

International Commission for



the Northwest Atlantic Fisheries

Serial No. 3232
(B.g.14)

ICNAF Res.Doc. 74/46

ANNUAL MEETING - JUNE 1974

The Temperature of the Waters off South-West Greenland
during the International Salmon Tagging Experiment in 1972

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During the ICES/ICNAF Salmon Tagging Experiment in 1972 surface temperatures were measured, and BT casts were made, by the research vessels involved, viz., "Adolf Jensen", "Cameron", "Cryos" and "Scotia", when participating in the tagging, i.e., from beginning of August to mid-October. This material will be worked up and presented in the final Report of the Experiment. Here some preliminary observations are made.

Surface temperatures

The number of observations of surface temperature made in connexion with the Experiment is rather small. However, the Danish Meteorological Institute has most kindly placed at my disposal the surface temperatures collected by Danish vessels as part of the maritime meteorological observation scheme. On the basis of this material, as well as the above mentioned surface temperatures collected by research vessels, the surface values of the BT casts, and other data available in the ICES Service Hydrographique monthly means of the surface temperature have been calculated for 1°-squares of the standard areas A₁ (60°N-70°N, 50°W-58°W) and B (55°N-63°N, 40°W-50°W). For these areas surface temperatures are available, and anomalies have been published in the series Annales Biologiques, for the period 1876-1971. The monthly anomalies for the whole period are presented here in Tables 1a-1d and 2a-2d for the Areas A₁ and B respectively.

To tie up the 1972-data with the long-term series temperature anomalies were calculated employing, as usual in this series, for each month and 1°-square the mean values over the period 1876-1915 as basis (Ryder, 1917). Averaging over each of the areas A₁ and B resulted in the monthly anomalies listed in Table 3.

As appears from Table 3 positive anomalies are not met with in any of the months, neither in A₁ nor in B. Obviously very cold conditions were found in these regions in 1972, in accordance with the findings of Hermann, Lenz and Blacker (1973).

A study of Tables 1 and 2 shows that from the start of the observations in 1876 to about 1920 the values are fluctuating, without any conspicuous trend. At about 1920 the temperature rises rather abruptly, culminating about 1930. However, positive anomalies are still dominating for a long period of years. A deterioration sets in at about 1967,

Table 3. Monthly anomalies ($\Delta^{\circ}\text{C}$) and numbers (n) of observations of the sea surface temperature in Areas A₁ and B during 1972.

	A ₁		B	
	Δ	n	Δ	n
March	-2.0	7	-1.4	50
April	-0.2	49	-0.4	67
May	-0.2	108	-0.6	113
June	-1.0	130	-0.8	136
July	-1.5	97	-1.9	115
August	-0.8	226	-1.2	111
September	-0.3	199	-1.0	124
October	0.0	88	-0.4	109
November	-1.1	20	-1.2	103
December			-1.2	21

reaching a domination of negative anomalies in 1969, and still lower values are obtained in 1970. In 1971 there is obviously some improvement. In 1972, however, temperatures are again at the same low level as in 1970. For each of the months April-November (area A₁) or March-November (area B) the variation of the temperature anomaly during the period 1946-1972 has been plotted in Figures 1a and 1b.

Sub-surface temperatures

Some information on the sub-surface temperature conditions in the region during the tagging experiment is available from the BT casts made from the research vessels involved. From the BT curves the values of the Mixed Layer Depth (MLD) have been determined as this parameter may be of some interest seen in relation to the figures obtained for catch per unit effort. For determination of MLD the water was considered mixed if the approximate vertical temperature gradient was less than 0.1°C in any 15 metres.

In order to see whether a variation of MLD with time can be demonstrated the values were grouped according to week numbers:-

- I. Week nos. 32-34, i.e., 30/7-19/8.
- II. " " 35-36, " , 20/8- 2/9.
- III. " " 37-39, " , 3/9-23/9.

The MLD values for these groups are indicated in Figures 2a, 2b, 2c. There is an obvious increase of the MLD values from Group I to Group II, and perhaps a further small increase from Group II to Group III which latter, however, contains only few values.

The development and deepening of a homogeneous layer is promoted by autumnal cooling. The reason for the rather sudden intensification of it in weeks 35-36 should perhaps, however, be sought partly in some spells of fairly strong winds (5-7 Beaufort) in these weeks.

As a mixed layer develops and deepens the salmon may be expected to spread in it. As a matter of fact a drop of catch per unit effort from the weeks 32-34 to the weeks 35-36, and a further drop in the weeks 37-39, was demonstrated by Christensen and Lear (1974, Table 8). It is suggested therefore, that the development of the MLD be taken into consideration when explanations for variations in salmon catch per unit effort are sought.

References

- Christensen, O. and W.H. Lear. 1974: Distribution and abundance of salmon at West Greenland. - Report to the meeting of the ICTS/ICNAF Working Party on North Atlantic Salmon, Charlottenlund, 11-15 March 1974.
- Hermann, F., W. Lenz and R.W. Blacker. 1973: Hydrographic conditions off West Greenland during 1972. - ICNAF Res.Doc. 73/53.
- Ryder, C. 1917: Monthly mean temperatures of the surface water in the Atlantic, north of 50°N. lat. (App. to Naut.-Meteor. Annual). Copenhagen.

Table 1a Monthly Anomalies ($\Delta^{\circ}\text{C}$) and Numbers (n) of Observations of Sea Surface Temperature in Area A₁.

