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Canadian mackerel catches (m.t.) and numbers at age
in Subarea 4 for 1974.

by

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Catch

Preliminary estimates of Canadian catches of mackerel in Subarea 4 indicate a decline in the total catch to 14,600 tons in 1974 compared to 18,900 tons in 1973 (Table 1). This decrease was the result of reduced catches in Div. 4T and 4Vn which may be attributed in part to unstable market conditions and restricted effort by fishermen. Landings in the Gulf of St. Lawrence (Div. 4T) continued to account for close to 50% of the total Canadian catch.

In excess of 56% of the total catch was taken by inshore-fixed gears (8,200 tons, Table 2). The majority of catches were made in early summer (June and July, 7,600 tons) although landings were made from early May through December.

Sampling

A total of 12,225 mackerel (76 samples) were measured to the nearest half-centimeter length group (fork length) for length frequency analysis. When possible, two fish were selected from each length interval of these length frequencies and subsequently examined for various biological parameters. Approximately 1,800 fish were examined from a total of 46 detail samples.

Biological Parameters

Since biological samples were selected on a length-stratified basis, it was necessary to weight for length frequency numbers. This was accomplished by reducing individual length frequencies to a percent and then combining these frequencies on a monthly basis for Subarea 4 in the same proportion as individual fishing gears were represented in the total monthly catch. Samples combined in this way yielded combined length frequencies reduced to per mille by month.

To obtain length-weight parameters, biological samples (unweighted) were combined by month for Subarea 4 and regression curves fitted to mean weight at length data using a logarithmic transformation. This resulted in curves of the form

$$\text{Weight} = A* \text{Length}^B$$

Estimates of age were made from otoliths by counting hyaline (winter) zones excluding the nucleus. Age-group was thus defined as the number of counted zones and year-class as the year sampled minus the age-group.

Age-length keys by month were constructed using numbers at age. The mean length of fish in the catch was determined from weighted length frequencies. This length was used to determine mean weight from the length-weight parameters which yielded total numbers when the monthly catch was divided by mean weight. This total number was then proportioned by the length frequency to arrive at the number of individuals in each length group. Biological samples combined by month gave numbers at age in each length group for samples. The proportion of each age group by length interval was applied to the total number caught to arrive at numbers caught by age group and length interval in the catch.

Weighted length frequencies by month are shown in Figure 1. Analysis of these distributions suggests a shift from fish over 30 cm in May to fish under 30 cm in August and then back to larger fish in November. This implies a size-segregated movement of mackerel into and out of Subarea 4 with older (larger) fish arriving first and leaving last. Less than 30% of the catch is composed of fish under 30 cm.

Mean lengths and weights at age, year-class composition and number caught are shown by month in Table 3. Considerable variation in year-class composition is apparent between months with a distinct shift to younger age-groups in the mid-summer. The 1971 year-class is well represented throughout the season and is dominant on an annual basis (22.6%). Mackerel 3 years and younger made up more than 52% of the total catch in numbers and 36% of the catch in weight. The 1967 year-class is still well represented in the fishery but its contribution has declined to 16% of the total catch in weight. Figure 2 summarizes year-class composition in the 1974 catch by numbers. Numbers caught by age-group and length are shown in Table 4.

Von Bertalanffy parameters were calculated from mean lengths at age in 1974 to yield the following equation:

$$I_t = 39.57 \left[1 - Exp \ (-0.31(t+1.81))\right]$$

Observed data and the resultant growth curve are as shown in Figure 3.

Table 1.   Canadian mackerel catches by Month and Division in Subarea 4 for 1974.

DIVISION	5	6	7	8	9	10	11	12	TOTAL	PERCENT
4T	2	760	3556	1485	828	150	23		6808	46.5
4Vn		661	148	67	348	583	634		2440	16.8
4W	17	880	69	64	158	151	216		1555	10.6
4X	327	1203	299	186	768	527	373	154	3836	26.2
TOTAL	346	3504	4072	1802	2102	1411	1246	154	14637 mt.	
SAMPLES	13	24	25	7	34	12	7		122	

Table 2.   Canadian mackerel catches in Subarea 4 by gear and month.

