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Sea-surface Temperatures in the Northwestern Atlantic in 1980¹

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 this sort for the northwestern Atlantic for Jan 1980-Jan 1981 (figs. 1-13) show that distributions of SST anomalies were not very unusual until November, when Georges Bank ($40-42^{\circ}\text{N}$, $66-69^{\circ}\text{W}$) and the nearshore areas of the Middle Atlantic Bight showed strongly negative anomalies, as large as -3.1°C . This unusual cooling was the consequence of strong W-NW winds bringing cold, continental air into the New England and

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Middle Atlantic states and across coastal waters. Meteorological records from coastal weather stations for November (Table 1) clearly show the regional impact of the cold, continental air with temperature departures from normal ranging up to -2.6°C in Atlantic City.

The negative anomalies continued in the Georges Bank - Middle Atlantic Bight area during December 1980 and January 1981 as the result of continuing westerly-northwesterly flow of cold air. January air temperatures were the most anomalous (Table 1) of the three months, but the negative SST anomalies were not noticeably greater then.

Pooled average SST anomalies for the entire mapped area (Table 2) similarly show the strongest negative anomalies in the November 1980 - January 1981 period. Otherwise the record is nearly featureless except for positive anomalies of 0.56 and 0.50 in May and September.

Table 1. Monthly average values of air temperature departures (from long term monthly station means), resultant wind velocity, and scalar wind speed from Atlantic coastal weather stations for November 1980 - January 1981.

| | Air Temperature Departure ($^{\circ}\text{C}$) | Resultant Wind Direction and Speed ($^{\circ}/\text{m}\cdot\text{s}^{-1}$) | Av. Wind Speed ($\text{m}\cdot\text{s}^{-1}$) |
|---|---|--|--|
| <u>PORTLAND, MAINE</u> | | | |
| Nov. 80 | -1.3 | 300/2.3 | 4.2 |
| Dec 80 | -2.4 | 310/2.3 | 3.7 |
| Jan 81 | -4.3 | 300/2.1 | 3.4 |
| <u>BOSTON, MASS</u> | | | |
| Nov 80 | -2.2 | 290/3.7 | 6.2 |
| Dec 80 | -2.4 | 290/3.3 | 5.0 |
| Jan 81 | -4.3 | 290/4.4 | 5.8 |
| <u>PROVIDENCE, RHODE ISLAND</u> | | | |
| Nov 80 | -1.3 | 300/2.8 | 4.7 |
| Dec 80 | -1.7 | 310/2.9 | 4.4 |
| Jan 81 | -4.5 | 300/2.8 | 3.8 |
| <u>NEW YORK, NY (JFK INTL. AIRPORT)</u> | | | |
| Nov 80 | -0.6 | 300/3.9 | 6.5 |
| Dec 80 | -0.7 | 320/3.9 | 6.4 |
| Jan 81 | -2.7 | 310/4.1 | 6.1 |
| <u>ATLANTIC CITY, NEW JERSEY</u> | | | |
| Nov 80 | -2.6 | 280/2.1 | 3.8 |
| Dec 80 | -2.2 | 300/2.3 | 4.1 |
| Jan 81 | -5.5 | 290/2.6 | 4.0 |
| <u>NORFOLK, VIRGINIA</u> | | | |
| Nov 80 | -0.9 | 320/1.4 | 4.8 |
| Dec 80 | 0.0 | 350/2.2 | 5.3 |
| Jan 81 | -4.3 | 330/1.8 | 4.4 |

Table 2. Monthly average sea-surface temperature anomalies ($^{\circ}\text{C}$) from the 1948-67 means for January 1980 - January 1981 in the northwestern Atlantic Ocean (35° - 46°N , 60° - 76°W)

| Month/Year | Number of 1° squares | Area mean Anomaly | Standard Deviation 1948-67 |
|------------|----------------------------------|----------------------|----------------------------------|
| Jan 1980 | 111 | +0.20 | 1.26 |
| Feb | 117 | -0.31 | 1.23 |
| Mar | 109 | -0.28 | 1.49 |
| Apr | 113 | +0.12 | 1.51 |
| May | 119 | +0.56 | 1.22 |
| Jun | 121 | -0.04 | 0.91 |
| Jul | 127 | -0.25 | 0.89 |
| Aug | 61 | -0.47 | 0.85 |
| Sep | 103 | +0.51 | 0.89 |
| Oct | 111 | +0.03 | 0.95 |
| Nov | 112 | -0.64 | 0.90 |
| Dec | 108 | -0.59 | 0.91 |
| Jan 1981 | 107 | -0.69 | 1.26 |

