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International Council for
the Exploration of the Sea

C.M. 1975/P: 6
Baltic Fish Committee

Cod fishery of the GDR in the Mecklenburg Bay and
state of the cod stock in the last 10 years

by

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Since the second world war the Mecklenburg Bay was fished only by cooperatives with wooden cutters measuring up to 15 m till 1958 and up to 17 m from 1958 onward. The catches by passive fishing gear in coastal waters were always very low. Practically since 1961 the fishing fleet has not changed. The small cutters and some cutters of 17 m length have 60-80 h.p., the other cutters of 17 m length have 120-140 h.p.

All over the year fishing is carried out mainly with bottom pair trawls. The trawls used are herring trawls and in all months we have a mixed cod herring fishery with changing proportions of cod and herring. In autumn the proportion of cod in the pair trawls is rising and sometimes some fishermen begin a cod fishery with one boat cod trawls in this time, but only for some weeks or a few months. In the last years most fishermen were pair trawling all over the year. In the meantime they have got much experience in fitting the pair trawl to a fairly good catch of cod.

From table 1 and figure 1 may be seen the cod catches of the GDR in region 22 and the annual cycle of the catches. The catch per day is not high and it is for this reason that there is always a mixed fishery. In the last years the cutters of 120-140 h.p. have not got a higher cod catch per unit effort than the cutters of 60-80 h.p. The best catch per day is obtained from August/September to March, i.e. in the prespawning and spawning time. In this time likewise the cod landings are the highest. The total annual catch of cod in the column "revised" changes, but does not show any trend. The cod catches are strongly related to stock conditions, but also to environmental conditions and fishing intensity.

The cod stock in the Mecklenburg Bay was analysed since 1965 in the first quarter of the year. In this time cod is growing rather slowly and all analyses could be comprehended. The analysed cod was fished by the herring trawl. The length composition by number and the mean length per age group in all years may be seen from

figure 2. In table 2 the mean length per age group only of all cod analysed (not of all cod measured) is shown. From this data, somewhat better adapted in the youngest and oldest age groups by taking the weighted mean, the Bertalanffy growth curve was calculated.

On the whole the length composition of the stock is dependent on the strength of age groups or year classes and on their mean length or growth. Both components are considered in figure 3, which shows percents by weight for age groups in all analysed years and also for every year class. This figure gives a picture of the different strength of year classes and of their fishing mortality. By 1970-1972 the fishing intensity rised and therefore the year classes 1968-1970 already in age group 3 were not so strong as in age group 2. Age group 5 was nearly fished off in the years 1971-1973. Some indices of year classes are given in table 4. The index AG 2-4 corresponds best to the optical picture of figure 3. Here the year classes 1967, 1968, and 1972 are weak, the year classes 1963, 1969, 1971, and 1973 are fairly strong.

From table 5 the calculated and estimated parameters of the stock of cod, characterizing its state in the last ten years, may be seen. The total mortality for age 3+ was very high especially in the last years. Using the method of catch per unit effort Z is in the same range. But it should be underlined that Z comprehends cod fished off as well as cod migrated out of the Bay for spawning. This fact increases the total mortality. The fishing mortalities F were assessed from tagging experiments and are mean data (G.M. 1974/ $F:32$).

The growth parameters according to Bertalanffy were calculated by mean lengths of age groups 1-7 as may be seen in table 2, and by percentage strengths of age groups.

Table 1 Total catches of cod and catches per boat day in the Mecklenburg Bay in 1965-1974 (in tons)

Year	Total cod from national statistics	Total cod revised ¹⁾	Annual cod catch per boat day ²⁾
1965	2 020	3 494	0.21
1966	2 444	3 918	0.28
1967	4 188	4 188	(0.21)
1968	5 097	5 097	(0.25)
1969	4 177	4 177	(0.23)
1970	4 495	4 495	0.34
1971	3 602	3 602	0.26
1972	4 145	4 560	0.34
1973	3 566	4 004	0.30
1974	2 558	3 028	0.16

1) Total cod from national statistics enlarged by an estimated proportion of cod in unidentified sea fishes