GEAR	5	6	7	8	9	10	11	12	TOTAL
Weir	16	85	40	34	121	172	14		481.8
Seines	5	474	2930	1144	680	539	664		6434.9
Trawls	1	1	9	2	11	2	1		26.7
Handline	2	19	6	99	247	194	4		572.5
Trap	146	1252	218	121	506	183	108	16	2547.8
Gillnet	176	1675	870	401	537	321	456	154	4573.7 mt.
TOTAL	345.5	3505.5	4072.4	1801.6	2101.6	1410.6	1246.3	153.7	14637.2
PERCENT	2.36	23.95	27.82	12.31	14.36	9.64	8.51	1.05	

Table 3.　　Mean length and weight, year-class composition and numbers caught by month in Subarea-4.

Month	Parameter	Age Group										
		1	2	3	4	5	6	7	8	9	10	10+
MAY	Mean length			32.3	32.5	34.7	35.7	36.2	38.5	38.5	39.5	39.5
	Mean weight			321	374	464	519	540	572	665	675	740
	Numbers (10⁻³)			99	82	146	162	215	25	6	3	6
	Percent			13.3	11.0	19.6	21.7	28.8	3.3	0.8	0.4	0.7
JUNE	Mean length		28.1	32.1	33.5	35.0	35.9	36.3	37.5	38.7	39.5	40.5
	Mean weight		243	346	427	486	554	574	650	721	771	798
	Numbers (10⁻³)		31	1268	808	1383	1279	1557	473	280	74	196
	Percent		0.4	17.2	10.9	18.8	17.4	21.1	6.4	3.8	1.0	2.5
JULY	Mean length	21.9	27.6	31.7	32.5	34.9	35.4	35.1	36.5	36.5	37.5	41.5
	Mean weight	88	183	332	382	481	507	490	544	572	361	768
	Numbers (10⁻³)	54	471	3154	3695	991	1159	919	268	34	34	11
	Percent	0.5	4.3	29.2	34.2	9.1	10.7	8.5	2.4	0.3	0.3	0.1
AUGUST	Mean length	23.6	24.7	32.0	31.9	36.5		37.5		36.5		
	Mean weight	127	148	358	409	510		583		531		
	Numbers (10⁻³)	4275	6604	83	34	39		58		19		
	Percent	38.4	59.4	0.7	0.3	0.3		0.5		0.1		
SEPT.	Mean length	24.9	27.0	32.3	33.9	35.1	36.0	36.1	36.1	38.9	39.1	
	Mean weight	157	190	305	388	503	533	561	587	627	715	
	Numbers (10⁻³)	771	2362	1476	680	409	410	344	89	18	43	
	Percent	11.6	35.7	22.3	10.2	6.1	6.2	5.2	1.3	0.2	0.6	
OCT.	Mean length	24.4	26.7	31.4	33.1	34.9	35.5	36.0	35.4			
	Mean weight	115	189	301	348	388	469	457	583			
	Numbers (10⁻³)	214	4706	924	253	91	23	62	24			
	Percent	3.3	74.7	14.6	4.0	1.4	0.3	0.9	0.3			
NOV.	Mean length	24.4	29.5	33.4	35.4	36.3	36.3	36.8	40.5	39.8	37.9	40.0
	Mean weight	172	270	375	496	523	522	562	856	747	692	714
	Numbers (10⁻³)	16	142	706	111	519	713	283	7	18	55	24
	Percent	0.6	5.4	27.2	4.2	20.0	27.4	10.9	0.2	0.6	2.1	0.9
ANNUAL	Mean length	23.9	26.3	31.9	33.1	35.0	35.8	36.1	36.9	38.4	39.0	40.4
	Mean weight	144	187	328	394	486	530	547	618	686	712	759
	Numbers (10⁻³)	3196	9018	9342	5108	4216	4137	4242	1040	477	221	316
	Percent	7.7	21.8	22.6	12.4	10.2	10.0	10.3	2.5	1.2	0.5	1.6

Table 4.   Age length key for mackerel in Subarea 4 for Annual in 1000's of fish.