A₁

	January		February		March		April		May		June	
	Δ	n	Δ	n	Δ	n	Δ	n	Δ	n	Δ	n
1876	-	-	-	-	-	-	0.9	10	0.2	14	0.6	6
1877	-	-	-	-	-	-	1.2	28	1.5	33	1.1	49
1878	-	-	-	-	-	-	0.0	30	0.5	27	0.2	59
1879	-	-	-	-	-	-	1.6	17	0.7	11	0.7	94
1880	-	-	-	-	-	-	0.4	18	0.4	19	1.5	47
1881	-	-	-	-	-	-	1.0	14	0.1	25	-0.2	76
1882	-	-	-	-	-	-	-0.2	21	0.4	27	0.2	54
1883	-	-	-	-	-	-	-	-	-0.1	43	-0.6	57
1884	-	-	-	-	-	-	-0.8	19	-0.1	48	-0.5	22
1885	-	-	-	-	-	-	0.7	15	0.6	19	-0.6	62
1886	-	-	-	-	-	-	1.0	2	0.3	37	0.3	94
1887	-	-	-	-	-	-	0.1	30	-0.3	24	-0.5	43
1888	-	-	-	-	-	-	-	-	2.0	10	1.3	69
1889	-	-	-	-	-	-	0.2	11	0.4	14	-0.2	46
1890	-	-	-	-	-	-	0.1	10	0.3	18	0.1	64
1891	-	-	-	-	-	-	2.2	3	0.1	9	0.3	105
1892	-	-	-	-	-	-	-0.1	23	0.5	27	0.4	99
1893	-	-	-	-	-	-	0.5	1	-0.5	35	-0.5	75
1894	-	-	-	-	-	-	-2.0	4	-0.5	54	-1.2	128
1895	-	-	-	-	-	-	0.0	23	0.1	53	0.1	77
1896	-	-	-	-	-	-	-1.0	10	-3.0	30	-0.2	83
1897	-	-	-	-	-	-	-1.2	2	-0.1	18	0.5	81
1898	-	-	-	-	-	-	-0.4	6	-0.6	53	-0.4	143
1899	-	-	-	-	-	-	1.7	27	0.7	56	0.2	66
1900	-	-	-	-	-	-	-0.1	14	0.6	34	0.6	112
1901	-	-	-	-	-	-	0.9	3	-0.2	37	-0.2	87
1902	-	-	-	-	-	-	0.0	31	0.2	36	0.4	87
1903	-	-	-	-	-	-	-0.4	30	-0.9	42	0.1	51
1904	-	-	-	-	-	-	-1.0	4	-0.7	62	-0.1	59
1905	-	-	-	-	-	-	1.0	3	0.6	40	0.6	41
1906	-	-	-	-	-	-	-0.7	12	0.4	61	-0.8	32
1907	-	-	-	-	-	-	-1.7	42	-0.9	51	-1.1	66
1908	-	-	-	-	-	-	0.8	27	-0.7	51	-1.1	58
1909	-	-	-	-	-	-	-0.1	22	0.2	74	0.3	57
1910	-	-	-	-	-	-	-0.7	35	-0.1	32	-0.7	29
1911	-	-	-	-	0.0	2	-0.1	43	-0.4	30	-0.3	9
1912	-	-	-	-	-	-	0.6	63	0.2	64	0.5	54
1913	-	-	-	-	-	-	-0.6	24	0.1	131	0.0	89
1914	-	-	-	-	-	-	-0.7	121	-0.9	144	-2.0	18
1915	-	-	-	-	-	-	0.2	8	0.7	20	0.1	114
1916	-	-	-	-	-	-	0.5	60	1.3	86	0.2	12
1917	-	-	-	-	-	-	-	-	0.4	30	0.4	168
1918	-	-	-	-	-	-	-1.8	26	-1.6	71	-2.1	160
1919	-	-	-	-	-	-	-1.6	11	0.2	75	-1.7	246
1920	-	-	-	-	-	-	-	-	0.4	98	1.2	1