2) 60-140 h.p., pair trawl

Table 2 Mean length and mean weight per age group

Year	AG	<u>Length (cm)</u>								
		1	2	3	4	5	6	7	8	9
1965		20.0	33.6	44.9	52.5	64.0	84.0	92.0		
1966		19.0	36.1	45.7	54.0	67.8	69.0	78.5	92.0	
1967		18.0	34.1	45.5	52.0	60.4	70.7	83.0		100.0
1968		16.9	34.0	46.3	51.9	61.7	80.0	88.0		106.0
1969		21.4	36.6	46.5	53.6	58.9	70.4	84.0	82.0	
1970		20.1	34.9	44.3	55.4	65.0	72.0			
1971		19.5	37.4	46.6	54.0	65.5	76.0			
1972		21.1	35.5	45.7	53.6	61.0				
1973		20.9	35.7	45.6	54.3	67.3	73.2	80.0	82.0	
1974		23.8	37.0	46.2	55.1	63.3	75.1	89.3		
Mean										
65-74		20.0	35.5	45.7	53.6	62.3	72.5	84.0	85.3	103.0
Accor- ding to Bertalanffy		21.7	34.9	45.9	55.0	62.7	69.0	74.3	78.7	82.4

Table 2 continued

Year	AG	<u>Weight (g)</u>								
		1	2	3	4	5	6	7	8	9
1965		74	340	878	1362	2955	4533	8190		
1966		65	469	955	1526	3061	4055	6364	9395	
1967		54	384	867	1336	2158	3681	4953		9960
1968		59	312	1012	1485	2310	5110	5845		9360
1969		104	466	956	1474	1860	3475	7158	5405	
1970		79	466	887	1724	2825	3768			
1971		80	497	931	1509	2571	5087			
1972		97	440	997	1566	2130				
1973		92	458	934	1482	2736	4542	5488		
1974		146	533	1027	1441	2140	4004	6670		
Mean										
65-74		85	437	944	1491	2475	4251	6381	7400	9660

Table 3 Age composition

Year	AG	<u>Percentages by number</u>						
		1	2	3	4	5	6	7 ⁺
1965		1.4	73.6	18.7	5.1	0.9	0.2	0.1
1966		0.9	31.0	52.8	13.0	1.6	0.3	0.4
1967		5.2	38.5	39.9	13.3	2.0	0.7	0.4
1968		7.8	63.9	19.0	8.0	1.0	0.1	0.2
1969		27.8	33.8	28.3	6.7	2.3	0.7	0.4
1970		24.1	55.2	13.9	4.8	1.5	0.5	-
1971		5.3	80.3	11.6	2.0	0.6	0.2	-
1972		7.3	64.5	27.0	1.0	0.2	-	-
1973		2.1	67.4	23.7	6.0	0.4	0.3	0.1
1974		12.0	30.3	52.2	3.6	1.2	0.6	0.1
1975		0.4	87.7	8.4	2.5	0.6	0.2	0.2
Mean								
65-75		8.6	56.9	26.9	6.0	1.1	0.3	0.2

Year	AG	<u>Percentages by weight</u>						
		1	2	3	4	5	6	7 ⁺
1965		0.2	47.4	31.0	13.2	5.0	1.7	1.5
1966		-	15.5	53.7	21.2	5.2	1.3	3.1
1967		0.4	19.3	45.0	23.1	5.6	3.4	3.2
1968		0.9	35.7	34.4	21.3	4.1	0.9	2.7
1969		4.5	24.3	41.6	15.2	6.6	3.7	4.1
1970		3.5	47.3	22.7	15.2	7.8	3.5	-
1971		0.7	70.4	19.1	5.3	2.7	1.8	-
1972		1.3	48.9	46.4	2.7	0.7	-	-
1973		0.3	47.5	34.0	13.6	1.7	2.1	0.8
1974		2.1	19.6	65.1	6.3	3.2	2.9	0.8
1975		0.1	67.6	15.2	9.0	3.4	2.0	2.7
Mean								
65-75		1.3	40.3	37.1	13.3	1.2	2.1	1.7