Weight = 0.003657(Length **3.3009)   Catch = 14638

Mean weight = 354.33   Total numbers = 41312

Length Group (CM)	AGE															Total
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	14+	
15-15.9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16-16.9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17-17.9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18-18.9	42	0	0	0	0	0	0	0	0	0	0	0	0	0	0	42
19-19.9	42	0	0	0	0	0	0	0	0	0	0	0	0	0	0	42
20-20.9	0	167	0	0	0	0	0	0	0	0	0	0	0	0	0	168
21-21.9	294	205	0	0	0	0	0	0	0	0	0	0	0	0	0	499
22-22.9	725	523	0	0	0	0	0	0	0	0	0	0	0	0	0	1248
23-23.9	638	943	0	0	0	0	0	0	0	0	0	0	0	0	0	1581
24-24.9	709	971	26	0	0	0	0	0	0	0	0	0	0	0	0	1706
25-25.9	309	1687	0	0	0	0	0	0	0	0	0	0	0	0	0	1997
26-26.9	431	1315	43	0	0	0	0	0	0	0	0	0	0	0	0	1789
27-27.9	29	974	57	0	0	0	0	0	0	0	0	0	0	0	0	1082
28-28.9	8	610	130	0	0	0	0	0	0	0	0	0	0	0	0	749
29-29.9	10	637	403	21	0	0	0	0	0	0	0	0	0	0	0	1082
30-30.9	0	395	1207	114	0	0	0	0	0	0	0	0	0	0	0	1706
31-31.9	0	258	2485	750	256	0	0	0	0	0	0	0	0	0	0	3494
32-32.9	0	224	3144	1636	730	0	65	0	0	0	0	0	0	0	0	5325
33-33.9	0	88	1315	1433	926	468	263	29	0	0	0	0	0	0	0	4826
34-34.9	0	0	337	695	1248	759	611	84	0	0	0	0	0	0	0	3412
35-35.9	0	0	175	307	709	971	998	194	28	0	0	0	0	0	0	3911
36-36.9	0	0	28	142	326	1134	992	227	56	66	0	0	0	0	0	3287
37-37.9	0	0	0	22	18	568	852	241	88	72	0	0	0	0	0	2163
38-38.9	0	0	0	0	0	243	379	126	163	23	0	18	0	0	0	957
39-39.9	0	0	0	0	0	68	68	101	78	39	7	11	33	0	17	416
40-40.9	0	0	0	0	0	7	15	38	30	11	23	67	11	7	0	208
41-41.9	0	0	0	0	0	0	0	0	39	11	33	23	6	11	11	125
42-42.9	0	0	0	0	0	0	0	0	0	0	0	6	0	6	11	42
43-43.9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
44-44.9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
45-45.9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	3196	9018	9342	5108	4216	4137	4242	1040	477	221	64	135	51	25	41	41312
Mean length	23.9	26.3	31.9	33.1	35.0	35.8	36.1	36.9	38.4	39.0	40.3	39.5	40.3	41.4	40.4	
Mean weight	144.2	187.2	328.4	394.2	485.7	530.1	546.5	617.5	686.3	712.2	751.4	775.6	732.8	822.5		
Percent	7.74	21.83	22.61	12.36	10.21	10.01	10.27	2.52	1.16	0.53	0.15	0.33	0.17	0.06	0.10	

