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Greenland Salmon Research Programme, 1969
Pelagic Long Lining Cruises by the R.V. 'Adolf Jensen'

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As part of the Danish/United Kingdom research programme in 1969, arrangements were made to use the 'Adolf Jensen' to carry out a further investigation of the possibilities of pelagic long lining as a means of catching salmon in suitable condition and in sufficient numbers for tagging. Drift nets were also to be fished in the areas fished by long line to provide an indication of the local abundance of salmon.

The two members of the United Kingdom team (from D.A.F.S.), who were to participate in this programme, arrived in Godthåb on 1st October but problems with the 'Adolf Jensen's' radar, the reliability of which was essential to the success of any long-lining trip, delayed departure until 9th October. The 'Adolf Jensen' then sailed north and fished in the area of Store Hellefiske Banke until 17th October, when it was decided to move further north and try long lines in the Disko area where commercial drift netters had recently been making heavy catches and where the Canadian research vessel 'A.T. Cameron' had had most success with its drift nets.

After fishing in the Disko area until 24th October the 'Adolf Jensen' returned to Holsteinsborg and again fished on the Store Hellefiske Banke until 28th October, when she left for Godthåb, arriving there on 30th October.

Although this cruise lasted for 21 days, bad weather and other troubles, mainly mechanical, prevented fishing being carried out on more than 11 days. Lines were shot on eleven occasions and 43 salmon were caught on a total of 4620 hooks. Twenty-nine of these were subsequently tagged. Fuller details are given in Table 1.

Drift nets were also fished on two occasions during this cruise, once on the Store Hellefiske Banke, about 18 n.m. West of Holsteinsborg, and once in Disko Bay, about 14 n.m. off Godhavn. Sixty-three nets, with meshes ranging from 60-70 mm. knot-to-knot, were fished on each occasion. Seven salmon, all in poor condition and unsuitable for tagging, were taken during the first setting but none were caught during the second fishing. These drift net catches were poor and it was evident that the mesh sizes of the nets available on board were too small to cover more than the lower part of the size range of fish shown to be present by long lining. Their use was therefore discontinued as it seemed unlikely that they would provide an adequate indication of the numbers of salmon of all sizes present in the areas fished by long line.

The 'Adolf Jensen' sailed north again on 4th November and fished long lines in the Holsteinsborg area, mainly on the south end of the Store Hellefiske Banke, until 13th November when she returned south making one further 'set' on Lille Hellefiske Banke (off Sukkertoppen) on her way to Godthåb, which she reached on 15th November. During this cruise a report was received that a commercial boat had caught 76 salmon on 900 hooks about 50 n.m. west of Holsteinsborg, in water with a surface temperature of 2°C. This temperature was considerably higher than

that in the area in which the 'Adolf Jensen' was fishing at the time and, in an attempt to profit by this information, she moved further off-shore and made three fishings 55-70 n.m. west of Holsteinsborg. Unfortunately, higher water temperatures were not found and no improvement in the catch was achieved.

This second trip lasted for eleven days but fishing was only possible on six days. On this trip the main problem was the weather, storm force winds and low air temperatures preventing fishing and indeed sailing on several occasions, because of the dangers of over-icing. A total of 3,000 hooks was fished and 22 salmon were caught, of which 14 were subsequently tagged. Fuller details are given in Table 1.

The fish caught by long line were mostly in excellent condition when brought on board. They were lifted on board in a long-handled dip-net and, if they were alive, the snood was cut close to the fish. They were then placed in a tank of circulating sea water and if, after 10-15 minutes, they still appeared to be suitable for tagging, they were anaesthetised in a bath containing a solution of approximately 40 p.p.m. MS222 in sea water. As soon as they became immobilized, the position of the hook was determined and, if possible without damaging the fish, it was removed after cutting off the point and the barb. The fish were then tagged and returned to the tank of circulating sea water. When they had fully recovered from the anaesthetic and were swimming normally, they were released by hand over the side of the ship. Fish which were bleeding from the gills or vent and fish which 'sickened' in the tank after being brought on board, were killed. On internal examination most of the fish which 'sickened' were found to have been hooked dorsally deep in the throat and to have suffered severe bleeding into the body cavity.