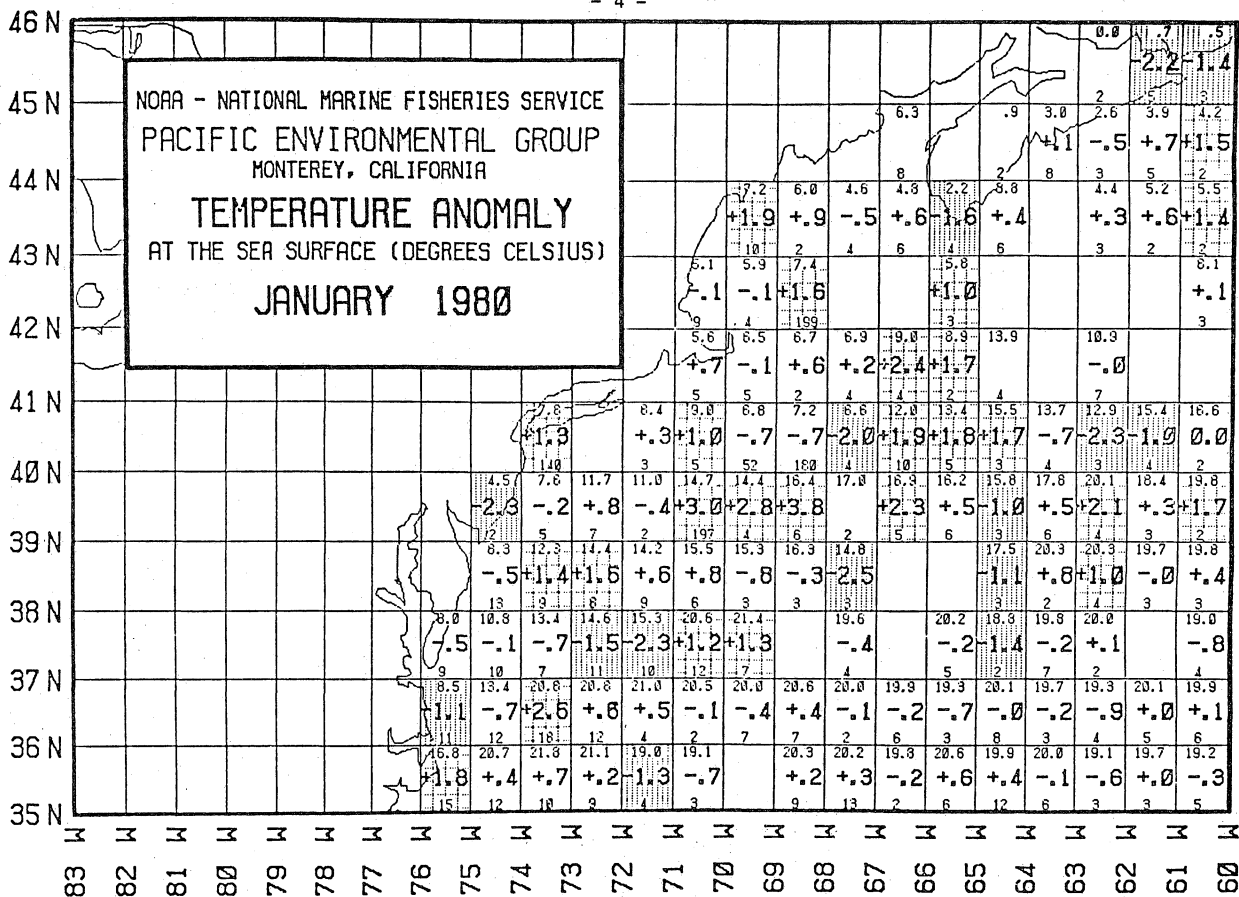


Fig 1. Average sea-surface temperature anomalies ($^{\circ}\text{C}$) for January 1980. Also shown in each 1° square are average sea-surface temperatures (upper number) and the number of observations (lower number).

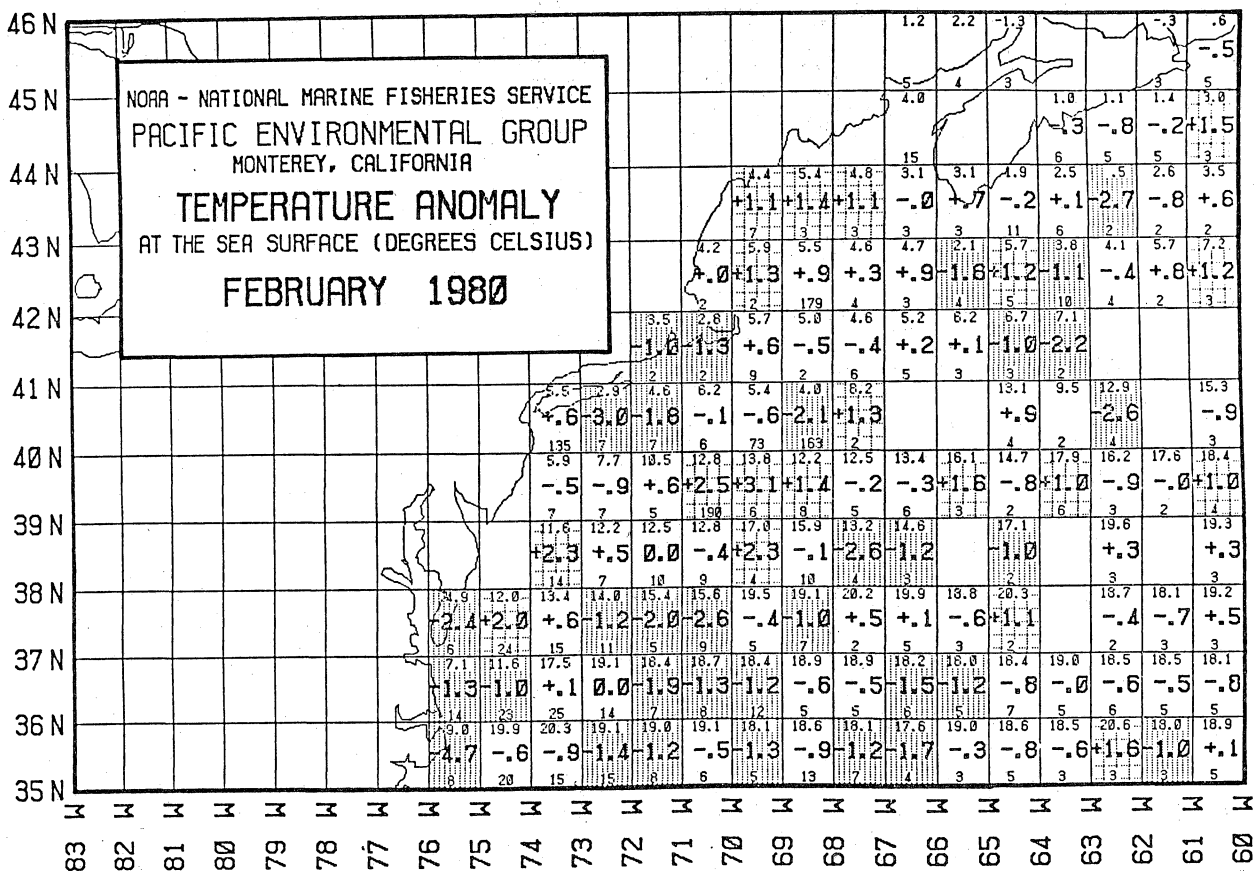


Fig 2. Average sea-surface temperature anomalies ($^{\circ}\text{C}$) for February 1980. Also shown in each 1° square are average sea-surface temperatures (upper number) and the number of observations (lower number).

