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ICNAF Cod Otolith Exchange Programme

by R.S. Keir

Following a recommendation from the Eighth Annual Meeting of ICNAF in June 1958, a Cod Otolith Exchange Programme was set up in 1958/59. Seventeen samples of cod otoliths, each containing twenty otoliths from commercial-sized fish and frequently an additional ten otoliths from smaller fish, were exchanged among interested scientists. This document contains in the appended tables a synopsis of their age analyses of the samples.

Table I summarises some pertinent data about the samples themselves.

Table I. Showing for each sample the ICNAF subdivision from which it was taken, the date, the country which collected the sample, and the countries to which the otoliths have been sent as part of the exchange programme.

Sample Letter*	As	Bs	C	Ds	Es	Fs	G	H	Is	K	Ls	Ms	N	Os	Ps	Q	Rs
Subdivision	4T	4T	4V	1F	1B	1F	1B	1B	1F	3K	3L	3N	3P	3N	3L	4T	5Z
Month	Jun.	Oct.	May	Aug.-Sept.	Aug.	Aug.	Aug.	May	Sept.	Jun.	May	Sept.	Apr.	Sept.	Aug.	May	July
Year	1957	1957	1958	1957	1956	1957	1953	1957	1952	1955	1953	1955	1957	1957	1957	1954	1958
Canada (M & Q)	⊗	⊗	⊗									⊠	⊠			⊠	⊠
Canada (Nfld.)				⊠						⊗	⊗	⊗	⊗	⊠	⊠	⊠	⊠
Denmark				⊠	⊗	⊗	⊠	⊠	⊠								
France							⊠									⊗	
Germany				⊗	⊠	⊠	⊠	⊠	⊠		⊠		⊠	⊠			
Iceland				⊠	⊠	⊠	⊗	⊗	⊠	⊠					⊠		
Norway					⊠		⊠	⊠	⊠		⊠				⊠		
Portugal	⊠	⊠	⊠	⊠				⊠		⊠		⊠				⊠	
Spain						⊠	⊠		⊠		⊠	⊠		⊗	⊗		
U.K.				⊠	⊠	⊠		⊠	⊗						⊠		
U.S.A.				⊠				⊠									⊗

⊗ Source of otoliths ⊠ Samples sent

* All samples include the otoliths of 20 commercial-sized fish. A small 's' after the sample letter indicates that a sample of 10 small fish is included.

Six of the samples were from Subarea 1, six from Subarea 3, four from Subarea 4, and one from Subarea 5.

In the tables which follow, where two or more estimates are given and no indication is made as to which is the more probable, one has been chosen randomly to use in determining the mode and the deviation from the mode. This one is underlined. Where no single age dominated, either the median was chosen instead of the mode or the nearest whole number to the median.

Sr. Figueras' readings for Sample E have not been included in the calculations because of the gaps in his estimates. Mr. Wise's readings for Samples D and H have been excluded from the calculations; all other scientists were experienced in reading Subarea 1 otoliths.

In some cases readings were followed by a plus or a 1/2. These have been deleted in the summary tables.

ICNAF COD OTOLITH EXCHANGE PROGRAMME

SAMPLE D SUBDIVISION 1F DATE COLLECTED AUGUST 9, 1957. SEPTEMBER 16, 1957. (Nos. 19 & 20) COLLECTED BY GERMANY

Serial No.	Sex	Length (cm)	Maturity	Estimated Age: Canada (N&S.) Fleming	Denmark Hansen Madsen	Germany Meyer	Iceland Gudmundsson	Portugal Ruivo Santos	U.K. Trout	U.S. Wise	Mode	Total Deviation	Mean Deviation	Mean Deviation per Year	Estimated Age at First Maturity: Canada (N&S.)	Denmark	Germany	Iceland	Portugal	U.K.		Mode	Total Deviation	Mean Deviation	
D.1	♂	63	immature		7	7	7	7	7	7	7	0						?							
2	♂	63	immature		8	8	8	8	8-9?	7	8	0						?	?	7-9					
3	♂	69	mature		10	10	10	10	10	10	10	0				8	10	8	8	8					
4	♀	77	mature		9	9	9	9	9	8	9	0				9	8	8	8	8					
5	♂	83	immature		12	12	12	12	12	10	12	0				8 (9)		9	9	8 or 11					
6	♂	87	mature		11	(12, 10, 11?)	10	11	11	9 (10?)	11	2	0.40	0.04		8	9	7	8	11?					
7	♀	86	mature		12	12	12	12	12	10	12	0				11	12	11	10	12					
8	♂	88	?		11	12	12	12	12	10	12	1	0.20	0.02		9	12-13	?	9?	12					
9	♀	99	mature		12	12	12	12	12	11	12	0				11 (8)	12	11	?	11					
10	♀	95	mature		15	15	15	15	16	15	15	1	0.20	0.01		7	7 (12)	7	8	8					
11	♂	77	mature		12	12	10	11	11-12	11	11	3	0.60	0.05		9	9-10	7	8	9-10?					
12	♂	100	mature		12	12	13	12	12-13	14 (15?)	12	2	0.40	0.03		9 (8)	12	?	9	12-13					
13	♀	72	mature		10	10	10	10	11	11	10	1	0.20	0.02		7	8	?	7	10?					
14	♂	65	mature		10	12	12	11	12?	12	12	3	0.60	0.05		8	9	?	8						
15	♂	61	mature		10	10	9	10	11?	10	10	2	0.40	0.04		6	6	?	7	10?					
16	♀	73	immature		8	8	8	8	10	10	8	2	0.40	0.05		7 (6)		?	?	9					
17	♀	66	immature		8	8	8	8	8	8	8	0				7 (6)		?	?	8?					
18	♀	68	immature		7	7	7	7	7	8	7	0						?		7?					
19	♀	93	mature		15	15	15	15	15	15	15	0				8	7	7	7	7					
20	♀	92	mature		15	16	16	16	16	14	16	1	0.20	0.01		7	9	9	8	7 or 9					
Total					214	219	215	216	222-225	210	217	19	0.18	0.0008											
Ds.1		14	immature		1	1	1	2	2	–	1	2	0.40	0.40											
2		28	immature		2	2	2	2	2	2	2	0													
3		32	immature		3	3	3	3	3	3	3	0													
4		34	immature		3	3	3	3	3	3	3	0													
5		35	immature		4	4	4	4	4	4	4	0													
6		38	immature		4	4	4	4	4	4 (5?)	4	0													
7		40	immature		4	4	4	4	4	4	4	0													
8		38	immature		4	5	4	5	4	5 (4?)	4	2	0.40	0.10											
9		31	immature		4	4	4	4	4	4	4	0													
10		43	immature		5	5	5	5	5	5	5	0													
Total					34	35	34	36	36	35	34	4	0.08	0.0028											

