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Sea-Surface Temperatures in the Northwestern Atlantic in 1981

by

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Sea surface temperature (SST) data, principally collected from cooling water intakes of merchant ships, are reported in radio weather messages and log books transmitted to the U.S. Fleet Numerical Oceanography Center (FNOC) and the National Climatic Center for processing and archiving. The "real-time" reports of the data base provided by the radio messages are analyzed by FNOC and the Pacific Environmental Group of the National Marine Fisheries Service, which is co-located with FNOC. An elementary step in the analysis is the computation of average monthly temperatures and anomalies (from 1948-67 means) for each $1^{\circ} \times 1^{\circ}$ square for which enough data have been reported each month. The average SST's, anomalies and number of observations are then printed in the $1^{\circ} \times 1^{\circ}$ squares they characterize to produce a map such as the one shown in figure 1. To facilitate interpretation of the data, anomalies greater than $+1^{\circ}\text{C}$ or less than -1°C are shaded.

Monthly maps of SST anomalies in the northwestern Atlantic for 1981 show a continuation through May of the cold conditions which began in November 1980 (Ingham and McLain (MS 1981). The negative anomalies were most intense and persistent in the Middle Atlantic Bight, ranging to -4.0°C off the southern New Jersey coast in January. In June the negative anomalies were replaced by a positive pattern which persisted through October, when the pattern became negative again and remained so through December.

In the Gulf of Maine-Scotian Shelf area, however, the negative anomaly pattern began to break down in February and was replaced by a positive

anomaly pattern in April, which weakened in July but persisted in variable strength until October-December. During the last quarter of the year the anomaly pattern in this area was neither strongly positive nor strongly negative.

Pooled average SST anomalies for the entire area north of 35°N and west of 60°W (Table 1) were negative in all months except April-July, when they were weakly positive. The anomalies, either positive or negative, were considerably less than the standard deviations of the 1948-67 reference period in all months.

By determining the algebraic sum of the 12 monthly area mean anomalies we can obtain a rough index of how anomalous the sea surface temperature was for this area of northwest Atlantic for the year 1981. The resulting value, -3.53, is considerably "colder" than those for 1978, 1979, and 1980, which were -2.92, +0.70 and -1.85, respectively. Most of the negative anomalies responsible for this effect occurred south of 42°, however, so the Gulf of Maine and Scotian Shelf did not experience the "colder" year experienced on Georges Bank and in the Middle Atlantic Bight.

In order to characterize the spatial (SW to NE) and temporal gradients of SST anomalies during the course of 1981, monthly anomalies from 15 one-degree squares (Fig. 13) were plotted on a space-time grid (Fig. 14). The plot shows that the positive anomalies of April through July developed first at the northeastern end of the range, off southern Nova Scotia, and one or two months later in the Middle Atlantic Bight. The negative anomaly pattern of August-December developed first in the Georges Bank area and spread to the Middle Atlantic Bight two months later. Comparison with the plot for 1980 (Fig. 15) shows that the most apparent difference between the two years was this early development of a negative anomaly pattern, beginning in August around Georges Bank.

REFERENCE

- INGHAM, M. C., and D. R. MCLAIN. MS 1981. Sea-surface temperatures in the northwestern Atlantic in 1980. NAFO SCR Doc. 81/VI/94.

Table 1. Monthly mean sea-surface temperature anomalies ($^{\circ}\text{C}$) from the 1948-1967 monthly means for 1981 in the northwestern Atlantic Ocean (35° - 46°N , 60° - 76°W).

Month	Number of 1° Squares	Area Mean Anomaly ($^{\circ}\text{C}$)	Standard Deviation 1948-67
Jan	107	-0.69	1.26
Feb	113	-0.40	1.23
Mar	125	-0.16	1.49
Apr	124	+0.05	1.51
May	117	+0.02	1.22
Jun	122	+0.23	0.91
Jul	127	+0.05	0.89
Aug	132	-0.49	0.85
Sep	134	-0.19	0.89
Oct	125	-0.77	0.95
Nov	110	-0.51	0.90
Dec	115	-0.67	0.91

