The 1965 year-class was only found predominating on Little Halibut Bank and in some catches on Fyllas Bank. However the catches were very poor. No fish of this year-class was found off South Greenland. The predominant year-class in October on the southern banks was that from 1963. These 6 years old fish are also well represented off East Greenland especially in the Heimland-Angmagssalik area. However this 1963 year-class by far does not reach the importance of the 1961 year-class.

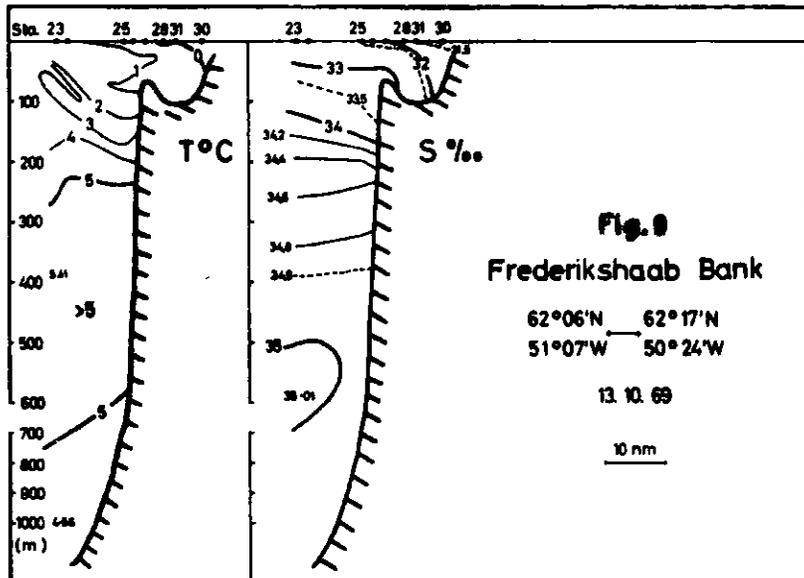
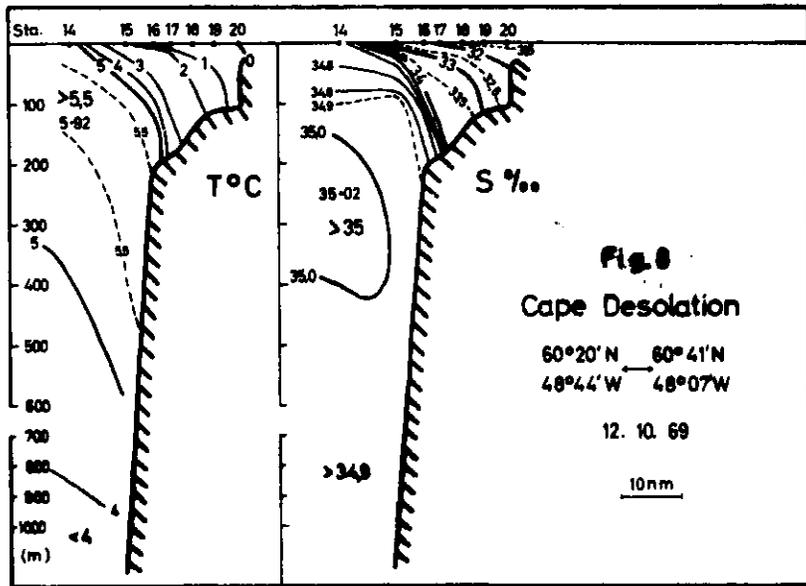
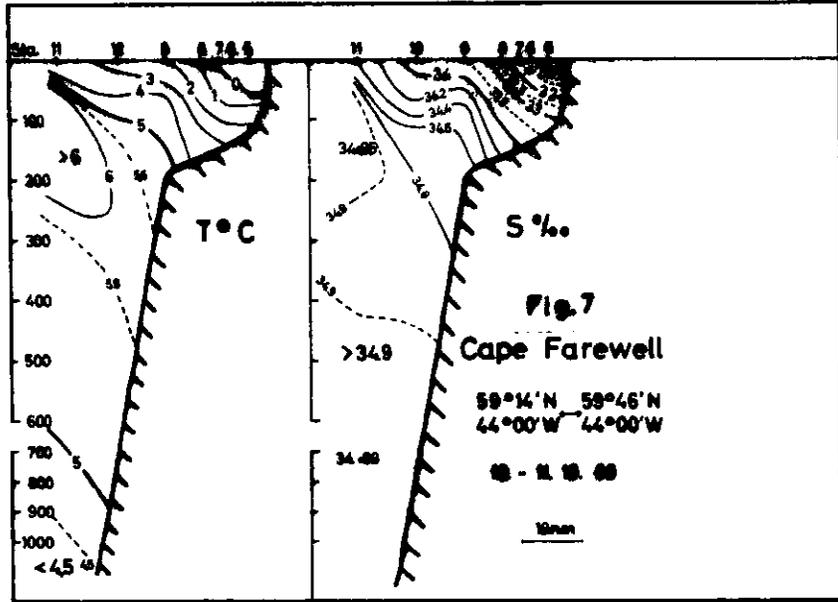
With the new egg-counting device, constructed by Schulz in the Hamburg institute, the eggs of roes collected off S.E. Greenland in March 1969 from cod of 66 to 96 cm were counted. The number of eggs varied between 0.5 to 4 millions. As Fig.13 shows the number of eggs are increasing with increasing length of the fish. The average length of the spawners was 79.3 cm, which corresponds to a number of egg per spawner of 1.3 million.

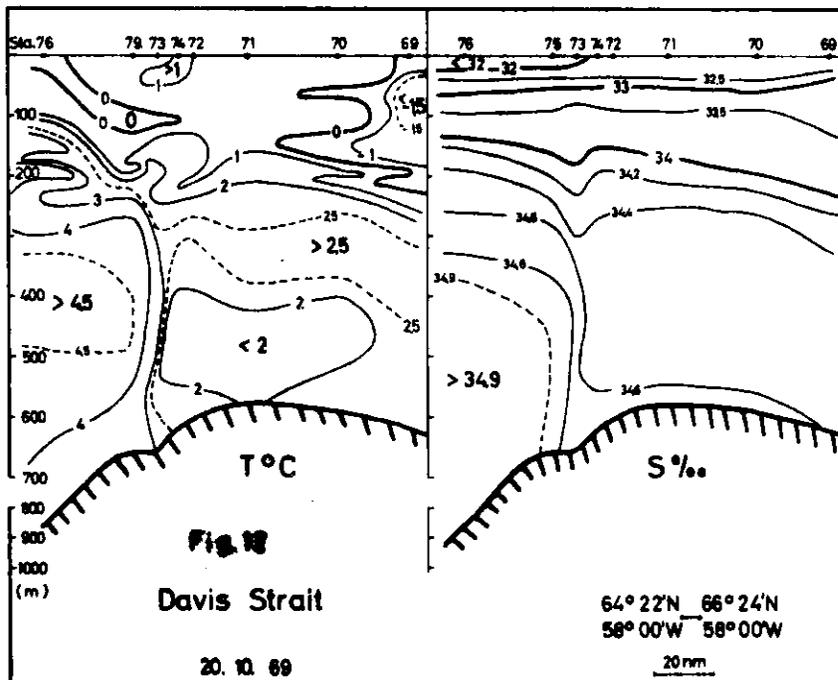
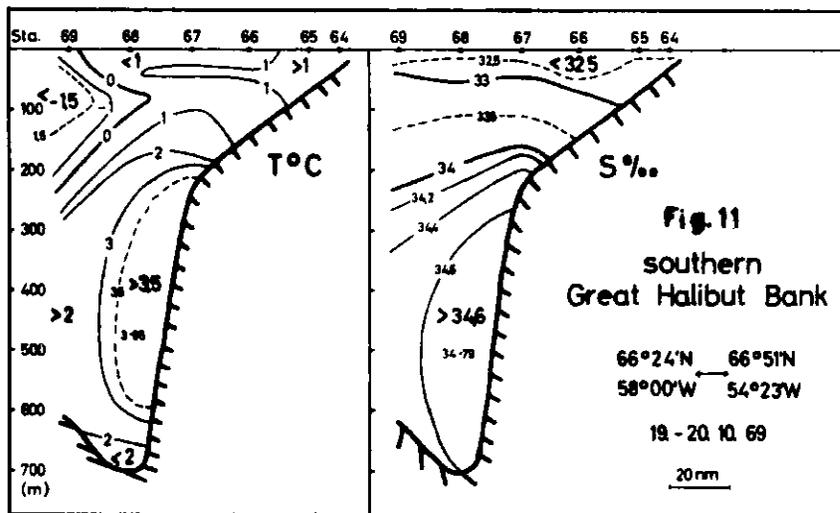
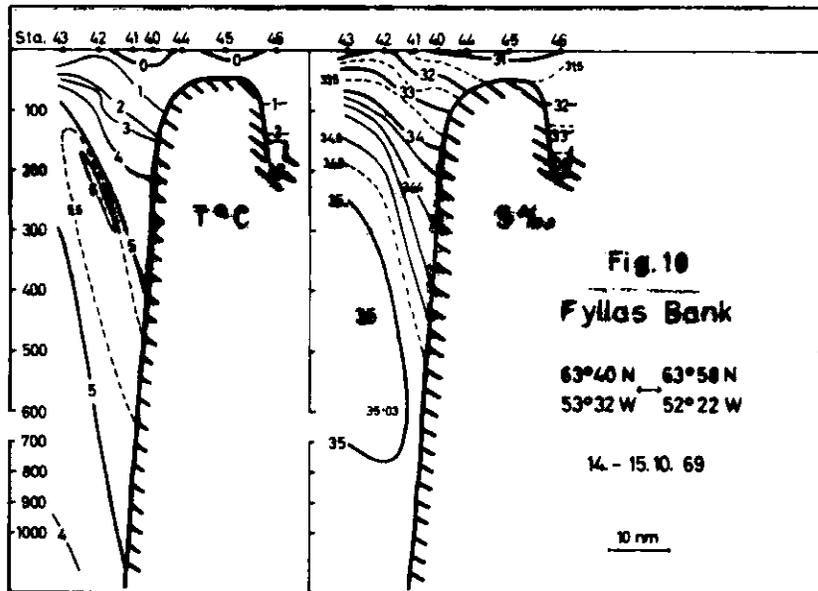
Table 4. Age composition of catches of cod off Greenland 1969 (R = research catch, C = commercial catch).