A₁

Table 1b

July		August		September		October		November		December		
Δ	n	Δ	n	Δ	n	Δ	n	Δ	n	Δ	n	
0.0	11	-0.7	20	-0.2	10	0.2	5	-	-	-	-	1876
0.9	44	1.3	48	0.2	19	-	-	-	-	-	-	1877
0.4	56	0.6	54	-0.6	38	0.0	4	-	-	-	-	1878
0.6	62	0.7	79	-1.0	7	-	-	-	-	-	-	1879
0.8	77	0.5	77	-0.3	19	0.9	1	-	-	-	-	1880
-0.4	73	-0.7	97	-0.5	28	0.6	1	-	-	-	-	1881
0.4	70	-0.4	79	-0.5	31	-	-	-	-	-	-	1882
-1.0	38	-0.5	85	0.6	7	0.6	3	-	-	-	-	1883
-0.1	68	-0.7	60	-1.2	29	-0.5	28	-	-	-	-	1884
0.2	35	0.5	62	0.2	29	-	-	-	-	-	-	1885
0.1	39	0.6	84	0.2	23	0.5	21	-	-	-	-	1886
-0.1	84	-0.8	61	-0.6	18	1.8	2	-	-	-	-	1887
0.7	66	1.2	45	0.5	6	1.0	11	-	-	-	-	1888
-0.6	87	-0.7	57	0.1	26	-	-	-	-	-	-	1889
0.0	66	-0.6	56	0.1	14	-	-	-	-	-	-	1890
-0.1	62	0.3	93	-	-	-	-	-	-	-	-	1891
-0.5	75	0.1	67	-0.3	38	-	-	-	-	-	-	1892
-0.5	70	0.6	77	1.1	58	-	-	-	-	-	-	1893
-0.8	35	-1.6	57	-0.8	55	-0.6	4	-	-	-	-	1894
0.4	63	0.7	84	1.5	42	-	-	-	-	-	-	1895
-0.7	35	-1.2	114	-0.4	71	-2.4	1	-	-	-	-	1896
0.0	75	0.2	78	0.5	51	-0.1	12	-	-	-	-	1897
-0.5	17	-1.0	67	-1.3	51	-0.4	8	-	-	-	-	1898
0.6	12	0.4	89	-0.1	44	0.4	9	-	-	-	-	1899
1.3	38	0.9	73	1.9	2	-	-	-	-	-	-	1900
-0.2	46	-0.4	90	0.0	30	-	-	-	-	-	-	1901
-0.2	53	0.2	56	0.7	17	-	-	-	-	-	-	1902
0.3	37	0.1	71	1.0	33	-	-	-	-	-	-	1903
-0.5	29	0.5	70	0.8	17	-	-	-	-	-	-	1904
-0.2	57	0.1	55	0.1	16	-	-	-	-	-	-	1905
-0.9	18	0.1	79	0.3	53	0.7	4	-	-	-	-	1906
-0.6	36	-0.7	70	-0.6	34	-1.3	9	-	-	-	-	1907
-0.5	44	-0.6	82	0.1	57	-0.9	11	-	-	-	-	1908
0.6	18	0.5	72	0.7	28	-0.6	6	-	-	-	-	1909
0.2	71	1.5	85	0.7	36	-0.5	18	-	-	-	-	1910
1.1	39	1.4	54	0.6	25	0.9	9	-	-	-	-	1911
0.0	124	0.1	114	0.6	52	-	-	0.5	8	-	-	1912
-0.1	43	-0.5	80	-0.4	218	0.1	64	-0.2	5	-	-	1913
-1.1	155	-1.4	174	-0.7	117	-0.6	16	-	-	-	-	1914
0.4	65	-0.1	103	0.0	71	-0.2	19	-0.7	3	-	-	1915
0.8	32	0.6	114	0.7	166	1.3	32	-	-	-	-	1916
1.3	139	1.4	172	1.3	15	-0.5	21	-	-	-	-	1917
-2.4	131	-1.0	140	-0.3	139	-	-	-2.4	7	-	-	1918
0.3	44	-0.5	125	-0.5	37	-0.4	94	0.0	19	-	-	1919
-0.2	236	-1.4	204	-1.0	136	-1.2	25	-	-	-	-	1920

A₁

Table 1c

	January		February		March		April		May		June	
	Δ	n	Δ	n	Δ	n	Δ	n	Δ	n	Δ	n
1921	-	-	-	-	-	-	-0.8	18	0.1	161	0.0	75
1922	-	-	-	-	-	-	0.7	22	0.4	90	0.3	12
1923	-	-	-	-	-	-	0.9	99	1.2	82	1.9	86
1924	-	-	-	-	-	-	0.7	52	1.2	49	1.4	173
1925	-	-	-	-	-	-	-0.6	7	-0.3	130	-0.4	246
1926	-	-	-	-	-	-	0.6	45	1.8	90	1.4	215
1927	-	-	-	-	-	-	1.2	15	-0.2	2	1.3	158
1928	-	-	-	-	-1.8	2	1.0	29	1.9	101	2.0	138
1929	-	-	-	-	-	-	2.1	94	2.0	46	1.1	167
1930	-	-	-	-	-	-	1.1	69	1.2	48	0.9	92
1931	-	-	-	-	-	-	0.0	45	0.8	90	0.7	125
1932	-	-	-	-	-	-	1.0	46	1.0	29	1.0	104
1933	-	-	-	-	-0.6	4	-0.3	46	0.4	41	0.1	104
1934	-	-	-	-	-	-	0.0	54	0.7	59	0.6	121
1935	-	-	-	-	-	-	0.4	59	0.9	16	1.2	116
1936	-	-	-	-	-	-	1.1	66	1.0	48	0.6	88
1937	-	-	-	-	-2.2	2	-0.3	39	1.0	108	0.4	77
1938	-	-	-	-	-	-	-0.6	31	-0.2	114	-0.6	90
1939	-	-	-	-	-	-	0.1	86	0.1	106	0.2	33
1945	-	-	-	-	-	-	-	-	-	-	-	-
1946	-	-	-	-	-	-	0.2	7	1.1	48	0.7	37
1947	-	-	-	-	-	-	0.3	13	2.3	53	0.5	20
1948	-	-	-	-	-	-	0.1	35	0.3	53	1.2	120
1949	-	-	-	-	2.0	1	-0.8	33	-0.4	51	0.0	84
1950	-	-	-	-	-	-	0.5	3	0.8	42	0.8	46
1951	-	-	-	-	-1.6	2	0.2	13	0.6	73	0.7	111
1952	-	-	-	-	-	-	0.1	15	0.6	56	0.5	123
1953	-	-	-	-	-	-	2.2	10	1.6	49	1.0	68
1954	-	-	-	-	-	-	-0.3	18	0.8	106	0.9	173
1955	-	-	-	-	0.8	9	1.2	16	1.2	107	1.2	188
1956	-	-	-	-	-1.8	3	0.5	14	0.3	88	0.0	140
1957	-	-	-	-	-1.5	2	0.6	30	0.3	103	0.7	67
1958	-	-	-	-	-0.5	2	0.2	34	0.7	95	0.9	95
1959	-	-	-	-	-1.7	1	1.0	30	1.5	109	0.8	142
1960	-	-	-	-	-	-	1.5	42	1.2	110	1.2	94
1961	-	-	-	-	-	-	1.8	36	0.6	55	0.9	119
1962	-	-	-	-	-1.3	1	0.7	21	1.1	84	1.1	118
1963	-	-	-	-	-0.4	5	1.1	21	0.6	102	0.0	157
1964	-	-	-	-	-0.4	3	0.6	54	0.8	204	0.7	196
1965	-	-	-	-	2.3	1	0.4	35	1.6	113	0.8	149
1966	-	-	-	-	-0.3	7	1.0	33	1.0	88	0.7	98
1967	-	-	-	-	-2.0	2	0.2	33	0.7	75	0.0	116
1968	-	-	-	-	-	-	0.3	32	0.5	166	0.4	143
1969	-	-	-	-	-1.5	5	0.3	55	0.6	97	-0.2	145
1970	-	-	-	-	-	-	-0.8	26	0.0	98	-1.5	118
1971	-	-	-	-	-0.9	1	0.3	67	0.0	121	-0.1	166