$\Sigma = -3.53$

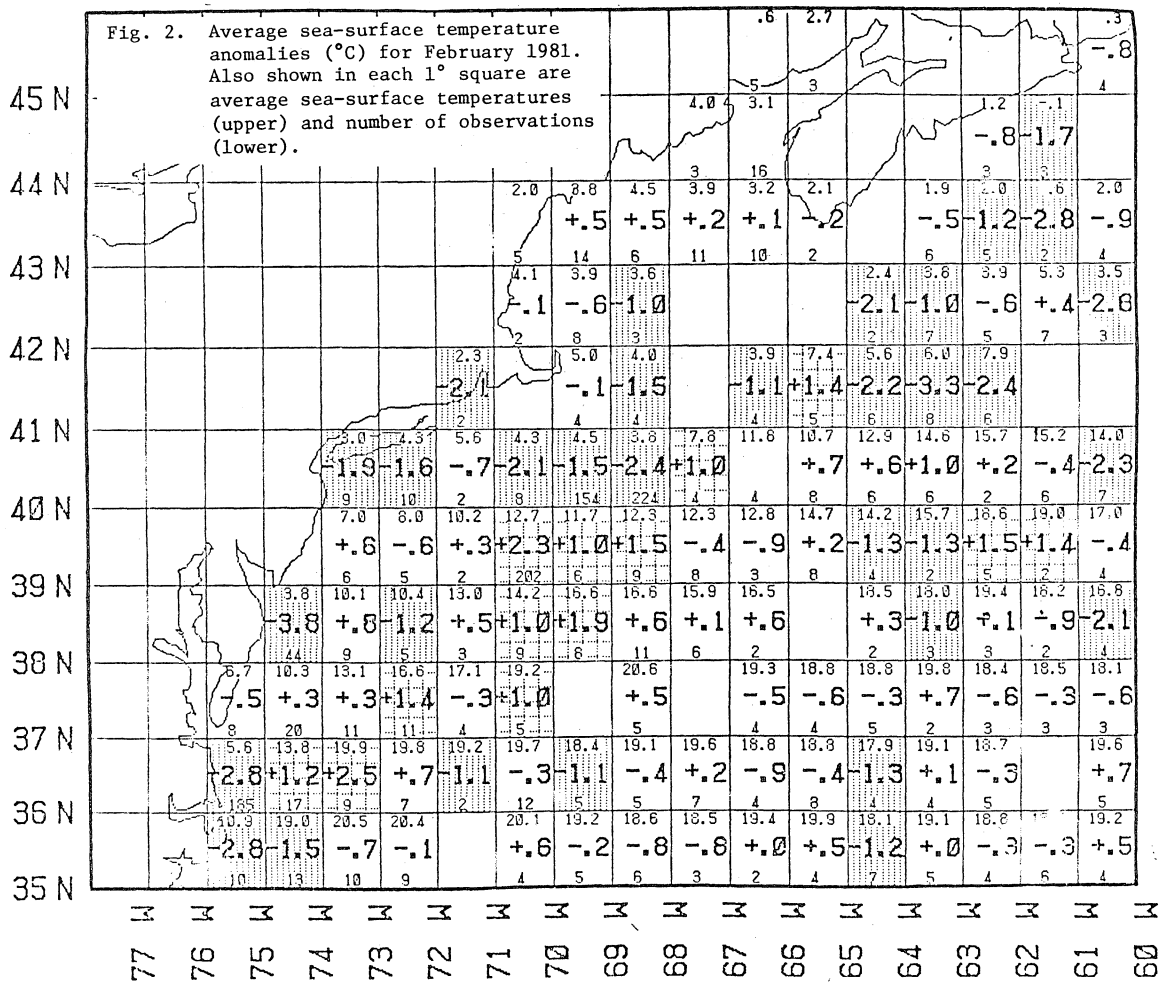
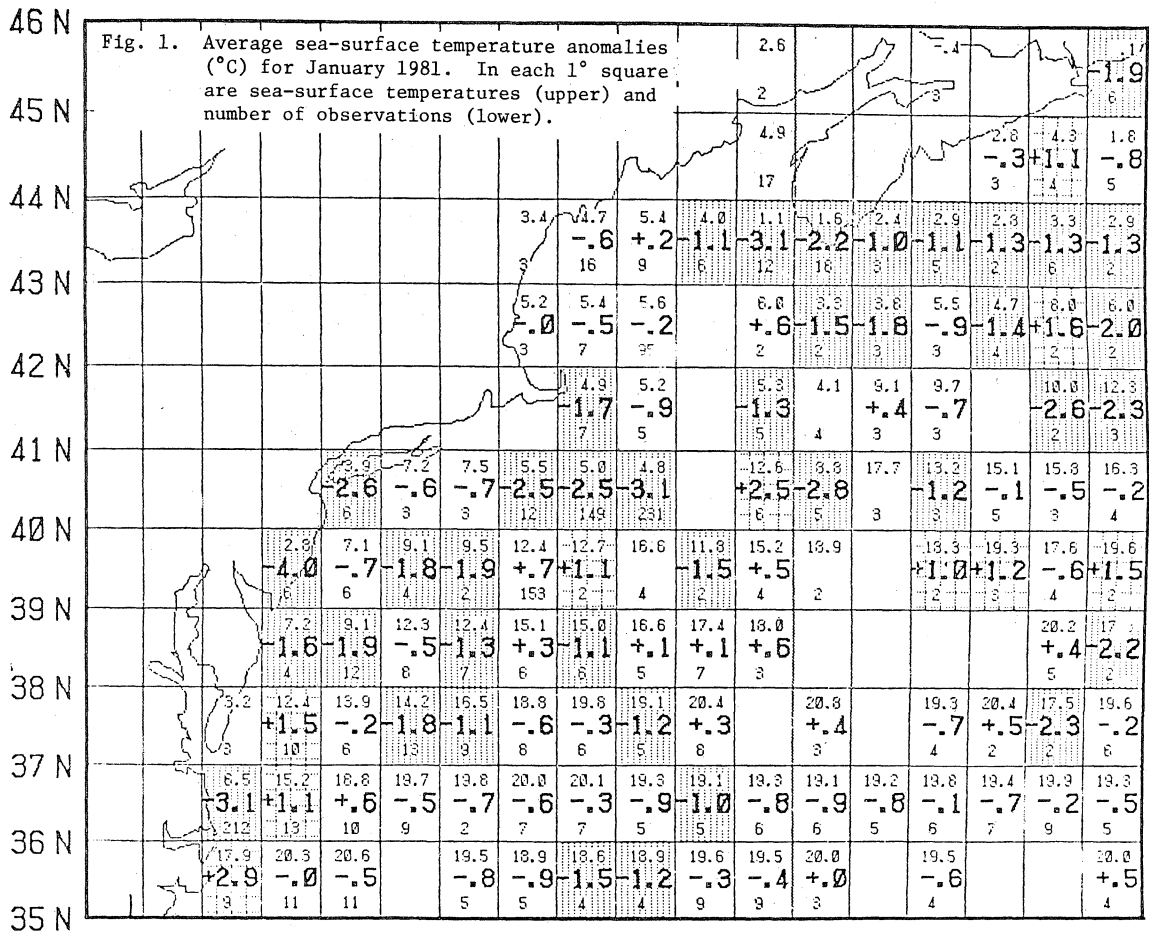


Fig. 5. Average sea-surface temperature anomalies ($^{\circ}\text{C}$) for May 1981. In each 1° square are average sea-surface temperatures (upper) and number of observations (lower).