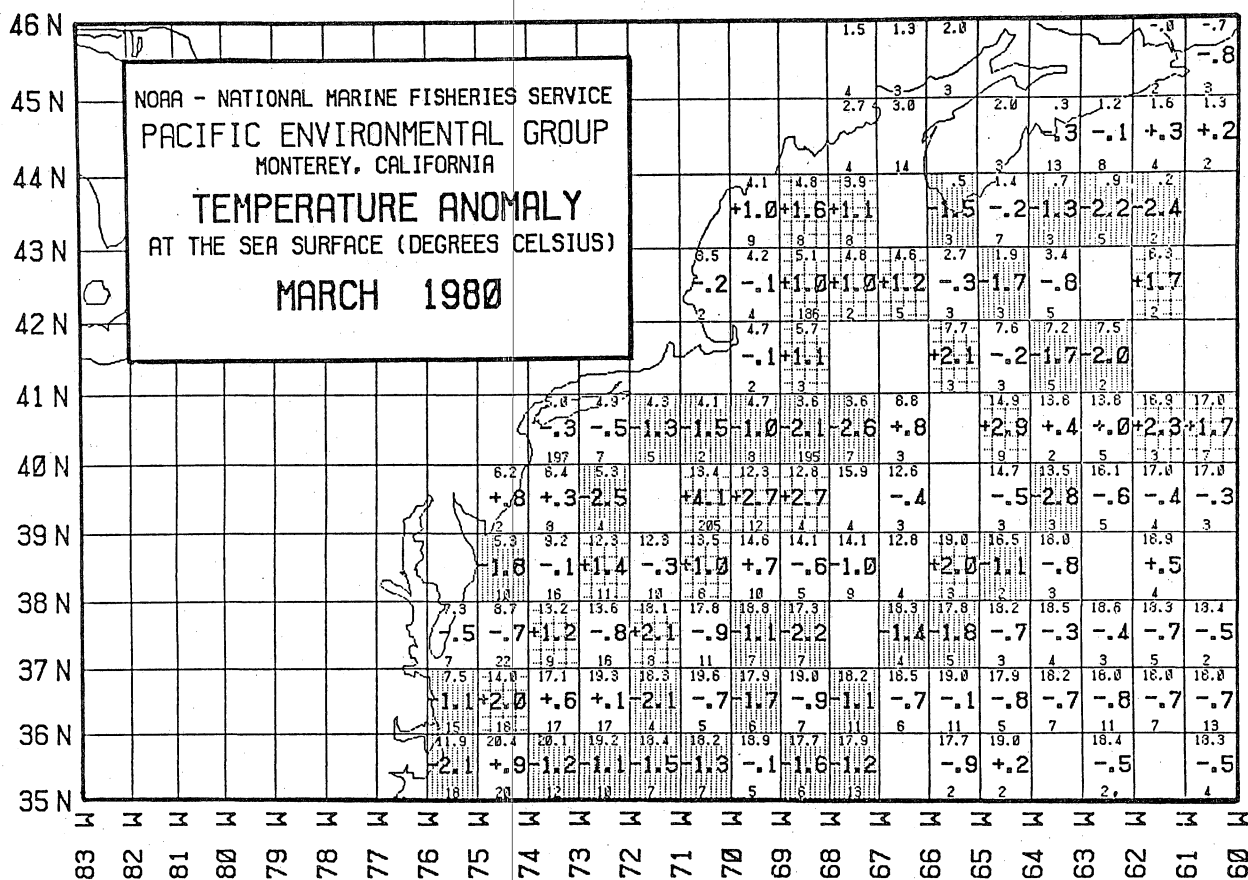


Fig 3. Average sea-surface temperature anomalies ($^{\circ}\text{C}$) for March 1980. Also shown in each 1° square are average sea-surface temperatures (upper number) and the number of observations (lower number).