Division	month	year - classes													
		68	67	66	65	64	63	62	61	60	59	58	57	56	55
1 B	R	10	144	127	117	33	159	201	126	68	5	5	10	5	5
1 C	R	3	-	9	637	162	140	31	16	-	-	5	-	-	-
1 C	R	10	23	132	254	65	168	115	144	50	6	6	37	-	-
1 D	R	3	-	-	459	262	192	60	14	-	-	-	13	-	-
1 D	R	7	-	-	32	86	364	209	223	76	-	-	5	5	-
1 D	R	10	11	23	127	73	248	185	171	43	15	3	17	-	12
1 E	R	4	-	-	-	136	648	175	41	-	-	-	-	-	-
1 E	R	6	-	-	-	128	545	225	100	1	-	-	1	-	-
1 F	C	1	-	-	-	63	262	238	403	8	2	6	6	12	-
1 F	R	6	-	-	-	179	535	219	63	2	-	-	-	2	-
1 F	R	10	-	7	3	253	545	103	89	-	-	-	-	-	-
S.E.Greenland	C	2-4	-	-	-	13	86	176	535	84	22	21	30	12	21
Angmagssalik	R	4	-	-	6	92	219	171	501	11	-	-	-	-	-
Dohrn Bank	R	3	-	5	18	65	111	143	642	16	-	-	-	-	-









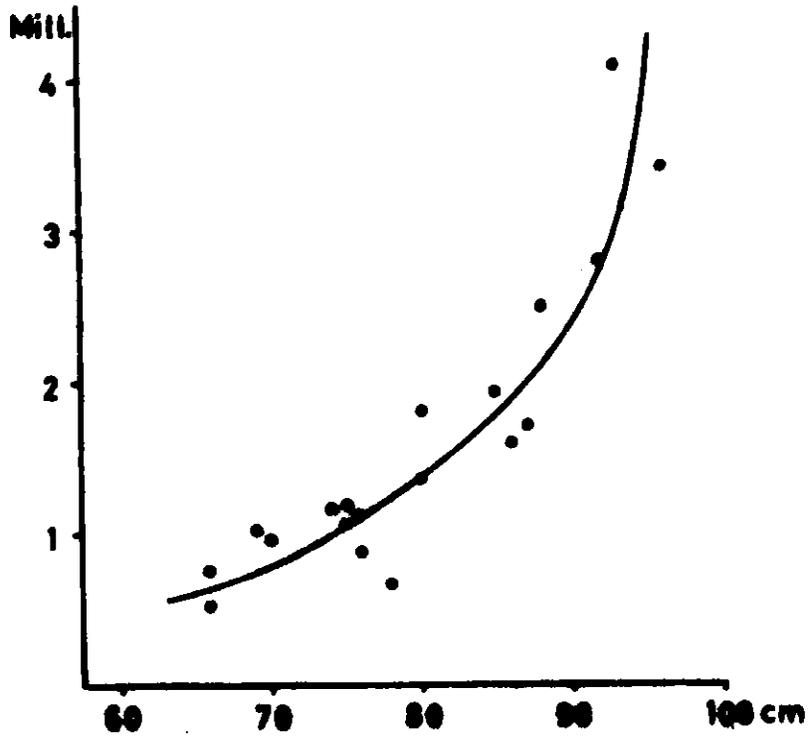


Fig.13 Relation between quantity of eggs per ovary and length of the cod



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Part II

ANNUAL MEETING - JUNE 1970

German Research Report

C. Subarea 4 and 5  
by K.Schubert

A. Status of the Fisheries

29 freezer stern trawlers operated with pelagic nets in Subarea 4 (25 trawlers) and 5 (29 trawlers) from January to March, May and from June to December mainly for herring. Fig. 1 shows the operations from June to December.

The total catch in 1969 in these two Subareas amounted to 90,941 t. In Subarea 4 the catch yielded 6,949 t in winter and spring and 14,474 t in November/December. The catch in late autumn in this Subarea increased from 10,557 t to 14,474 t. This increase was due to a higher effort which increased from 191 fishing days to 464. The catch per day showed a strong decline from 55,3 t to 31,2 t (43,6%), however. In Subarea 5 the catch amounted to 69,518 t (1968 = 62,671 t). The increase of the catch was mainly due to a higher effort which increased from 1,534 fishing days to 1932, whereas the catch per day decreased from 40.9 t to 35.9 t (12,9%). (Table 1)

Fig. 2 shows the mean catch per day in baskets on an average of about 5 days from 11 German freezer trawlers in 31 trips.

### B. Special Research Studies

Till now 45 samples and 16657 measurements from Subarea 3, 4 and 5 were investigated. These were taken from several factory ships and one research vessel.

10 samples and 4773 measurements from July to November from Division 5 Ze (Georges-Bank) were examined.

The average length fluctuated between 28.57 cm and 32.42 cm (Fig. 3 and Table 2 ). The length range varied from 20.5 cm - 37.5 cm, with peaks at 28.0 cm (July), 25.5 cm, 28.5 cm, 30.5 cm (August), 29.0 cm (September), 26.0 cm, 31.5 cm (October) and 31.5 cm (November).

Maturity stage 4 was predominant in July, whereas in August the stages 5 and 4, in September stage 5 and in October stage 7 formed the bulk of the samples (Fig. 4 ). The spawning presumably took place from middle of September to the middle of October.

The average number of vertebrae varied between 56.36 and 56.40, the average number of gillrakers fluctuated between 49.53 to 49.58 (Table 3 ). The meristic characters were the same as in 1968.

In July younger year-classes (1962-1966) formed the main part of the samples. The year-class 1965 (554 ‰) was predominant. In August the year-class 1965 (385 ‰) was dominant too, but some importance had the year-classes 1963 (215 ‰) and 1964 (170 ‰). In the next two months more older herring appeared in the samples. In September the dominant age groups were the 1963 (248 ‰), 1960 (207 ‰) and 1965 (186 ‰) year-classes, the year-classes 1961 (134 ‰) and 1964 (113 ‰) were important, too. The October shows the predominance of the year-classes 1960 (190 ‰), 1965 (185 ‰), 1964 (155 ‰), moreover the year-classes 1961-1963 (305 ‰) and 1966 (112 ‰) had some importance. The quota of herring older than 9 years was very small (Fig. 4 and Table 4 ). One sample from December from Division 5 Zw (Block-Island) was examined. The average length amounted to 27.36 cm. The length ranged from 20.0 cm - 33.5 cm (Figure 5 and Table 2 ).

Maturity stages 8 and 2 were predominant (Fig. 4 ).

After the meristic characters it seems that the herring in this area belongs to another stock than that from the Georges-Bank. The differences are based on the higher average number of gillrakers. The average number of vertebrae was 56.33 cm, of gillrakers 49.63 cm (Table 3 ).

The age composition shows the predominance of the 1966 year-class (458 ‰). The year-classes 1965 (205 ‰) and 1964 (169 ‰) had also some importance (Fig. 4 and Table 4 ).

32 samples and 3146 measurements from Division 5 Y (Gulf of Maine) from July to December were investigated. The average length varied from 27.52 cm to 33.31 cm. The length ranged from 16.5 cm - 37.0 cm. From July to September larger herring were in the samples, from October to December the share of the smaller herring increased (Table 5 and Fig. 6).

In July maturity stage 4 was dominant, in August and September stage 5, whereas in October stages 7 and 2 were found in the samples (Fig. 7).

After the meristic characters it seems that in the different months different stocks were in the Division. In July, August and November herring with higher average of gillrakers were met in the samples (49.68-49.71), whereas in September and October herring with characters (49.56-49.59) from Division 5 Ze inhabited this area (Table 3).

The age composition in July is composed of more older herring than that of the Georges-Bank. The dominant year-classes are 1961 (217 ‰), 1960 (190 ‰), 1964 (147 ‰), 1963 (142 ‰) and 1965 (114 ‰). In August and September the composition is similar. The year-classes 1960 (219 ‰ respectively 321 ‰), 1961 (174 ‰/173 ‰), 1963 (207 ‰/133 ‰), 1964 (127 ‰/103 ‰) and 1962 (114 ‰/130 ‰) are dominant. In October and November the age composition changed. More younger fish were in the samples. The year-class 1966 (331 ‰/375 ‰) was predominant, some importance had in both month the year-classes 1960 (148 ‰/139 ‰) and 1963 (115 ‰/125 ‰), in October moreover year-classes 1963 (115 ‰), 1964 (115 ‰) and in November year-class 1965 (111 ‰).  
(Table 4 and Fig. 7)

In September and November one sample and 895 measurements came from Division 4 W (Sable Island).

The average length was 30.70 cm in September and 32.63 cm in November. The length ranged from 26.0 cm - 38.5 cm. The peak of the curves was in both months 31.0 cm: The portion of smaller herring was higher <sup>in September</sup> whereas in November more larger herring were in the samples in September (Fig. 8 and Table 6).

The maturity stages 5 and 7 were dominant (Fig. 9).

The average number of vertebrae was 56.40 cm, of gillrakers 49.66 cm. This herring does not belong to the stock from Division Ze. (Table 3).

The age composition showed the predominance of the 1963 (263 ‰) and 1964 (231 ‰) year-classes. The year-classes 1961 (138 ‰), 1960 (123 ‰) and 1965 (123 ‰) had also some importance (Fig. 9, Table 4).

In January, February, March and December the Division 4 Vs (Misaine-Bank, Banquereau) was investigated. 6 samples and 1119 measurements came from this area.

From January-March the average was 33.61 cm. The length ranged from 21.0 cm - 40.0 cm. In December the average length was 34.33 cm. The length in this month ranged from 26.0 cm - 38.0 cm. Mainly large herring were in the Division 4 Vs. (Fig. 10, Table 7).

From January to March and in December stage 8 was predominant, some admixture of stage 1-5 were also present (Fig. 9).

After the meristic characters it seems that in the beginning of the year (I - III) and in December two different stocks were in the area. They had a high average number of vertebrae (56.60/56.62), but they were different in their average number of gillrakers (49.57, respectively 49.30)(Table 3).

The year-classes older than 1960 (681 %/675 %) were in both periods predominant. Besides the year-class 1960 had some importance. The portion of all other year-classes was small (Fig. 9, Table 4).

Only 948 measurements from the Division 4 Vn (Cape Breton, Scatarie) from October (391 herring) and November (557 herring) are available. The average length in October was 32.11 cm, in November 31.81 cm (Fig. 11, Table 7).

One sample from November from the Division 3 Ps (St. Pierre) was examined. The average length amounted to 30.63 cm (Fig. 12, Table 6).

Maturity stages 8 and 2 were dominant (Fig. 4).

The meristic characters showed a low average number of vertebrae (56.43), but a high average number of gillrakers (50.05)(Table 3).

The year-classes older than 1960 (270 %) had the largest share, but also the year-classes 1966 (216 %), 1965 (135 %), 1963 (135 %) and 1964 (108 %) had some importance (Fig. 9, Table 4).

Table 1 Nominal catch, effort, catch-per-unit effort and discards of German factory freezer trawlers, Subareas 4 and 5, in 1969 (including industrial fish).