ICNAF COD OTOLITH EXCHANGE PROGRAMME

SAMPLE E SUBDIVISION 1B DATE COLLECTED AUGUST 30, 1956 COLLECTED BY DENMARK

Serial No.	Sex	Length (cm)	Maturity	Estimated Age: Denmark Madsen	Germany Mecke Wildes	Sweden Ostmann	Norway Fagerheim Rasmussen	Spain Figueras	U.K. Beddington		Mode	Total Deviation	Mean Deviation	Mean Deviation per Year	Estimated Age at First Maturity: Denmark	Germany	Sweden	Norway	U.K.			Mode	Total Deviation	Mean Deviation
E.1	♂	56	immature	5	5	5	5	5	5		5	0												
2	♂	65	mature	8	8	8	8	8	8		8	0			7			7						
3	♂	70	immature	9	9	9	9	8	9		9	0						9	9?					
4	♂	74	mature	10	10	10	10	10	10		10	0			7	6	7	7						
5	♂	77	mature	11	11	11	11	10?	11		11	0			6	6	6	6						
6	♂	78	mature	11	11	11	11	?	11		11	0			7	7	7	7	10					
7	♂	91	mature	22	22	22	21	?	22		22	1	0.20	0.01	6	8	8	7	8					
8	♀	64	immature	6	6	6	6	?	6		6	0						6						
9	♀	66	immature	6	6	6	6	6	6		6	0												
10	♀	70	immature	7	7	7	7	7	7		7	0												
11	♀	75	mature	8	8	8	8	8	8		8	0			8?			7						
12	♀	76	mature	9	9	9	9	9	9		9	0			8	7	8	8	8-9?					
13	♀	81	mature	9	9	9	9	9	9		9	0			8?			9						
14	♀	81	mature	11	11	11	11	10?	11		11	0			7	7	7	7	7					
15	♀	84	mature	11	11	11	11	10?	11		11	0			7	8 (9)	8	8	9					
16	♀	75	mature	13	13	13	13	?	13		13	0			8	8	8	8	8					
17	♀	83	mature	14	14	13	13	?	13		13	2	0.40	0.03	9	9	8	8	8					
18	♀	77	mature	14	14	14	14	13?	14		14	0			8	9	8	7	8					
19	♀	80	mature	14	14	14	14	13?	14		14	0			7	7	7	7	7					
20	♀	79	mature	14	14	14	14	?	14		14	0			7	7	7	7	7					
Total				212	212	211	210	?	211		211	3	0.03	0.0001										
Es.1	♂	41	immature	4	4	4	4	4	4		4	0												
2	♂	46	immature	4	4	4	4	4	4		4	0												
3	♂	49	immature	4	4	4	4	4?	4		4	0												
4	♂	50	immature	4	4	4	4	4?	4		4	0												
5	♂	50	immature	5	5 (6)	5	4	4	5?		5	1	0.20	0.04										
6	♂	56	immature	5	6	6	5	5	5		5	2	0.40	0.08										
7	♀	42	immature	4	4	4	4	4?	4		4	0												
8	♀	44	immature	4	4	4	4	4	4		4	0												
9	♀	44	immature	5	5	5	5	5	5		5	0												
10	♀	55	immature	5	5	5	5	5	5		5	0												
Total				44	45	45	43	43	44		44	3	0.06	0.0014										