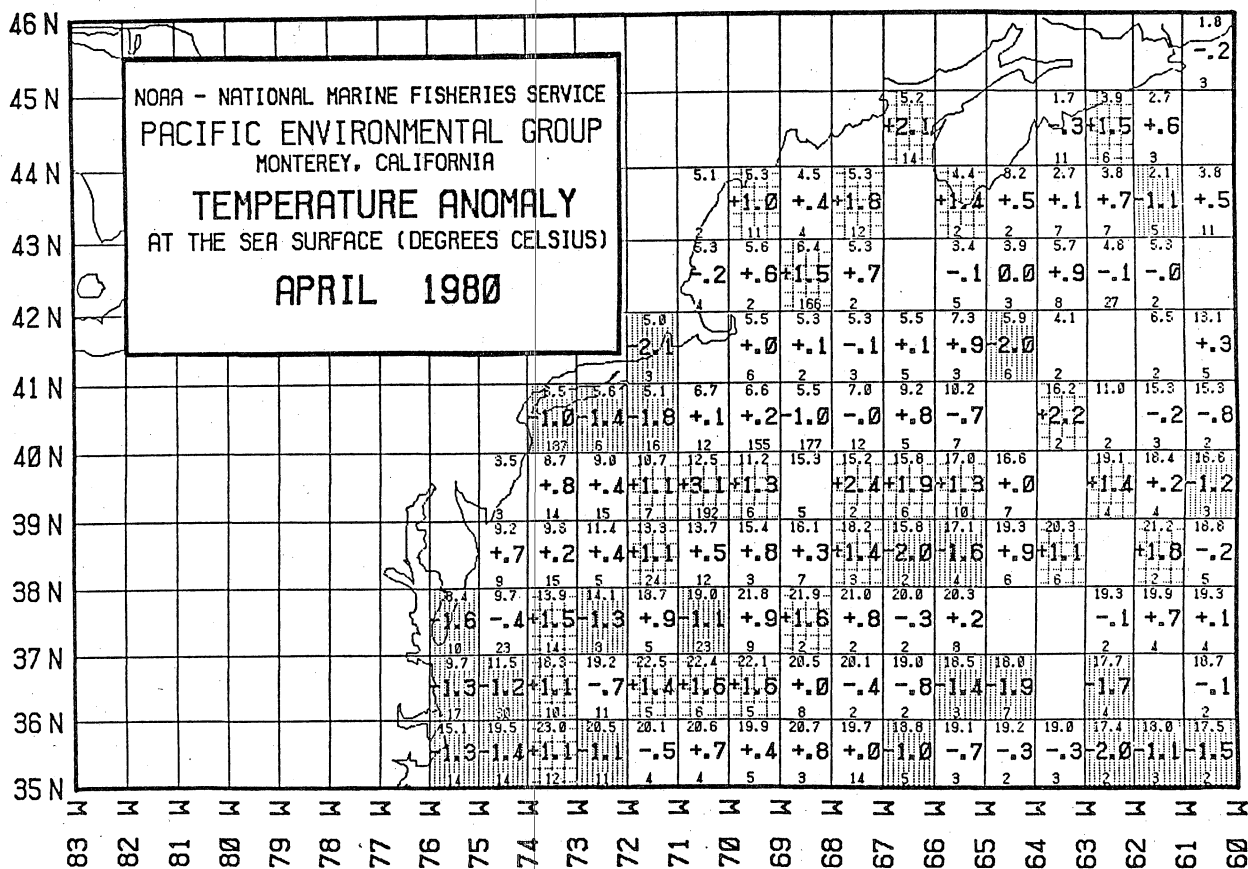


Fig 4. Average sea-surface temperature anomalies ($^{\circ}\text{C}$) for April 1980. Also shown in each 1° square are average sea-surface temperatures (upper number) and the number of observations (lower number).

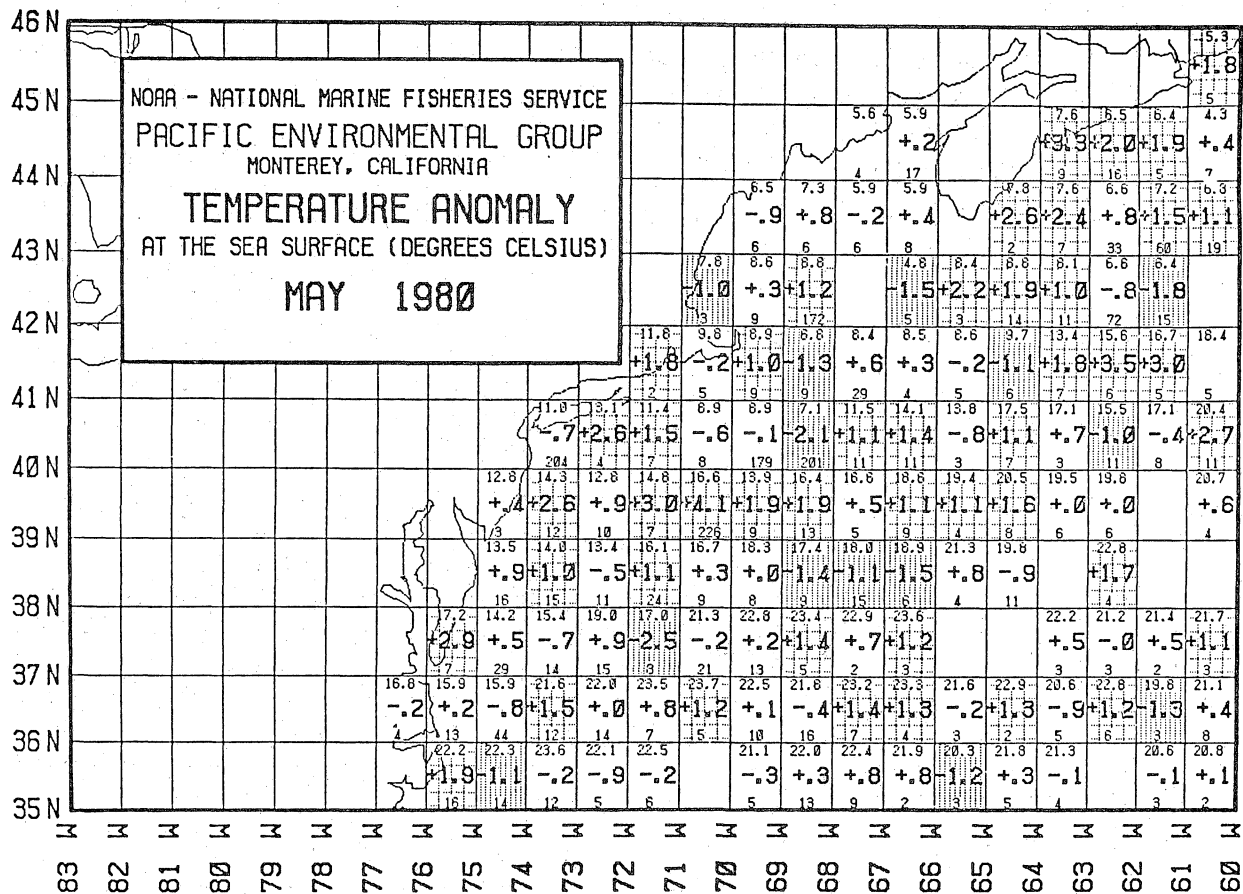


Fig 5. Average sea-surface temperature anomalies ($^{\circ}\text{C}$) for May 1980. Also shown in each 1° square are average sea-surface temperatures (upper number) and the number of observations (lower number).

