RESTRICTED

INTERNATIONAL COMMISSION FOR THE NORTHWEST ATLANTIC FISHERIES

Serial No. 1454
(D. c. 2)

Research Document No. 2

ANNUAL MEETING - JUNE 1965

Analysis of Age Reading from the Cod Otolith Exchange Program

by R. C. Hennemuth
Bureau of Commercial Fisheries
Woods Hole, Mass., U.S.A.

INTERNATIONAL COMMISSION FOR THE NORTHWEST ATLANTIC FISHERIES

Serial No. 1454
(D. c. 2)

Document No. 2

ANNUAL MEETING - JUNE 1965

Analysis of Age Reading from the Cod Otolith Exchange Program

by R. C. Hennemuth
Bureau of Commercial Fisheries
Woods Hole, Mass., U. S. A.

As a result of the recommendation of the Research and Statistics Committee, 16 samples of cod otoliths were exchanged and aged by five fisheries research institutions of four member countries of ICNAF.

The observed ages reported by the various institutions were outlined in detail by B. F. Calvin DeBaie and circulated as ICNAF Serial No. 1429, 14 August 1964.

This document presents the results of an analysis to determine the degree of agreement among the various readers.

Two of the 16 samples (Nos. 11 and 14) were not aged by Canada (M), and were excluded from the present analysis. There were 20 fish which were not aged by Spain, and these also were excluded from the analysis. The ages recorded for the remaining otoliths by the various institutions are presented in Table 1. All fish under 4 years of age, and over 15 years of age were grouped in the commercial sized samples in order to bring the expected value up near 5. Small sized fish of 0 + 1 and 4 + 5 years of age were grouped for the same reason.

The expected values were estimated from the marginal totals of observed values. The hypothesis of independence of observed age and country was tested by calculating X^2 values using deviations between observed and calculated values.

The total chi-square values of 89.54 (52 d.f.) for the commercial sized fish, and 79.40 (12 d.f.) for small sized fish are both significant at the .01 probability level (Table 1), and indicate that the observed age distributions are dependent upon the country (i.e., individuals) which aged them. Note that the largest chi-square values are associated with the smallest age groupings.

A rather large share of the chi-square value is caused by the divergence of observed ages reported by Spain. The analysis was re-run without Spain's readings (Table 2). Chi-square values for both size groups were reduced to about half the former values. The chi-square for the commercial sized fish, 40.09 (39 d.f.) was not significant; but that for the small fish, 32.74 (9 d.f.) was significant, primarily because of the discrepancy in observed frequencies of the one year old fish reported by Norway.

Thus, the analyses indicate some rather serious discrepancies in age reading among the countries involved, most particularly in the youngest age grouping for both commercial and small fish.

Table 1. --Chi Square Analy of dispersion of observed ages of cod in o h exchange program

Country		Age ≤ 3	4	5	6	7	8	9	10	11	12	13	14	15	≥ 16	Total	
Commercial Size Fish																	
Canada (M)	Observed	5	19	35	31	33	22	19	16	22	11	9	7	3	4	236	
	X^2	3.27	.03	.36	.03	.49	.00	.23	.06	.05	.35	.07	.10	.34	.01		5.39
Canada (N)	Observed	5	17	35	30	29	22	24	11	27	6	10	9	7	4	236	
	X^2	3.27	.69	.36	.00	.00	.00	.37	2.12	1.71	1.11	.39	1.26	1.87	.01		13.16
Germany	Observed	15	19	29	32	24	30	21	21	16	6	9	7	2	4	235	
	X^2	1.45	.03	.21	.13	.93	2.9	.00	.94	1.19	1.11	.07	.10	1.15	.01		10.22
Norway	Observed	5	20	25	21	39	21	21	18	22	11	11	7	9	6	236	
	X^2	3.27	.03	1.38	2.7	3.29	.04	.00	.06	.05	.35	.96	.10	5.48	.77		18.48
Spain	Observed	25	29	34	36	21	15	21	19	18	12	2	1	-	3	236	
	X^2	17.82	3.23	.18	1.2	2.30	2.23	.00	.23	.43	.85	4.69	4.36	4.2	.57		42.29
Total	Observed	55	104	158	150	146	110	106	85	105	46	41	31	21	21	1179	
	X^2	29.08	4.01	2.49	4.06	7.01	5.17	.60	3.41	3.43	3.77	6.18	5.92	13.04	1.37		89.54
Expected per Country		11.0	20.8	31.6	30.0	29.2	22.0	21.2	17.0	21.0	9.2	8.2	6.2	4.2	4.2		

Small Size Fish		Age ≤ 1	2	3	≥ 4	Total	
Canada (M)	Observed	2	14	37	13	66	
	X^2	6.98	.00	3.88	.10		10.96
Canada (N)	Observed	3	18	27	18	66	
	X^2	5.45	1.02	.00	1.02		7.49
Germany	Observed	4	11	30	21	66	
	X^2	4.11	.72	.38	3.26		8.47
Norway	Observed	17	7	25	17	66	
	X^2	3.86	3.65	.12	.55		8.18
Spain	Observed	27	21	15	2	65	
	X^2	25.37	3.26	5.19	10.48		44.30
Total	Observed	53	71	134	71	329	
	X^2	45.77	8.65	9.57	15.41		79.40
Expected per Country		10.60	14.20	26.80	14.20		