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German (FRG) Research Report, 1970 - Part I

A. Subarea 1 and East Greenland

by

A. Meyer and W. Lenz

A. Status of Fisheries

Table 1 gives the nominal catch off West and East Greenland taken by the fleet of the Federal Republic of Germany from 1962 to 1970. The total catch off Greenland varied considerably during these years. The drastic decrease in the last two years from a maximum of 251,000 t in 1963 to 75,000 t in 1970 was due mainly to less fishing activity off West Greenland.

I. Subarea 1 (West Greenland)

The fishing activity of German trawlers (mostly factory ships and some trawlers for salting and fresh fish) off West Greenland in 1970 decreased by a further 47%. The catch dropped by 41% from 75,000 t in 1969 to 44,000 t in 1970, which makes up only 22% of the maximum output in 1963.

There are several reasons for this considerable decrease in fishing activity of the German fleet in Subarea 1:

1. Low stock size of West Greenlandic cod and therefore low fishery output except during the spring when the spawning shoals are concentrated.

2. Very reduced stock of redfish, which only now can be fished to come extent in the southern part of Div. 1E and in 1F. In 1970 redfish catch was only 7.8% of that of 1962.

3. Again - now for the 3rd year - hampering of the fishery by ice during the first half of the year not only in Div. 1F (which is normal) but also in Div. 1E and 1D, which till 1968 were ice-free all year. In 1970, however, the ice situation was not as severe as in 1969 which was the severest ice-year since the start of the West Greenlandic fishery for cod in 1925.

4. Very profitable fishery off Labrador from January to the end of March, when ice stopped the fishery in Subarea 2.

5. Early start of the more profitable herring season in Subarea 5.

Thus in 1970 the real West Greenland season was reduced to 3 months only (April - June). On the 14th of July the last factory ships left Subarea 1. The daily catch in July had become unprofitable. In December the first factory trawlers returned to West Greenland. However, the daily catch was only poor to medium and not nearly comparable to the catch rate in the first half of the sixties at this time of the year.

Since 1953 German trawlers have also been salting cod off West Greenland for export purposes. The catches of these salters in 1970 were so small that there will probably be no repetition of this special production.

II. East Greenland

During the first half of the year, the fishery is often hampered by ice, but can be very profitable when northern or eastern winds press the southward drifting ice-belt against the shore and enable fishing on the very rough banks.

More and more factory trawlers are now working off East Greenland, especially during the spawning season for cod (March, April) or when ice hampers the fishery on the western side of Greenland. On the other hand, the activity of the German fresh-fish trawlers is being reduced more and more due to the market situation and the continuous reduction in the number of fresh fish trawlers. In 1970 the total catch off East Greenland decreased by 23% to 31,000 t. The average daily catch of cod increased by 42% and was the highest since the beginning of the fishery in 1955 in this region. However, the daily catch of redfish decreased further and was the lowest since 1955. For the first time nearly as much cod as redfish was caught, while during the preceding years redfish was always the main species caught.

III. Forecast for 1971

a) Subarea 1

The output of the German fishery of factory trawlers in 1971 will depend, as the preceding years, on the possibilities for catching cod off Labrador and in other areas, such as Iceland and the Norwegian Coast, where saithe is now also frozen in increasing quantities. Due to the fact that cod catches off Labrador in 1971 for the first time were smaller than in preceding years and the ice forced the fleet to leave Labrador by the 15th of March 1971, fishing activity in Subarea 1 in the first 3 months of 1971 was 56% higher than in 1970. During the second half of March part of the fleet because of ice and better catches moved to East Greenland. During the first 3 months the daily catch was 30% higher than in 1970. Also the ice situation, although not normal, seems to be better than in preceding years. Thus it can be expected that fishing effort and total catch in 1971 in Subarea 1 will again increase especially when ice conditions allow a repetition of the very profitable pelagic fishery on post-spawners in May and June in Div. 1E. Even if the 1971 catch exceeds the low landings of the last two years, the total catch certainly will be smaller than during the period 1962-1968. As in preceding years, the German fishery will probably end in July again with the onset of the slack period.

b) East Greenland

There is reason to expect that, off East Greenland in 1971, catches of cod will exceed those of redfish for the first time. This will be due to the increased activity of the factory trawlers and the rather good state of the spawning stock of cod off East Greenland (year classes 1961, 1962 and especially 1963). It must be expected, however, that a substantial part of the spawning stock will emigrate to the Icelandic spawning grounds.

B. Special Research Studies

I. Environmental Studies

1. Hydrography (by W. Lenz)

The cruise track of the German Walther Herwig from 8 - 28 March 1970 (Fig. 1) shows the area where hydrographic investigations were made. In addition to the serial and BT, XBT stations, the fronts of drift and pack ice in March 1969 and 1970 are shown. While the extent of ice was quite similar in both springs off the eastern and southern coast of Greenland an ice barrier was found off the western coast to Fiskenaes Bank in March 1970 which limited our work to the area of Fyllas and Banana Banks.