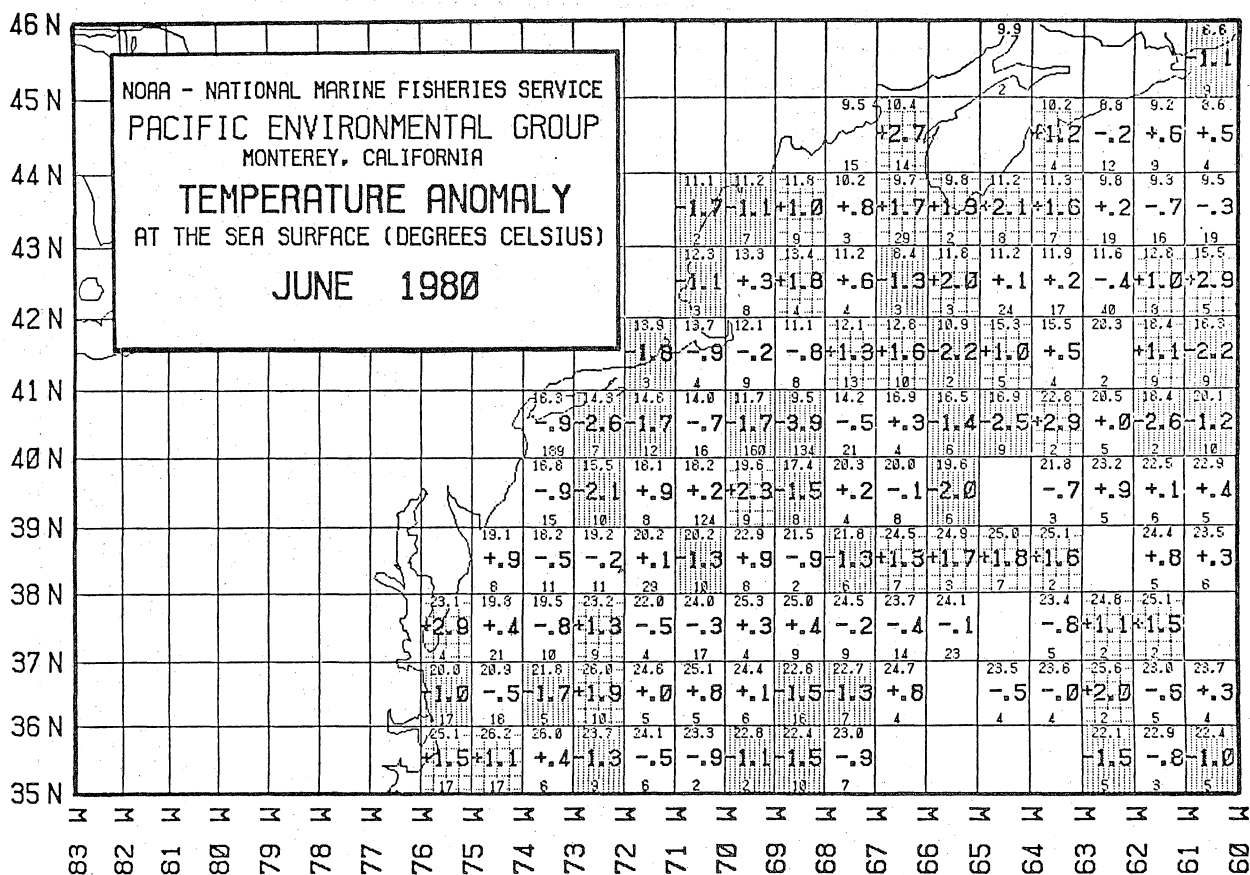


Fig 6. Average sea-surface temperature anomalies ($^{\circ}\text{C}$) for June 1980. Also shown in each 1° square are average sea-surface temperatures (upper number) and the number of observations (lower number).

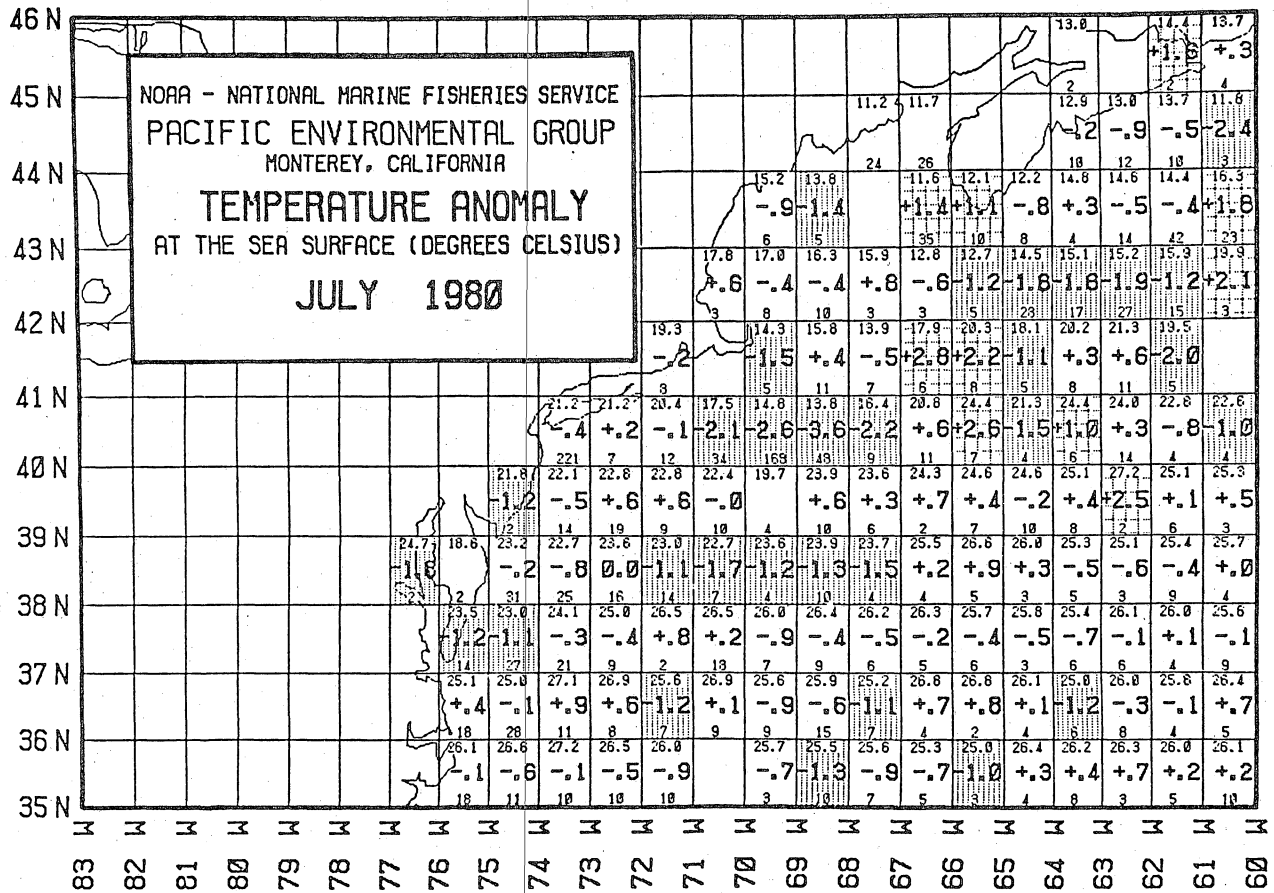


Fig 7. Average sea-surface temperature anomalies ($^{\circ}\text{C}$) for July 1980. Also shown in each 1° square are average sea-surface temperatures (upper number) and the number of observations (lower number).