Subarea Month	4 Vn		4 Vs		II	III	V	4 W		4 Total						
	XI	Total	I	Total				XII	Total		X	Total				
<u>Nominal catches (tons)</u>																
Herring	1664	6877	2033	2060	2711	145	7597	14546	95	21518						
Total	1664	6877	2095	2061	2712	145	7933	14946	192	22015						
Effort	40	178	37	38	52	6	286	419	10	607						
<u>Catch per day (tons)</u>																
Herring	41.6	38.6	54.9	54.2	52.1	24.2	26.6	34.7	9.5	35.4						
Total	41.6	38.6	56.6	54.2	52.2	24.2	27.7	35.7	19.2	36.3						
<u>Discards (tons)</u>																
Herring	-	-	-	5	-	-	-	5	-	5						
Total	-	-	-	5	-	-	-	5	-	5						
<u>5 Y</u>																
Subarea	VIII	IX		XI	XII	5 Ze		VIII	X	XI	XII	Total	IX	Total	Total	
Month							VII									
<u>Nominal catches (tons)</u>																
Herring	1631	3077	1048	2798	10187	1254	7258	16087	19607	10411	4028	58915	234	86	321	69423
Total	1681	3087	1050	4006	11477	1259	7568	16134	19658	10495	4057	59171	236	86	322	70970
Effort	66	106	26	43	360	30	227	413	496	267	122	1555	8	9	17	1932
<u>Catch per day (tons)</u>																
Herring	24.7	29.0	40.3	23.5	28.3	41.8	33.2	39.0	39.5	39.0	33.0	37.9	29.4	9.6	18.9	35.9
Total	25.5	29.1	40.4	33.7	31.9	42.0	33.3	39.1	39.6	39.3	33.3	38.1	29.5	9.6	18.9	36.7
<u>Discards (tons)</u>																
Herring	9	4	14	-	27	-	40	21	251	-	-	312	1	0	1	340
Total	28	5	14	-	57	-	127	79	251	-	-	457	4	1	5	519

Table 2 Length composition 1969

cm	Georges Bank Division 5 Ze						Block Island 5 Zw	
	July n %	August n %	September n %	October n %	November n %	December n %		
20.5	1 3	- -	- -	- -	- -	- -	1	10
21.0	- -	- -	- -	- -	1 1	- -	- -	- -
21.5	- -	- -	- -	- -	- -	- -	- -	- -
22.0	- -	- -	- -	- -	5 3	- -	1	10
22.5	- -	1 3	- -	- -	4 2	- -	1	10
23.0	- -	- -	- -	- -	15 8	- -	1	10
23.5	2 7	2 7	- -	- -	25 14	- -	2	20
24.0	2 7	3 10	- -	- -	53 30	- -	4	40
24.5	2 7	1 3	2 1	- -	59 33	- -	8	80
25.0	7 23	7 23	2 1	- -	96 54	- -	6	60
25.5	13 43	13 43	13 7	- -	111 62	1 2	6	60
26.0	11 37	7 23	19 10	- -	119 67	- -	13	130
26.5	20 67	7 23	27 14	- -	110 62	- -	6	60
27.0	28 93	24 80	48 25	- -	85 48	- -	9	90
27.5	36 119	22 73	51 27	- -	74 42	- -	7	70
28.0	39 130	28 93	78 41	- -	67 38	- -	5	50
28.5	21 70	34 114	103 55	- -	60 34	2 4	2	20
29.0	24 80	24 80	119 63	- -	62 35	3 6	6	60
29.5	24 80	16 54	100 53	- -	60 34	4 8	7	70
30.0	20 67	14 47	83 44	- -	52 29	9 18	3	30
30.5	11 37	30 101	89 47	- -	60 34	32 63	2	20
31.0	11 37	24 80	93 49	- -	59 33	38 75	2	20
31.5	13 43	18 60	175 93	- -	88 50	93 183	3	30
32.0	11 37	15 50	174 92	- -	76 43	82 161	2	20
32.5	2 7	5 17	193 102	- -	95 53	109 215	-	-
33.0	- -	3 10	172 91	- -	91 51	52 102	2	20
33.5	1 3	1 3	130 69	- -	64 36	42 83	1	10
34.0	1 3	1 3	87 46	- -	63 35	17 33	-	-
34.5	- -	- -	47 25	- -	56 32	16 31	-	-
35.0	- -	- -	34 18	- -	31 17	5 10	-	-
35.5	- -	- -	20 11	- -	16 9	3 6	-	-
36.0	- -	- -	18 9	- -	12 7	- -	-	-
36.5	- -	- -	9 5	- -	5 3	- -	-	-
37.0	- -	- -	2 1	- -	2 1	- -	-	-
37.5	- -	- -	1 1	- -	- -	- -	-	-
<b>Total:</b>	300 1000	300 1000	1889 1000	1776 1000	508 1000	100 1000		
<b>Average cm</b>	28.57	29.15	31.43	29.34	32.42	27.36		

Table 3 Meristic characters from different Divisions 1969

Month	I-III	VII	VIII	IX	X	XI	XII	Division
VS		56.40(299)	56.40(198)	56.29( 98)	56.36(466)			Georges Bank 5 Ze
Rf		49.53(298)	49.58(197)	49.53(100)	49.55(469)			
VS		56.36(200)	56.42(523)	56.48(199)	56.31(293)	56.37( 98)		Gulf of Maine 5 Y
Rf		49.71(200)	49.68(477)	49.59(199)	49.56(300)	49.71(199)		
VS							56.33( 98)	Blocks Island 5 ZW
Rf							49.63(100)	
VS				56.40( 81)				Sable Island 4 W
Rf				49.66( 82)				
VS	56.60(387)						56.62(198)	Misaine, Banquereau 4 Ys
Rf	49.57(331)						49.30(175)	
VS						56.43(100)		St. Pierre 3 Ps
Rf						50.05(100)		

Table 4 Age composition (%) 1969

Year class	1968	67	66	65	64	63	62	61	60	<	60	>	%	n	Division
Age	1	2	3	4	5	6	7	8	9	9	9	9			
July	-	-	69	554	170	110	17	28	42	10	10	10	1000	289	Georges Bank
August	-	-	56	385	170	215	36	87	51	-	-	-	1000	195	
September	-	-	30	186	113	248	41	134	207	41	41	41	1000	97	
October	-	5	112	185	155	105	102	98	190	48	48	48	1000	400	
December	-	72	458	205	169	60	-	12	12	12	12	12	1000	83	Block Island
July	-	-	65	114	147	142	76	217	190	49	49	49	1000	184	Gulf of Maine
August	-	-	10	98	127	207	114	174	219	51	51	51	1000	511	
September	-	-	4	59	103	133	130	173	321	77	77	77	1000	271	
October	4	29	331	94	115	115	78	66	148	20	20	20	1000	244	
November	-	-	375	111	56	125	83	28	139	83	83	83	1000	72	
September	-	-	15	123	231	263	92	138	123	15	15	15	1000	65	Sable Island
January/March	-	-	-	-	18	79	84	28	110	681	681	681	1000	392	Misaine Bank,
December	-	-	6	6	6	90	60	54	103	675	675	675	1000	166	Banquereau
November	-	-	216	135	108	135	41	81	14	270	270	270	1000	74	St. Pierre
															3 Pa

Table 5 Length composition 1969

Gulf of Maine Division 5 Y

July		August		September		October		November		December	
n	%	n	%	n	%	n	%	n	%	n	%
-	-	-	-	-	-	1	1	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	1	3
-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	1	3
-	-	-	-	-	-	-	-	-	-	1	3
-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	1	3
-	-	-	-	-	-	3	3	-	-	3	10
-	-	-	-	-	-	1	1	-	-	3	10
1	4	-	-	-	-	1	1	-	-	-	-
-	-	-	-	-	-	3	3	1	10	5	17
1	4	1	1	-	-	14	16	1	10	4	14
±	±	1	1	1	1	13	15	2	20	9	31
2	8	-	-	-	-	15	17	4	40	9	31
1	4	1	1	-	-	11	12	3	30	21	73
4	16	2	2	-	-	21	24	1	10	20	70
5	20	4	4	-	-	20	23	4	40	27	94
2	8	7	8	-	-	17	19	4	40	19	67
3	12	10	11	3	4	19	21	5	50	12	42
4	16	11	12	8	11	25	28	6	60	14	50
6	24	11	12	2	3	26	29	5	50	17	60
5	20	24	26	8	11	36	41	5	50	14	50
3	12	33	35	13	18	45	51	3	30	12	43
10	39	34	36	21	30	62	70	3	30	15	53
9	35	49	53	18	25	66	75	1	10	13	46
9	35	66	71	28	40	58	65	2	20	11	38
20	78	56	60	37	52	63	72	5	50	11	38
19	74	77	83	45	64	63	72	4	40	11	38
34	133	109	117	74	105	65	73	5	50	9	31
37	145	123	132	88	124	76	87	7	70	9	31
31	121	113	122	100	142	42	47	4	40	4	14
25	98	88	94	97	138	57	64	16	160	3	10
12	47	46	49	60	85	30	34	3	30	5	17
9	35	38	41	51	72	15	17	1	10	2	7
2	8	16	17	24	34	8	9	4	40	1	3
-	-	4	4	9	13	6	7	-	-	-	-
-	-	3	3	10	14	2	2	1	10	-	-
1	4	4	4	7	10	-	-	-	-	-	-
-	-	1	1	2	3	-	-	-	-	-	-
-	-	-	-	1	1	1	1	-	-	-	-
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age	31.23	31.52		33.31		29.97		29.76		27.52	

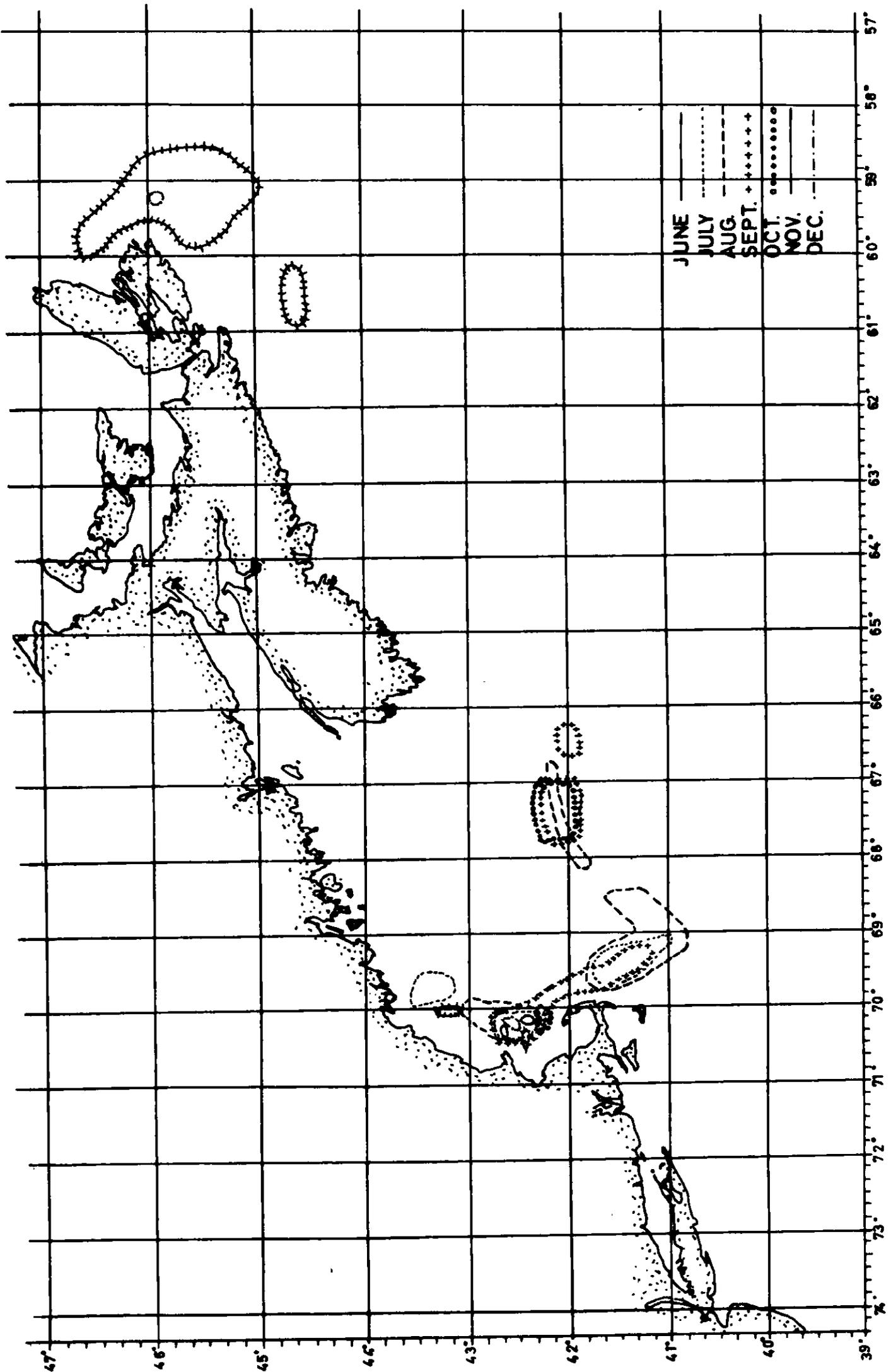
Table 6      Length composition 1969

Sable Island                      Division 4 W                      St. Pierre                      Division 3 Ps