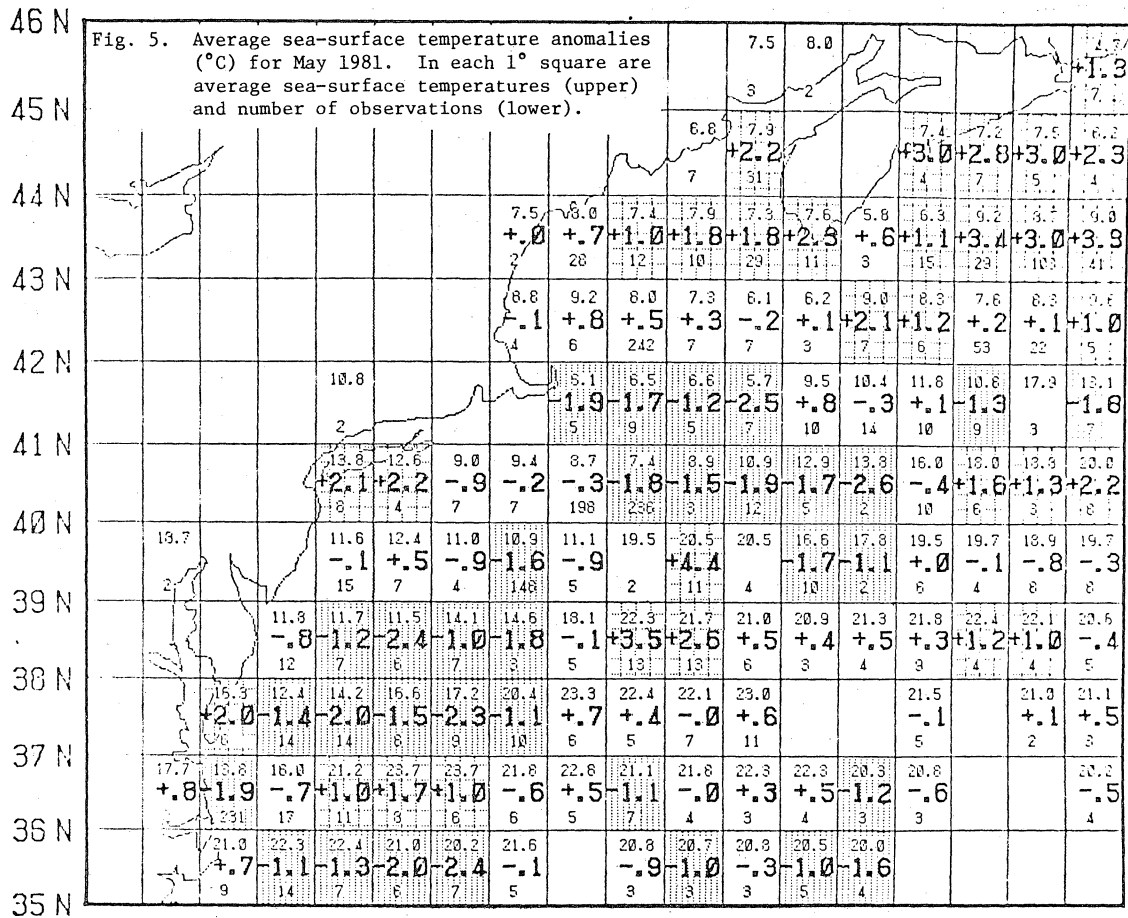
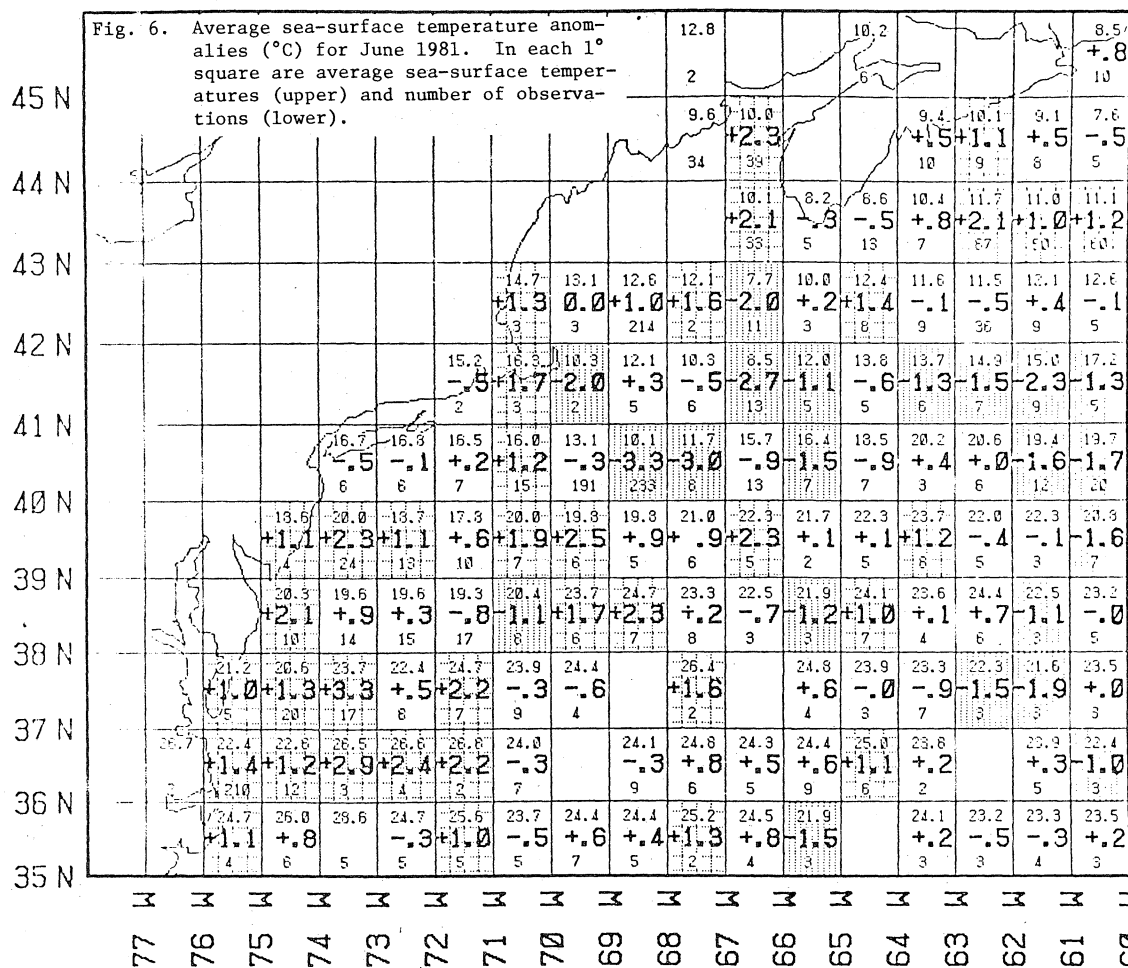