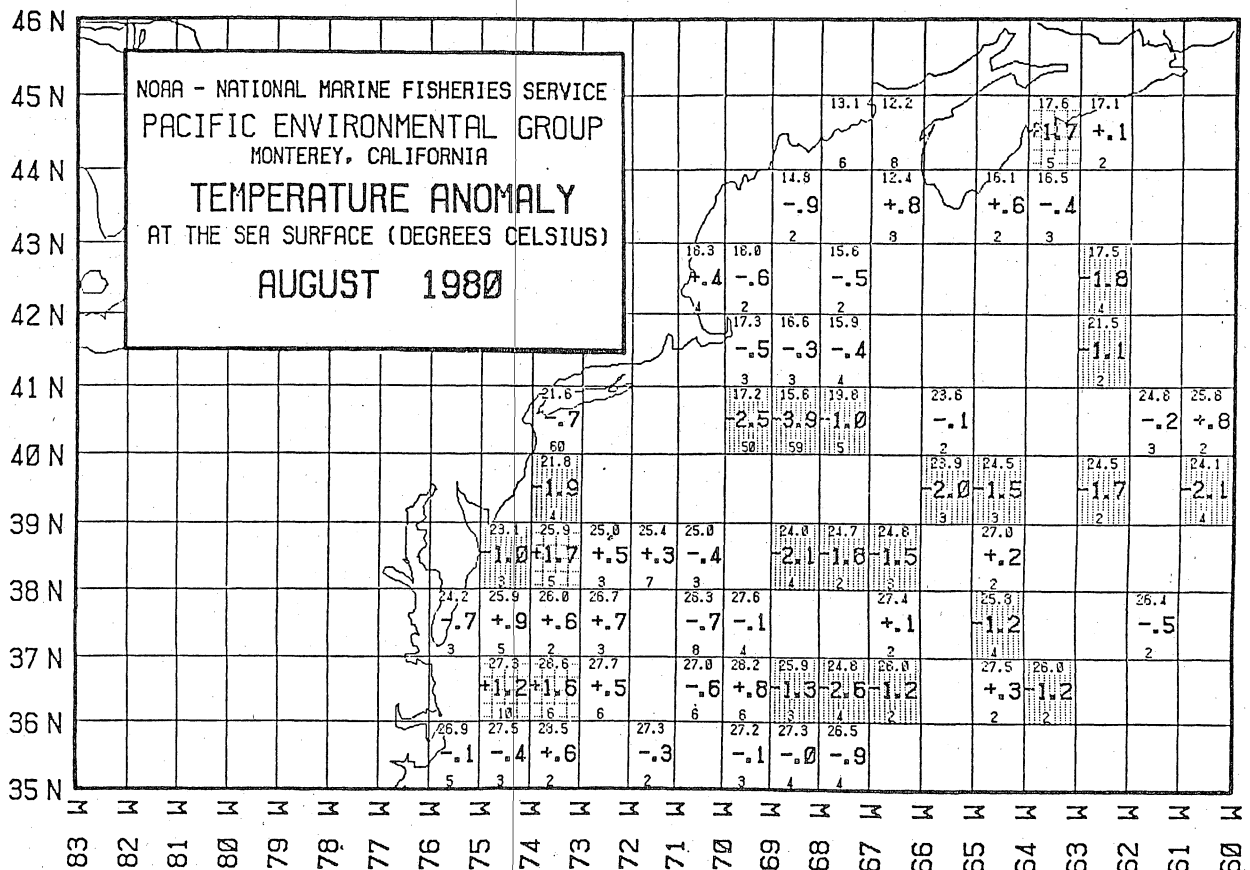


Fig 8. Average sea-surface temperature anomalies ($^{\circ}\text{C}$) for August 1980. Also shown in each 1° square are average sea-surface temperatures (upper number) and the number of observations (lower number).

