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Portuguese Investigations in the ICNAF Area during 1956
The Relation between Length of Cod (Gadus callarias L.) Whole, Split and Green Salted Fish in Newfoundland Waters.

by Mario Ruivo

1. One of the objects of ICNAF is to arrange the collection of data, as exact as possible, concerning the quantitative and qualitative composition of captures of fish from the various fishing fleets operating in the Convention Area. The length distribution of the fish is generally found by measurements carried out directly on board the vessels. In certain cases such samples can be completed by samples of the landings. Therefore it is indispensable to be able to convert the measurements of the fish without head and gutted or salted (green cod) to the lengths of the fish round fresh.

The advantages and limitations of this method of sampling have been reviewed by Erik M. Poulsen (Annual Meeting, 1956, Document No. 12). One of the main difficulties found is that it is not always possible to determine the origin of the landed fish, especially when the vessels frequently move from one zone to another during the fishing campaign. Further, it is necessary to establish a significant co-relation between the length of green cod and fresh round cod.

For the Portuguese fleet the method of sampling the landings can only be applied to those vessels which fish exclusively in Subarea 3. This reduced greatly the amount of material from the Newfoundland area.

The material studied includes 200 cod (Gadus callarias L) fished on the Grand Bank in the neighbourhood of 46°21'N. and 52°21'W (Subdivision 3L) from the 1 st to the 4th of June, 1956. The fish was unloaded in Portugal towards the end of December and in the first days of January; thus it had remained in the hold of the vessel around seven months.

Each individual, identified by a tag fixed in the tail, was submitted to four measurements (Fig. 1) carried out to the nearest cm:

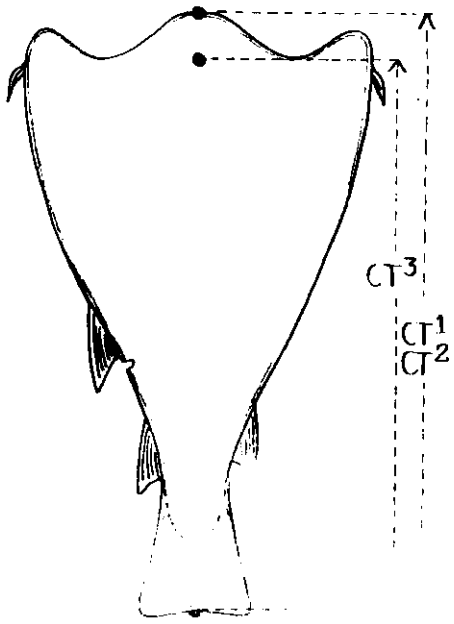

Fig. 1. Measurements taken on the dressed cod (cfr.p.1).

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CT - Size of fresh whole fish measured from the point of the snout to the end of the central rays of the caudal fin (fork length).

CT1- Size of fresh split fish measured from the most anterior point of the cephalic region to the end of the centre rays of the caudal fin.

CT2- Maximum size of the green salted fish measured from the anterior point of the split cod to the extremity of the central rays of the caudal fin.

CT3- Additional measurement of the green salted fish, from the central point of a line which passes along the anterior concave edge of the split cod and to the extremity of the central rays of the caudal fin.

Of the 2.000 individuals measured, a certain number were not considered in the calculation, due to errors in the measurements. The mean values and the range of the individual variation by classes of 1 cm. of CT are summarized in Table 1.

3. The correlations between the length of the round fresh cod (CT) and that of the split cod (CT1) and green, according to the two methods of measurements used (CT2 and CT3) follow a straight line.

The coefficients of correlation, the equations and the standard errors of regression for the three cases considered were as follows (see also the attached Figs. 2-5):

(i) Fish fresh, split (CT1);Fig. 2

$CT = 1.15\ CT1 + 1.1$

$r = 0.984$

$\pm R_X = \pm 2.0$

(ii) Fish green, max. length (CT2); Fig. 3

$CT = 1.21\ CT2 + 3.6$

$r = 0.959$

$\pm R_X = \pm 3.3$

(iii) Fish green, additional length (CT3); Fig. 4

$CT = 1.36\ CT3 + 5.2$

$r = 0.950$

$\pm R_X = \pm 3.7$

4. From the high figures for the correlation coefficients, one can conclude that the length of the whole fish and the lengths of the split and green salted fish are closely related, and that, therefore samples of landed cod can be used for the evaluation of the size length distribution of the round fresh fish in the catches.