A₁

Table 1d

July		August		September		October		November		December		
Δ	n	Δ	n	Δ	n	Δ	n	Δ	n	Δ	n	
0.7	108	-0.3	112	-0.5	162	0.1	36	-0.5	18	-	-	1921
0.0	185	0.0	277	-0.2	77	0.4	35	-	-	-	-	1922
1.0	139	1.1	248	1.5	138	1.1	23	0.4	6	-	-	1923
0.7	103	1.2	262	1.7	92	-0.1	15	-0.3	16	-	-	1924
-0.1	271	0.0	230	0.6	109	-0.6	10	-1.0	7	-	-	1925
0.9	97	1.3	305	1.6	138	1.5	70	0.7	7	-	-	1926
0.0	226	1.7	229	2.0	44	-	-	-1.8	12	-	-	1927
1.0	167	1.9	108	1.8	128	2.9	79	0.6	4	-	-	1928
2.0	127	1.8	229	2.0	57	1.4	43	0.0	6	-	-	1929
0.3	112	1.1	179	2.0	62	0.2	23	-0.4	24	-	-	1930
1.0	166	1.8	54	2.0	80	1.5	33	-0.3	7	-	-	1931
1.5	65	1.0	65	1.2	84	1.2	24	-0.4	10	-	-	1932
1.0	173	1.5	82	1.1	15	0.7	34	0.9	7	-	-	1933
1.2	104	1.5	67	1.7	47	0.5	41	0.7	9	-	-	1934
1.0	63	1.6	60	3.0	18	1.3	28	1.1	9	-	-	1935
1.1	82	1.4	27	1.4	57	0.6	63	0.6	7	-	-	1936
1.3	108	0.9	114	1.8	40	0.5	85	0.9	5	-	-	1937
-0.9	101	-0.9	26	-0.1	63	-0.8	17	-1.4	13	-	-	1938
0.1	42	0.3	61	0.9	58	1.2	24	-	-	-	-	1939
0.0	34	0.8	40	-0.6	72	0.4	64	-	-	-	-	1945
0.0	87	0.0	18	0.4	73	1.4	15	0.2	18	-	-	1946
1.6	9	0.9	46	0.5	10	0.6	40	-0.9	21	-	-	1947
1.5	27	1.4	123	2.0	78	1.0	41	0.0	11	-	-	1948
-0.4	113	0.0	41	0.3	37	-0.3	29	-0.8	24	-	-	1949
0.2	118	0.6	119	1.1	51	0.5	45	-0.1	18	-	-	1950
0.3	185	0.4	57	1.4	86	0.8	57	0.4	16	-	-	1951
-0.1	264	0.5	70	1.2	42	-0.3	46	-0.4	9	-	-	1952
-1.2	167	0.7	122	1.4	97	0.7	63	0.5	10	-	-	1953
0.3	244	1.3	210	1.0	129	0.7	92	-0.3	9	-	-	1954
-0.5	210	-0.3	97	0.3	78	0.7	55	0.2	12	-	-	1955
0.7	149	1.0	46	0.6	139	0.6	106	-0.2	6	-	-	1956
0.9	136	1.5	59	1.5	46	0.8	51	0.1	9	-	-	1957
1.0	138	1.0	109	0.8	78	0.7	61	0.8	5	-	-	1958
0.7	124	-0.1	58	1.0	54	0.8	59	-0.1	8	-	-	1959
1.6	74	1.2	55	1.4	40	1.8	60	1.1	5	-	-	1960
1.6	124	1.1	130	1.6	87	1.7	40	0.2	6	-	-	1961
1.1	131	0.6	88	0.9	71	1.4	91	0.3	11	-	-	1962
-0.2	162	1.0	142	0.4	144	0.4	91	0.3	32	-	-	1963
0.2	158	1.2	133	2.2	96	1.2	118	0.9	16	-	-	1964
0.8	118	0.8	109	0.8	107	0.5	58	0.3	20	-	-	1965
0.3	95	1.1	120	1.6	79	1.8	108	1.2	14	-	-	1966
0.6	125	0.7	139	0.9	97	0.5	102	-0.7	11	-	-	1967
0.3	118	-0.7	97	0.1	65	0.4	85	-0.5	17	-	-	1968
-0.8	133	-1.0	123	-0.4	143	-0.7	61	-1.6	10	-	-	1969
-2.2	151	-1.9	104	-0.5	69	0.0	68	-0.8	20	-	-	1970
0.3	145	-0.2	170	0.1	111	0.0	95	-0.3	30	-	-	1971

Table 2a Monthly Anomalies ($\Delta^{\circ}\text{C}$) and Numbers (n) of Observations of Sea Surface Temperature in Area B.