cm	September		November		cm	November	
	n	%	n	%		n	%
26.0	-	-	1	1	25.5	2	20
26.5	-	-	-	-	26.0	5	50
27.0	2	24	-	-	26.5	6	60
27.5	1	12	-	-	27.0	3	30
28.0	6	73	1	1	27.5	11	110
28.5	2	24	3	4	28.0	9	90
29.0	5	61	1	1	28.5	6	60
29.5	8	98	19	23	29.0	3	30
30.0	6	73	40	49	29.5	5	50
30.5	16	196	88	108	30.0	6	60
31.0	11	134	112	138	30.5	5	50
31.5	12	147	94	116	31.0	4	40
32.0	6	73	75	92	31.5	3	30
32.5	4	49	69	85	32.0	1	10
33.0	2	24	64	79	32.5	2	20
33.5	-	-	61	75	33.0	5	50
34.0	1	12	40	49	33.5	2	20
34.5	-	-	48	59	34.0	2	20
35.0	-	-	33	41	34.5	8	80
35.5	-	-	20	25	35.0	1	10
36.0	-	-	13	16	35.5	4	40
36.5	-	-	17	21	36.0	3	30
37.0	-	-	5	6	36.5	2	20
37.5	-	-	3	4	37.0	1	10
38.0	-	-	4	5	37.5	-	-
38.5	-	-	2	2	38.0	1	10
<b>Total:</b>	<b>82</b>	<b>1000</b>	<b>813</b>	<b>1000</b>	<b>Total</b>	<b>100</b>	<b>1000</b>
<b>average</b>	<b>30.70</b>		<b>32.65</b>		<b>average</b>	<b>30.63</b>	
<b>cm</b>					<b>cm</b>		

Table 7 Length composition 1969

n	Bretone, Scatarie Division 4 Vn		November		January-March		December	
	n	%	n	%	n	%	n	%
1.0	-	-	-	-	1	1	-	-
1.5	-	-	-	-	-	-	-	-
2.0	-	-	-	-	-	-	-	-
2.5	-	-	-	-	-	-	-	-
3.0	-	-	-	-	-	-	-	-
3.5	-	-	-	-	-	-	-	-
4.0	2	5	-	-	-	-	-	-
4.5	3	8	-	-	-	-	-	-
5.0	4	10	-	-	1	1	-	-
5.5	8	20	-	-	-	-	-	-
6.0	13	33	-	-	-	-	1	5
6.5	10	26	-	-	1	1	-	-
7.0	9	23	2	4	3	3	-	-
7.5	12	31	-	-	8	7	1	5
8.0	10	27	2	4	6	5	1	5
8.5	15	38	4	7	11	10	1	5
9.0	8	20	10	18	29	26	3	15
9.5	20	51	29	52	28	25	3	15
0.0	15	38	43	77	39	35	7	35
0.5	24	61	105	188	48	43	1	5
1.0	24	61	85	153	35	31	10	50
1.5	23	59	79	141	58	52	7	35
2.0	21	54	50	90	55	49	5	25
2.5	4	10	42	75	61	55	5	25
3.0	13	33	31	56	100	89	10	50
3.5	13	33	21	38	110	98	20	100
4.0	15	38	12	22	95	84	24	120
4.5	23	59	10	18	111	99	14	70
5.0	20	51	9	16	93	83	19	95
5.5	11	28	10	18	70	63	17	85
6.0	20	51	3	5	51	46	20	100
6.5	21	54	4	7	50	45	12	60
7.0	17	44	4	7	21	19	7	35
7.5	3	8	-	-	15	13	8	40
8.0	3	8	2	4	7	6	4	20
8.5	3	8	-	-	3	3	-	-
9.0	2	5	-	-	5	4	-	-
9.5	-	-	-	-	2	2	-	-
0.0	2	5	-	-	2	2	-	-
<b>total:</b>	391	1000	557	1000	1119	1000	200	1000
<b>average cm</b>	32.11		31.81		33.61		34.33	



**Fig.1.** Herring. Fishing area of German (Fed.Rep.) freezer trawlers in Subarea 4 and 5 (1969).

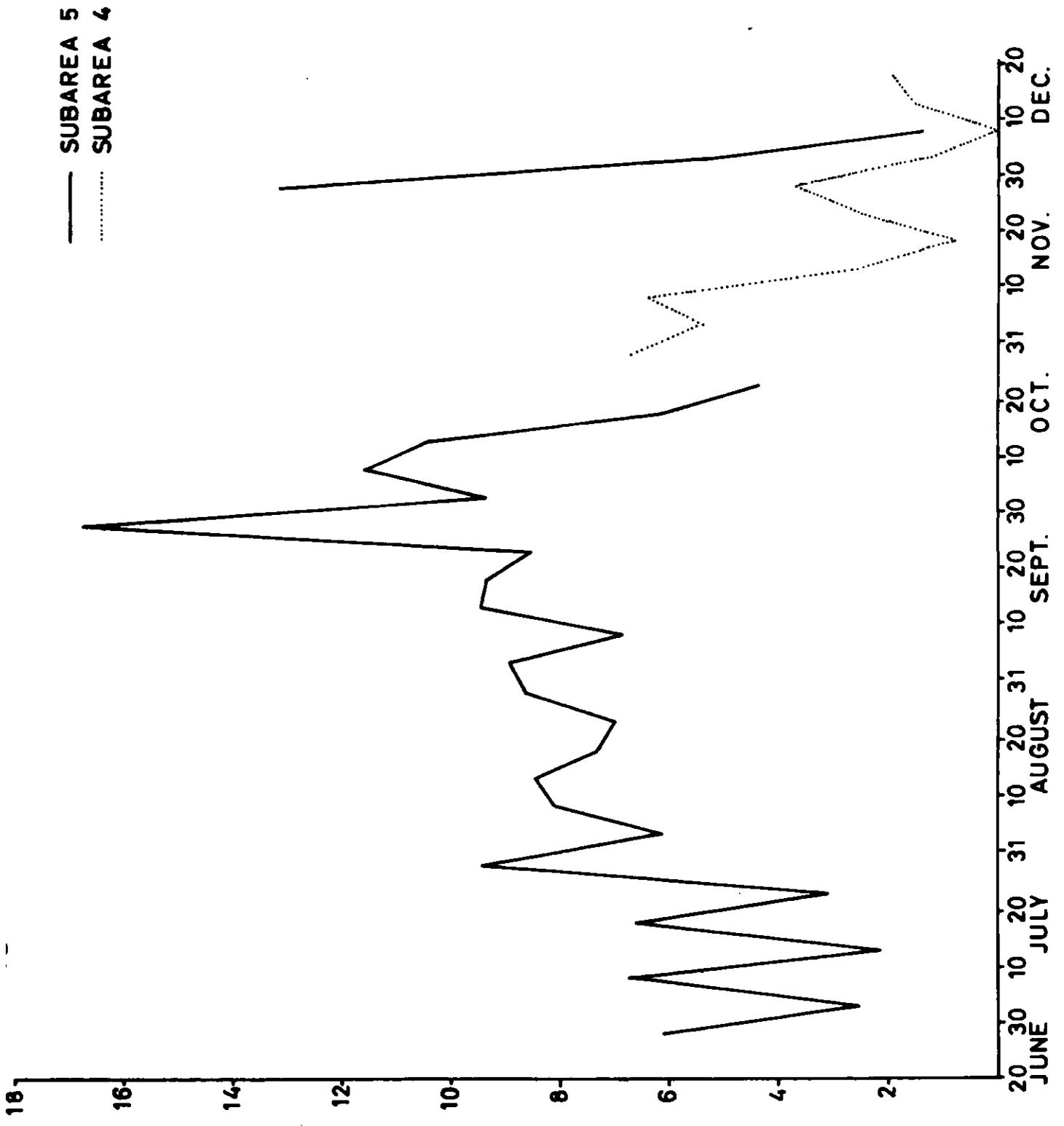


Fig. 2. Herring. Catch per day (baskets) on an average of about 5 days of 11 German freezer trawlers in 31 trips.

**Georges Bank 5 Ze**

Length composition 1969

Month	Length (cm)	n
VII	28.57	300
VIII	29.15	300
IX	31.43	1889
X	29.34	1776
XI	32.42	508