The two methods used in the measurement of the green salted cod (CT2 and CT3) can be considered as giving results practically the same for conversion to length of fish round fresh. However, the measurement from

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the anterior point of the split cod, besides being the more rapid and more easy to carry out, seems to show a smaller variability and a greater exactness, contrary to what we had originally expected. The reduction in size resulting from the dressing on board is about 15% of the size of the whole fish. The reduction in size owing to the salting represents approximately 8-11% of the length of the split fish when placed in the holds. The total reduction in size between the fish round fresh and the green salted fish at the landing (CT2) is around 24%.

The reduction in size is, as the observations show, slightly more pronounced in the small individuals.

TABLE 1. List of Measurements.

CT	CT1			CT2			CT3		
	No.	Range	Mean	No.	Range	Mean	No.	Range	Mean
46	1	40	40.0	1	36	36.0	1	31	31.0
55	2	45-47	46.0	1	43	43.0	1	38	38.0
56	1	48	48.0	1	46	46.0	1	40	40.0
60	1	52	52.0	1	47	47.0	1	41	41.0
61	1	55	55.0	1	48	48.0	1	45	43.0
62	2	53	53.0	2	48	48.0	2	42-45	42.5
63	2	54	54.0	2	50-51	50.5	2	44-45	44.5
64	4	54-55	54.7	3	50-53	51.3	3	45-47	46.0
65	4	55-56	55.2	4	50-53	51.7	4	44-47	45.5
66	4	55-57	56.2	4	51-57	53.2	4	43-49	45.5
67	3	57-59	57.6	2	52-55	53.5	2	46-47	46.5
68	3	57-59	58.0	3	53-57	55.0	3	47-50	48.6
69	4	59-60	59.2	4	51-58	55.0	4	45-50	47.5
70	3	59-62	60.3	3	56-60	58.3	3	49-52	50.6
71	1	60	60.0	1	56	56.0	1	49	49.0
72	4	61-63	62.2	2	55	55.0	2	47-50	48.5
73	5	61-68	63.4	4	56-60	58.7	4	47-52	50.2
74	6	62-65	64.0	4	54-61	59.0	4	50-53	51.5
75	5	64-65	64.6	3	57-61	59.3	3	49-54	51.3
76	9	62-66	64.3	8	57-63	61.0	8	49-55	52.6
77	1	66	66.0	-	-	-	-	-	-
78	6	65-68	66.6	5	59-63	61.0	5	50-55	52.4
79	8	65-72	68.2	5	61-64	62.8	5	53-58	55.2
80	-	-	-	-	-	-	-	-	-
81	4	70-71	70.7	4	62-68	64.2	4	55-60	56.2
82	4	71	71.0	3	65-69	67.3	4	55-62	58.2
83	6	68-71	70.3	6	63-67	65.1	5	55-58	56.1
84	6	72	72.0	6	64-69	66.8	5	55-59	57.6
85	2	71-73	72.0	1	66	66.0	1	60	60.0
86	7	71-77	74.0	5	64-70	67.8	5	55-62	59.2
87	3	75-76	75.3	3	65-67	65.6	3	54-56	55.0
88	3	74-75	74.6	3	66-72	69.0	3	58-63	61.0
89	5	75-77	75.6	4	69-75	71.5	4	61-65	63.0
90	9	75-79	77.1	8	69-76	72.0	8	57-67	62.1
91	5	77-80	78.0	5	68-76	72.2	5	60-67	63.8
92	8	78-81	79.2	7	70-76	73.7	7	64-66	65.1
93	10	78-81	79.8	9	68-77	72.5	9	60-66	62.6
94	6	80-82	80.6	6	69-78	73.8	6	61-68	63.5
95	11	80-84	81.9	8	73-80	75.6	8	63-69	65.7
96	4	81-83	82.2	3	71-77	74.6	3	65-66	65.6
97	2	78-82	80.0	2	73-74	73.5	2	65-66	65.5
98	2	84-85	84.5	2	79-81	80.0	2	67-70	68.5
99	1	85	85.0	1	73	73.0	-	-	-
100	4	85	85.0	3	74-82	78.3	3	67-71	69.3
101	3	85-89	87.3	3	75-82	79.3	3	67-73	70.0
102	2	87-89	88.0	2	82-84	83.0	2	70-75	72.5
103	1	87	87.0	1	81	81.0	1	68	68.0
105	2	90	90.0	2	83-84	83.5	2	71-72	71.5
106	2	90-91	90.5	2	84-85	84.5	2	73	73.0
107	1	90	90.0	1	84	84.0	1	74	74.0
108	2	92	92.0	1	81	81.0	1	70	70.0
109	-	-	-	-	-	-	-	-	-
110	1	93	93.0	1	91	91.0	1	80	80.0
112	1	96	96.0	1	91	91.0	1	76	76.0
118	1	103	103.0	-	-	-	-	-	-
TOTAL	198			167			166		