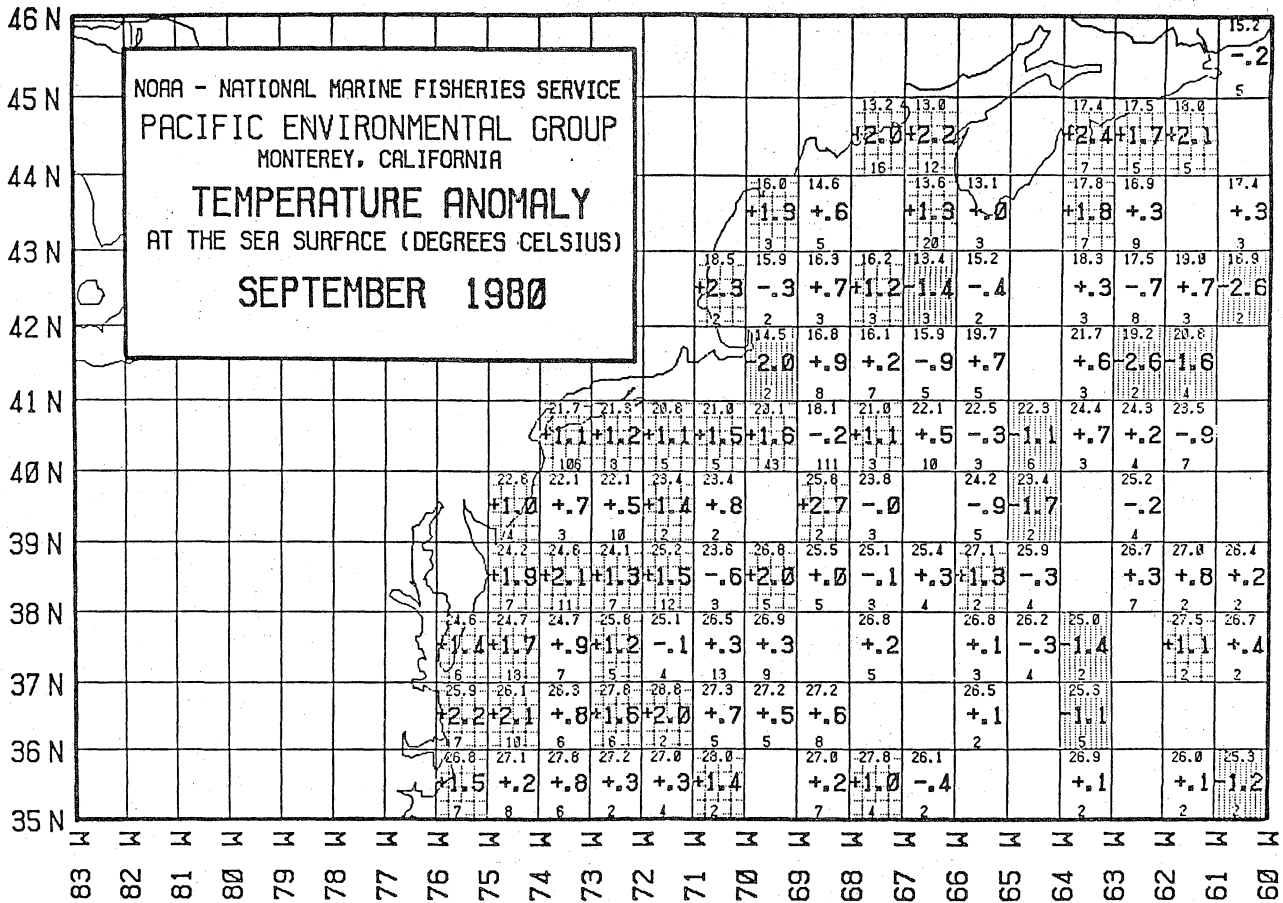


Fig 9. Average sea-surface temperature anomalies ($^{\circ}\text{C}$) for September 1980. Also shown in each 1° square are average sea-surface temperatures (upper number) and the number of observations (lower number).

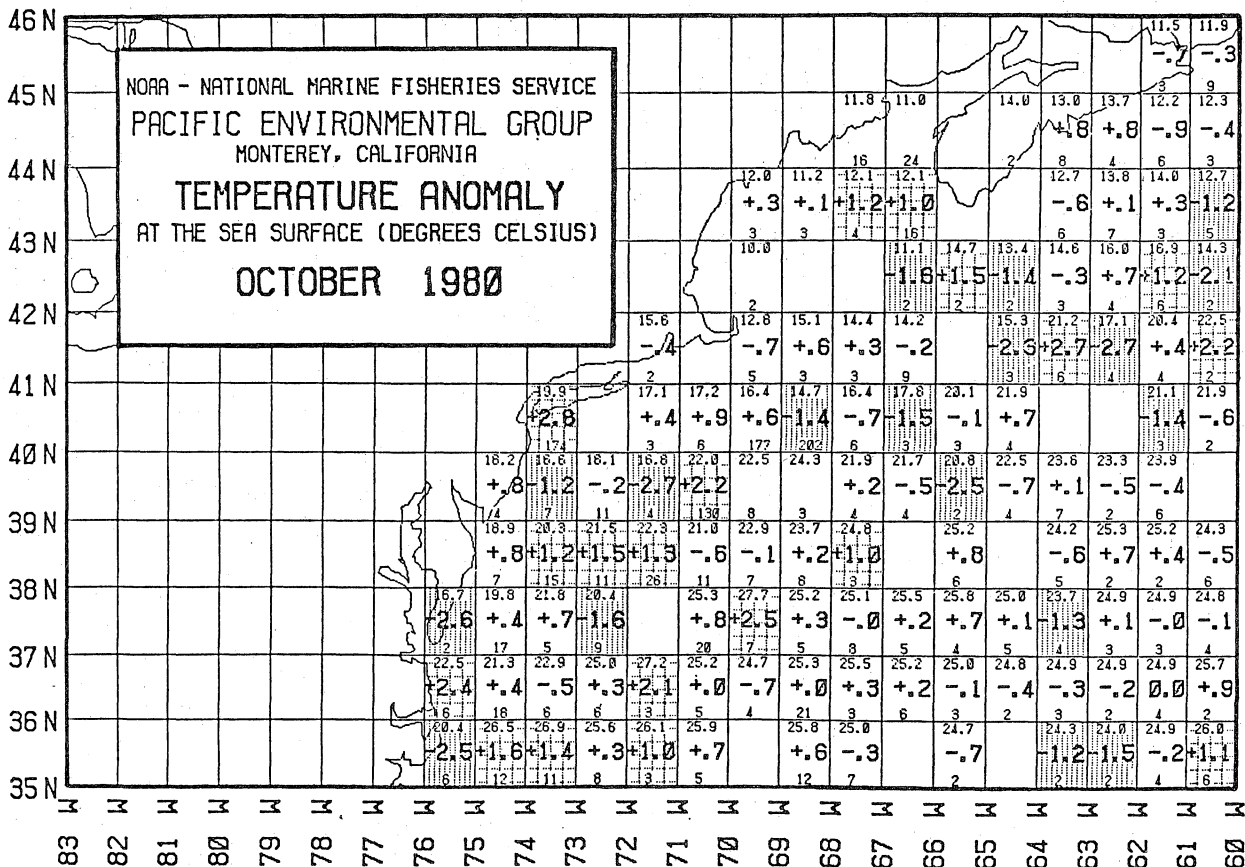


Fig 10. Average sea-surface temperature anomalies ($^{\circ}\text{C}$) for October 1980. Also shown in each 1° square are average sea-surface temperatures (upper number) and the number of observations (lower number).