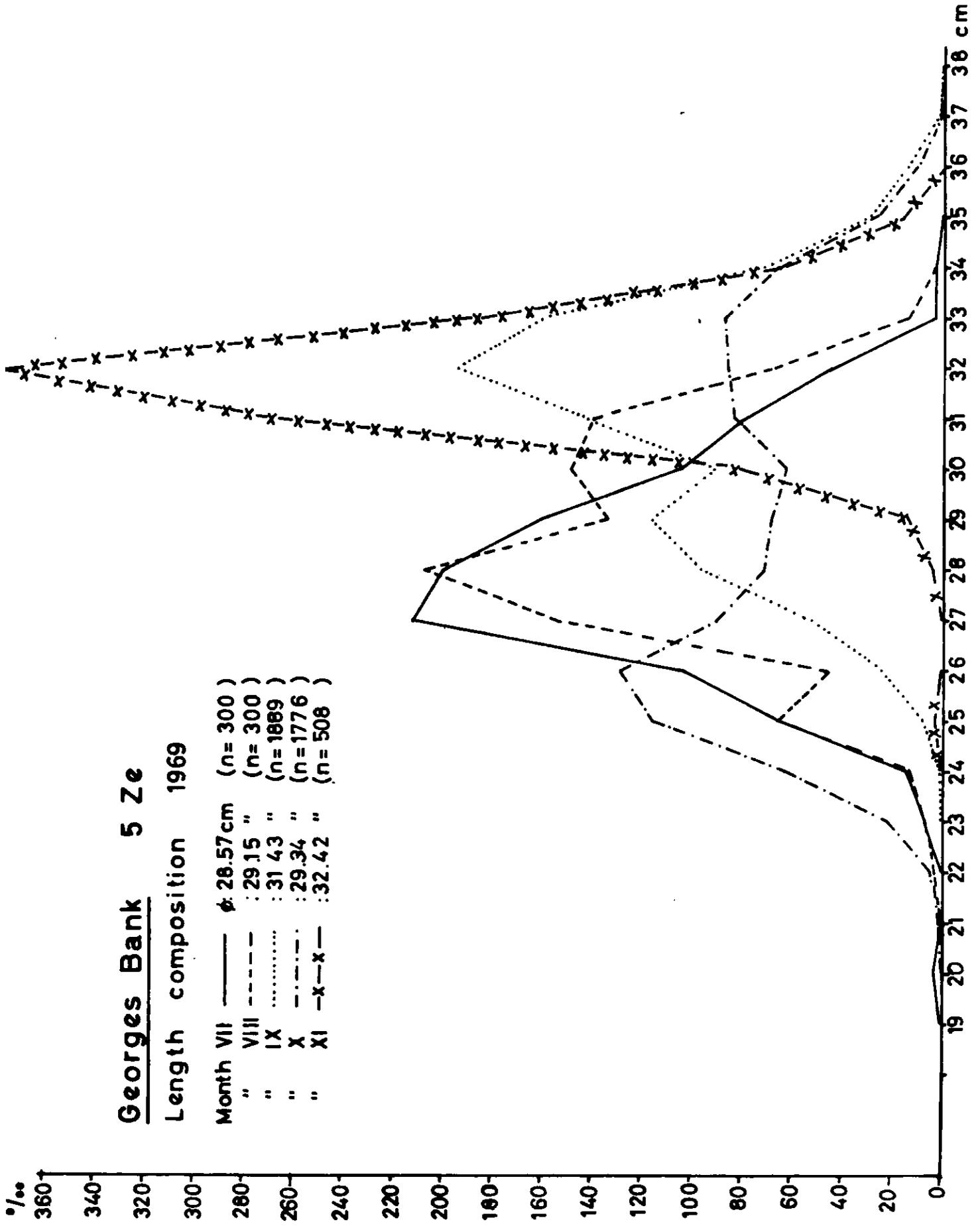
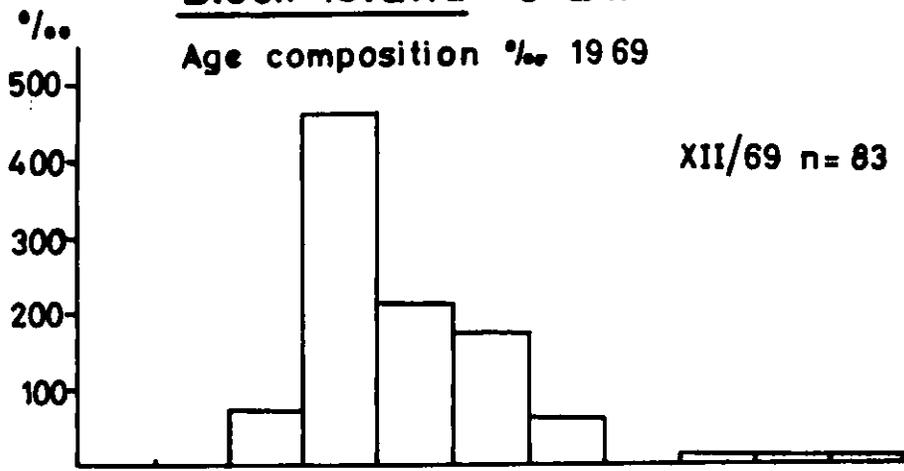


Fig. 3

**Block Island 5 Zw**

Age composition %<sub>oo</sub> 1969

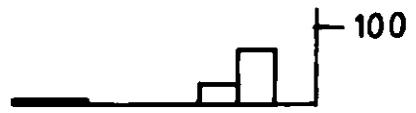
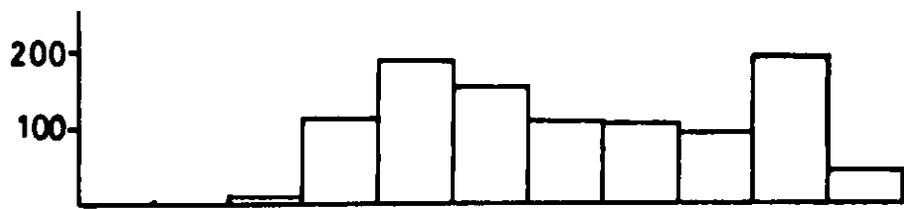


Maturity stages %

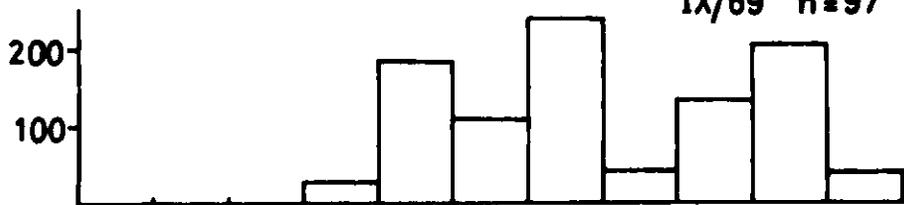


**Georges Bank 5 Ze**

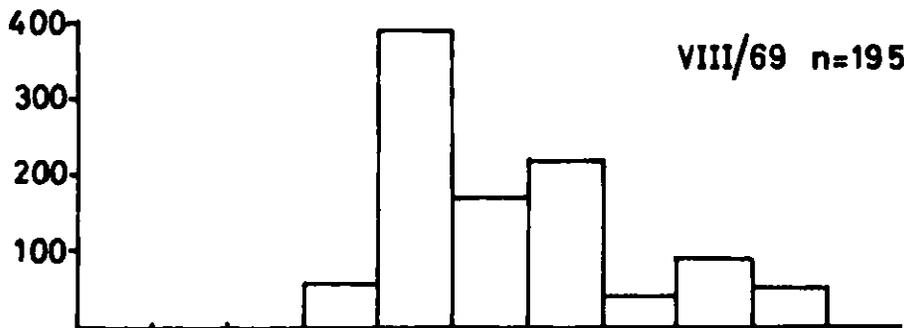
X/69 n=400



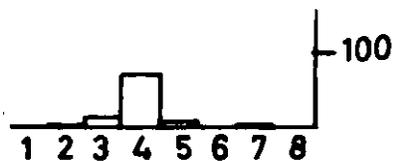
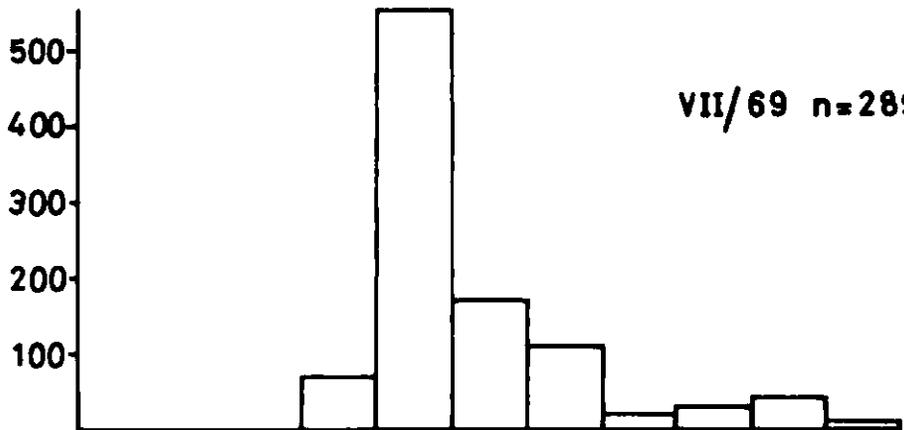
IX/69 n=97



VIII/69 n=195



VII/69 n=289



year-class 1968 67 66 65 64 63 62 61 60 <60  
age 1 2 3 4 5 6 7 8 9 >9

Fig. 4

Block Island 5 Zw

Length composition 1969

Month XII +++  $\phi$ : 27.36 cm (n=100)

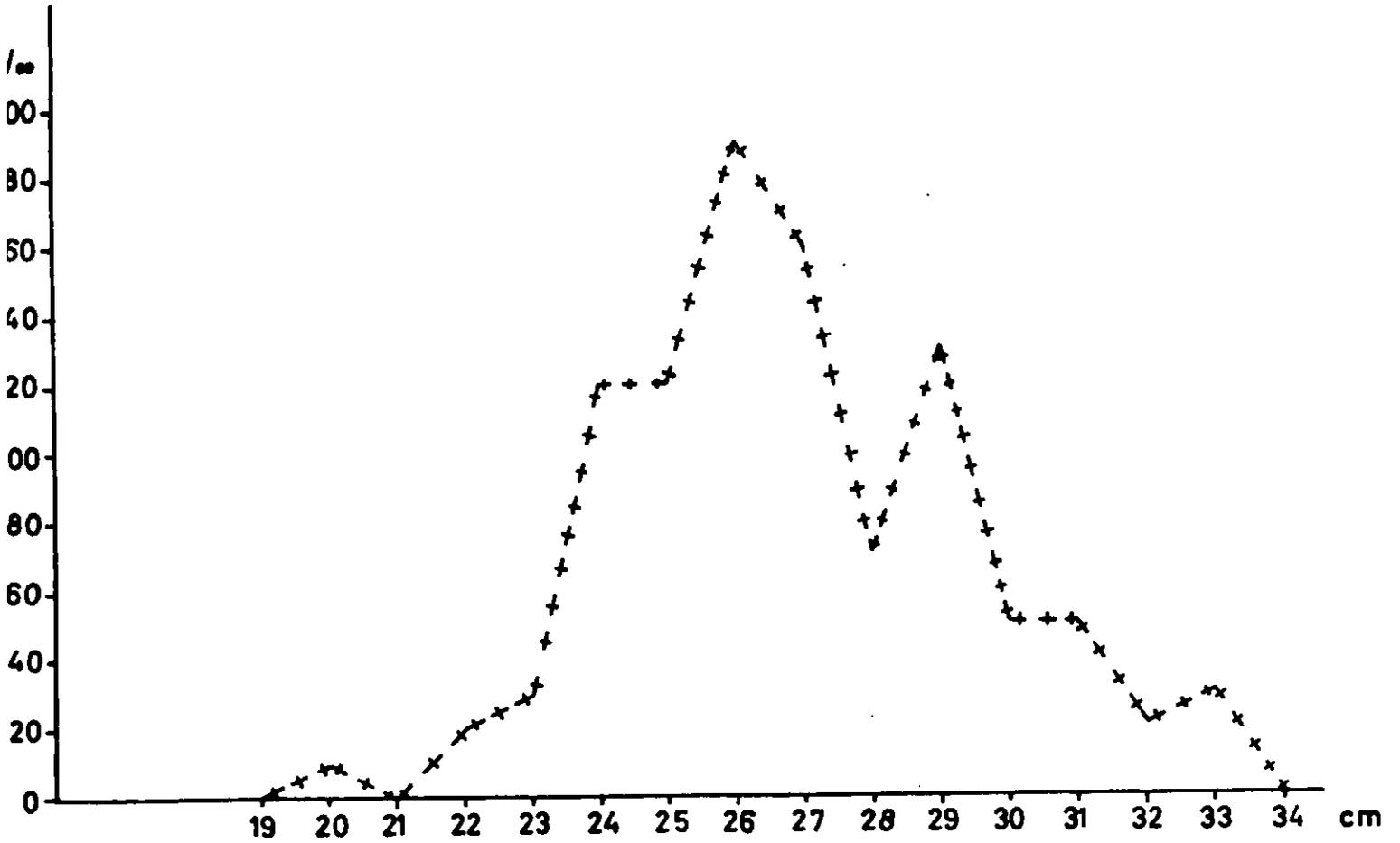


Fig. 5

**Gulf of Maine 5 Y**  
**Length composition 1969**

Month VII	—	♂ : 31.23 cm	(n = 255)
" VIII	- - -	: 31.52 "	(n = 932)
" IX	.....	: 33.31 "	(n = 707)
" X	- · - · -	: 29.97 "	(n = 885)
" XI	- x - x -	: 29.76 "	(n = 100)
" XII	+ + + +	: 27.52 "	(n = 287)