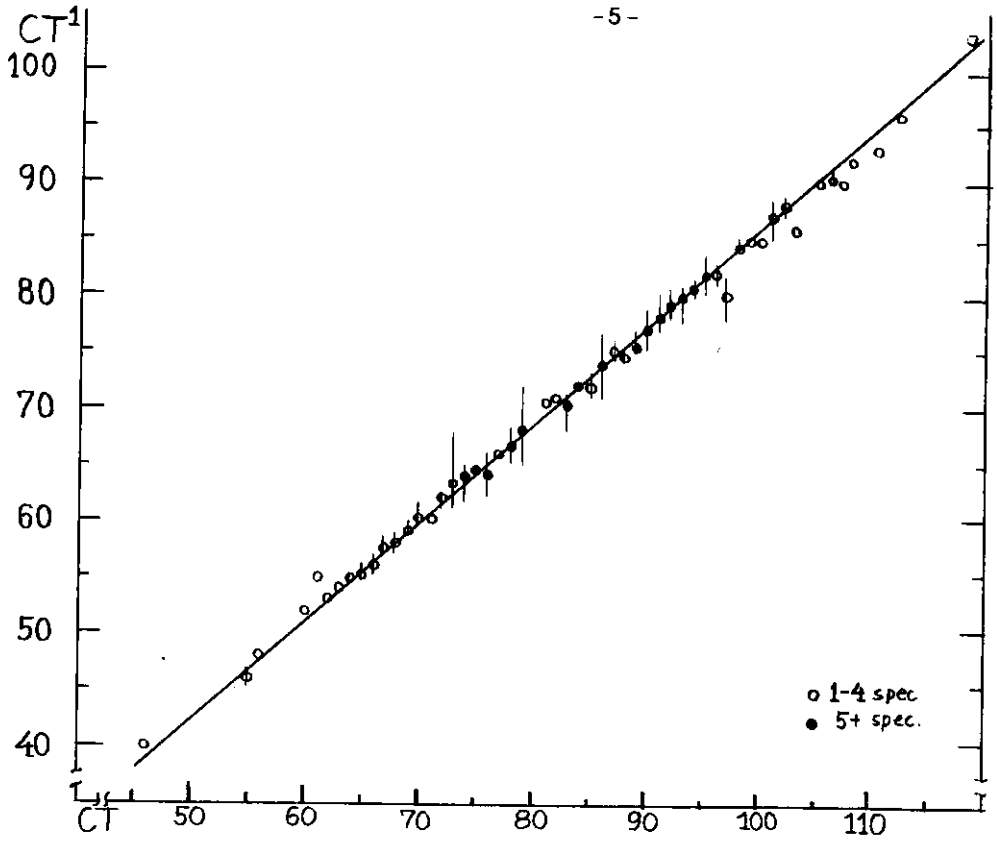

Fig. 2 Regression of CT^1 on CT.