ICNAF COD OTOLITH EXCHANGE PROGRAMME

SAMPLE F SUBDIVISION 1F DATE COLLECTED AUGUST 5, 1957 COLLECTED BY DENMARK

Serial No.	Sex	Length (cm)	Maturity	Estimated Age: Denmark Mohlenat	Germany Meyer-Nielsen	Sweden Johnstone	Spain Rojo	U.K. Dottington			Mode	Total Deviation	Mean Deviation	Mean Deviation per Year	Estimated Age at First Maturity: Denmark	Germany	Sweden	Spain	U.K.			Mode	Total Deviation	Mean Deviation
F. 1	♂	55	immature	6	6	6	6	6			6	0												
2	♂	60	immature	7	7	7	7	7			7	0												
3	♂	69	immature?	8	8	8	8	8			8	0												
4	♂	69	mature	9	9	9	9	9			9	0			7	8	8	8	8					
5	♂	68	mature	10	10	10	9	9			10	2	0.40	0.04	7	6	?	7	?					
6	♂	69	mature	10	10	10	10	10			10	0			8	8	?	9 (7?)						
7	♂	71	mature	10	10	10	10	9			10	1	0.20	0.02	8	8	9	8	8					
8	♂	67	mature	10	10	10	10	9			10	1	0.20	0.02	9	3-4-10?	9	6	8					
9	♂	70	mature	12	12	12	12	12			12	0			8		7	9						
10	♀	60	immature	7	7	7	7	7			7	0						7						
11	♀	62	immature	7	7	7	7	7			7	0												
12	♀	63	immature	7	7	7	7	7			7	0												
13	♀	64	immature	7	7	7	7	7			7	0												
14	♀	70	immature?	8	8	8	8	8			8	0						7						
15	♀	69	immature	8	8	8	8	8			8	0												
16	♀	70	immature	8	8	8	8	8			8	0												
17	♀	68	mature	8	8	8	8	8			8	0			7									
18	♀	65	mature	9	9	9	9	9			9	0			8	8 (7?)		7						
19	♀	71	mature	10	10	10	10	10			10	0			8	8	8	8	8					
20	♀	88	mature	15	15	15	15	14			15	1	0.20	0.01	7	7	7	7	6					
Total				176	176	176	175	172			176	5	0.05	0.0003										
Fs. 1	♂	41	immature	4	4	4	3	4			4	1	0.20	0.05										
2	♂	43	immature	4	4	4	3	4			4	1	0.20	0.05										
3	♂	50	immature	5	5	5	4	5			5	1	0.20	0.04										
4	♀	36	immature	4	4	4	3	4			4	1	0.20	0.05										
5	♀	38	immature	4	4	4	3	4			4	1	0.20	0.05										
6	♀	40	immature	4	4	4	3	4			4	1	0.20	0.05										
7	♀	43	immature	4	4	4	4	4			4	0												
8	♀	43	immature	4	4	4	3	4			4	1	0.20	0.05										
9	♀	44	immature	4	4	4	3	4			4	1	0.20	0.05										
10	♀	44	immature	4	4	4	3	4			4	1	0.20	0.05										
Total				41	41	41	32	41			41	9	0.18	0.0044										

ICNAF COD OTOLITH EXCHANGE PROGRAMME

SAMPLE G SUBDIVISION 1B DATE COLLECTED AUGUST 4, 1953. COLLECTED BY ICELAND

Serial No.	Sex	Length (cm)	Maturity	Estimated Age: Denmark Hansen Muldal	France Anadon	Germany Meyer	Scotland Dethmann	Norway Rasmussen England	Spain Rojo		Mode	Total Deviation	Mean Deviation	Mean Deviation per Year	Estimated Age at First Maturity							Mode	Total Deviation	Mean Deviation	
G.1	♀	64	mature	6		6	6	6	6		6	0													
2	♂	67	mature	6		6	6	6	6		6	0													
3	♂	61	mature	7		7	7	7	7		7	0													
4	♂	70	mature	7		7	7	7	7		7	0													
5	♀	84	mature	8		8	8	8	8		8	0													
6	♂	64	mature	8		8	8	8	8		8	0													
7	♀	70	mature	8		8	8	8	8		8	0													
8	♀	75	mature	8		8	8	8	8		8	0													
9	♀	73	mature	9		9	9	9	9		9	0													
10	♂	70	mature	9		9	9	9	9		9	0													
11	♀	71	mature	9		10	9	9	9		9	1	0.20	0.02											
12	♀	82	mature	10		10	10	10	10		10	0													
13	♂	70	mature	10		10	10	10	10		10	0													
14	♀	75	mature	10		10	10	10	10		10	0													
15	♀	72	mature	10		10	10	10	10		10	0													
16	♂	77	mature	11		11	11	11	11		11	0													
17	♂	75	mature	11		11	11	11	11		11	0													
18	♀	76	mature	11		11	11	11	11		11	0													
19	♂	80	mature	12		12	12	12	11		12	1	0.20	0.02											
20	♀	92	mature	16		17	16	16	16		16	1	0.20	0.01											
Total				186		188	186	186	185		186	3	0.03	0.0002											
Total																									