The year 1969 has been an extremely cold year in Greenland waters, but our measurements in March show that 1970 will be even colder. Compared to March 1969 the situation at Fyllas Bank (Fig. 2) was as follows:

Water in the upper 50 m was warmer in March 1970 than in the previous year by a few tenths of a degree, but from the 50 m to 500 m it was colder with a maximum of almost 2 degrees at 150 m (see Redbook 1970, Part II, P. 50-51). Corresponding to the usual T/S relationship in West Greenland waters, the salinity distribution showed a similar difference to March 1969, the 34‰ isohaline lay 150 m deeper at 250 m.

However, further north at the west side of Little Halibut Bank, the water was warmer again, 0° at 90 m and 1° at 150 m; the result of progressive mixing of the cold and warm components of the West Greenland Current.

The core of the warm Irminger component of this current was found at the same depth (ca. 500 m) with the same values in temperature and salinity (5.1° ; $34.97^{\circ}/\text{oo}$) as in March 1969.

With a new design of instrument (developed by Dr. H. Schulz, Institute for Seafisheries, Hamburg) to measure continuously the vertical temperature structure down to 1000 m a forward step was taken in understanding more about the hydrography in the fishing areas off the coast of Greenland. Figure 3 shows the temperature distribution within 3 hours in the trough between Fyllas and Fiskenaes Bank. There was an almost horizontal stratification of the isotherms.

But just north of Fyllas Bank, the situation was quite different. At two stations, only 3 nm apart (Fig. 4) the temperature was similar only in the upper 50 m. On bottom at the shallower station the temperature just exceeded 0° while it reached 2° at the same depth at the deeper station. There was no opportunity to investigate whether this phenomenon was stationary in time.

Off East Greenland, the Walther Herwig could always reach the outer fishing grounds. Bottom temperatures were between 3.5° and 5.0° at the end of March 1970. They were generally cooler from north to south, since the core of the Irminger component of the East Greenland Current was moving deeper on at Moesting Ground (Fig. 5) and at Walloe Bank (Fig. 6). The maximum values of temperature and salinity in this core (5.1° , 4.9° ; $34.99^{\circ}/\text{oo}$, $34.97^{\circ}/\text{oo}$) were slightly lower than in March 1969.

At the south-western tongue of Anton Dohrn Bank the vertical temperature distribution was the same as in March 1969 (only 3 days earlier in the year). From the surface to about 200 m the temperature was slightly above 6° and on the slope of the Bank, below 4° . Salinity was unexpectedly $1/10^{\circ}/\text{oo}$ higher.

II. Biological Studies

The trend of increasing fishing activity in the two southern Div. 1E and 1F (with the greatest output in 1E) which started in 1968, increased considerably. In 1970, 77% of the total catch in Subarea 1 was caught in its southern part (1967: 27%, 1968: 42%, 1969: 50%) in spite of the fishery on the southern grounds being more hampered by ice than in Div. 1D and 1C (Fig. 1). This shows clearly, as mentioned in last year's report (Redbook 1970, Part II, p.46), that the cod fishery in Subarea 1 for several years has depended mainly on the East Greenlandic year-classes and that the stock of West Greenlandic cod is in a rather poor state.

In 1970, 24,307 length measurements and 6,664 age determinations were made. They showed that, in the northern Div. 1C and 1D (Ranana, Fyllas, and Fiskenaes Bank), the 1965 year-class was dominating. This seems for the time being the only year-class of West Greenlandic origin, which could have some commercial importance, especially when concentrating for spawning in the coming years. This year-class made up 36-73% of the catches by the Walther Herwig in March and had an average length of 56.4 cm. Ten percent of these 5-year-old cod had already reached maturity. The 1966 year-class was the second strongest (24%) in Div. 1C and 1D. Catches with an average of 13 baskets per hour, however, were rather small. Also, the catches of a factory trawler on Fyllas Bank at the end of June were dominated by the 1965 year-class (37%). However, the catches were not encouraging. The 1965 year-class does not seem to be very promising.

In Div. 1E and 1F, the catches by factory ships in February and June and by a fresh-fish trawler in January were mainly composed of the 1961, 1962 and 1963 year-classes which are mainly of East Greenlandic origin. These 3 year-classes accounted for 80% of the total catch. The 1963 year-class (average length 66.6 cm) is at present the most important one (44%) followed by the 1962 (20%) and 1961 (16%) year-classes. Most of these cod were mature and on their way to the spawning grounds off East Greenland (January-February) or post-spawners coming back (June). Almost no cod of the 1965 year-class were found in these catches. Specimens of this year-class were absent from the catches of some trawlers fresh fishing occasionally west of Cape Farewell from August to November. This confirms that the year-class is a real West Greenlandic one. In the autumn catches in Div. 1F, the 1963 year-class dominated (50%) followed by the 1964 (28%), 1962 (14%), and 1961 (8%) year-classes.