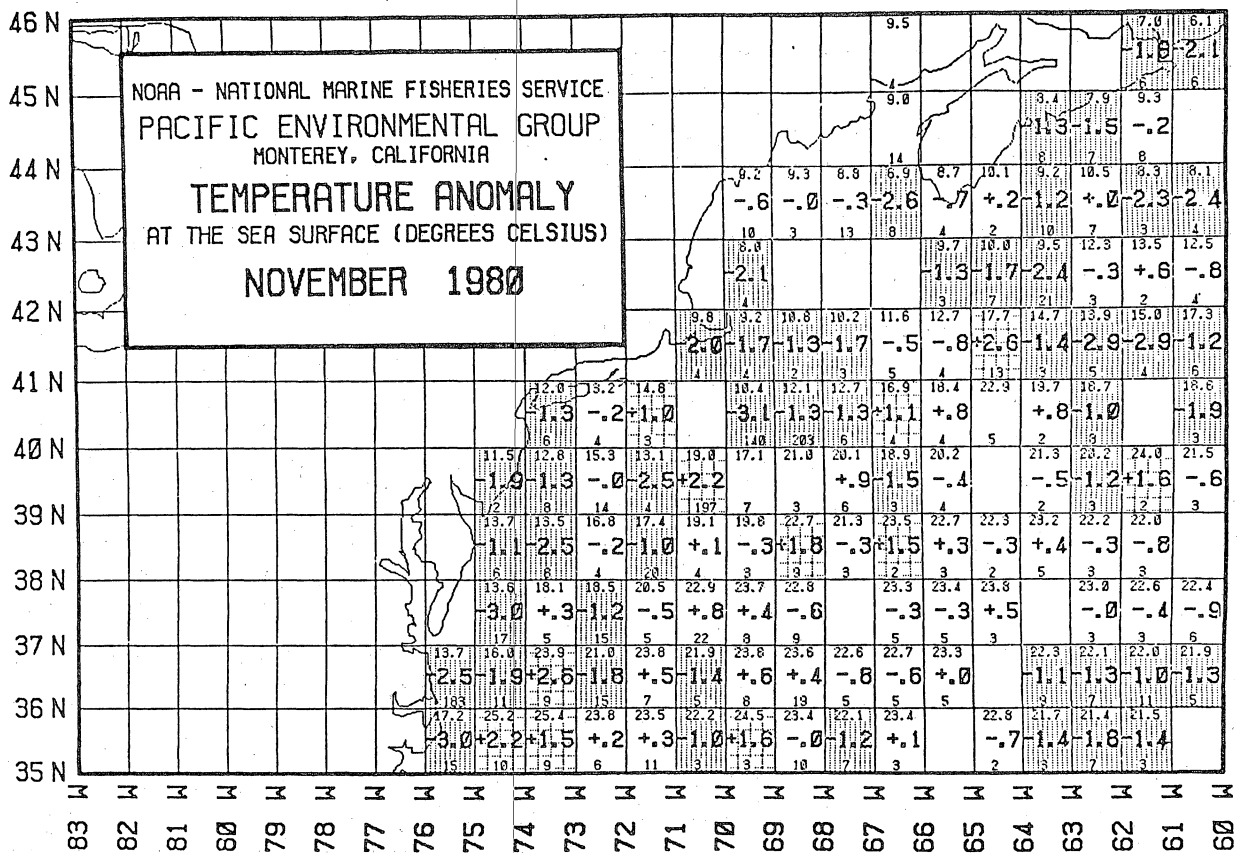


Fig 11. Average sea-surface temperature anomalies ($^{\circ}\text{C}$) for November 1980. Also shown in each 1° square are average sea-surface temperatures (upper number) and the number of observations (lower number).

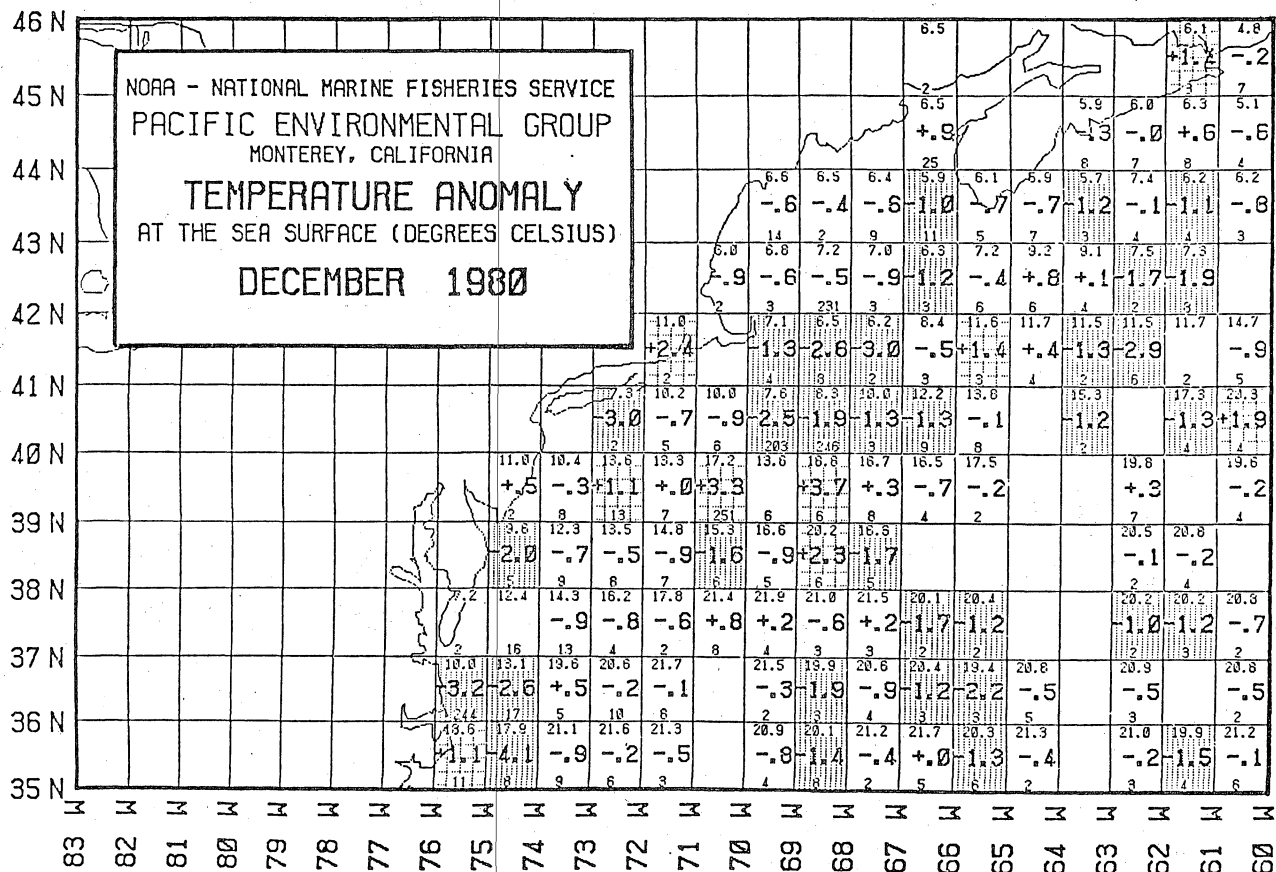


Fig 12. Average sea-surface temperature anomalies ($^{\circ}\text{C}$) for December 1980. Also shown in each 1° square are average sea-surface temperatures (upper number) and the number of observations (lower number).