ICHAF COD OTOLITH EXCHANGE PROGRAMME

SAMPLE H SUBDIVISION IE DATE COLLECTED MAY 2, 1957. COLLECTED BY ICELAND

Serial No.	Sex	Length (cm)	Maturity	Estimated Age: Denmark (Mollad Hansen)	Germany (Meyer)	Iceland (Dahnsson)	Norway (Rasmussen)	Portugal (Ruivo Quintin)	U.K. (Trout)	U.S. (Wise)	Mode	Total Deviation	Mean Deviation	Mean Deviation per Year	Estimated Age at First Maturity: Denmark	Germany	Iceland	Norway	Portugal	U.K.	Mode	Total Deviation	Mean Deviation
H. 1	♀	47	immature	4	4	4	4	4	4	4	4	0											
2	♀	54	immature	5	5	5	5	5	5	4	5	0											
3	♂	58	immature	5	5	5	5	5	5	4	5	0											
4	♂	60	immature	6	6	6	6	6	6	5	6	0											
5	♂	70	mature	6	6	6	6	6	6	6	6	0					6						
6	♂	68	mature	7	7	7	7	7	7	6	7	0					7						
7	♂	74	mature	7	7	7	7	7	7	5	7	0					7	6?					
8	♀	63	immature	8	8	8	8	8	8	7	8	0			7			7?	7?	7?			
9	♂	67	mature	8	8	8	8	8	8	7	8	0				6?	8	7	6?				
10	♂	81	mature	8	8	8	9	8	9	8	8	2	0.33	0.04		8	9		6?				
11	♂	63	mature	8	8	8	8	8	8	8	8	0			7	7	7	7	7	7			
12	♀	80	mature	9	9	9	9	9	9	9	9	0			7	7	7	7	7	7			
13	♀	89	mature	9	9	9	9	9	9	10	9	0				8	9	8	8	8			
14	♀	73	mature	9	9	9	9	9	9	8	9	0			8	8	8	8	8	8			
15	♂	70	mature	10	10	10	10	10	9	11	10	1	0.17	0.02	9	9	9	9	8	8			
16	♀	71	mature	10	10	10	10	10	10	10	10	0			8	8	8	8	8	8			
17	♀	74	mature	10	10	10	10	10	10	9	10	0			7	7	7	7	7	7 (8?9?)			
18	♂	73	mature	11	11	11	11	11	11	9	11	0			8	8	8	6-8	6	8			
19	♀	79	mature	11	11	11	11	11	11	10	11	0			7	7	7	7	7	7			
20	♀	73	mature	12	12	12	12	12	12	11	12	0			9	9?	8	8	7? 6?	11 (6?)			
Total				163	163	163	164	163	163	151	163	3	0.03	0.0002									
Total																							

ICNAF COD OTOLITH EXCHANGE PROGRAMME

SAMPLE I SUBDIVISION 1F DATE COLLECTED SEPTEMBER 1952. COLLECTED BY UNITED KINGDOM

Serial No.	Sex	Length (cm)	Maturity	Estimated Age: Denmark (Hansen-Madsen)	Germany (Meyer)	Iceland (Ostvedt)	Norway (Rasmussen-England)	Spain (Rojo)	U.K. (Trout)		Mode	Total Deviation	Mean Deviation	Mean Deviation per Year	Estimated Age at First Maturity: Denmark	Germany	Iceland	Norway	Spain	U.K.		Mode	Total Deviation	Mean Deviation
I. 1	♀	42	immature	4	5	4	4	4	4		4	1	0.17	0.04										
2	♂	44	immature	4	5?	4	3-4	3	5?		4	3	0.50	0.13										
3	♀	46	immature	4	5?	4	4	3	4		4	2	0.33	0.08										
4	♂	51	immature	5	5	5	5	4	5		5	1	0.17	0.03										
5	♂	55	immature	5	5	5	5	4	5?		5	1	0.17	0.03										
6	♂	60	immature	6	6	6	6	5	6		6	1	0.17	0.03										
7	♂	65	maturing	8	8	8	8	7	8		8	1	0.17	0.02	7			7						
8	♂	68	immature	8	8?	8	8	7	8		8	1	0.17	0.02										
9	♂	70	immature	7	7	7	7	6	7		7	1	0.17	0.02				7	6					
10	♀	72	immature	7	7	7	7	6	7		7	1	0.17	0.02										
11	♀	75	immature	6	7	6	7	6	7?		6	3	0.50	0.08										
12	♀	77	immature	7	7	7	7	6	7		7	1	0.17	0.02										
13	♂	79	maturing	7	7	7	7	7	7		7	0												
14	♂	82	maturing	7	7	7	7	7	7		7	0							7					
15	♂	85	immature	9	10 (9?)	9	9	9	9		9	1	0.17	0.02		7 (6?)		9	7					
16	♀	90	immature	9	10	9	9	9	9		9	1	0.17	0.02		9 (10?)		9	8					
17	♀	91	immature	10	10	8	10	9	10		10	3	0.50	0.05	8	9 (10?)		8	8					
18	♀	96		12	11/12	11	10	11	11		11	3	0.50	0.05	11		10	9		10?				
19	♀	116	immature?	12	12?	13	14	12?	13-14		12	5	0.83	0.07	8	11?	?	9		?				
20	♀	128	maturing	20	>18	18	19	19	17-18		19	5	0.83	0.04	7 (11)	?	10	10	11	10				
Total				157	>160	153	156-157	144	156-158		155	35	0.29	0.0019										
Is. 1	–	12.5	immature	1	1	1	1	1	1		1	0												
2	♀	21	immature	2	2	2	2	2	2		2	0												
3	–	22	immature	2	2	2	2	2	2		2	0												
4	♀	24	immature	2	2	2	2	2	2		2	0												
5	♀	26	immature	2	2	2	2	2	2		2	0												
6	♂	30	immature	2	2	3	2	2	2		2	1	0.17	0.09										
7	♂	31	immature	3	3	3	3	2	3		3	1	0.17	0.06										
8	♂	33	immature	3	3	3	3	3	3		3	0												
9	♂	35	immature	3	3	3	3	2	3		3	1	0.17	0.06										
10	♂	37	immature	3	3	3	3	3	3		3	0												
Total				23	23	24	23	21	23		23	3	0.05	0.0022										

TOTAL COD OTOLITH EXCHANGE PROGRAM

SAMPLE K SUBDIVISION 3K DATE COLLECTED JUNE 22, 1955. COLLECTED BY CANADA (NFLD.)