Figure 1. Length frequency distribution of Canadian caught mackerel in Subarea 4 by month in 1974 (‰)
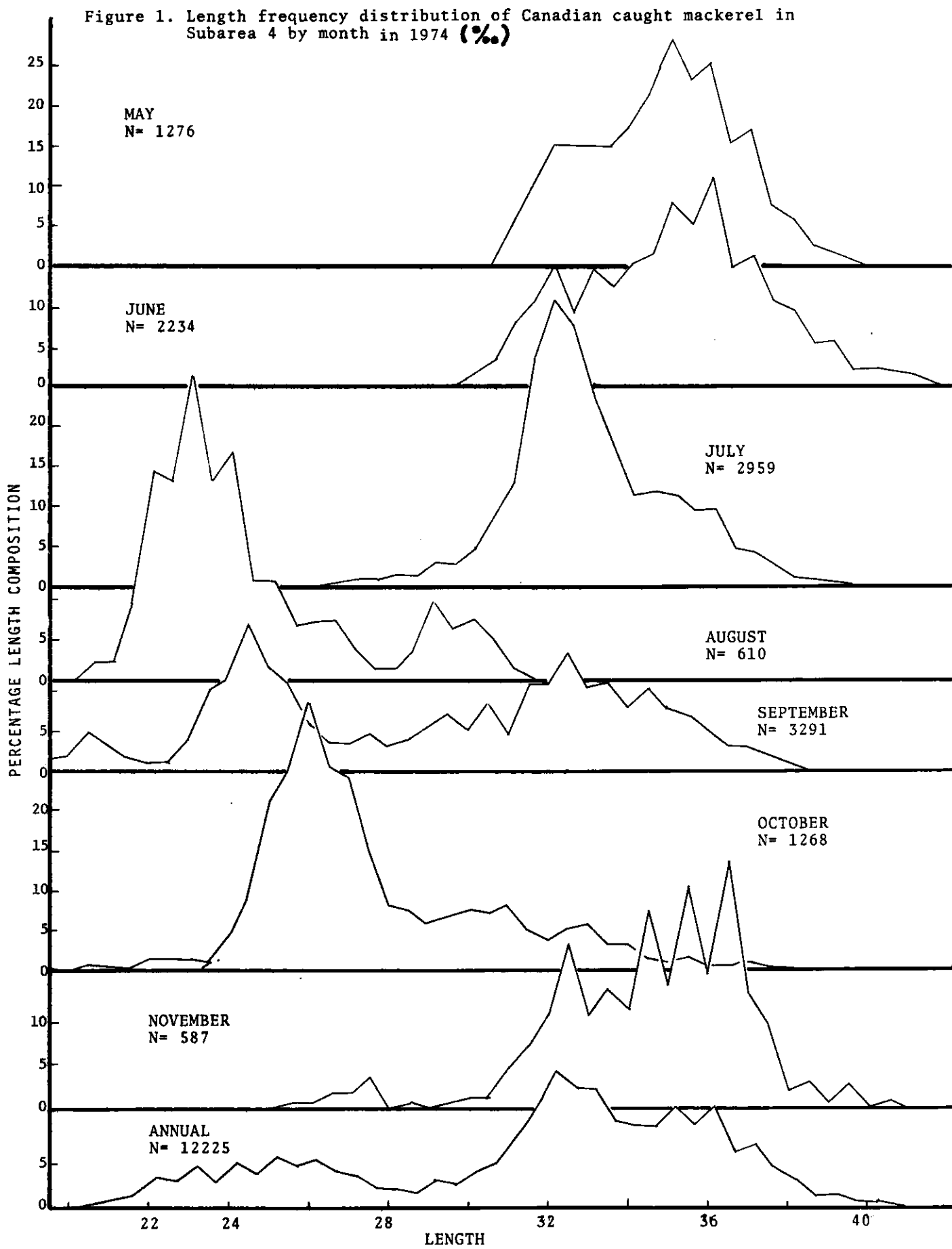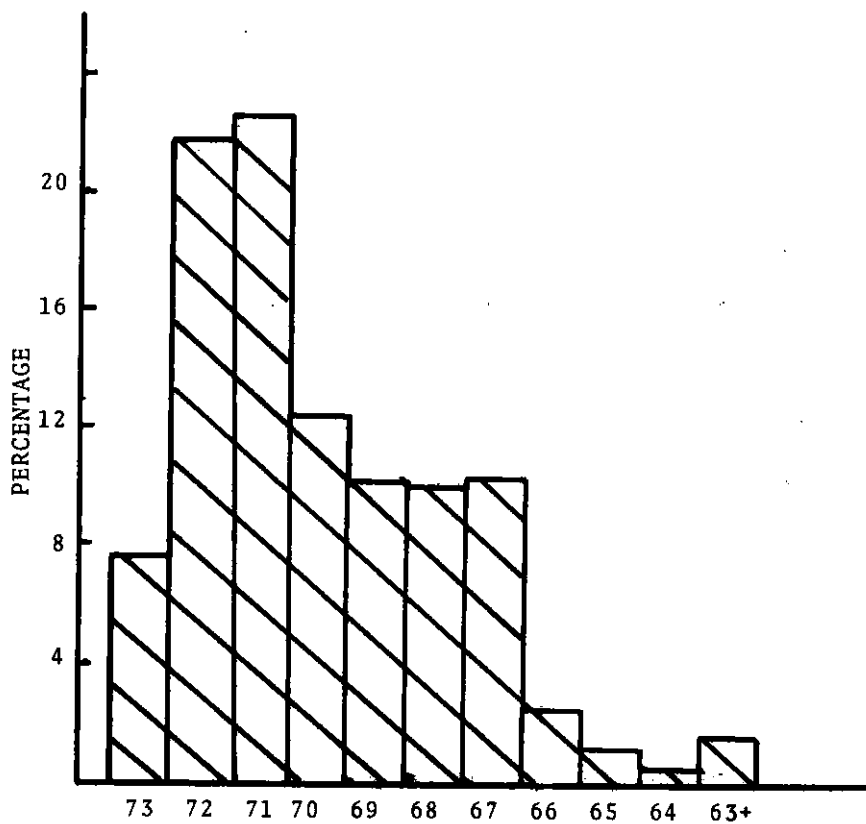
Fig. 1. Length frequency distribution of Canadian caught mackerel in Subarea 4 by month in 1974 (°/oo).