Fig. 6. Average sea-surface temperature anomalies ($^{\circ}\text{C}$) for June 1981. In each 1° square are average sea-surface temperatures (upper) and number of observations (lower).



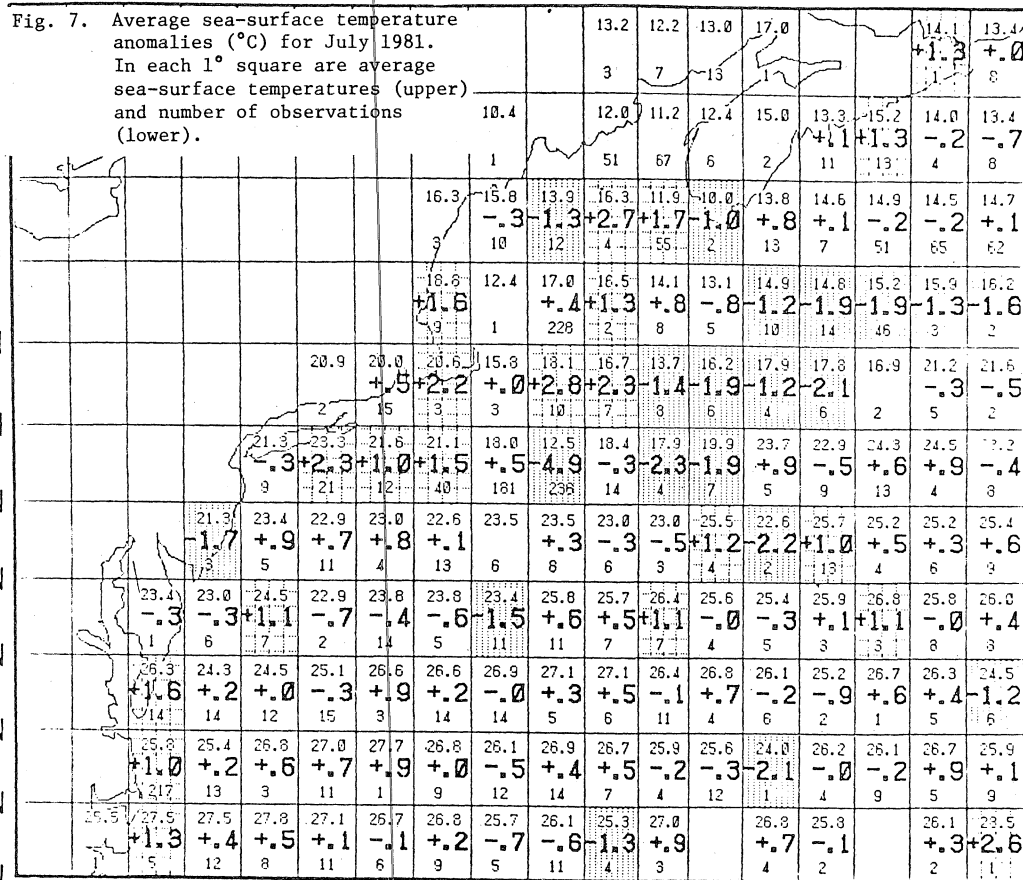
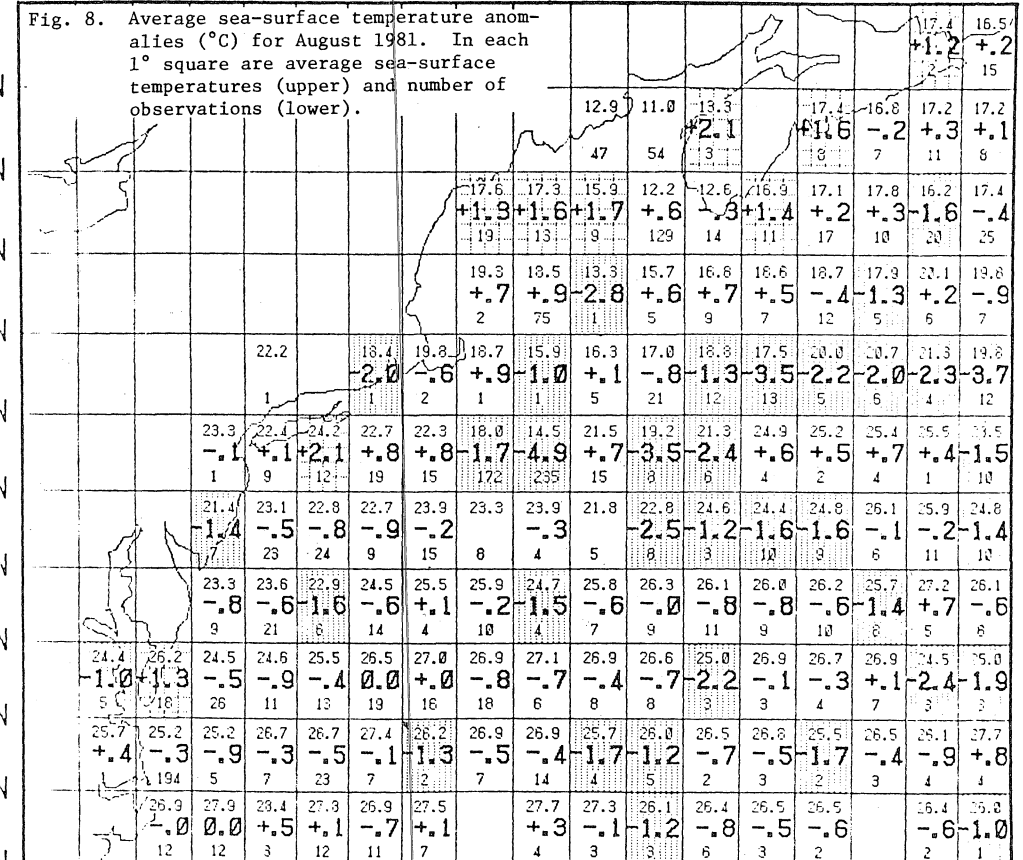