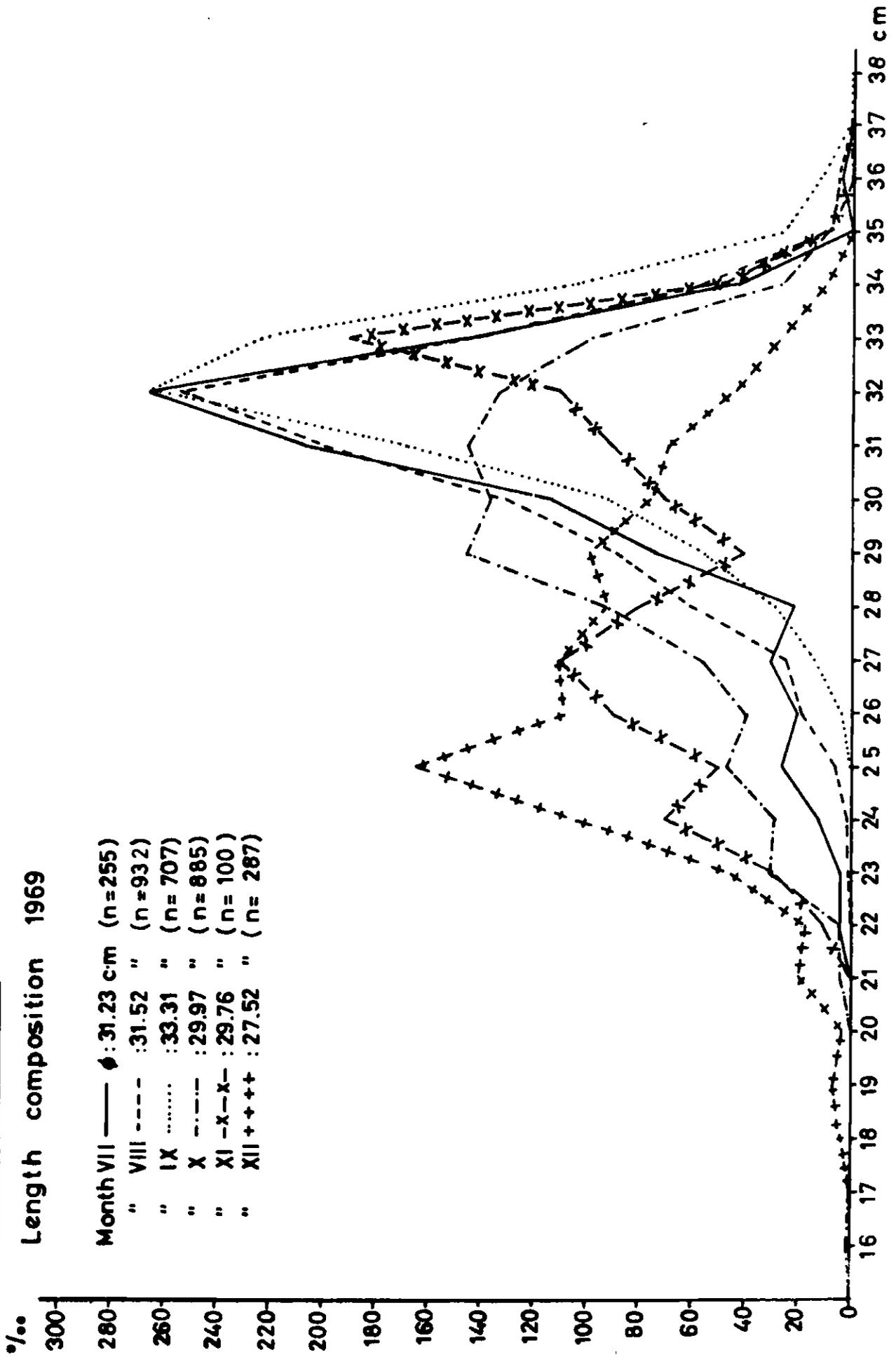


Fig. 6

**Gulf of Maine 5y**

Age composition ‰ 1969

Maturity stages %

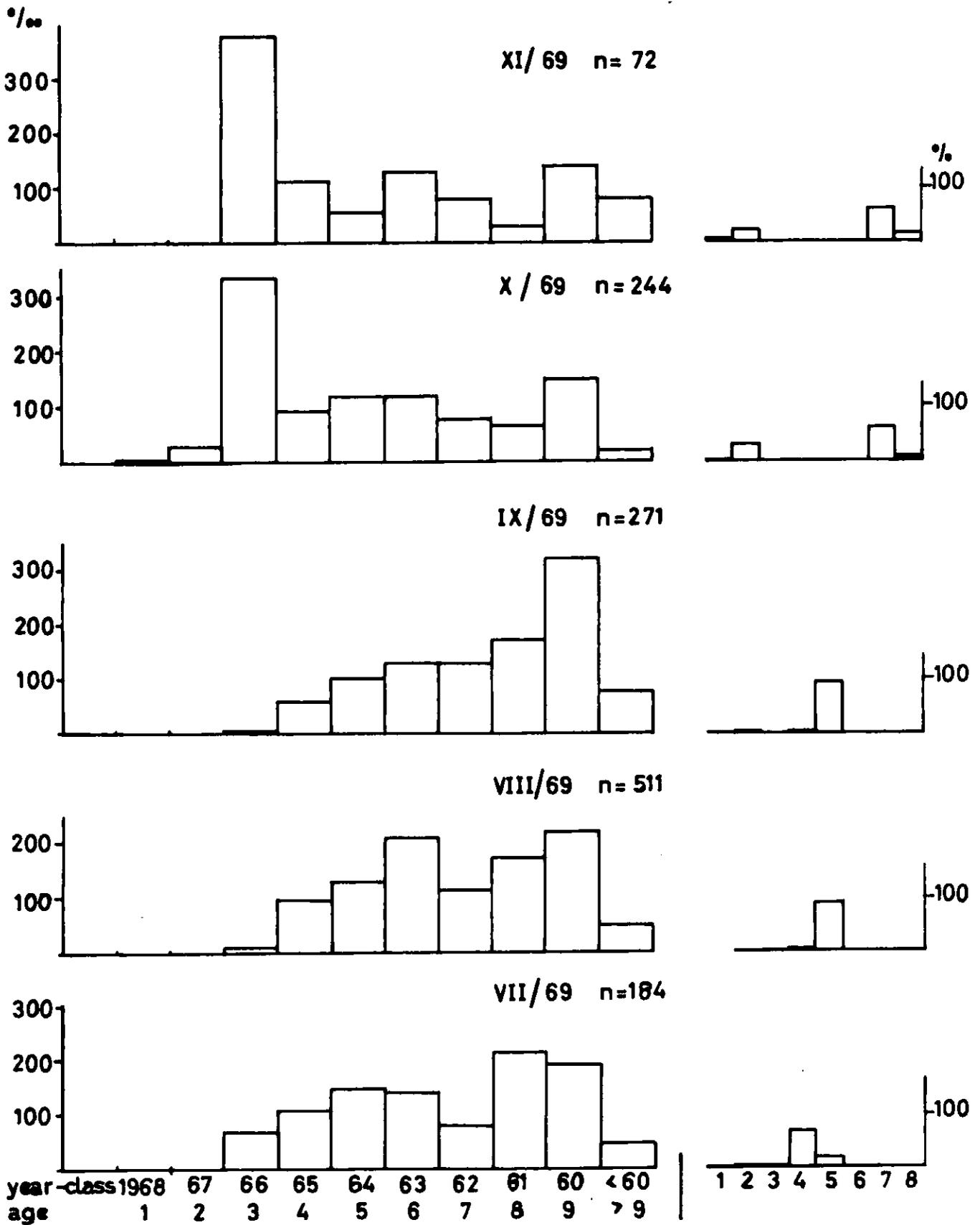


Fig. 7

Sable Island 4 W

Length composition 1969

Month IX .....  $\phi$ : 30.70 cm (n=82)  
" XI-x- : 32.65 " (n=813)