Off East Greenland during the first 4 months of 1970, when on spawning migration (January, February) or spawning (March, April), the rich 1961 year-class was again of greatest commercial importance as in preceding years. During this

time (the main German fishing season off East Greenland) the 9-year-old cod dominated (42%) (average length 81.1 cm). The other two good year-classes, 1962 and 1963, each contributed 25%. Their average length was 74.1 and 77.3 cm respectively. Thus these 3 important year-classes constituted 92% of the total catch.

Maturity studies of catches made by the Walther Herwig and Anton Dohrn in March and April showed that on the southern banks of East Greenland (Walloe and Discord Bank, and Moesting Ground) the 7-, 8-, and 9-year-old cod were 49, 61 and 77% mature respectively. However, on the northern banks (Heimland Ridge and Dohrn Bank) 88, 92 and 93% were mature. Probably a substantial part of these mature cod will have emigrated to Iceland and strengthened the Icelandic spawning stock.

In the catches after the spawning season from May to October the 1963 year-class was dominating (43%) followed by the 1962 year-class (20%) and the 1961 year-class (15%). The average length of these year-classes was 70.0, 72.4 and 77.8 cm respectively.

Table 1. Subarea 1 and East Greenland. German nominal catches in tons (industrial fish included), 1962 - 1970

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
1970	1,722	38,551	22.4	4.0	4,501	2.6	9.1	44,283	25.7	5.9
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
1970	1,532	14,388	9.4	0.9	15,672	10.2	4.5	31,104	20.3	3.3
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
1970	3,254	52,939	16.3	3.2	20,173	6.2	5.5	75,387	23.2	4.9

Table 2. Discarded fish in Subarea 1 in tons, 1970

	Cod	Redfish	Species unknown	Total
1C	5	-	4	9
1D	3	-	2	5
1E	10	-	8	18
1F	12	-	12	24
Total	30	-	26	56

Table 3. Average gross registered tonnage of German trawlers fishing in Subarea 1, 1962-1970

Year	Average gross registered tonnage of German trawlers fishing in Subarea 1
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)
1970	1320 G.R.T. (645 - 2684)