	January		February		March		April		May		June	
	Δ	n	Δ	n	Δ	n	Δ	n	Δ	n	Δ	n
1876	-	-	-	-	-	-	0.3	21	-0.4	33	0.3	72
1877	-	-	-	-	0.5	3	0.7	79	1.5	41	0.4	48
1878	-	-	-	-	-	-	0.6	79	0.8	82	0.8	61
1879	-	-	-	-	-	-	1.1	69	0.5	51	0.9	91
1880	-	-	-	-	-	-	0.6	68	0.4	68	0.6	81
1881	-	-	-	-	-	-	2.1	41	0.7	71	0.3	55
1882	-	-	-	-	-	-	-0.2	75	0.6	54	0.2	78
1883	-	-	-	-	-	-	0.1	40	0.1	66	-0.1	39
1884	-	-	-	-	-	-	-0.2	47	-0.7	59	-0.7	50
1885	-	-	-	-	-	-	0.4	55	0.3	54	-0.3	34
1886	-	-	-	-	-	-	0.0	61	0.0	25	0.5	72
1887	-	-	-	-	-	-	0.4	51	0.0	33	-0.3	72
1888	-	-	-	-	-	-	0.5	9	0.8	56	0.8	91
1889	-	-	-	-	-	-	0.3	19	0.1	17	-0.4	56
1890	-	-	-	-	-	-	0.0	34	-0.4	64	0.0	45
1891	-	-	-	-	-	-	-0.1	32	0.2	39	0.4	88
1892	-	-	-	-	-	-	0.7	44	0.9	35	0.8	62
1893	-	-	-	-	-	-	0.1	36	-0.1	56	0.7	69
1894	-	-	-	-	-	-	-0.9	89	-0.6	52	-1.1	48
1895	-	-	-	-	-	-	0.4	45	0.9	29	0.7	56
1896	-	-	-	-	-	-	-0.2	48	-0.6	47	-0.2	79
1897	-	-	-	-	0.2	8	-0.4	18	-0.2	49	-0.3	43
1898	-	-	-	-	-	-	-0.4	44	-0.7	48	-0.2	86
1899	-	-	-	-	0.3	8	0.7	61	0.6	74	0.1	45
1900	-	-	-	-	-	-	-0.1	17	0.5	54	0.3	93
1901	-	-	-	-	0.7	3	0.1	56	0.2	75	-0.3	80
1902	-	-	-	-	-	-	0.2	65	0.1	49	0.9	91
1903	-	-	-	-	-	-	-0.3	65	-0.6	43	-0.1	95
1904	-	-	-	-	-	-	-0.8	61	-1.3	29	-0.8	79
1905	-	-	-	-	-1.0	2	0.4	13	-0.4	36	-0.2	67
1906	-	-	-	-	-0.7	4	-1.1	64	-0.4	94	-0.4	58
1907	-	-	-	-	-	-	-0.7	80	-0.7	55	-1.3	82
1908	-	-	-	-	-	-	-0.4	71	-0.7	51	-1.0	86
1909	-	-	-	-	0.0	3	-0.6	93	0.2	46	0.9	77
1910	-	-	-	-	-	-	-0.8	80	-0.6	107	-0.3	35
1911	-	-	-	-	0.0	12	-0.5	78	-0.6	66	-0.8	28
1912	-	-	-	-	-0.2	18	0.1	94	0.1	98	0.7	77
1913	-	-	-	-	-	-	-0.5	111	-0.7	189	-0.3	114
1914	-	-	-	-	-0.8	6	0.0	135	-1.1	111	-2.0	77
1915	-	-	-	-	-	-	-0.7	77	0.3	38	-0.3	103
1916	-	-	-	-	-0.1	4	0.3	139	0.6	114	1.3	7
1917	-	-	-	-	-	-	2.0	1	0.5	74	0.8	91
1918	-	-	-	-	-2.5	1	-2.4	51	-0.8	62	-1.4	65
1919	-	-	-	-	-	-	-0.2	54	0.1	69	-1.3	89
1920	-	-	-	-	-	-	-0.3	27	-0.5	47	0.4	36