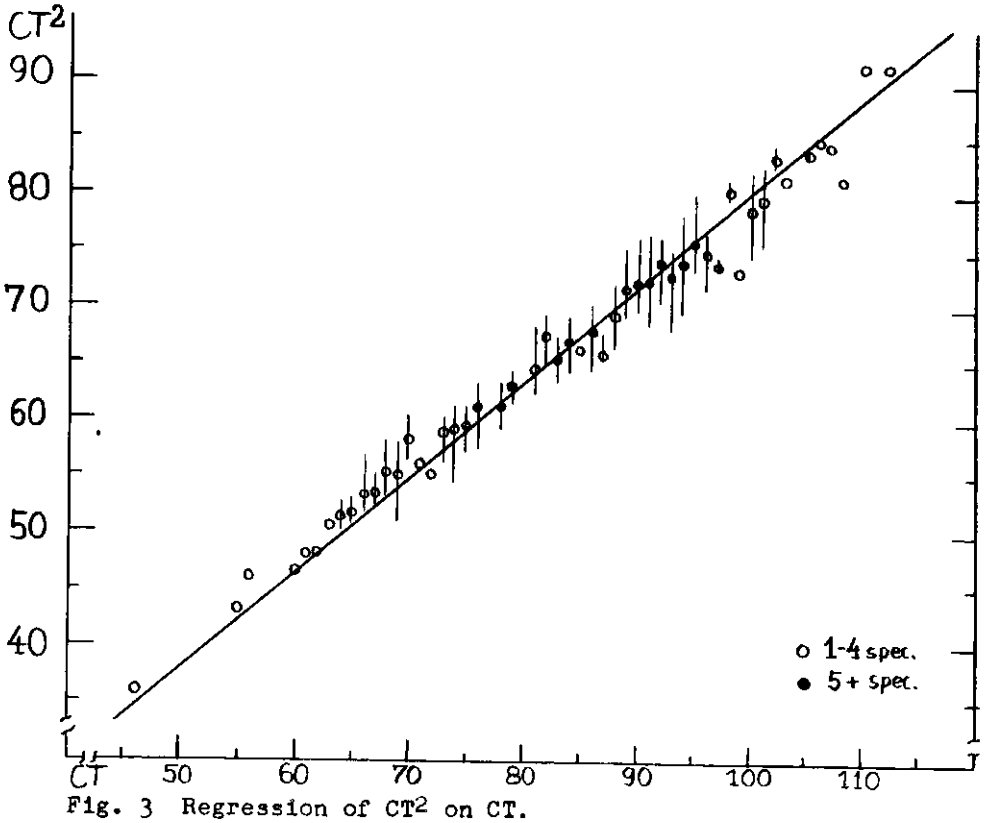

Fig. 3 Regression of CT^2 on CT.