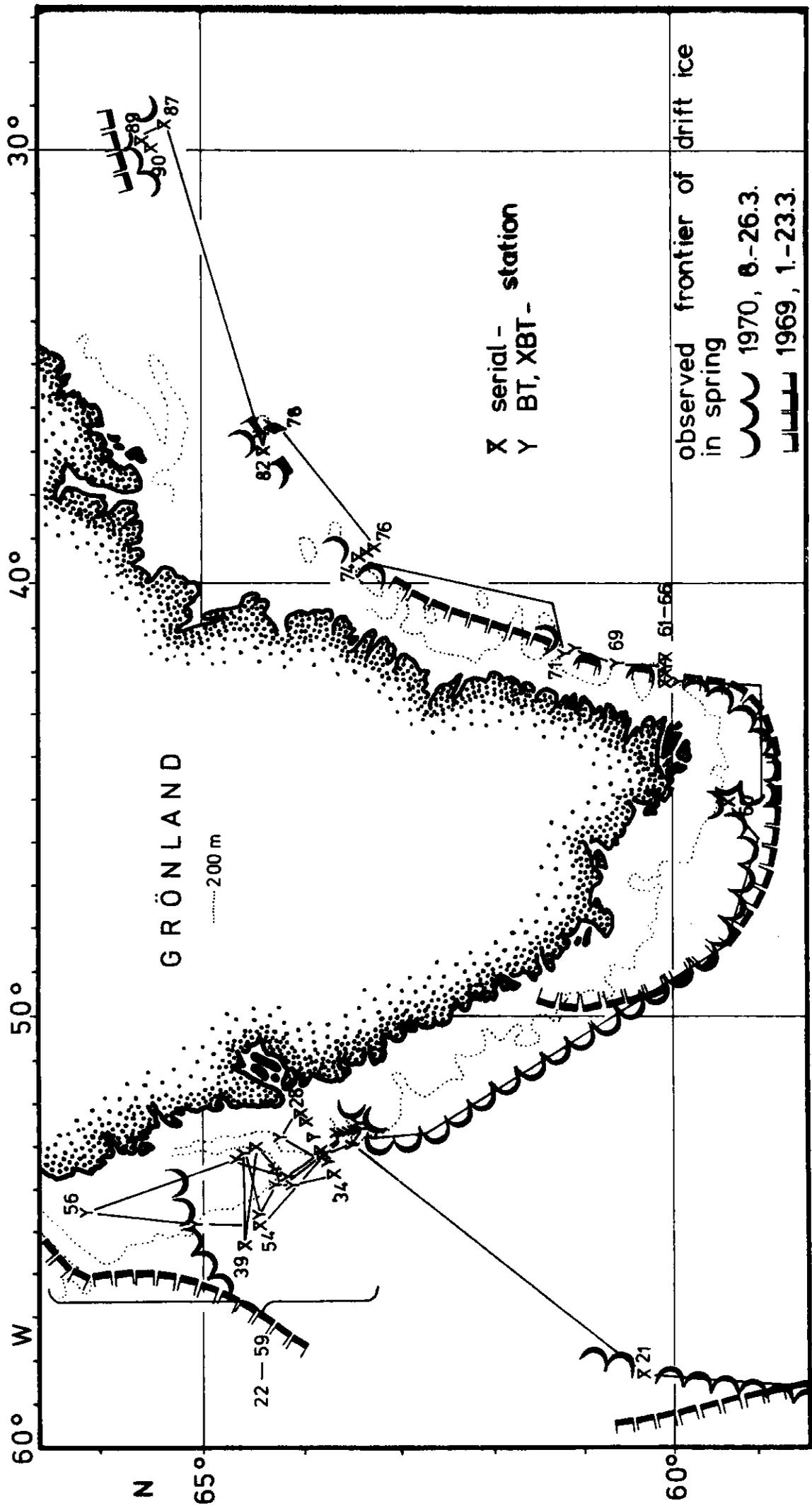
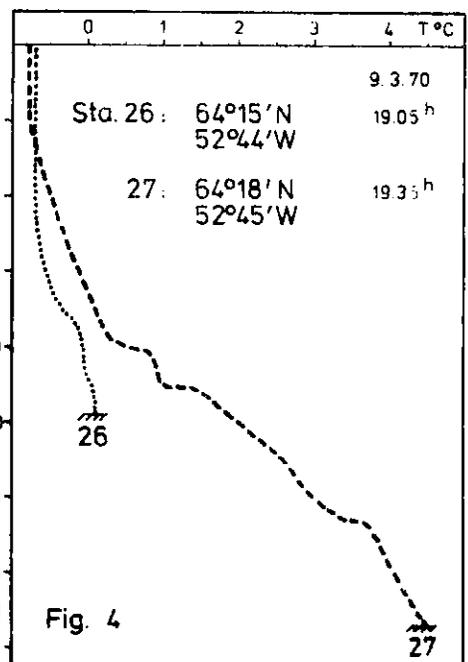
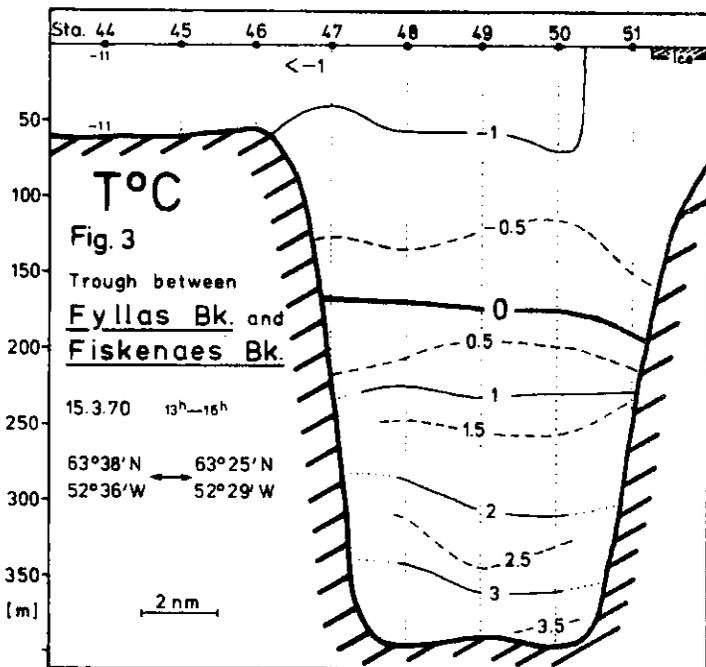
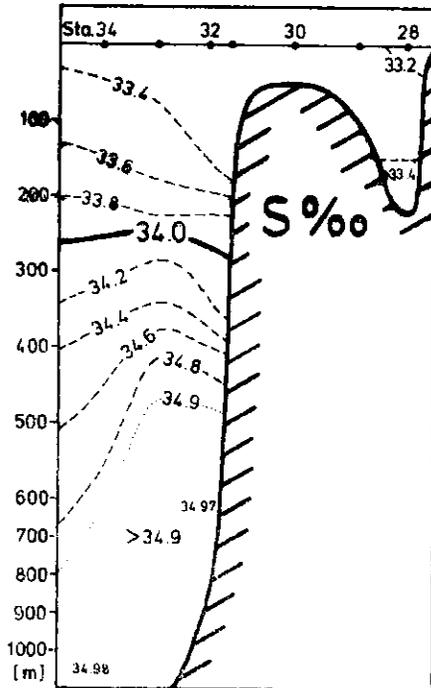