Table 2b

July		August		September		October		November		December		
Δ	n	Δ	n	Δ	n	Δ	n	Δ	n	Δ	n	
-1.0	13	-0.7	40	0.2	50	1.0	15	-	-	-	-	1876
1.0	51	0.7	20	1.4	56	0.8	29	-	-	-	-	1877
1.2	17	0.6	78	0.7	43	0.6	28	-	-	-	-	1878
0.7	39	0.2	81	-0.2	34	-0.2	2	-	-	-	-	1879
1.6	46	1.6	74	0.8	33	0.6	14	-	-	-	-	1880
0.1	52	-0.3	60	0.0	59	-0.5	36	-	-	-	-	1881
0.4	34	-0.1	53	0.1	73	-1.7	23	-	-	-	-	1882
-0.5	26	0.2	78	0.3	48	-0.3	18	-	-	-	-	1883
-0.8	43	-1.4	65	-1.8	47	-1.1	36	-	-	-	-	1884
-0.3	43	0.6	32	0.0	49	-0.2	36	-	-	-	-	1885
-0.1	45	0.6	50	0.1	71	0.0	39	-	-	-	-	1886
-0.4	33	-0.5	83	-0.3	30	0.9	49	-	-	-	-	1887
0.9	49	0.7	52	0.4	23	1.1	27	-	-	-	-	1888
-0.2	53	-0.2	51	-0.5	35	-0.1	8	-	-	-	-	1889
0.2	42	-0.2	79	-0.4	38	-0.8	9	-	-	-	-	1890
1.4	16	0.2	67	0.0	35	-0.8	12	-	-	-	-	1891
-0.1	32	0.6	44	-0.2	53	0.8	41	-	-	-	-	1892
0.1	45	0.8	39	1.3	101	0.7	8	-	-	-	-	1893
-1.4	52	-1.3	44	-0.2	42	0.0	37	-	-	-	-	1894
1.3	39	0.4	73	1.2	56	0.5	16	-	-	-	-	1895
-0.9	24	-0.6	38	0.2	52	-0.5	25	-	-	-	-	1896
-0.6	68	0.1	46	0.3	48	0.0	25	-	-	-	-	1897
0.3	17	-0.3	71	-1.0	60	-0.8	34	-	-	-	-	1898
-0.4	58	0.0	85	0.1	44	-0.2	50	-	-	-	-	1899
0.8	43	0.3	82	0.8	36	-0.2	23	-0.2	17	-	-	1900
-0.7	54	-0.4	94	-0.3	56	-0.6	33	-	-	-	-	1901
-0.3	51	1.2	76	1.1	42	0.9	38	0.2	1	-	-	1902
0.3	64	-0.2	69	0.6	70	0.6	18	0.8	4	-	-	1903
0.2	24	0.1	57	-0.2	65	-0.4	15	-	-	-	-	1904
-0.2	21	-1.0	77	-0.2	35	0.0	11	-	-	-	-	1905
-0.7	86	-0.7	60	-0.5	76	0.2	29	-	-	-	-	1906
-0.1	70	-0.4	42	-1.7	68	-0.3	58	-	-	-	-	1907
0.1	59	-0.7	64	-0.5	87	-0.7	38	-	-	-	-	1908
0.3	51	0.3	52	0.2	48	0.1	43	-	-	-	-	1909
-0.4	101	0.0	76	0.9	47	0.6	96	-0.1	14	-	-	1910
0.2	92	0.5	78	-0.4	46	0.4	57	-	-	-	-	1911
-0.4	101	0.1	222	0.3	70	-0.1	73	0.9	28	-	-	1912
-0.6	54	-0.5	149	-0.4	89	-1.0	98	0.2	24	-	-	1913
-1.5	101	-1.0	137	-0.8	126	-1.1	82	-	-	-	-	1914
0.0	97	0.5	52	0.1	125	0.0	84	-0.5	36	-	-	1915
0.4	13	0.6	116	0.2	98	0.6	93	-0.4	44	-	-	1916
1.3	32	1.0	78	0.5	97	-1.3	60	-0.4	29	-	-	1917
-1.5	111	-1.0	61	-0.7	125	-1.1	71	-1.9	95	-	-	1918
-1.7	43	-0.8	168	-1.2	48	-0.8	87	0.7	55	-	-	1919
-0.5	112	-0.7	93	-1.2	153	-0.2	47	-1.7	34	-	-	1920