Serial No.	Sex	Length (cm)	Maturity	Estimated Age: Canada (NFLD) Training	Estimated Age: Scotland Software	Estimated Age: Portugal Check					Mode	Total Deviation	Mean Deviation	Mean Deviation per Year	Estimated Age at First Maturity: Canada (NFLD)	Estimated Age at First Maturity: Scotland	Estimated Age at First Maturity: Portugal					Mode	Total Deviation	Mean Deviation
K. 1	♂	43	[illegible]	5	5	5					5	0				?								
2	♂	46	[illegible]	5	6	6					6	1	0.33	0.06		?								
3	♂	48	[illegible]	7	7	7					7	0				7								
4	♂	51	[illegible]	12	12	10					12	2	0.67	0.06	9	8	7							
5	♂	52	[illegible]	8	8	8					8	0				8								
6	♂	52	[illegible]	9	9	8					9	1	0.33	0.04	8	7	8?							
7	♂	55	[illegible]	10	10	10					10	0			8	?	6							
8	♂	61	[illegible]	13	13	12					13	1	0.33	0.03	8	9	7							
9	♂	63	[illegible]	12	12	11					12	1	0.33	0.03	7	8	8							
10	♂	63	[illegible]	13	14	14					14	1	0.33	0.02	9	11	?							
11	♀	49	[illegible]	7	7	7					7	0				?								
12	♀	53	spent	9	9	8					9	1	0.33	0.04	8	8								
13	♀	55	spent	8	8	8					8	0			7	8	8							
14	♀	56	spent	11	11	10					11	1	0.33	0.03	8	9	8?							
15	♀	59	spent	10	10	11					10	1	0.33	0.03	7	7	8							
16	♀	60	spent	9	9	9					9	0			7	9	8							
17	♀	64	spent	10	10	10					10	0			8	8	8							
18	♀	66	spent	11	10	10					10	1	0.33	0.03	8	9	8							
19	♀	69	spent	20	19	18					19	2	0.67	0.04	9	11	8							
20	♀	70	spent	12	11	11					11	1	0.33	0.03	9	8	8							
Total				201	200	193					200	14	0.23	0.0012										
Total																								

ICNAF COD OTOLITH EXCHANGE PROGRAMME

SAMPLE L SUBDIVISION 3L DATE COLLECTED MAY 13, 1953 (COMMERCIAL) OCTOBER 10, 1954 (SMALL) COLLECTED BY CANADA (NFLD.)

Serial No.	Sex	Length (cm)	Maturity	Estimated Age: Canada (Nfld.) Fleming	France Nédélec	Germany Meyer	Norway Rasmussen England	Spain Rojo			Mode	Total Deviation	Mean Deviation	Mean Deviation per Year	Estimated Age at First Maturity: Canada (Nfld.)	France	Germany	Norway	Spain			Mode	Total Deviation	Mean Deviation
L. 1	♂	41	immature	3	4	4-5	4	4			4	2	0.40	0.10											
2	♂	46	immature	6	6	6	6	5			6	1	0.20	0.03											
3	♂	51	spent	6	6	6	5	5			6	2	0.40	0.07	?										
4	♂	55	immature	6	–	6	6	5			6	1	0.25	0.04											
5	♂	57	immature	6	7	6 (5?)	5	5			6	3	0.60	0.10											
6	♂	61	maturing	7	7	7	6	7			7	1	0.20	0.03	7	6									
7	♂	64	maturing	7	7	7	7	7			7	0			7			7							
8	♂	68	maturing	9	9	9	9	9			9	0			7	7	7?	7	8						
9	♂	75	spent	14	13	13	13	13			13	1	0.20	0.02	8	7	7	7	8						
10	♂	88	maturing	13	12	13 (12?)	12	13			13	2	0.40	0.03	8	7	8 (7?)	8	8						
11	♀	48	immature	6	6	5	6	6			6	1	0.20	0.03											
12	♀	53	immature	7	7-8	6?	6	8			7	3	0.60	0.09				6	7						
13	♀	57	immature	6	6	6	7	9			6	4	0.80	0.13											
14	♀	59	spent	8	10	8	8	12			8	6	1.20	0.15	8	8			9						
15	♀	61	immature	6	8	7	6	9			6	6	1.20	0.20		7	6?								
16	♀	65	immature	7	8	8 (7?)	7	10			8	4	0.80	0.10		5-6			7						
17	♀	69	spent	15	15	16	15	15			15	1	0.20	0.01	9	8	9	8	8						
18	♀	71	spent	10	10	10	10	10			10	0			7	6	9 (6-9?)	8	7						
19	♀	84	spent	14	14	15?	14	14			14	1	0.20	0.01	9	7	11?	10	10						
20	♀	104	spent	14	14-15	16?	14	14			14	3	0.60	0.04	?	6-7	4?	13	?						
Total				170	175-177	174-175	166	180			171	42	0.42	0.0025											
LS. 1	♂	12.3	immature	1	1	1	1	1			1	0													
2	–	13.8	immature	1	1	1	1	1			1	0													
3	–	14.1	immature	1	1	1	1	1			1	0													
4	–	16.1	immature	1	1	1	1	1			1	0													
5	♂	17.1	immature	1	1	1	1	1			1	0													
6	♂	18.5	immature	1	1	1?	1	1			1	0													
7	–	19.5	immature	2	2	2	2	2			2	0													
8	–	19.7	immature	2	2	2	2	2			2	0													
9	–	20.6	immature	2	3	2 (3?)	3	2			2	2	0.40	0.20											
10	–	21.5	immature	2	1-2	1?	0	1			1	2	0.80	0.40											
Total				14	14-15	13	13	13			13	4	0.08	0.0062											