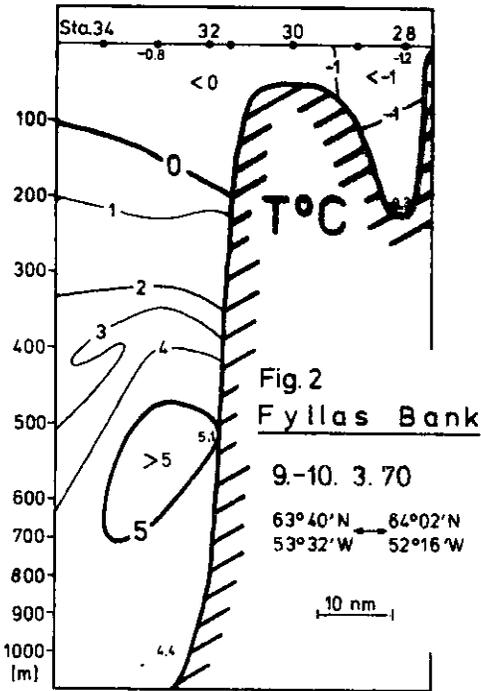
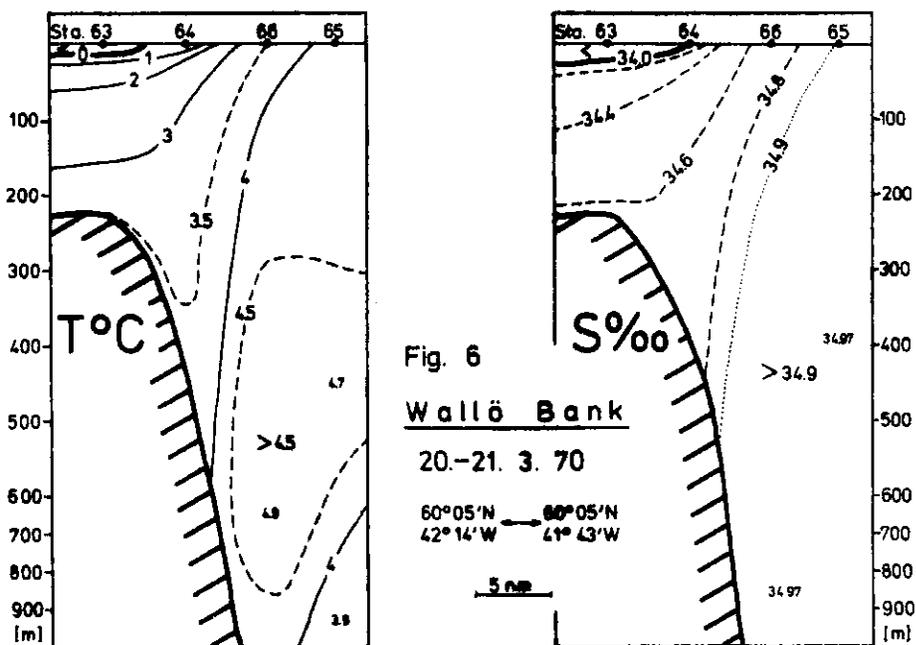
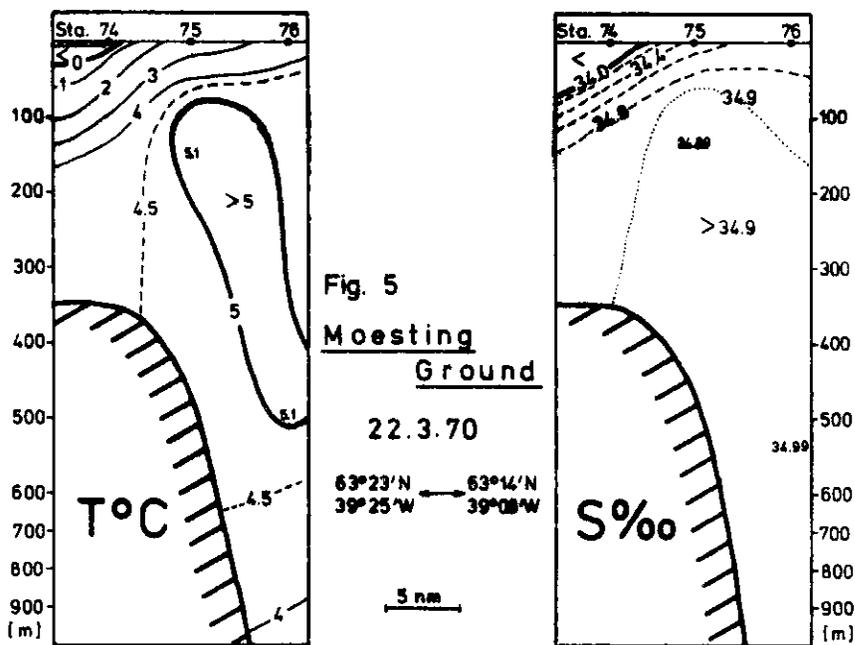