Table 2c

	January		February		March		April		May		June	
	Δ	n	Δ	n	Δ	n	Δ	n	Δ	n	Δ	n
1921	-	-	-	-	-	-	-0.8	53	-0.2	76	-0.9	112
1922	-	-	-	-	-	-	0.5	40	-0.2	133	-0.1	33
1923	-	-	-	-	-0.5	13	-0.1	109	0.6	47	0.7	58
1924	-	-	-	-	-	-	0.1	62	0.3	59	0.8	91
1925	-	-	-	-	-	-	-0.4	110	-0.3	150	-0.2	125
1926	-	-	-	-	-0.4	2	0.6	166	0.9	158	0.9	103
1927	-	-	-	-	0.4	15	1.0	30	-0.5	12	1.3	77
1928	-	-	-	-	-0.4	35	0.4	161	1.7	100	1.7	89
1929	-	-	-	-	-	-	1.7	119	2.0	44	1.8	88
1930	-	-	-	-	-	-	0.7	100	0.8	90	0.6	103
1931	-	-	-	-	-1.3	15	-0.3	192	0.7	54	1.6	45
1932	-	-	-	-	0.8	16	1.1	82	1.8	35	1.5	78
1933	-	-	-	-	-0.1	13	0.0	82	0.6	62	0.5	81
1934	-	-	-	-	-0.8	11	0.9	103	0.7	41	0.7	86
1935	-	-	-	-	0.3	19	1.0	76	1.3	31	0.9	36
1936	-	-	-	-	0.4	9	1.0	102	0.5	74	0.9	62
1937	-	-	-	-	0.5	12	0.0	78	0.3	93	0.4	92
1938	-	-	-	-	-	-	-0.9	91	-0.3	94	0.2	52
1939	-	-	-	-	-1.4	8	0.7	99	0.5	59	-0.2	30
1945	-	-	-	-	-	-	-	-	-	-	-	-
1946	-	-	-	-	-	-	0.7	59	0.5	78	0.4	40
1947	-	-	-	-	1.3	8	1.1	93	1.2	58	1.5	38
1948	-	-	-	-	-1.6	5	-0.5	87	0.5	78	1.0	60
1949	-	-	-	-	-1.4	77	-0.9	97	-0.5	170	0.1	70
1950	-	-	-	-	-0.2	36	0.8	46	0.7	124	0.5	78
1951	-	-	-	-	-1.6	48	0.0	74	0.6	186	0.8	113
1952	-	-	-	-	0.2	42	-0.5	100	0.3	97	0.3	65
1953	-	-	-	-	-1.3	36	0.9	101	1.6	93	0.8	103
1954	-	-	-	-	-1.1	24	-0.5	54	0.5	140	0.7	107
1955	-	-	-	-	0.4	30	0.6	103	0.5	134	0.9	157
1956	-	-	-	-	-1.3	16	1.9	30	0.7	105	-0.2	102
1957	-	-	-	-	0.5	9	0.6	89	0.7	57	0.6	52
1958	-	-	-	-	-0.7	35	0.0	104	0.7	96	0.9	113
1959	-	-	-	-	-0.5	22	0.4	91	0.7	67	0.5	86
1960	-	-	-	-	0.5	27	0.4	60	0.8	88	0.9	54
1961	-	-	-	-	0.1	21	1.2	88	1.6	23	1.2	102
1962	-	-	-	-	0.6	69	0.9	81	1.1	152	0.8	116
1963	-	-	-	-	0.6	54	1.2	68	0.7	197	0.6	129
1964	-	-	-	-	0.0	32	0.2	93	1.3	192	0.7	136
1965	-	-	-	-	0.7	58	0.6	74	1.3	125	1.4	120
1966	-	-	-	-	1.0	28	1.7	77	1.0	125	0.6	98
1967	-	-	-	-	-0.8	30	0.3	81	0.5	131	0.7	100
1968	-	-	-	-	-0.6	40	0.3	93	0.5	159	0.6	128
1969	-	-	-	-	0.2	43	0.2	80	0.4	184	0.1	125
1970	-	-	-	-	-0.1	25	0.1	48	-0.2	131	-1.5	104
1971	-	-	-	-	0.1	38	0.1	95	-0.3	94	0.3	107

Table 2d

July		August		September		October		November		December		
Δ	n	Δ	n	Δ	n	Δ	n	Δ	n	Δ	n	
-0.6	102	-0.8	164	-1.0	89	-1.3	62	0.1	43	-	-	1921
-1.1	189	0.4	84	-0.6	158	0.4	51	-0.5	32	-	-	1922
1.2	77	0.3	97	0.4	77	0.3	78	0.4	26	-	-	1923
1.2	100	0.5	108	-0.1	93	-0.1	57	0.1	53	-	-	1924
-0.1	138	-0.4	140	0.0	80	0.1	55	0.7	78	0.2	5	1925
0.8	95	0.5	117	0.9	105	0.0	91	1.3	63	-	-	1926
0.7	59	1.7	33	0.4	60	-0.6	38	0.6	19	-	-	1927
2.1	78	1.7	127	1.3	101	1.0	153	0.8	30	1.0	13	1928
0.6	81	2.5	82	0.7	83	0.8	88	0.2	48	-	-	1929
0.4	94	-0.9	145	0.9	104	0.8	117	0.5	17	-	-	1930
0.8	102	1.0	55	0.8	95	0.2	56	-0.6	15	-	-	1931
0.9	72	0.9	26	0.7	115	0.2	49	0.1	26	-	-	1932
0.9	70	0.4	48	0.5	74	0.3	59	0.3	49	-	-	1933
1.1	33	0.4	61	0.8	83	-0.2	46	1.5	43	-	-	1934
0.2	47	0.8	50	1.6	23	0.6	51	-0.3	16	-	-	1935
1.1	53	0.7	21	0.9	56	1.2	62	0.3	18	-	-	1936
0.4	79	0.0	49	0.0	39	0.3	78	0.9	68	-	-	1937
0.1	55	-0.7	49	-1.0	41	-2.5	13	-0.9	73	1.0	9	1938
0.7	36	0.8	52	0.9	90	1.1	40	0.5	15	-0.7	1	1939
-0.5	59	-1.3	35	0.1	21	-0.5	44	1.3	1	-0.5	1	1945
-0.7	86	-0.5	30	-0.6	120	0.4	43	0.0	36	-0.4	6	1946
0.7	15	0.8	25	-0.1	30	0.1	57	0.1	46	0.3	7	1947
0.2	29	0.5	66	0.6	65	0.0	46	-0.6	28	-1.6	10	1948
0.6	56	-0.6	69	-1.2	73	-1.2	50	-0.4	87	0.5	5	1949
0.6	75	0.0	29	-0.4	46	-0.7	53	-0.4	97	3.5	2	1950
1.1	87	0.4	90	0.5	68	0.5	99	-0.1	50	0.4	9	1951
-0.1	99	0.3	50	0.0	44	-0.1	79	0.6	33	1.8	1	1952
0.2	144	0.1	131	0.0	49	0.2	98	-0.9	55	0.5	5	1953
0.6	122	1.2	122	1.1	100	-0.2	87	-0.7	48	0.6	3	1954
-0.4	160	-1.2	132	-0.9	104	-0.4	97	-0.2	85	0.3	4	1955
0.1	107	0.0	80	0.3	89	0.3	81	-0.5	82	-0.3	11	1956
0.9	83	1.0	72	0.6	40	-0.4	87	0.1	54	2.0	7	1957
0.9	105	1.4	141	1.1	80	0.0	84	0.2	53	-2.0	5	1958
1.2	102	0.1	79	-0.2	92	0.1	65	-0.1	58	0.0	15	1959
1.0	54	0.6	59	0.2	50	1.1	28	0.7	26	-0.3	4	1960
0.8	102	1.0	119	1.2	72	0.6	32	-0.2	29	1.2	9	1961
1.0	108	0.6	89	-0.3	136	0.4	90	0.1	40	0.9	13	1962
0.4	118	0.1	149	-1.0	100	-0.7	91	-0.6	88	0.6	27	1963
-0.1	100	0.5	96	0.7	105	0.3	123	0.2	84	0.7	24	1964
1.3	111	1.6	113	0.9	90	0.3	97	0.9	78	2.0	21	1965
0.5	85	1.5	165	1.0	117	0.6	113	-0.3	81	0.4	18	1966
0.7	106	0.3	139	-0.2	105	-0.7	106	-0.4	82	0.6	44	1967
0.4	124	0.1	108	-0.5	94	-0.7	109	-0.3	88	0.9	37	1968
-0.3	120	-0.3	117	-0.5	125	-0.3	76	-1.0	40	-0.2	20	1969
-1.4	108	-1.4	90	-0.9	110	-0.9	95	-1.0	87	-1.5	15	1970
-0.2	104	-0.6	100	-0.7	88	-0.1	89	-0.7	117	0.5	47	1971