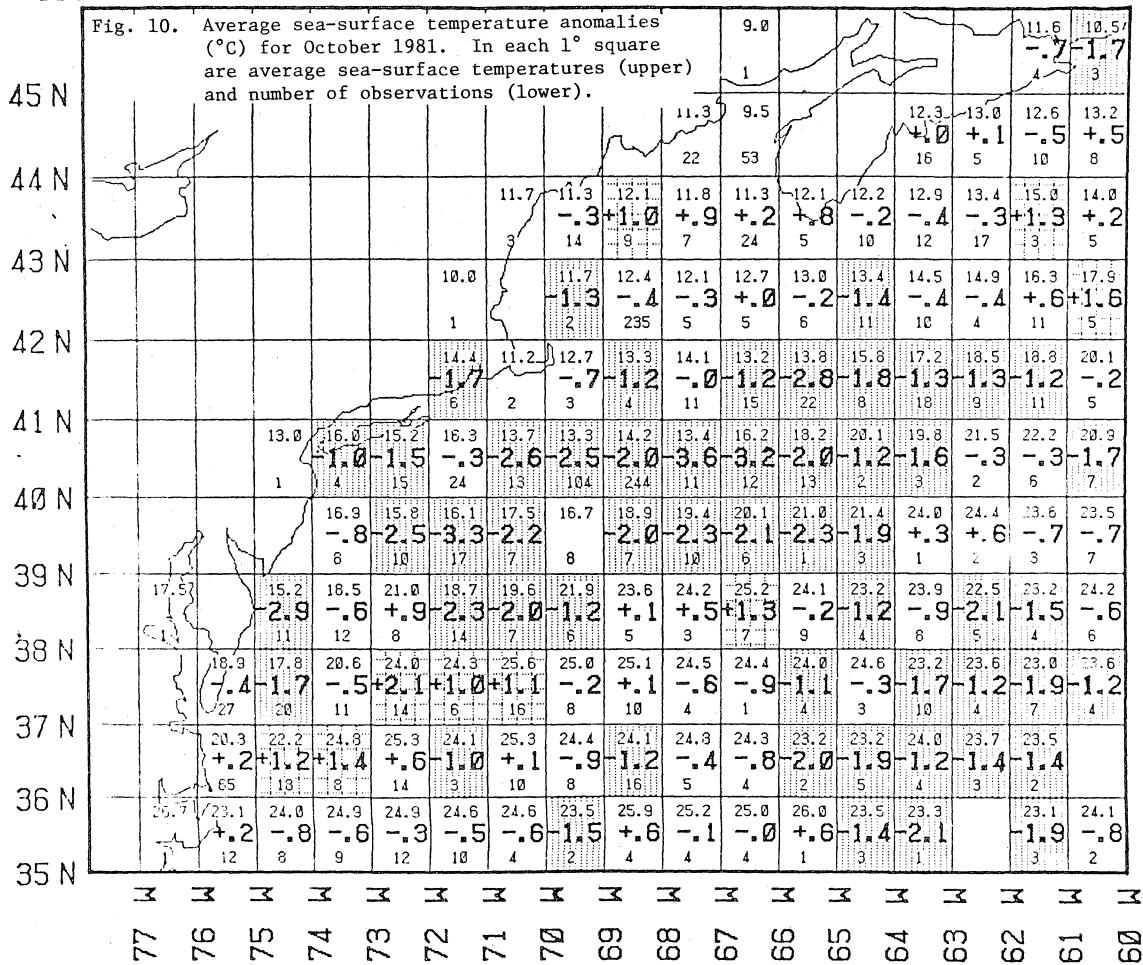
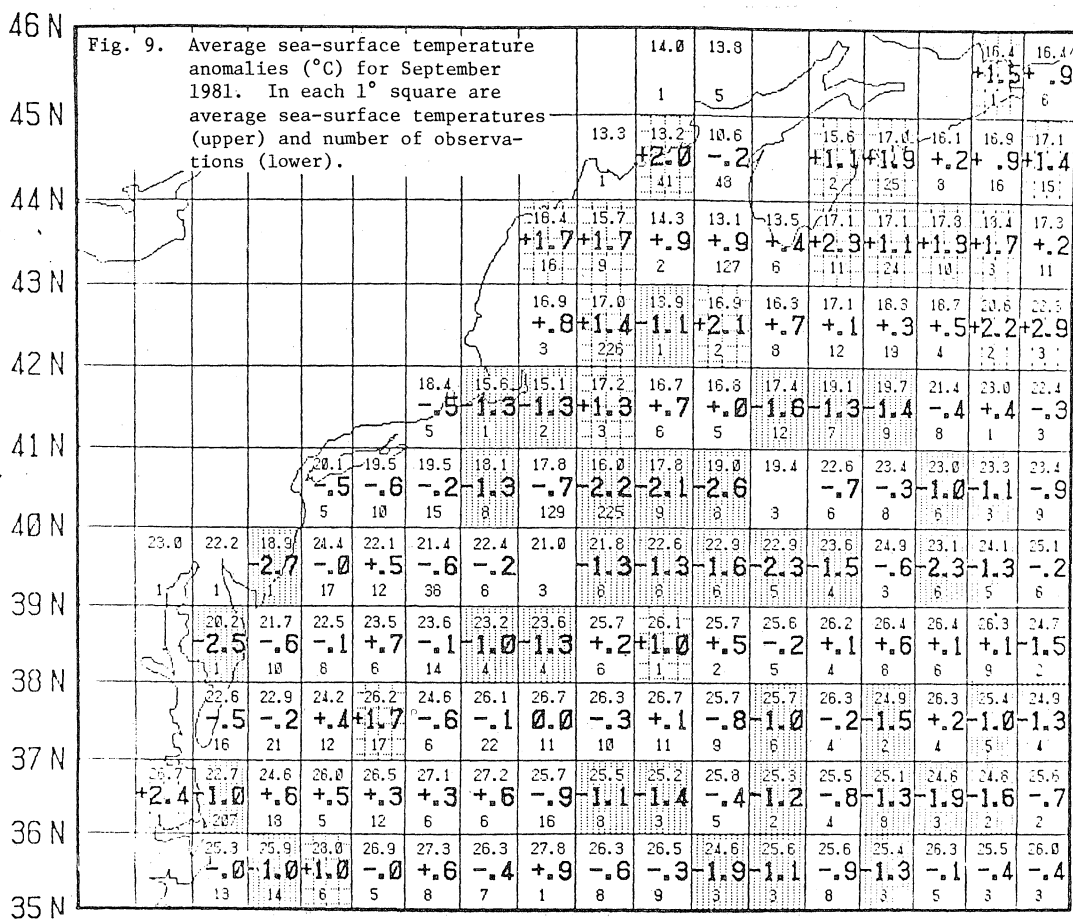
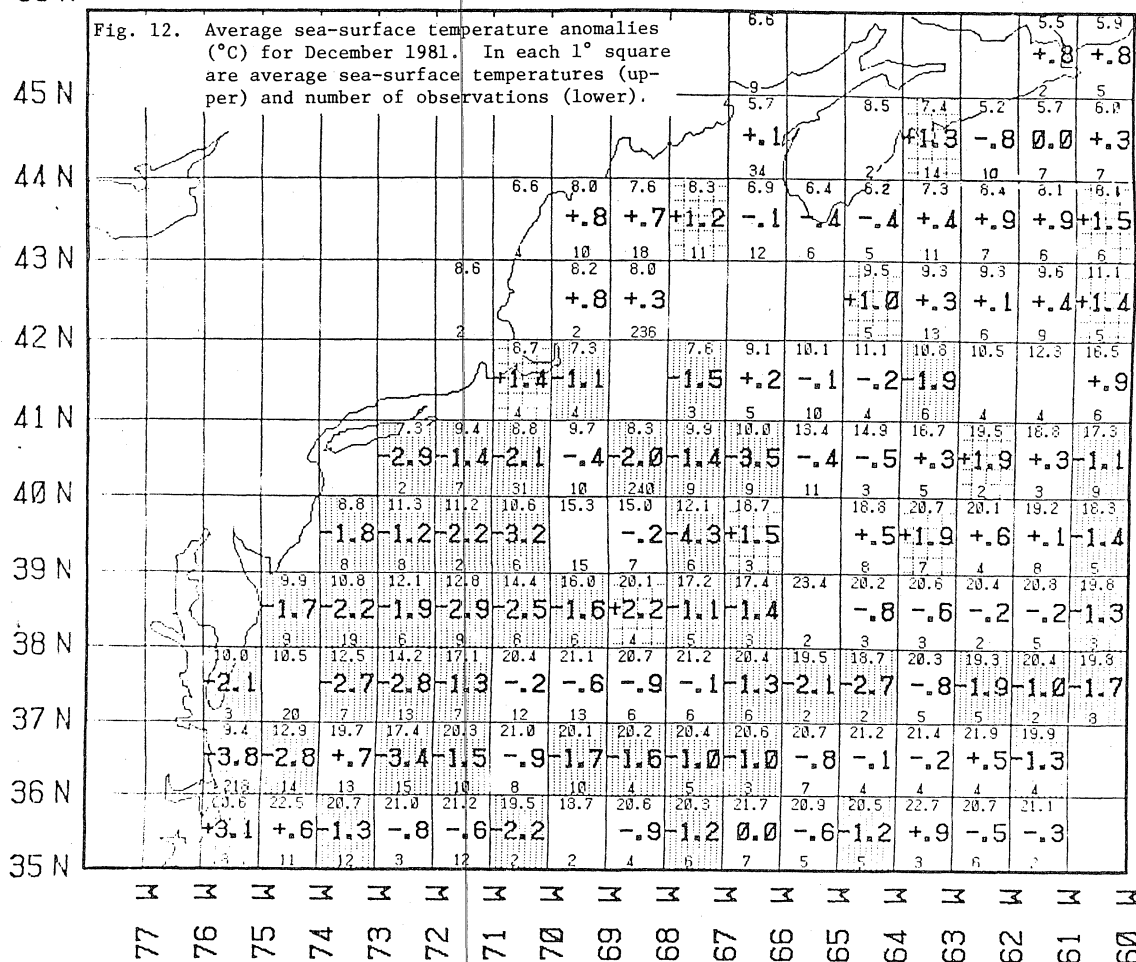