Fig. 1







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Addendum #1

ANNUAL MEETING - JUNE 1971

German (FRG) Research Report, 1970 - Part II

B. Subareas 2 - 5 (excluding Herring)

by

J. Messtorff and W. Lenz

Subarea 2

A. Status of the Fisheries

The total catch taken by trawlers of the Federal Republic of Germany off Labrador decreased sharply by 23 400 t (32 %) in 1970 against the record catch of 1969 and fell even below that of 1968. For comparison, the nominal catches of the last six years are given in Table 4.

Similar to the preceding two years 97 % of the total catch consisted of cod. The sharp decline of the Subarea 2 catch of cod was mainly due to a considerable reduction of fishing effort (days fished) by about 25 % against 1969. But this reduction was almost completely compensated by a corresponding shift of effort to the most northern part of Division 3 K from March to May just adjacent to the main fishing area of the German fleet in the southern part of Division 2 J. As there was practically no separation of fishing operations in both Divisions obviously the same cod population (Labrador stock) was exploited. Moreover no additional fishing activity took place in Subarea 3 Divisions farther south. Therefore the combined nominal catches of Subarea 2 + 3 are given at the bottom of Table 4. Off Central Labrador (Div. 2H) some fishing activity was only recorded in February but none off North Labrador (Div. 2 G). But even the combined cod catches show a remarkable decline of 13 500 t (19 %) against 1969, although the total effort was almost the same.

The following reasons may have been responsible for the less efficiency of the fishery.

- 1) Still severer ice conditions than in 1969. The drift ice covering the Labrador shelf in spring 1970 extended still farther east than in 1969 and even beyond the continental slope off South Labrador (See Fig. 7). Trawlers were frequently forced to operate under very difficult conditions within limited and often rapidly changing areas of more or less open water inside the ice frontier.

- 2) Hydrographic observations indicated, that on the other hand the area of optimum bottom temperatures was less restricted in 1970 so that cod may not have formed quite as dense concentrations as in 1969.
- 3) Reduced abundance of the adult stock exposed to fishery.

Fishing activity was recorded from January to June. However, 89 % of the total catch was taken during the main season from February to April with a peak of 45 % in March.

Although there was no special redfish fishery the relatively small by-catch of this species increased slightly in Subarea 2 since 1968 probably due to the restriction of fishing operations to the slope of the shelf on account of the extreme hydrographic as well as ice conditions. The redfish catch, however, remained unimportant with only 1 % of the total catch in Subarea 2 and 5 % in Subarea 3 (Div. 3 K).

Forecast for 1971

After preliminary estimates cod catches taken by trawlers of the Federal Republic of Germany off Labrador in January and for the most part in February 1971 may have exceeded those of the same months in 1970 by approximately 40 %, but in spite of that the catch per unit effort has probably decreased. Already about the middle of March, however, ice as well as presumably unprofitable catches forced the fleet to leave Labrador and fishing has not been taken up again since. The German fishery off Labrador is therefore not expected to yield much more than 30 000 t in 1971.

B. Special Research Studies

I. Environmental Studies (W. Lenz)

Hydrographic observations were carried out by RV "Walther Herwig" in Subarea 2 in February/March 1970 mainly in the southern part of Division 2 J where the fishing fleets were concentrated. Although the operations were rather restricted by severe ice conditions one hydrographic section (Fig. 8) could be obtained even among the drift ice up to some 80 miles inside the ice frontier. The temperature distribution underneath the ice showed a rather horizontal stratification with a cold upper layer extending beyond the slope of the banks and reaching down to over 100 m at the innermost station. In the whole area of observations bottom temperatures were above 3° C between 280 and 350 m and even above 4° C in deeper water at the slope. Compared to the hydrographic situation observed at the same time of the year in 1969 a considerably wider area was covered by warmer bottom water. Because of the drift ice only few salinity values could be determined, but those indicate that also the salinities in the West Greenland component of the Labrador Current were slightly higher than in the year before.

II. Biological Studies

R.V. "Walther Herwig" worked off Labrador in February/March 1970 but sampling for length and age distribution of cod was restricted on account of ice to the area of the commercial fishery in the most southern part of Division 2 J. After preliminary results the mean lengths of cod in research and commercial catches varied between 51 and 56 cm and did not differ significantly from last year's estimates. - But the predominant length groups (40 - 60 cm) as well as age groups (year classes 1962 - 1965) were more evenly distributed in 1970.

In order to test a new egg-counting device, developed by Dr. Schulz of the Institute for Seafishery at Hamburg, a sample of ovaries of Labrador cod (prespawners) was collected in March 1970. Although the material was rather limited the results of the successful test countings seemed good enough to give at least some rough estimates of the egg production of Labrador cod. The actual egg numbers from cod of 50 to 72 cm varied between 0.13 and 1.8 million. The mean values were 0.8 million eggs at 61.2 cm total length of fish. A comparison with egg numbers of East Greenland cod obtained by the same method showed that in relation to length of fish they fitted in roughly the same exponential curve. But whether this relationship is in fact specific for all Atlantic cod and independent of different stocks can only be derived from a more comprehensive material. The slow growth rate of Labrador cod, however, results in a much smaller size at first maturity and hence in a considerably lower egg production to start with than in fast growing cod populations.

Subarea 3

A. Status of the Fisheries

The nominal catch taken by trawlers of the Federal Republic of Germany is given in Table 4. As the fishing activity was restricted to the most northern part of Division 3 K and was connected with the fishing operations in Division 2 J more detailed informations are given in section A. for Subarea 2.

