

I.C.N.A.F. Bergen, 1960

"Cod Sampling on board a factory stern trawler"

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During January and February 1960, it was possible (i) to investigate conditions at sea for sampling the catch of a factory stern trawler, Fairtry II; (ii) to obtain the size composition of the catch of cod from the two main grounds fished - Le Grand Nord in I.C.N.A.F. Sub-division 3L and The Gullies S.E. of St. Pierre, in Sub-division 3P; (iii) to obtain a measure of the proportion of the catch of the main commercial species discarded at sea; (iv) to discuss and arrange tentatively a future sampling programme on the three ships of this type now operating.

1. Sampling. Because of the layout of the ship and the speed of handling the catch, sampling was reduced to obtaining length compositions of the different size categories after they had been sorted from the catch and before they passed through the mechanical heading and filleting machines. No random or 'as caught' check samples could be obtained.

No fish was handled on the upper trawl deck since the whole catch - sometimes up to 15 or more tons - was transferred to the factory fish pounds, on the deck below, within seconds of the codends being untied. Port and starboard openings at the after end of the trawl deck, immediately forward of the top of the stern ramp, were so arranged as to allow the catch to fall, as the ship rolled, direct into the fish pounds, on either side of the factory, as required. (A vertical slide at the top of the ramp prevented the catch from slipping back into the sea). After the cascade of fish had ceased, sorting into species and sizes began. Cod was the predominant species and three streams, sorted as to size, were moved progressively forward by gravity, sliding from high level storage bins, with washing jets, via stainless steel troughing to the 'pick-up' troughs adjacent to the mechanical heading and filleting machine.

Five machines were in operation - (i) a centrally placed Baader '99' which dealt with 'medium' cod of 55-100 cm whole length, (ii) two Baader '38's', one port, one starboard, for the 'small' cod 35-60 cm, (iii) a Baader '338' (starboard) for slightly larger small fish, e.g. up to 65 cm and (iv) a Redfish machine (port) which was sometimes used for the smaller run of cod. Whilst the

'38', '338' and Redfish machines combined heading and filleting in the one process and worked on whole (guts in) fish, the '99' was preceded by a heading machine and guts were removed by hand after the fish was headed.

Samples for measurement were taken from the 'pick-up' troughs of the heading machine preceding the '99' and of the port '38'. The '338' proved somewhat difficult to sample but an adequate sample was obtained in Area 2. (In Area 1 sampling for this machine was carried out inside the stainless steel bin, but this was only feasible in light fishing). For Medium Cod, a sample weight of 6 x 10 stone kits (840 lb or 373 kg approx.) gave a sample of some 200 fish. A sample of half this weight was used for small cod and also provided 200 measurements.

Measurements (Tables 1 and 2) were made by means of a 'one man' board on the white plastic surface of which pencil marks are made for each fish length. When measurement of the samples has been completed, the number of marks at each centimeter length are summed - they are usually arranged in 'windows' of five - entered in the log book and the pencil marks erased ready for the next sample. Fish were measured and dropped into a 10 stone aluminium tub kit and returned, when this had been filled, to the 'pick-up' trough.

Cod of category Large were too few to include in the samples. They ranged in size from 101-143 cm and occurred principally in Area 1, where larger fish predominated (see Table 1).

At the end of each day a typed factory output data sheet was available, which recorded the number of 28 lb (approx. 12.5 kg) trays of fillets, for each species and for each size category. It was thus possible to obtain the numbers caught and processed per day, using the factory conversion factor of 3:1, (whole round to fillet weight) and the size distribution accepted by each filleting machine. Thus, with an observer on board, a ground to ground change in size composition was simple to obtain.

Errors in sampling. There were probably three main sources of error:- (a) When the catch was first sorted it was observed that the larger of the Medium Cod were selected first for splitting and liver removal and these fish, therefore, reached the 'pick-up' trough first. Subsequently, the mean size of the fish declined as sorting continued. Thus the time of onset of measuring could affect the length composition of a single sample, particularly when fishing was light.

In practice, during heavy fishing, it was impossible to ensure that all fish of one sample came from the same haul.

(b) In converting fillet weight back to 'whole round' weight, a single conversion factor (1:3) was used, irrespective of category. It is probable that a greater weight of fillets would be derived from a given weight of Medium fish, than from the same weight of Small. It is hoped that a test sample may be run on the Fairtry II in the near future, to obtain a measure of this difference.