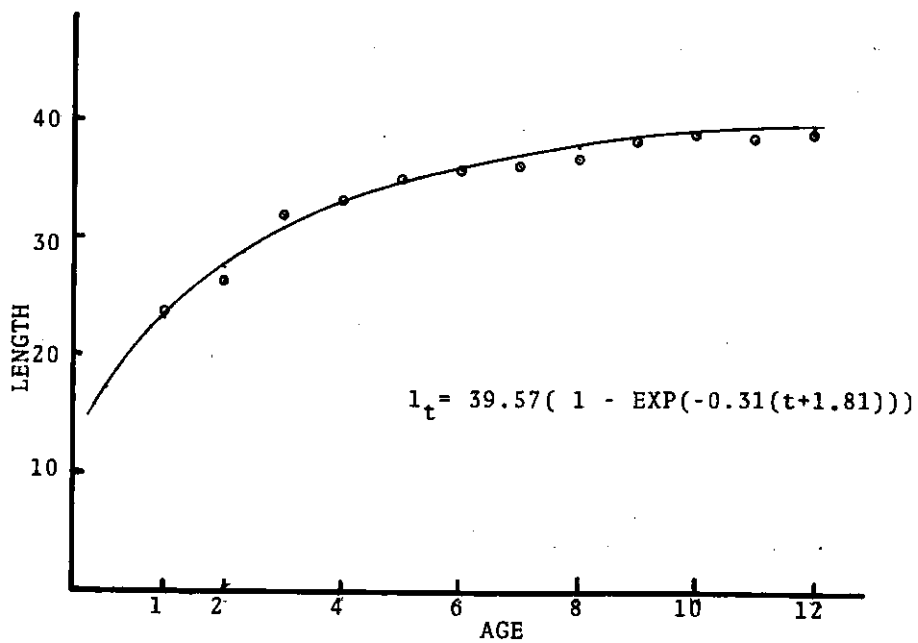Figure 2. Year-class composition (annual) in Canadian mackerel catches
for 1974.

$$l_t = 39.57(1 - EXP(-0.31(t+1.81)))$$

Figure 3. Von Bertalanffy grqwth curve for Canadian-caught mackerel
(fork length)