B. Special Research Studies

Samples for length and age distribution of cod were taken by RV "Walther Herwig" in February/March 1970. The average length of cod was with 42.3 cm considerably lower than off South Labrador at the same time and the same depth zone (300 - 400 m). The predominance of younger cod formed a pronounced peak at 37.5 cm in the length distribution. In the research vessel catch 69 % of cod were smaller than 45 cm.

Subarea 4

A. Status of the Fisheries

Except herring, no commercial fishery.

B. Special Research Studies

During April extensive selectivity experiments with polyamide bottom trawl codends were carried out by RV "Walther Herwig" in Div. 4 Vn. The assumption that the elongation of the netting yarn is one of the most important factors by which the selectivity might be influenced, could not be substantiated. The results of the experiments are given in Res. Doc. 71/1 (H. Bohl: Selection of cod by polyamide trawl codends in ICNAF Division 4 Vn).

Subarea 5

A. Studies of the Fisheries

Except herring, no commercial fishing.

B. Special Research Studies

For Environmental and Biological Studies (herring) see Section C. of the Research Report.

Table 4. German nominal catches in Subareas 2 (1965 - 1970) and 3 (1969 - 1970) in tons, (including industrial fish = fish converted to fish meal on board).

Year	Days fished	COD			REDFISH			OTHER FISH			TOTAL		
		Catch	Catch per day fished	% industrial	Catch	Catch per day fished	% industrial	Catch	Catch per day fished	% industrial	Catch	Catch per day fished	% industrial
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
1970	1 585	48 232	30.4	2.1	650	0.4	29.5	945	0.6	50.4	49 827	31.4	3.3
1969	-	257	-	-	4	-	-	1	-	-	262	-	-
1970	414	9 937	24.0	3.1	587	1.4	7.2	103	0.2	69.9	10 627	25.7	4.0
1970	1 999	58 169	29.1	2.3	1 237	0.6	18.9	1 048	0.5	52.3	60 454	30.2	3.4

Table 5. Discarded fish in Subareas 2 and 3 in tons, 1970 (1969 in brackets).

	COD	REDFISH	OTHER FISH	ALL SPECIES
Div. 2 H	42 (905)	1 (17)	2 (207)	45 (1129)
Div. 2 J	592(2362)	82 (40)	221 (565)	895 (2967)
Total	634(3267)	83 (57)	223 (772)	940 (4096)
Div. 3 K	- (-)	35 (---)	15 (-)	50 (---)

Note: Tables 1. to 3. are found in Part I of this Research Report.