(c) As the weight output of a particular '38' or '338' filleting machine is not recorded, the relative amounts passing through the '338' cannot be assessed. It would be reasonable to expect that it produced rather more than $\frac{1}{3}$, by weight, of category Small, (i) because of the slightly higher length acceptance and (ii) because it was the first machine in the starboard line - hence there was a tendency to use it more frequently. Allowing for mechanical breakdowns this error may be expected to vary from ground to ground. Table 3a gives a comparison of estimates of the different relative outputs. The 1:2 ratio is considered the most probable (Column C). It will be seen, however, that the variation is only small.

3. Discards. The selectivity of the codend mesh of 112-114 mm was such that an insignificant number of cod below 40 cm were retained, even under conditions of the heaviest fishing. (Tables 1, 2 and 3). It is probable that in the total catch, less than ten baskets of small cod were considered too small for filleting and were used for fish meal. This is because all fish down to 35 cm can be accepted by the Baader '38' and the '338' machines. Small side gear draggers fishing nearby were discarding up to 50% of some hauls, i.e. most of their fish below 50-55 cm.

Cod Otoliths. A small stratified sample of otoliths was collected from ten cod per 5 cm length group between 35 and 84 cm. A small number were obtained from the large cod of lengths between 101 and 134 cm. Peaks in the length compositions (50/54 and 65/69 cm) appear to correspond to five and eight year old fish. For their size, the larger cod appear to have a higher growth rate, those of 120-130 cm being approximately sixteen years of age.

Haddock. This species represented less than 1% of the total landing and it was found that there were too few available each haul to measure.

Other Species. These included halibut, saithe, redfish, dabs, skates and rays and Lophius sp. All other fish, too small or damaged, were reduced to fish meal on the deck below the factory. Heads, offal, guts, etc, all but the skins from the fillet skinning machines, went to fish meal.

The approximate total catch, converted to round whole fish was:-
Cod 1,260 tons; haddock 19 tons; saithe 160 tons; halibut 30 tons. This was derived, on the whole, from Sub-divisions 3P (south).

4. Future Sampling. A programme is being worked out with the co-operation of the owners and it is hoped that it will be in operation by the autumn of this year. A laminated fibre glass 'one-man' measuring board and appropriate log books will be put on board each vessel for the use of shipborne personnel. In addition it is hoped that United Kingdom laboratory staffs will also act as observers when specific needs arise.

TABLE 1

FAIRTRY II COD

Area I Le Grand Nord 3L 16th-18th January, 1960

Length Group (cm)	Fish Measured				Raised to Total Catch			
	Medium		Small		Medium	Small	Medium and Small	
	Nos.	%	Nos.	%			Nos.	%
35-39								
40-44			39	9.0		1,014	1,014	2.8
45-49			137	31.6		3,562	3,562	9.8
50-54	8	1.9	199	46.0	484	5,174	5,658	15.6
55-59	51	12.4	55	12.7	3,088	1,430	4,518	12.5
60-64	107	26.0	3	0.7	6,479	78	6,557	18.1
65-69	122	29.6			7,387		7,387	20.4
70-74	68	16.5			4,117		4,117	11.4
75-79	32	7.8			1,938		1,938	5.4
80-84	15	3.6			908		908	2.5
85-89	5	1.2			303		303	0.8
90-94	2	0.5			121		121	0.3
95-99	2	0.5			121		121	0.3
Total	412	100	433	100	24,946	11,258	36,204	100
No. of Kits	13		6					

Total weight of fillets (tons)	16.4	3.25
Round weight (tons)	49.2	9.75
Total number of kits	787.2	156
Raising factors	60.55	26

Total number of baskets estimated	
(a) from weight of fillets (cod only)	1,607
(b) by skipper (all species)	2,400