[illegible]

SAMPLE M SUBDIVISION 3N DATE COLLECTED SEPTEMBER 15, 1966 (COMMERCIAL) MAY 7, 1968 (SMALL) COLLECTED BY CANADA (NFLD.)

Serial No.	Sex	Length (cm)	Maturity	Estimated Age: Canada (Newfld) Condon	Canada (Newfld) Lemming	Portugal Reiner	Spain Iriquoas				Mode	Total Deviation	Mean Deviation	Mean Deviation per Year	Estimated Age at First Maturity: Canada (Newfld.)							Mode	Total Deviation	Mean Deviation
M. 1	♂	45	immature	3	3		4				3	1	0.33	0.11											
2	♂	49	immature	4	4		4				4	0													
3	♂	56	maturing	5	5		5				5	0													
4	♂	59	maturing	6	7		6				6	1	0.33	0.06											
5	♂	64	maturing	6	6		7				6	1	0.33	0.06											
6	♂	68	partly spent	7	7		6				7	1	0.33	0.05											
7	♂	71	maturing	8	9		7				8	2	0.67	0.08	8										
8	♂	86	maturing	9	8		8				8	1	0.33	0.04	8										
9	♂	96	maturing	9	9		4-10?				9	0			?										
10	♂	112	maturing	15	15		9-10?				15	5	1.67	0.11	8										
11	♀	42	immature	3	4		4				4	1	0.33	0.08											
12	♀	47	immature	4	4		5				4	1	0.33	0.08											
13	♀	54	immature	5	6		6				6	1	0.33	0.06											
14	♀	53	immature	5	5		7				5	2	0.67	0.13											
15	♀	62	spent	7	7		8				7	1	0.33	0.05	?										
16	♀	66	spent	6	6		6				6	0			?										
17	♀	75	spent	7	7		6				7	1	0.33	0.05	?										
18	♀	83	spent	7	8		9				8	2	0.67	0.08	?										
19	♀	91	spent	12	12		9				12	3	1.00	0.08	10										
20	♀	117	spent	17	17		13				17	4	1.33	0.08	10										
Total				145	149		136-140				147	28	0.47	0.0032											
Ms. 1	♀	17.8	immature	2	2		2				2	0													
2	♀	19.0	immature	2	2		2				2	0													
3	♀	19.8	immature	2	2		2				2	0													
4	♂	20.1	immature	2	2		1				2	1	0.33	0.17											
5	♀	24.3	immature	2	2		2				2	0													
6	♀	26.8	immature	3	3		2				3	1	0.33	0.11											
7	♀	28.0	immature	3	3		3				3	0													
8	♀	28.5	immature	3	3		3				3	0													
9	♀	29.0	immature	3	3		3				3	0													
10	♂	34.0	immature	3	3		3				3	0													
Total				25	26		23				25	2	0.07	0.0028											

C 11

ICNAF COD OTOLITH EXCHANGE PROGRAMME

SAMPLE N SUBDIVISION 3PN DATE COLLECTED APRIL 18, 1957. COLLECTED BY CANADA (NFLD.)

Serial No.	Sex	Length (cm)	Maturity	Estimated Age: Canada (Maritime) Condon	Canada (Nfld.) Hornby	France Anraldin					Mode	Total Deviation	Mean Deviation	Mean Deviation per Year	Estimated Age at First Maturity: Canada (Nfld.)	France Anraldin						Mode	Total Deviation	Mean Deviation
N. 1	♂	46	immature	6	5	6					5	1	0.33	0.07											
2	♂	50	immature	6	6	6					6	0													
3	♂	55	maturing	10	11	10-11					11	1	0.33	0.03	8	7									
4	♂	58	maturing	8	9	9					9	1	0.33	0.04		4 or 5?									
5	♂	62	maturing	10	14	13					13	4	1.33	0.10	10	6									
6	♂	66	maturing	12	12	12					12	0			7	6 or 7									
7	♂	68	maturing	10	11	10					10	1	0.33	0.03	10	5 or 6									
8	♂	71	maturing	8	9	9-10					9	1	0.33	0.04	9	6 or 7									
9	♂	77	maturing	9	10	11					10	2	0.67	0.07	8	6									
10	♂	80	maturing	15	15	16					15	1	0.33	0.02	8	7									
11	♀	43	immature	3	4	4					4	1	0.33	0.08											
12	♀	50	immature	4	4	4-5					4	0													
13	♀	53	maturing	6	6	6					6	0													
14	♀	56	immature	7	7	7					7	0													
15	♀	60	maturing	6	8	8					8	2	0.67	0.08	8	7									
16	♀	63	maturing	7	8	7					7	1	0.33	0.05	8	6?									
17	♀	65	immature	6	8	7					8	2	0.67	0.12		6									
18	♀	67	maturing	9	10	12					10	3	1.00	0.10	7	6 or 7									
19	♀	68	ripe	7	8	9					8	2	0.67	0.08	7	6									
20	♀	77	maturing	16	16	17					16	1	0.33	0.02	9	6?									
Total				164	181	184-187					178	24	0.40	0.0023											
Total																									