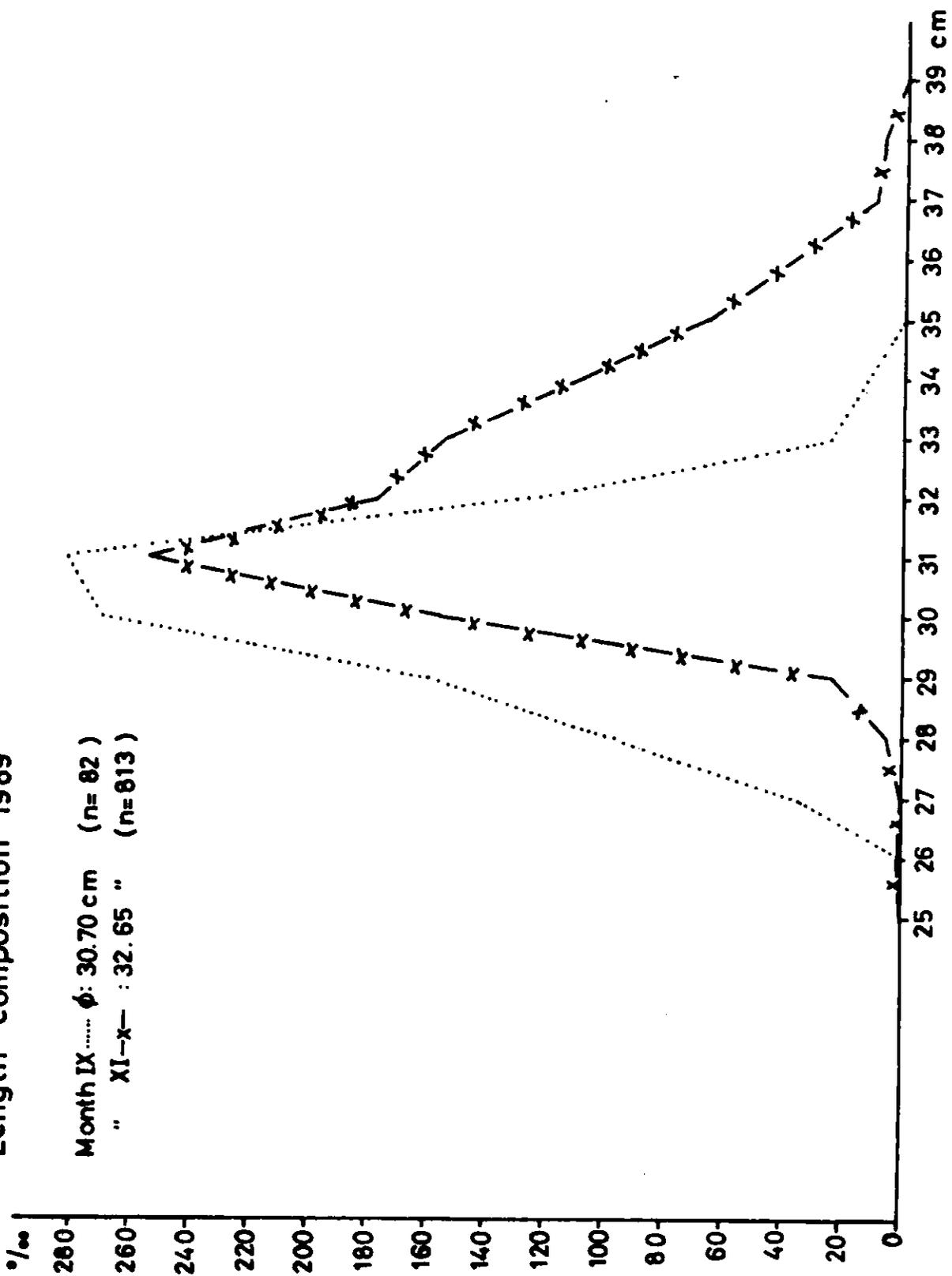


Fig. 8

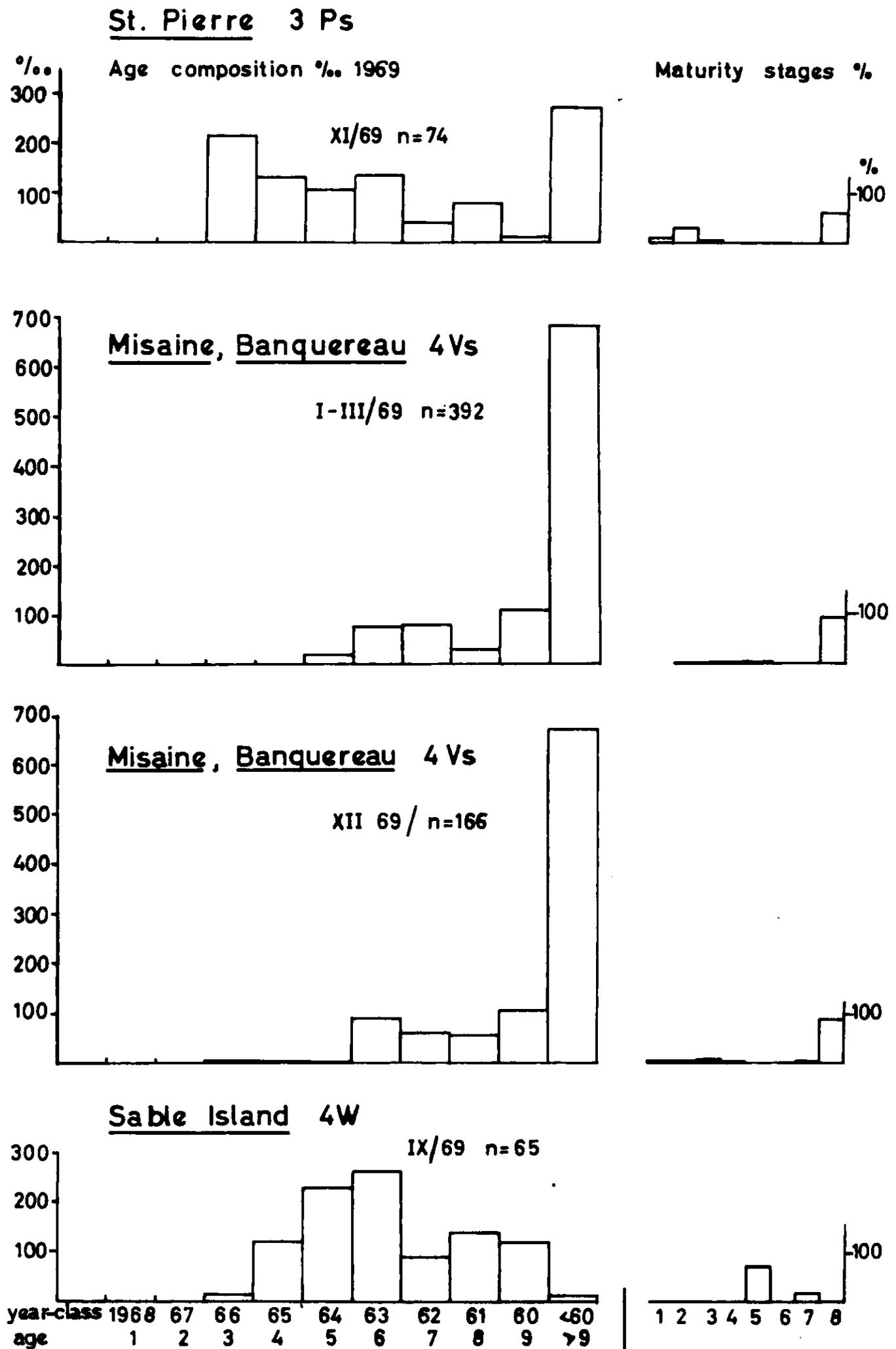


Fig. 9

Misaine, Banquereau 4 Vs

Length composition 1969

Month I-III —  $\phi$ : 33.61 cm (n=1119)  
" XII ++++ : 34.33 " (n=200)

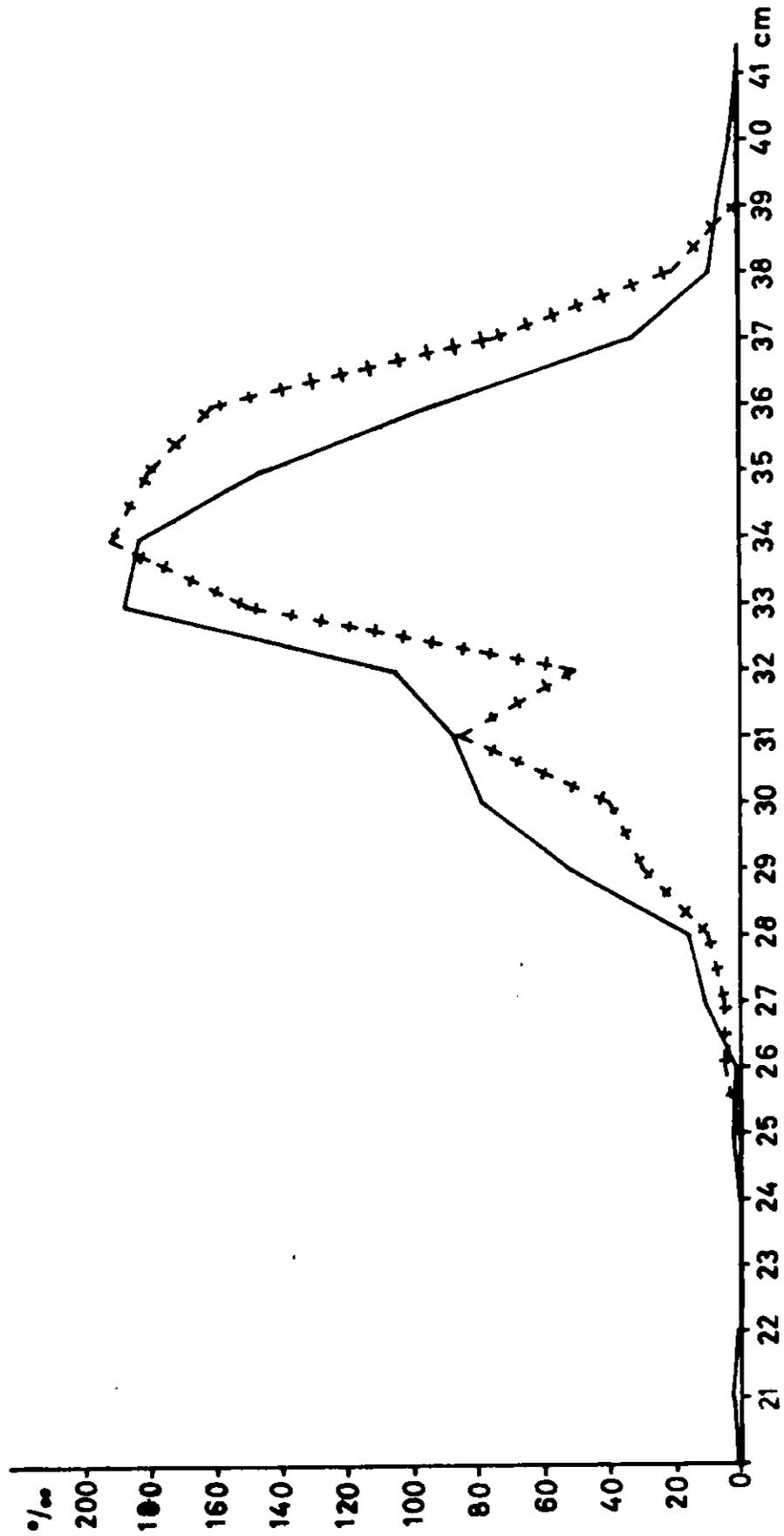


Fig. 10

Bretone, Scatarie 4 Vn

Length composition 1969

Month X ---  $\phi$ : 32.11 cm (n= 391)

" XI -x- : 31.81 " (n= 557)

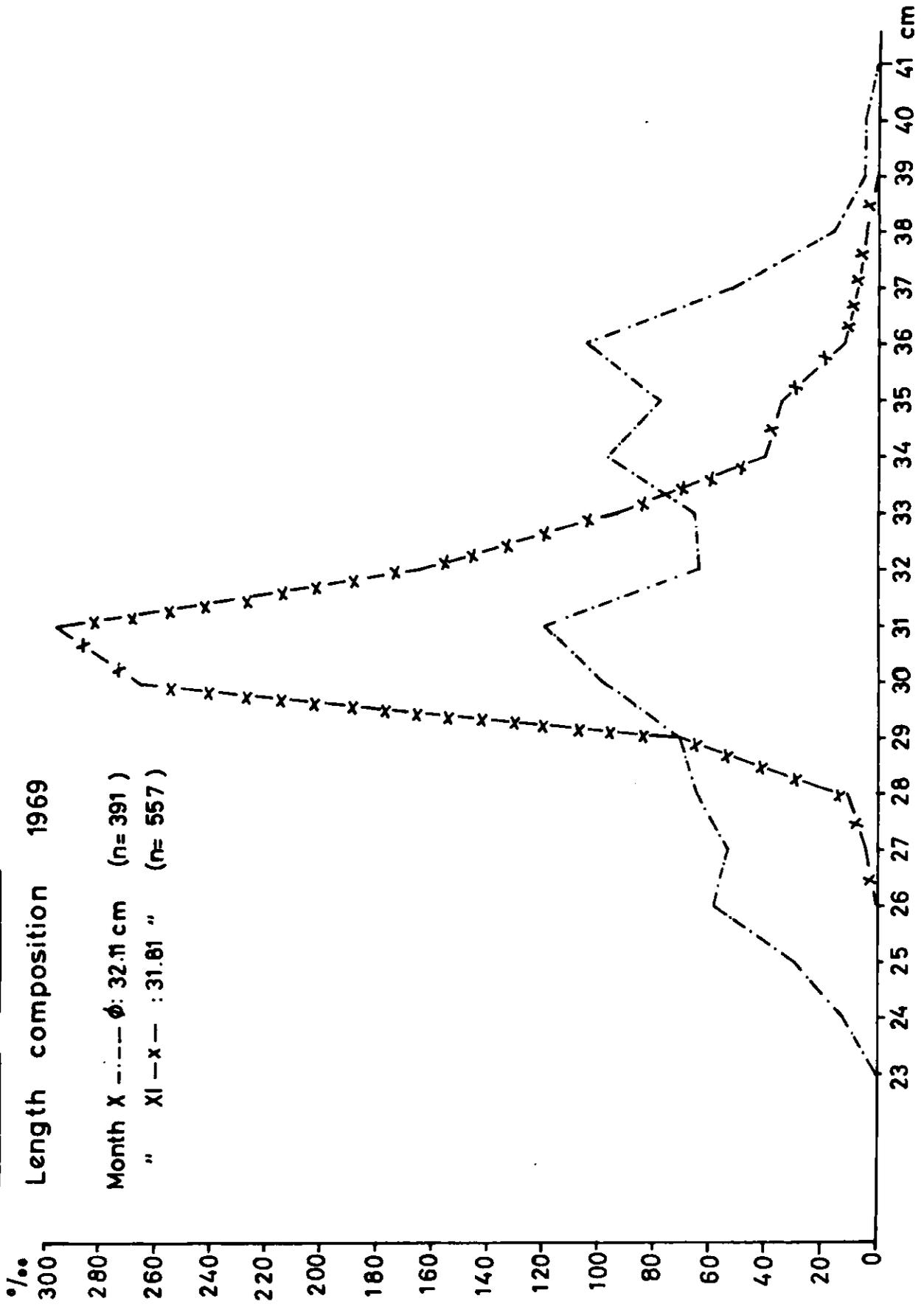


Fig. 11

St. Pierre 3 Ps

Length composition 1969

Month XI —x—x—  $\phi$ : 30.63 cm (n=100)