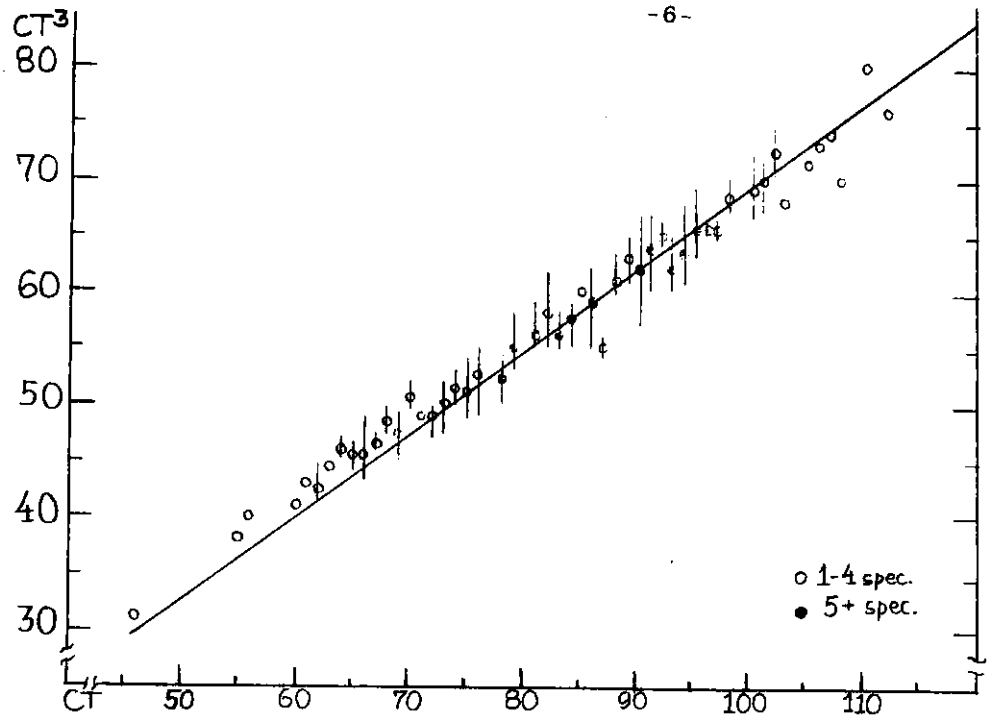

Fig. 4 Regression of CT^3 on CT

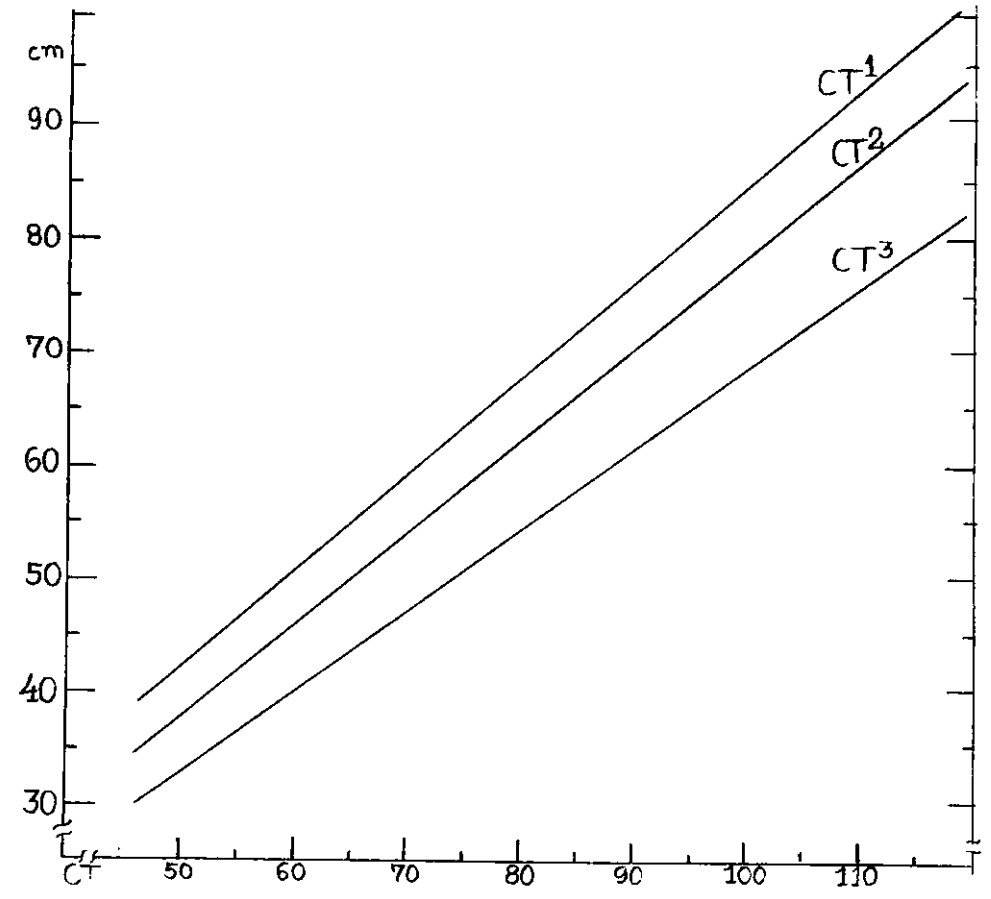

Fig.5 Comparison of the regression lines of Figs.2, 3 and 4.