Fig. 8. Average sea-surface temperature anomalies ($^{\circ}\text{C}$) for August 1981. In each 1° square are average sea-surface temperatures (upper) and number of observations (lower).



77 W 76 W 75 W 74 W 73 W 72 W 71 W 70 W 69 W 68 W 67 W 66 W 65 W 64 W 63 W 62 W 61 W 60 W





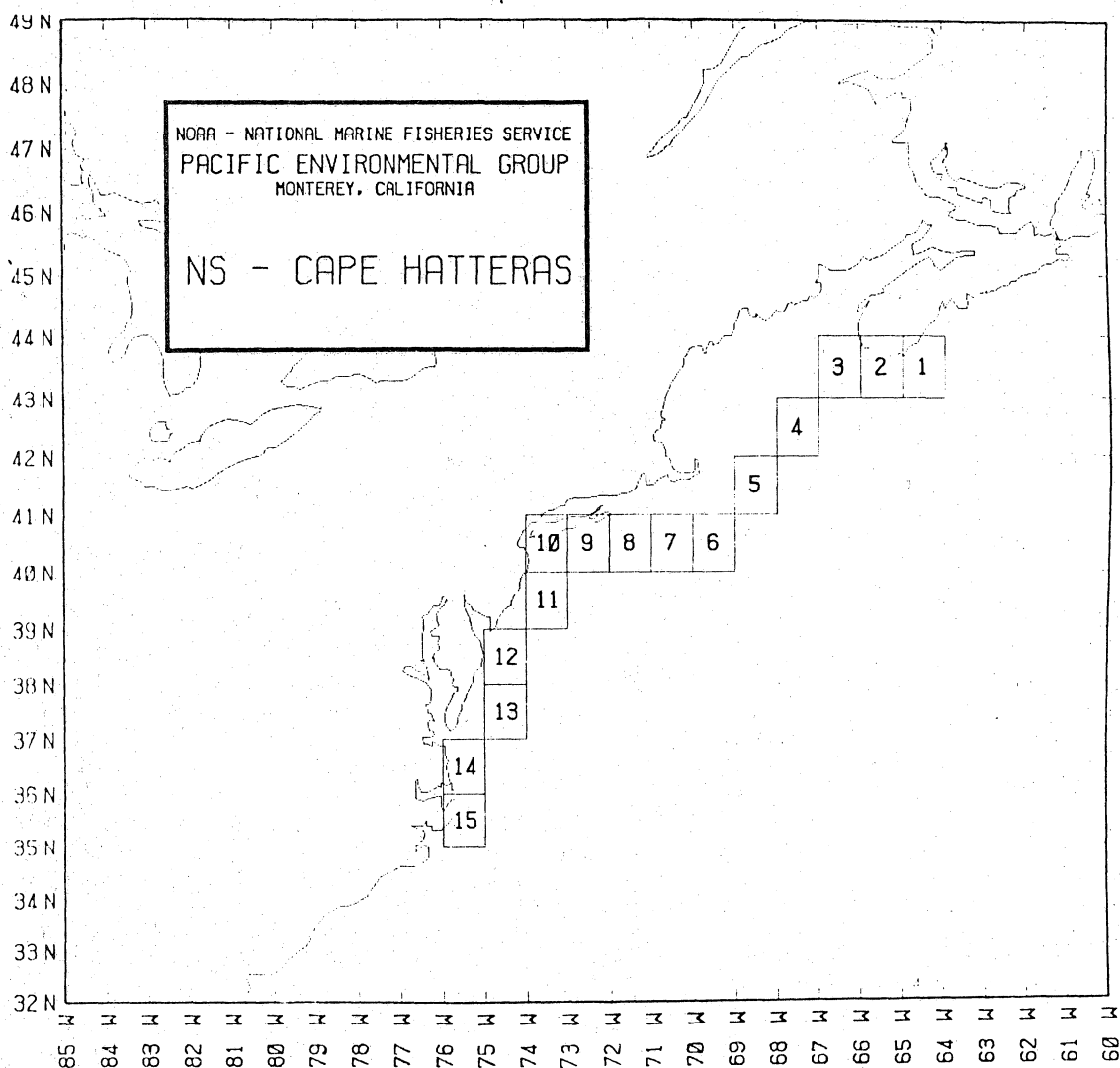


Figure 13. Location of one-degree squares of interest utilized in figures 14 and 15.

1981

	D	J	F	M	A	M	J	J	A	S	O	N	D
1 43 N 64 W	-0.7 7	-1.0 3	-1.1 1	0.2 7	1.5 10	0.6 3	-0.5 13	0.8 13	1.4 11	2.3 11	-0.2 10	-0.4 5	-0.4 5
2 43 N 65 W	-0.7 5	-2.2 18	-0.2 2	0.9 12	2.3 11	-0.3 5	-1.0 2	-0.3 14	0.4 6	0.8 5	-0.6 14	-0.4 6	
3 43 N 66 W	-1.0 11	-3.1 12	0.1 10	-0.4 10	3.5 55	1.8 29	2.1 39	1.7 55	0.6 129	0.9 127	0.2 24	-0.0 9	-0.1 12
4 42 N 67 W	-0.9 3		-0.9 1	0.4 12	-0.0 7	0.3 7	1.6 2	1.3 2	-2.8 1	-1.1 1	-0.3 5	-0.4 5	-2.9 1
5 41 N 68 W	-2.6 8	-0.9 5	-1.5 4	0.2 8	0.3 14	-1.7 9	0.3 5	2.8 10	-1.0 1	1.3 3	-1.2 4	-2.1 5	-1.8 1
6 40 N 69 W	-2.5 203	-2.5 149	-1.5 154	-1.0 178	-0.8 219	-0.3 198	-0.3 191	0.5 181	-1.7 172	-0.7 129	-2.5 104	-1.7 150	-0.4 10
7 40 N 70 W	-0.9 6	-2.5 12	-2.1 8	-1.2 4	-0.8 11	-0.2 7	1.2 15	1.5 40	0.8 15	-1.3 8	-2.6 13	-2.3 13	-2.1 31
8 40 N 71 W	-0.7 5	-0.7 3	-0.7 2	-1.2 12	-0.1 5	-0.9 7	0.2 7	1.0 12	0.8 19	-0.2 15	-0.3 24	-1.7 13	-1.4 7
9 40 N 72 W	-3.0 2	-0.6 3	-1.6 10	-0.9 5	-1.3 4	-2.2 4	-0.1 6	2.3 21	-2.1 12	-0.6 10	-1.5 15	-2.5 3	-2.9 2
10 40 N 73 W		-2.6 6	-1.9 9	-0.5 7	-0.4 6	2.1 8	-0.5 6	-0.3 9	0.1 9	-0.5 5	-1.0 4	-1.8 2	
11 39 N 73 W	-0.3 9	-0.7 6	0.6 6	-0.9 13	-0.4 12	-0.1 15	2.3 24	0.9 5	-0.6 23	-0.0 17	-0.8 8	-1.4 11	-1.8 8
12 38 N 74 W	-2.0 5	-1.6 4	-3.8 44	-2.0 7	0.6 7	-0.8 12	2.1 10	-0.3 6	-0.8 9	-0.6 10	-2.9 11	-2.3 9	-1.7 9
13 37 N 74 W	-0.2 16	1.5 10	0.3 20	0.2 15	0.8 17	-1.4 14	1.3 20	0.2 14	-0.5 26	-0.2 21	-1.7 20	-2.1 24	-2.0 20
14 36 N 75 W	-3.2 244	-3.1 212	-2.8 185	-3.2 217	0.2 217	-1.9 231	1.4 210	1.0 217	-0.3 194	-1.0 207	0.2 65	-3.0 164	-3.8 218
15 35 N 75 W	1.1 11	2.9 3	-2.8 10	-5.3 12	3.4 12	0.7 9	1.1 4	1.3 5	-0.0 12	-0.0 13	0.2 12	-1.6 9	3.1 9