Table 4 Indices of year classes, calculated from percentages by weight (table 3)

Year	AG	Calculated relative strength (by weight)			
		2	3	4	5
1965		1.2	0.8	1.0	1.2
1966		0.4	1.4	1.6	1.2
1967		0.5	1.2	1.7	1.3
1968		0.9	0.9	1.6	1.0
1969		0.6	1.1	1.1	1.6
1970		1.2	0.6	1.1	1.9
1971		1.7	0.5	0.4	0.6
1972		1.2	1.3	0.2	0.2
1973		1.2	0.9	1.0	0.4
1974		0.5	1.8	0.5	0.8
1975		1.7	0.4	0.7	0.8

Relative strength of year classes

Year class	Index AG 2	Index AG 3	Index AG 2-4	Index AG 2-5
1962	-	0.8	-	-
1963	1.2	1.4	1.4	1.3
1964	0.4	1.2	1.1	1.2
1965	0.5	0.9	0.8	1.1
1966	0.9	1.1	1.0	0.9
1967	0.6	0.6	0.5	0.5
1968	1.2	0.5	0.6	0.6
1969	1.7	1.3	1.3	1.2
1970	1.2	0.9	0.9	0.9
1971	1.2	1.8	1.2	-
1972	0.5	0.4	-	-
1973	1.7	-	-	-

Table 5 Stock parameters

Parameter	Data used	Age	Years	Results
M	Age comp. (weighted mean)	3 +	1965-1975	1.51
			1965-1969	1.33
			1970-1975	1.82
		2 +	1965-1974	0.90
			1965-1972	0.95
F	Tagg. exp.	2+	1962-1970	0.61
			1965-1970	0.65
M	Z-F	2 +	1962-1974	0.29
			1965-1972	0.30
L	Bertalanffy	1 - 7	1965-1974	100.84
K	"	1 - 7	1965-1974	0.1822
t ₀	"	1 - 7	1965-1974	-0.3304

Figure 1 Yearly cycle of total catches of cod (mean 1965-1974) and of catch per boat day (mean 1967-1973) in the Mecklenburg Bay

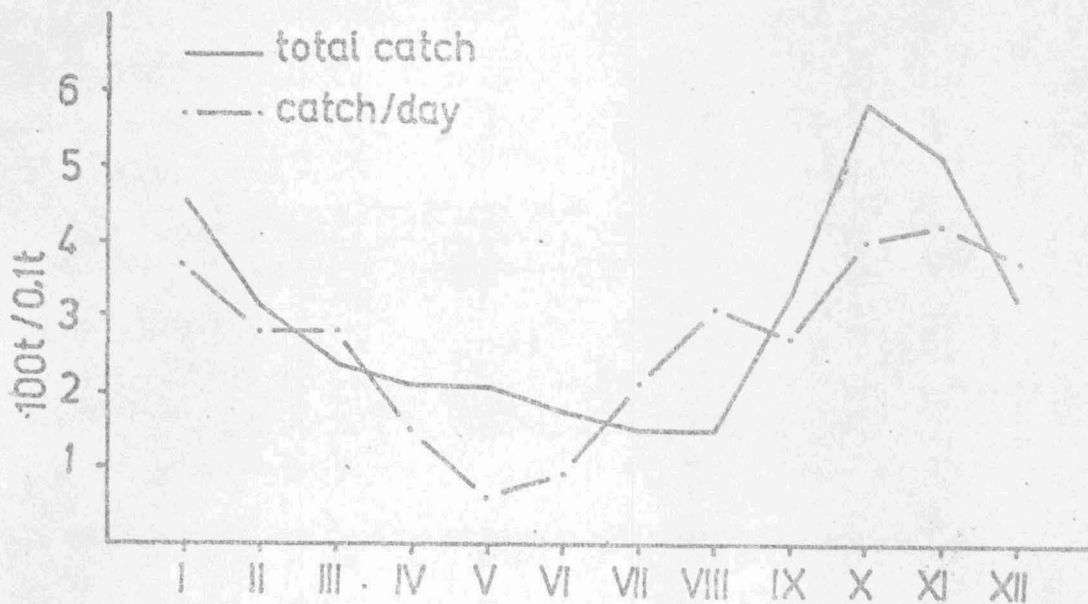


Figure 2 Length composition of the measured cod in percents by number and mean lengths per age group in 1965-1975