HERRING COD OTOLITH EXCHANGE PROGRAMME

SAMPLE 0 SUBDIVISION 3N DATE COLLECTED SEPTEMBER, 1957. COLLECTED BY SPAIN

Serial No.	Sex	Length (cm)	Maturity	Estimated Age: Canada (N.Ill.) Fleming	France Cocatrix	Spain Rojo					Mode	Total Deviation	Mean Deviation	Mean Deviation per Year	Estimated Age at First Maturity: Canada (N.Ill.)	France	Spain					Mode	Total Deviation	Mean Deviation
0.1	♀	45	immature	3	4-5	4					4	1	0.33	0.08											
2	♂	46	immature	4	6?	4					4	2	0.67	0.17											
3	♀	48	immature	4	4	4					4	0													
4	♂	48	immature	5	5	5					5	0													
5	♀	48	immature	4	4-5	5					5	1	0.33	0.07											
6	♀	49	immature	4	4-5	5					5	1	0.33	0.07											
7	♂	49	immature	4	5	5					5	1	0.33	0.07											
8	♀	49	spawned	4	4	5					4	1	0.33	0.08			5								
9	♂	52	immature	4	4	4					4	0													
10	♂	54	spawned	5	5	5					5	0					5								
11	♀	55	spawned	5	6	6					6	1	0.33	0.06			6								
12	♀	55	spawned	4	6-7	6					6	2	0.67	0.11			6								
13	♀	55	spawned	4	4	5					4	1	0.33	0.08			5								
14	♀	56	spawned	4	7	5					5	3	1.00	0.20			5								
15	♀	57	spawned	5	5	5					5	0					5								
16	♂	58	spawned	5	6-7	5					5	1	0.33	0.07			5								
17	♀	61	spawned	4	5?	5					5	1	0.33	0.07			5								
18	♀	66	spawned	5	7	6					6	2	0.67	0.11			6								
19	♂	67	spawned	5	5-6	6					6	1	0.33	0.06			5								
20	♂	70	spawned	4	8	8					8	4	1.33	0.17			5								
Total				86	104-110	103					101	23	0.38	0.0038											
Os. 1	♀	30	immature	2		2					2	0													
2	♂	33	immature	2		2					2	0													
3	♂	36	immature	3		4					3	1	0.50	0.17											
4	♂	37	immature	3		3					3	0													
5	♀	38	immature	3		3					3	0													
6	♂	39	immature	3		3					3	0													
7	♀	39	immature	3		3					3	0													
8	♀	36	immature	3		3					3	0													
9	♂	37	immature	3		3					3	0													
10	♀	33	immature	3		2					3	1	0.50	0.17											
Total				28		28					28	2	0.10	0.0036											