Although the hook had to be left in almost 50% of the fish which were tagged, the fish tagged from long lines were considered to be in much better physical condition when released than those tagged in other years after capture by other methods. The tagging rate (Table 1) was satisfactorily high and there seems no reason to doubt that it would remain so even if the hooking rate increased, provided that adequate facilities for handling the fish were available.

The overall hooking rate, which averaged 8.5 salmon/1000 hooks and ranged from 0-23/1000 hooks, although somewhat better than that of 4.5/1000 hooks achieved during a short long-lining cruise by the 'Adolf Jensen' in the Holsteinsborg area in 1968 (possibly because of the substitution of sprats for sandeels as bait), was still disappointingly low. However, even allowing for the small numbers of fish tagged, it is hoped that sufficient will be recaptured to confirm that fish caught by this method are in much more suitable condition for tagging. Recapture results from this experiment may also provide a useful comparison with those of the salmon tagged from drift nets during the cruise by the 'A.T. Cameron' in 1969.

Details of the average length and weight of the salmon caught during these two cruises are given in Table 2. The difference in the length range of the fish caught in the drift nets and on long lines is clearly seen in this table. The average length of the fish caught on long lines is considerably greater than those recorded from gill nets in the Godthåb area in previous years and this difference is clearly related to a difference in the age composition in the samples, as is discussed later.

The sex ratio (1 male:4.4 females), based on the internal examination of dead fish, was higher than that recorded in previous research catches but this may well be an artefact produced by the small number of fish involved (27) or by the method of capture (mainly long line), as a sample of 370 salmon, from which scales were taken by a Danish scientist during a short trip on board the commercial drift-netter K/V 'Polarlaks', gave a sex ratio of approximately 1 male:3 females, a value within the range recorded in research catches in previous years.

The stomach contents of 27 fish which died or were killed, were examined. In October, when 12 long line fish and 7 drift net caught fish were examined, 4 of the long-line caught fish had empty stomachs, compared with only one of those caught by drift net. In November, when all 8 fish examined were caught by long line, 6 had empty stomachs. Fish, predominantly sandeels, were again the most important item in the diet, capelin occurring in 15% and sandeels in 51% of the stomachs examined, while crustacea occurred in just under 4%.

The scale samples collected during these two cruises have been examined and details of the age composition of the long line catch are given in Table 3 and are compared, in Table 4, with the age compositions of the research catches in previous years from the Godthåb area, which were taken almost entirely by gill nets.

A comparison between the age composition of this sample and those of earlier research catches shows that, in the present sample, a slightly higher proportion of fish had migrated to sea at an earlier age, but the most striking difference is the much higher proportion of fish which had spent two or more winters in the sea. It would obviously be unwise to draw any firm conclusions from such a small sample but, if samples from other sources (the 'Polarlaks', 'A.T. Cameron', 'Tornak' and commercial gill net catches from other areas) and taken by other methods, confirm that a change in the sea age composition of the salmon stock off Greenland is taking place, this could have a very important bearing, both on the assessment of the effects of the Greenland fishery on home water catches and, on the consideration of any measures which might be proposed for the conservation of the stock.