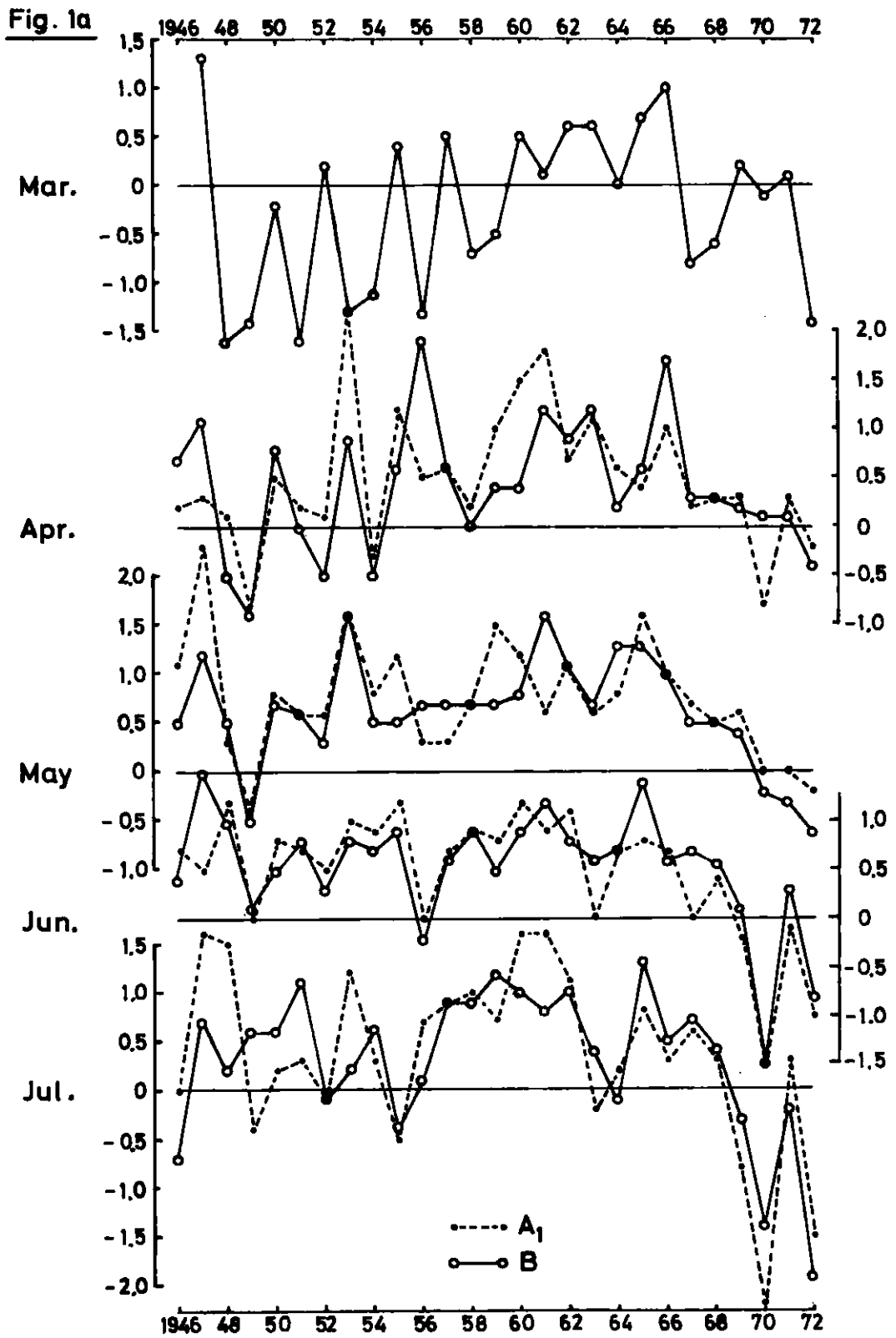


Fig. 1b