immature

ICNAF OTB OTTER EXCHANGE PROGRAMME

SAMPLE P SUBDIVISION 3L DATE COLLECTED AUGUST, 1957. COLLECTED BY SPAIN

Serial No.	Sex	Length (cm)	Maturity	Estimated Age: Canada (Nfld.) Fleming	Germany Meyer	Norway Rasmussen Iceland	Spain Rojo	U.K. Trent			Mode	Total Deviation	Mean Deviation	Mean Deviation per Year	Estimated Age at First Maturity: Canada (Nfld.)	Germany	Norway	Spain	U.K.			Mode	Total Deviation	Mean Deviation
P. 1	♀	37	immature	4	4	4	4	4			4	0				?									
2	♀	44	mature	5	6	5	6	6			6	2	0.40	0.07		?		6							
3	♀	44	immature	5	5	5	5	6			5	1	0.20	0.04		?									
4	♂	47	immature	5	5	5	5	5			5	0				?									
5	♂	53	immature	5	6	5	6	6			6	2	0.40	0.07		?									
6	♀	55	mature	10	10	10	10	9			10	1	0.20	0.02	8	8	8	8	7						
7	♂	55	mature	10	10	10	9	10			10	1	0.20	0.02	8	8	8	8	8						
8	♂	55	immature	7	7	7	8	7			7	1	0.20	0.03			7		7						
9	♀	57	mature	7	7-8	7	8	9			7	3	0.60	0.09		6-7	6	7	9						
10	♂	58	mature	7	7	8	10	7?			7	4	0.80	0.11			7	6							
11	♂	59	mature	10	11-13	11	12	9			11	6	1.20	0.11		8-10	6	9							
12	♀	59	mature	6	6?	7	10	8			6	7	1.40	0.23				9							
13	♀	61	mature	13	14	13	15	14			14	3	0.60	0.04	9	10 (8?)	7	10	11						
14	♀	63	mature	11	11 (10?)	11	14	11			11	3	0.60	0.05	8	8 (7?)	8	11	8						
15	♀	65	mature	12	12 (13?)	12	13	12			12	1	0.20	0.02	8	9 (10) 8 (7)	6	8	10						
16	♂	66	mature	10	9-10	9	12	10			10	3	0.60	0.06	9	8-7	7	10	8-10						
17	♂	67	mature	11	10	11	10	11			11	2	0.40	0.04	7	6	7	8	9						
18	♂	68	mature	15	16	14	16	14			15	4	0.80	0.05	8	9?	7	11	?						
19	♀	77	mature	9	10?	10	13	11			10	5	1.00	0.10		8?	8	9	9-10						
20	♀	103	mature	19	19	18	21	11-12?			19	10	2.00	0.11	10	8	7	8	?						
Total				181	185-189	182	207	180-181			186	59	0.59	0.0032											
P. 1	♀	39	immature	3	3	3	3	3			3	0													
2	♀	39	immature	4	4	3	3	5			4	3	0.60	0.15											
3	♀	41	immature	4	5	3	5	5			5	3	0.60	0.12											
4	♂	40	immature	4	4?	3	3	6?			4	4	0.80	0.20											
5	♀	36	immature	4	4	4	5 (4?)	4			4	1	0.20	0.05											
6	♂	40	immature	4	4	4	4	4			4	0													
7	♀	35	immature	4	4	4	3	4			4	1	0.20	0.05											
8	♂	33	immature	3	3	3	3	3			3	0													
9	♂	31	immature	3	2?	2	3	4?			3	3	0.60	0.20											
10	♂	37	immature	4	5	3	3	4			4	3	0.60	0.15											
Total				37	38	32	35	42			38	18	0.36	0.0095											

ICNAF OTB OTOLITH EXCHANGE PROGRAMME

SAMPLE Q SUBDIVISION 4T DATE COLLECTED MAY 2, 1954 COLLECTED BY FRANCE

Serial No.	Sex	Length (cm)	Maturity	Estimated Age: Canada (Manning) Canada	Canada (Hall) Manning	France Anraillin	Portugal Ramos				Mode	Total Deviation	Mean Deviation	Mean Deviation per Year	Estimated Age at First Maturity: Canada (Hall)							Mode	Total Deviation	Mean Deviation
Q. 1	♀	67		10	10	10					10	0			7										
2	♂	55		8	8	8					8	0													
3	♀	62		8	8	8					8	0													
4	♂	62		10	11	10					10	1	0.33	0.03	8										
5	♀	62		7	7	8					7	1	0.33	0.05											
6	♂	69		9	9	8					9	1	0.33	0.04	8										
7	♂	69		15	15	14					15	1	0.33	0.02	8										
8	♂	55		7	8	7					7	1	0.33	0.05											
9	♀	58		7	7	7					7	0													
10	♀	50		7	7	7					7	0													
11	♀	50		5	5	5					5	0													
12	♂	54		7	7	7					7	0													
13	♂	58		7	8	8					8	1	0.33	0.04	8										
14	♀	50		7	7	7					7	0													
15	♂	57		7	8	6-7					7	1	0.33	0.05											
16	♂	43		4	4	4?					4	0													
17	♂	45		5	5	5					5	0													
18	♀	45		6	6	6					6	0													
19	♂	67		8	9	8-9					9	1	0.33	0.04	7										
20	♂	58		7	8	6 (7?)					7	2	0.67	0.10											
Total				151	157	149-151					153	10	0.17	0.0011											
Total																									

[illegible]

SAMPLE R SUBDIVISION 5Z DATE COLLECTED JULY 3, 1958 COLLECTED BY UNITED STATES

Serial No.	Sex	Length (cm) (mm)	Maturity	Estimated Age: Canada (Maritime) Cornish	Estimated Age: Canada (N.S.) Manning	Estimated Age: U.S. Cushing					Mode	Total Deviation	Mean Deviation		Estimated Age at First Maturity							Mode	Total Deviation	Mean Deviation	
R. 1		874		5		6																			
2		900		6		6																			
3		768		4		4																			
4		1010		10		9																			
5		860		6		6																			
6		895		6		6																			
7		833		4		4																			
8		930		5		6																			
9		1035		6		7 (6?)																			
10		862		6		8																			
11		813		4		4																			
12		960		6		6 (5?)																			
13		935		6		6 (7?)																			
14		952		6		6 (5?)																			
15		914		6		6																			
16		764		5		5																			
17		885		5		5																			
18		826		5		6																			
19		795		5		8 (9, 10?)																			
20		–		–		–																			
Total				106		114																			
Rs. 1		555		3		2																			
2		540		3		3																			
3		491		2		2																			
4		610		3		3																			
5		505		2		2 (3?)																			
6		488		2		2																			
7		500		2		2																			
8		480		2		2 (3?)																			
9		606		3		4 (5?)																			
10		601		3		3																			
Total				25		25																			