TABLE 2 COD

FAIRFAY II 20th January-3rd February 1960 Area II The Gulleys 3P

Length Group (cm)		FISH MEASURED													
		MEDIUM (99)							SMALL (38)						
		20.1.60	21.1.60	29.1.60	3.2.60	Total	%	20.1.60	23.1.60	27.1.60	29.1.60	Total	%	SMALL (338)	
35-39															
40-44															
45-49															
50-54															
55-59															
60-64	20	8	4	4	16	1.6	2	1	2	12	3	0.4	4	1.9	
65-69	55	71	17	28	139	14.1	14	3	18	64	31	3.8	47	22.0	
70-74	63	84	54	36	229	23.2	79	70	41	117	231	28.4	96	44.8	
75-79	36	117	63	40	283	28.7	125	112	11	36	395	48.6	58	27.1	
80-84	36	42	33	42	153	15.5	59	40	11		146	18.0	9	4.2	
85-89	18	33	24	33	108	11.0	6	1			7	0.9			
90-94	9	7	20	9	45	4.6									
95-99	4	5	2		11	1.1									
	2				2	0.2									
Total	207	370	217	192	986	100	285	227	72	229	813	100	214	100	
No. of Kits	6	11	6	6	29		4	3	1	3	11		3		

See Table 3A for raising factors

Table 3

C.O.D

TABLE II 20th Jan.-3rd Feb. 1960 Area II (cont.) The Gulleys 3 P

Weight of fillet output raised to numbers of Cod

Length Group (cm)	Total Numbers Caught (a)						Total Numbers Caught (b)						Total Numbers Caught (c)								
	MEDIUM			SMALL			MEDIUM + SMALL			SMALL			MEDIUM + SMALL			SMALL			MEDIUM + SMALL		
	38	338	Total	%	Nos.	%	38	338	Total	%	Nos.	%	38	338	Total	%	Nos.	%			
35-39	599	1,065	599	0.3	599	0.2	410	1,997	410	0.2	410	0.1	544	1,331	544	0.2	544	0.2			
40-44	6,188	12,516	7,253	3.3	7,253	2.3	4,232	1,997	6,229	2.9	6,229	2.0	5,626	1,331	6,957	3.2	6,957	2.2			
45-49	46,108	58,624	58,624	26.7	58,624	18.6	31,532	23,462	54,994	25.2	54,994	17.5	41,927	15,637	57,564	26.3	57,564	18.3			
50-54	78,842	25,565	104,407	47.6	105,964	33.6	53,917	47,923	101,840	46.8	103,397	33.0	71,693	31,939	103,632	47.4	105,189	33.4			
55-59	29,142	15,445	44,587	20.3	58,115	18.4	19,929	28,954	48,883	22.4	62,411	19.9	26,499	19,297	45,796	20.9	59,324	18.8			
60-64	1,397	2,397	3,794	1.7	26,081	8.3	955	4,493	5,448	2.5	27,735	8.8	1,270	2,994	4,264	2.0	26,551	8.4			
65-69	27,543				27,543	8.7					27,543	8.8					27,543	8.8			
70-74	14,391				14,891	4.7					14,891	4.7					14,891	4.7			
75-79	10,511				10,511	3.3					10,511	3.3					10,511	3.3			
80-84	4,380				4,380	1.4					4,380	1.4					4,380	1.4			
85-89	1,070				1,070	0.3					1,070	0.3					1,070	0.3			
90-94	195				195	0.1					195	0.1					195	0.1			
95-99																					
Total	95,962	162,276	56,988	219,264	100	315,226	100	110,975	106,829	217,804	100	313,766	100	147,559	71,198	218,757	100	314,719	100		

Note: Allocation of Small between "38" and "338" is in the ratios (a) 11 : 4 (b) 1 : 1 (c) 2 : 1

Table 3 A

C O D

MATURITY II

20th Jan. - 3rd Feb. 1960

Area II (cont.)

The Gulleys 3 P

	MEDIUM	Total	SMALL:						Total (including Large)
			(a)		(b)		(c)		
			38	338	38	338	38	338	
Total Weight of Fillets in Tons	58.8	62.4							
Equivalent round weight in Tons (conversion factor = 5:1)	176.4	187.2							
Equivalent Total Number of Kits (conversion factor = 16:1)	2,822.4	2,995.2							
Allocation of Total Small between "38" and "338" in the ratios (a) 11:4, (b) 1:1 (c) 2:1	29		2,196	799	1,497.6	1,497.6	1,997	998	
Number of Kits Measured (See Table II)	97.324		11	3	11	5	11	3	
Raising factors			199.6	266.3	136.5	499.2	181.5	332.7	
Total No. of Baskets of Cod estimated from weight of fillets (3 Kits = 5 Baskets) ..	4,705	4,993							
Total No. of Baskets, all species, estimated by Slipper								12,800	