Table 1

Date	Position	Wind Conditions	Surface Water Temp. (°C)	Number of Hooks	Salmon		No./1000 Hooks Caught	Percentage Tagged	
					No. Caught	No. Tagged			
<u>1st Cruise</u>									
October 11	12 n.m. W. of Holsteinsborg	NW 2-1	1.8	220	5	3	22.7	13.6	60.0
13	12 n.m. W. of Holsteinsborg	NW 2-1	1.3	450	5	4	11.1	8.9	80.0
14	18 n.m. W. of Holsteinsborg	NW 1-0	1.7	500	4	3	8.0	6.0	75.0
15	18 n.m. W. of Holsteinsborg	SW 1-3	1.6	350	2	1	5.7	2.9	50.0
17	34 n.m. N.W. of Holsteinsborg	SW 6-4	1.8	350	4	3	11.4	8.6	75.0
18	32 n.m. W.S.W. of Diskofjord	NE 2-3	0.9	500	2	1	4.0	2.0	50.0
22	10 n.m. N.N.E. of Godhavn	NE 2	1.4	400	3	1	7.5	2.5	33.3
23	8 n.m. N.E. of Godhavn	SE 2-3	1.2	450	3	2	6.7	4.4	66.6
25	30 n.m. W. of Sydbay	NW 5-6	1.3	600	8	5	13.3	8.3	62.5
27	20 n.m. W. of Holsteinsborg	SE 3-2	0.9	400	0	0	0.0	0.0	-
28	30 n.m. W. of Sydbay	SE 4-6	1.3	400	7	6	17.5	15.0	85.7
Overall - Holsteinsborg area (11-17, 25-28)									
Disko area (18-23)									
Overall - 1st Cruise									
				3270	35	25	10.7	7.6	71.4
				1350	8	4	5.9	3.0	50.0
				4620	43	29	9.3	6.8	67.5
<u>2nd Cruise</u>									
November 5	24 n.m. W. of Holsteinsborg	NE 5-6	0.2	400	8	6	20.0	15.0	75.0
7	24 n.m. W. of Holsteinsborg	NW 3-4	0.3	400	1	1	2.5	2.5	100.0
11	30 n.m. W. of Holsteinsborg	S 6	-0.3	400	6	3	15.0	7.5	50.0
12	55 n.m. W. of Holsteinsborg	SE 1	-0.9	550	6	4	10.9	7.3	66.7
13	55 n.m. W. of Holsteinsborg	SE 2	-0.9	300	0	0	0.0	0.0	-
13	70 n.m. W. of Holsteinsborg	SE 5	-0.9	400	0	0	0.0	0.0	-
14	30 n.m. W. of Kangamiut	S 5	-1.0	550	1	0	1.8	0.0	0.0
Overall - 2nd Cruise									
				3000	22	14	7.3	4.7	63.6
Overall - 1st and 2nd Cruises									
				7620	65	43	8.5	5.6	66.2

Table 2

<u>Month</u>	<u>Method</u>	<u>Fork Length (cm.)</u>		<u>Whole Weight (kg.)</u>	
		<u>Average</u>	<u>Range</u>	<u>Average</u>	<u>Range</u>
October	Drift nets	66.4 (7) ^a	61-75	3.4 (7) ^a	2.5-5.0
	Long lines	75.0 (43)	61-100	5.9 (14)	2.5-13.1
November	Long lines	79.2 (22)	60-100	7.1 (8)	4.6-11.2
Overall	Drift nets	66.4 (7)	61-75	3.4 (7)	2.5-5.0
	Long lines	76.4 (65)	60-100	6.4 (22)	2.5-13.1

a Figures in brackets are the numbers of fish involved.

Table 3

<u>Smolt A Age</u>	<u>Numbers of Fish^a</u>				<u>Overall</u>	<u>Percentage in Sample</u>
	<u>Sea Age</u>			<u>Previous Spawners</u>		
	<u>1+</u>	<u>2+</u>	<u>3+</u>			
1	7	4	-	1	12	18.5
2	25	16	1	-	42	64.6
3	6	2	-	1	9	13.8
4	1	-	-	1	2	3.1
Overall	39	22	1	3		
Percentage in Sample	60.0	33.8	1.5	4.6		

a Long line catch only

Table 4

<u>Year</u>	<u>Percentage Age Composition</u>								
	<u>1</u>	<u>2</u>	<u>3</u>	<u>Smolt Age</u>			<u>7</u>	<u>?</u>	
				<u>4</u>	<u>5</u>	<u>6</u>			
1965	3.0	49.3	31.5	11.4	3.8	0.8	0.2	0.0	
1966	3.4	42.4	41.4	9.0	3.2	0.7	0.0	0.0	
1967	2.9	52.4	28.0	11.5	4.0	1.0	0.2	0.0	
1968	4.8	44.7	28.2	12.1	9.3	0.2	0.0	0.6	
1969	18.5	64.6	13.8	3.1	0.0	0.0	0.0	0.0	
	<u>0+</u>	<u>1+</u>	<u>2+</u>	<u>Sea Age</u>		<u>Previous Spawners</u>			
				<u>3+</u>					
1965	0.0	98.0	0.8	0.0		1.2			
1966	0.0	98.0	0.9	0.0		1.1			
1967	0.2	95.6	2.0	0.0		2.3			
1968	0.0	97.0	1.7	0.0		1.3			
1969	0.0	60.0	33.8	1.5		4.6			