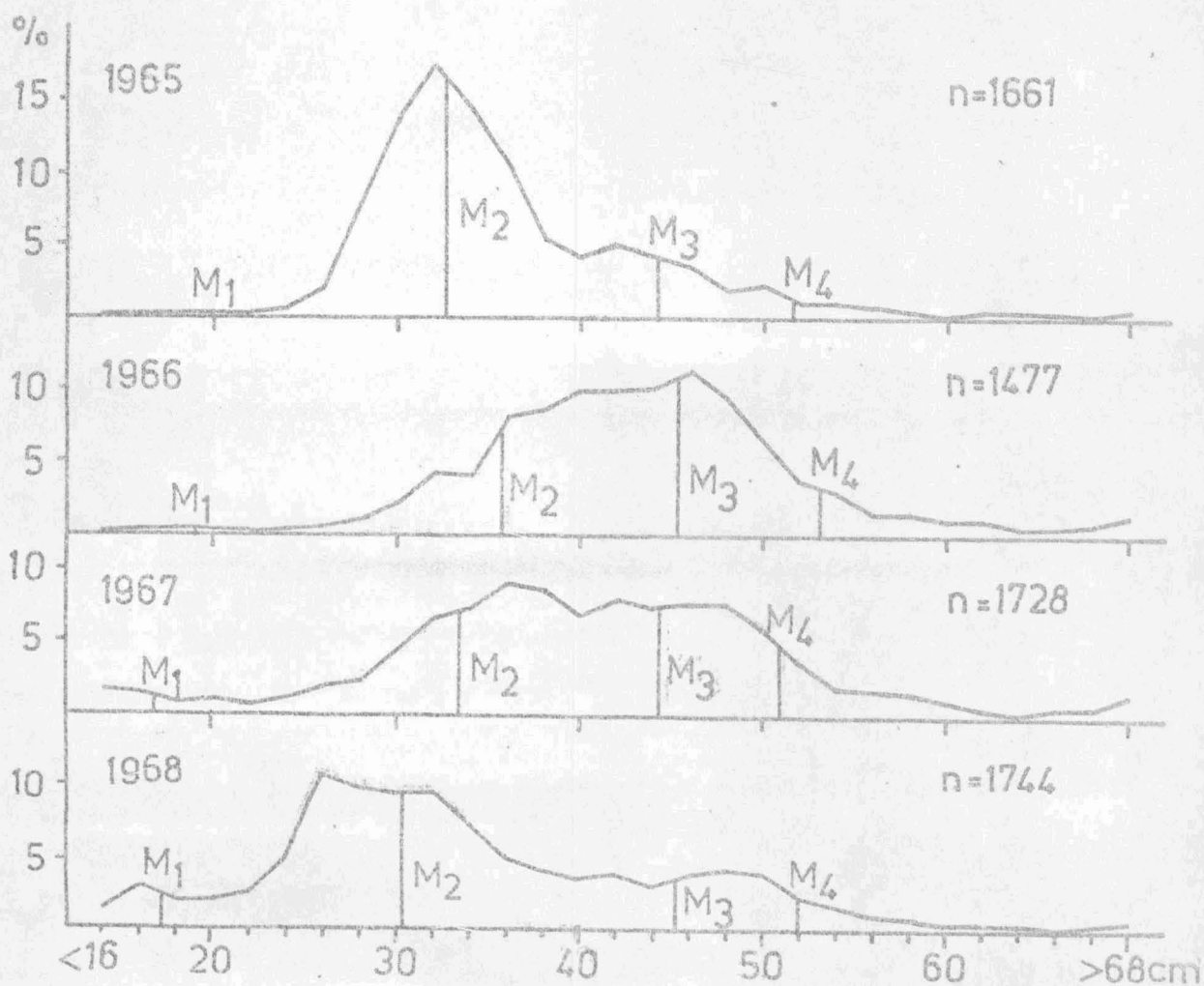


Figure 2 continued

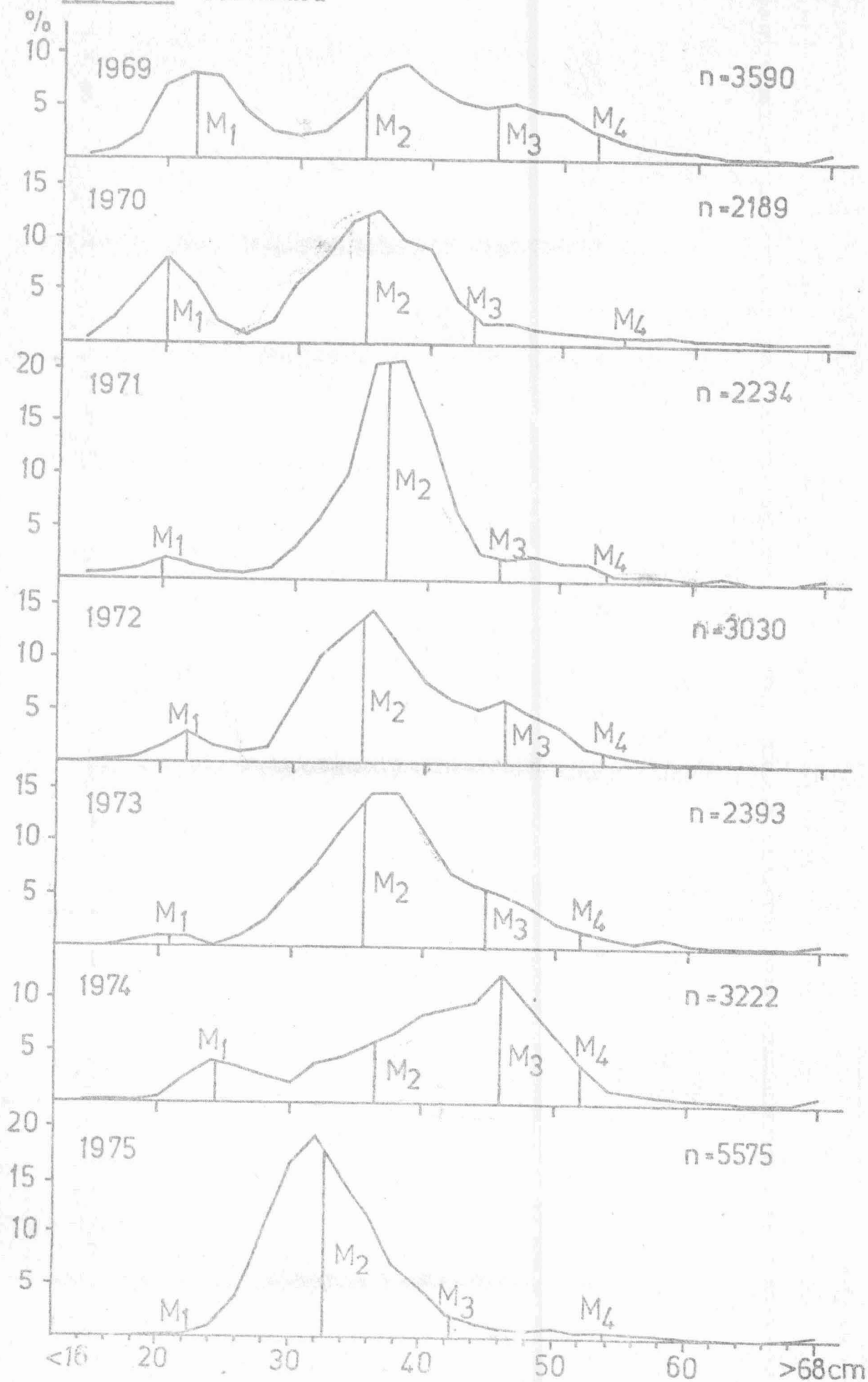


Figure 3 Strength of the age groups 2-5 and strength of the year classes in percent by weight in 1965-1975