Figure 14. Space-time plot of sea-surface temperature anomalies ($^{\circ}\text{C}$) for 1981. Also shown are the numbers of observations utilized (lower left corner of squares). Location of one-degree squares (1-15) shown in figure 13.

1980

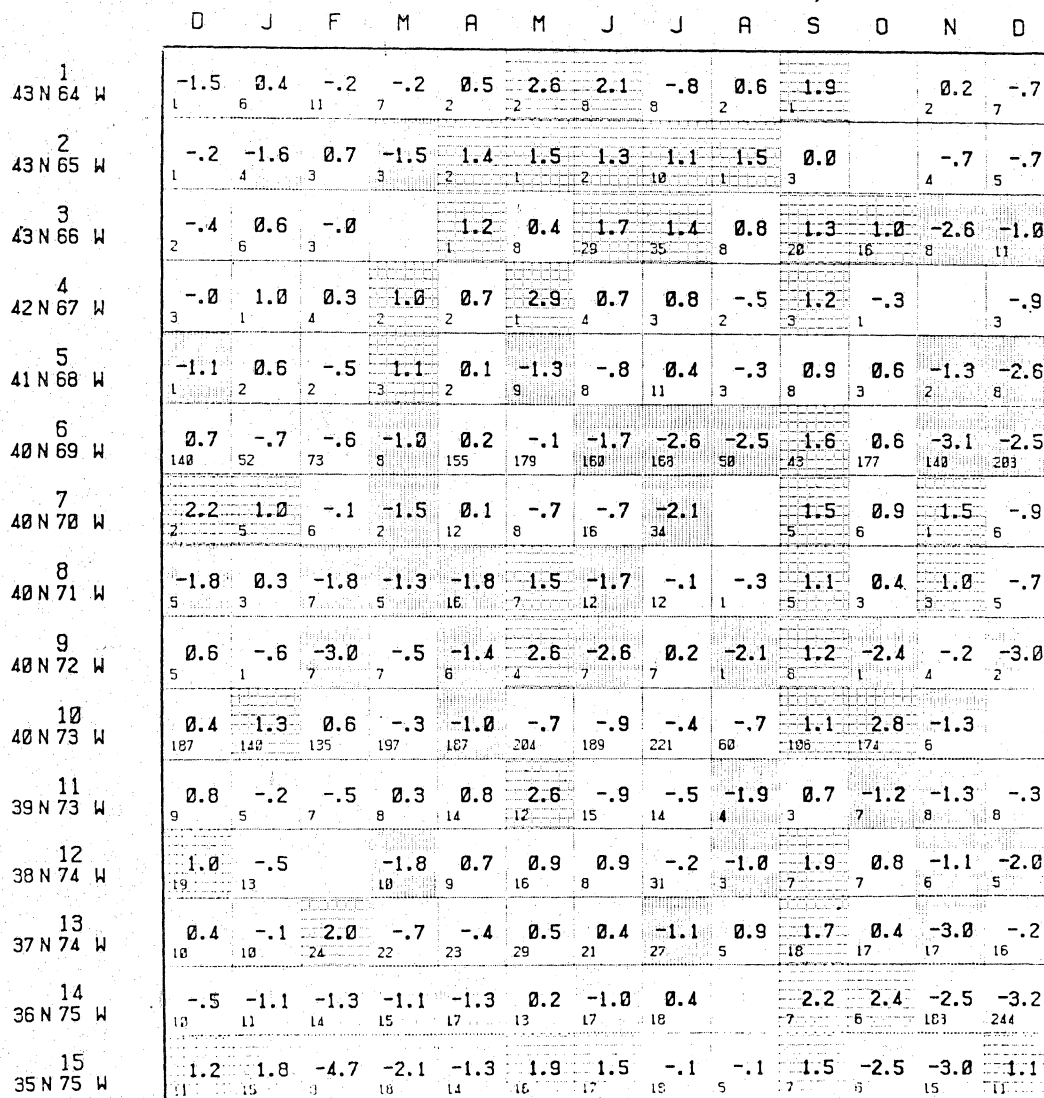


Figure 15. Space-time plot of sea-surface temperature anomalies ($^{\circ}\text{C}$) for 1980. Also shown are the numbers of observations utilized (lower left corner of squares). Location of one-degree squares (1-15) shown in figure 13.