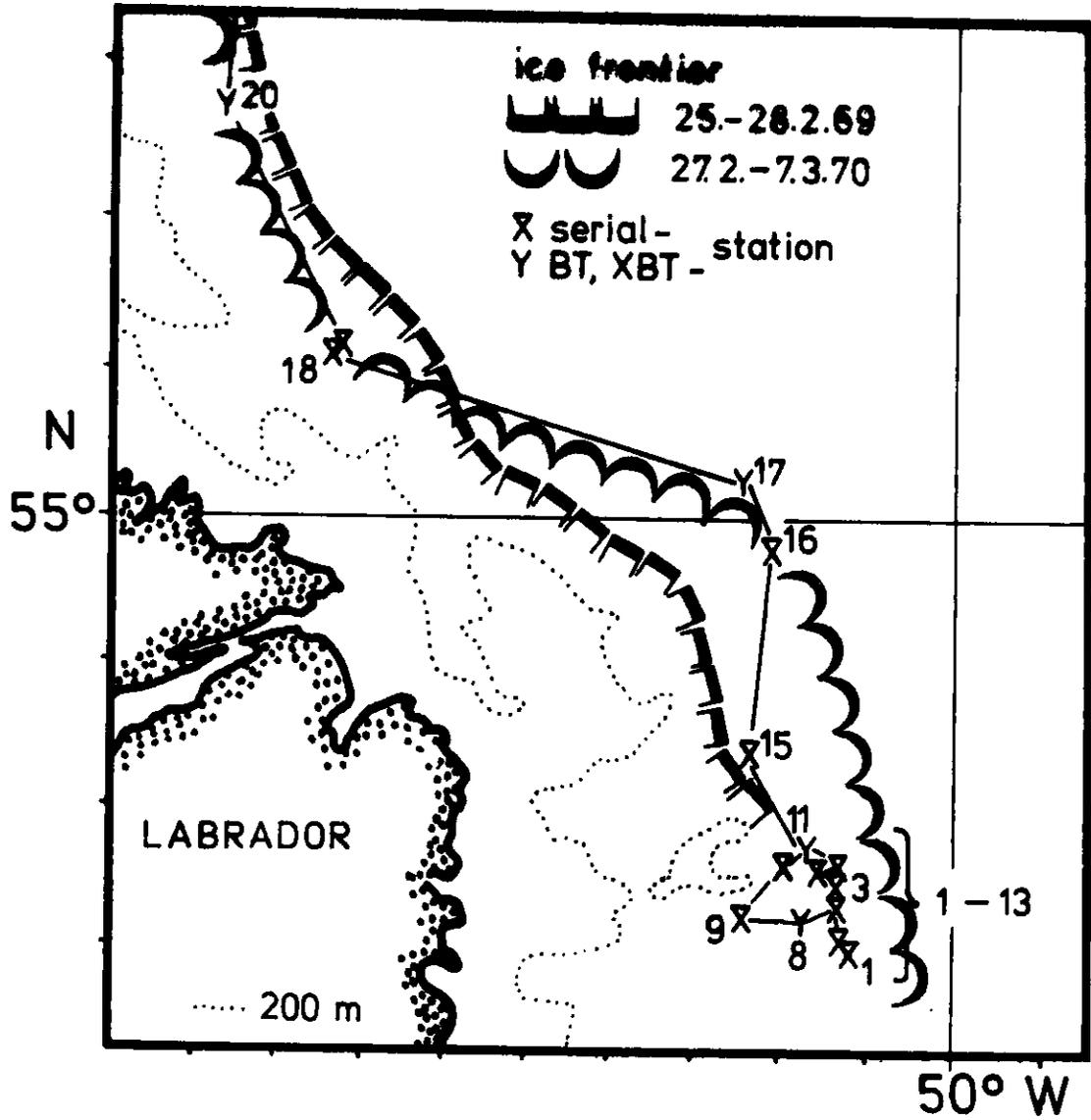


Figure 7.

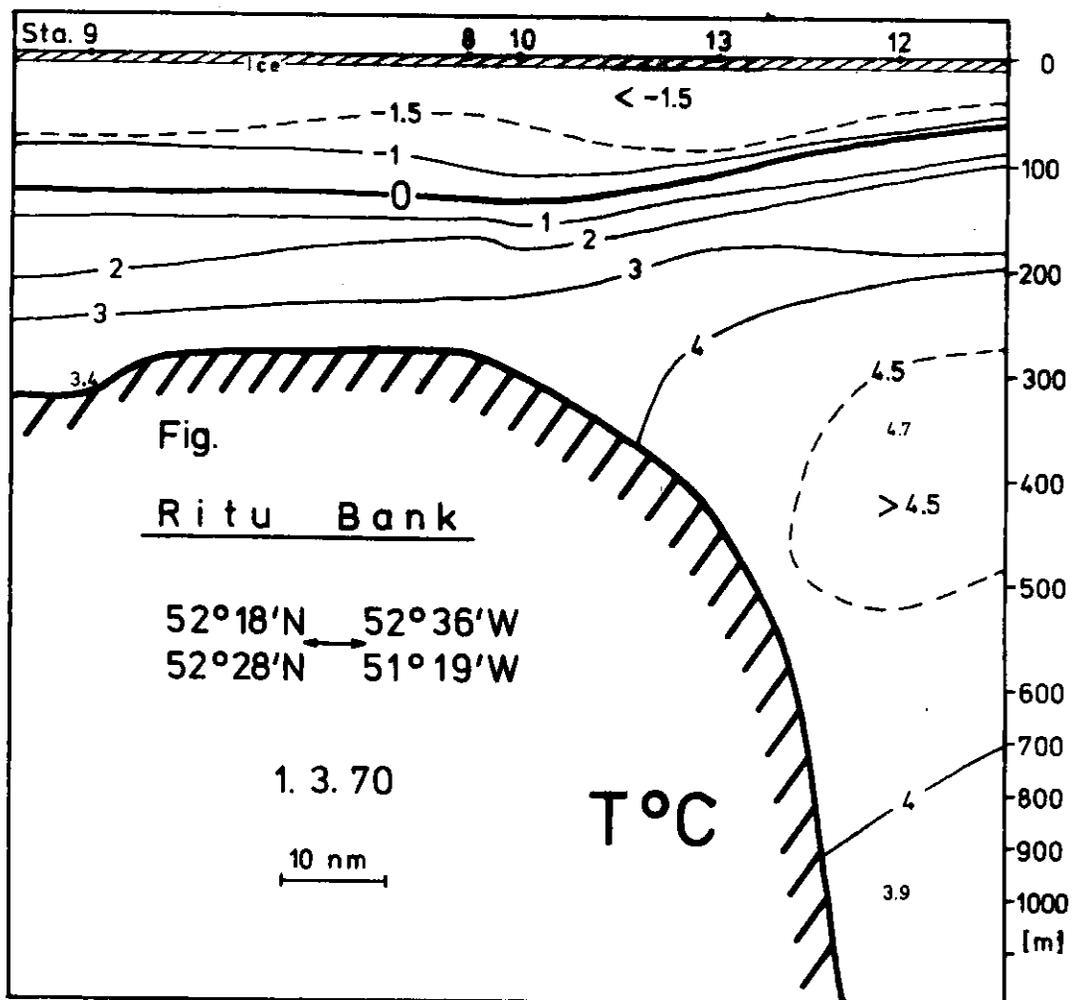


Figure 8.

Note: Figures 1 - 6 are found in Part I of this Research Report.