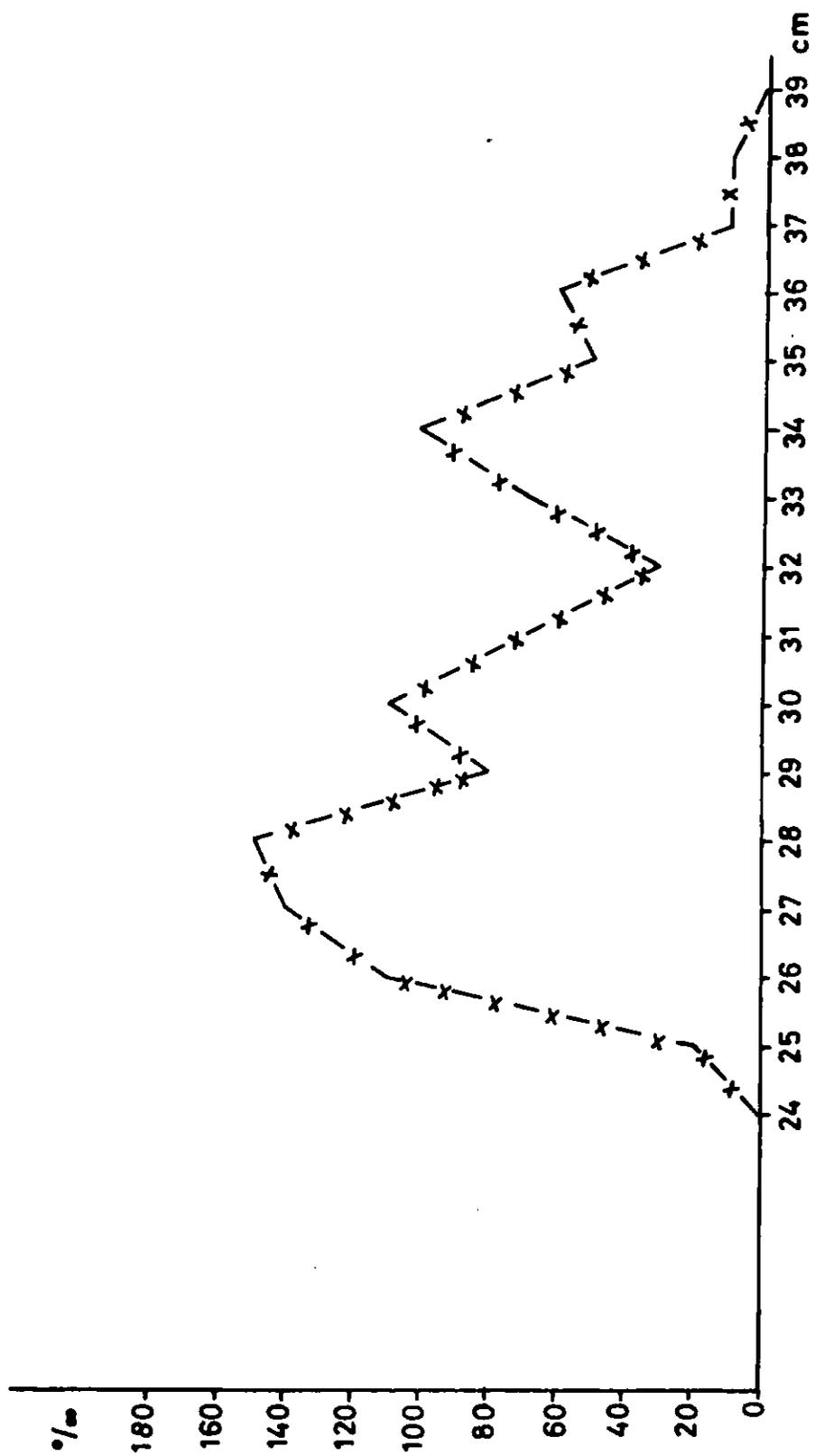


Fig. 12



1950

# International Commission for the Northwest Atlantic Fisheries



1970

RESTRICTED

Serial No. 2401

(D.a. 69)

ICNAF Res. Doc. 70/13

Part III

ANNUAL MEETING JUNE 1970

German (FRG) Research Report, 1969

Part III: Subareas 2 - 5 (excluding Herring)

Subarea 2

A. Status of the Fisheries

Due to extremely good cod fishing conditions and increased fishing activity, the highest total catch hitherto arrived at by German trawlers off Labrador was taken in 1969. For comparison, the nominal catches of the last five years are given in Table 1.

Fishing took place from January to July. However, 87% of the total catch was taken during the main season from February to April, although the fishing operations were sometimes hindered by severe ice conditions. More than 70% of the catches were taken in Division 2J and Division 2H was fished only in January and February, whereas no catches were reported from Division 2G. From May to July only mixed trips between Labrador and Greenland were recorded. As in the preceding year, 98% of the total catch consisted of cod.

There was no special redfish fishery. The small redfish by-catch was even less than 50% of the by-catch of other fish.

The percentage of industrial fish increased only slightly against 1968, but the amount of discarded cod (Table 2) was 8 - 9 times larger than in the year before, indicating a larger catch proportion of small cod, especially in Division 2J.

B. Special Research Studies

I. Environmental Studies.

Hydrographic sections were carried out by RV "Walther Herwig" across Hamilton Inlet Bank (Div. 2J) on the same line as the Canadian standard section in February (restricted on account of ice) and October and across the Labrador Current off Cape Chidley (Div. 2G) in October. The results are given in Res. Doc. 70/94.

II. Biological Studies.

Studies on the Labrador cod stock were carried out during two cruises of RV "Walther Herwig". On account of ice in February, 1969, samples could only be obtained within the area of the commercial fishery at the slope of Hamilton Bank (Div. 2J). The mean length of cod was 57.2 cm. and 5 - 8 year old cod (year-classes 1961-64) were predominant. In October, 1969, the mean length of cod was found to be considerably lower with 39.8 cm. in the same area and the fish were mostly 3 - 4 years old (year-classes 1965 and 66). At the same time, larger but less abundant cod were found in Div. 2H and 2G with mean lengths of 50.2 and 53.2 cm. respectively.

OVER

Subarea 3

A. Status of the Fisheries

With only 257 tons of cod from Division 3K, the fishery was negligible.

B. Special Research Studies

I. Environmental Studies.

Two hydrographic sections across the Grand Bank, one at 47°N to Flemish Cap (Canadian standard section) and one southward to the southwestern slope, were carried out by RV "Walther Herwig" in February, 1969. The results are given in Res. Doc. 70/94.

II. Biological Studies.

Cod and haddock have been sampled for length frequency and age composition by RV "Walther Herwig" in February, 1969 in the following divisions:

Division	Species	Mean Length	Number
3L	Cod	49.5	245
3M	Cod	54.5	428
	Haddock	66.8	78
3O	Cod	55.0	295
	Haddock	46.4	367
3P <sub>s</sub>	Cod	51.3	222
	Cod	55.4	2,406
	Haddock	43.6	432

Subarea 4

A. Status of the Fisheries

Except herring, no commercial fishery.

B. Special Research Studies

I. Environmental Studies.

Two hydrographic sections across Cabot Strait between Cape Breton Island (Div. 4 Vn) and Burgeo Bank (Div. 3 Ps), and two across Emerald Bank (4 W), were carried out by RV "Walther Herwig" in February and October, 1969. The results are given in Res. Doc. 70/94.

II. Biological Studies.

Cod and haddock were sampled for length and age composition by RV "Walther Herwig" in February, 1969 and silver hake in November, 1969, in the following divisions:

Division	Species	Mean Length	Number
4Vn	Cod	60.6	95
		49.2	1,477
		53.8	690
		57.3	794
		48.7	1,185
4Vs	Haddock	44.8	678
4W	Haddock	51.7	14
	Silver hake	Res. Doc. 70/91	-
4X	Cod	74.3	52
	Haddock	49.6	625

Subarea 5

A. Status of the Fisheries

Except herring, no commercial fishery.

B. Special Research Studies

I. Environmental Studies.

Hydrographic sections across the eastern and western part of Georges Bank were carried out by RV "Walther Herwig" in January, as well as in November, 1969. The results are given in Res. Doc. 70/94.

II. Biological Studies.

Length and age composition of silver hake (Merluccius bilinearis) and offshore hake (M. albidus) from the southern slope of Georges Bank (Div. 5Ze) were sampled by RV "Walther Herwig" in January and November, 1969. Both species were found in the same catches at almost equal numbers. Notes on their distribution are given in Res. Doc. 70/91.

OVER

Table 1. Subarea 2. German nominal catches in tons (1965-1969) (including industrial fish - fish converted to fish meal on board).

Year	Days fished	COD				REDFISH				OTHER FISH				TOTAL			
		Catch	Catch per day fished	% indus-trial	Catch	Catch per day fished	% indus-trial	Catch	Catch per day fished	% indus-trial	Catch	Catch per day fished	% indus-trial	Catch	Catch per day fished	% indus-trial	
1965	1,323	41,556	31.4	13.3	2,891	2.2	1.2	1,151	0.9	60.0	45,598	34.5	13.8				
1966	2,132	63,610	29.8	7.8	2,750	1.3	13.2	1,541	0.7	46.4	67,901	31.8	8.9				
1967	1,251	30,589	24.5	8.4	1,616	1.3	17.1	310	0.2	80.0	33,115	26.5	9.3				
1968	1,489	53,186	35.7	1.5	301	0.2	4.7	747	0.5	24.8	54,234	36.4	1.9				
1969	2,099	71,735	34.2	3.4	400	0.2	28.5	1,088	0.6	25.8	73,223	34.9	3.8				

Table 2. Discarded fish in Subarea 2 in tons, 1969 (1968 in brackets).

	COD	REDFISH	OTHER FISH	ALL SPECIES
Div. 2 H	905 (28)	17 (2)	207 (5)	1129 (35)
" 2 J	2362 (362)	40 (22)	565 (20)	2967 (404)
Total	3267 (390)	57 (24)	772 (25)	4096 (439)