NOAA Atlas NESDIS 21

WORLD OCEAN DATABASE 1998
VOLUME 4: Temporal Distribution of Conductivity/Salinity-Temperature-Depth (Pressure) Stations

Washington, D.C.
June 1998

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Environmental Satellite, Data, and Information Service

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1998 International Year of the Ocean

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PREFACE

The oceanographic databases described by this atlas series greatly expands on the *World Ocean Atlas 1994* (WOA94) database. Previous oceanographic databases including the NODC/WDC-A profile archives, and products derived from these databases, have proven to be of great utility to the international oceanographic, climate research, and operational environmental forecasting communities. In particular, the objectively analyzed fields of temperature and salinity derived from these databases have been used in a variety of ways. These include use as boundary and/or initial conditions in numerical ocean circulation models, for verification of numerical simulations of the ocean, as a form of "sea truth" for satellite measurements such as altimetric observations of sea surface height, and for planning oceanographic expeditions. The databases, and products based on these databases, are critical for support of international assessment programs such as the Intergovernmental Program on Climate Change (IPCC) of the United Nations.

We have expanded these earlier databases to include variables such as chlorophyll and plankton because:

1) there is a need for such databases to study the role of biogeochemical cycles in determining how the earth's climate system works, particularly the vulnerability of ocean ecosystems to climate change (IPCC, 1996);

2) the analysis of remotely sensed estimates of chlorophyll (SeaWIFS, ADEOS missions) requires knowledge of *in situ* variables such as chlorophyll and plankton;

3) our belief that the most comprehensive set of oceanographic databases should be available as a matter of course to the international research community.

It is well known that the amount of carbon dioxide in the earth's atmosphere will most likely double during the next century compared to CO_2 levels that occurred at the beginning of the Industrial Revolution. Regardless of one's scientific and/or political view of a possible "enhanced greenhouse warming" due to the increase of carbon dioxide, it is necessary that the international scientific community have access to the most complete historical oceanographic databases possible in order to study this problem, as well as other scientific and environmental problems. The science community should have access to the most complete oceanographic databases possible to fulfill its obligations.

The production of oceanographic databases is a major undertaking. Such work benefits from the input of many individuals and organizations. We have tried to structure the data sets in such a way as to encourage feedback from experts around the world who have knowledge that can improve the data and metadata contents of the database. It is only with such feedback that high quality global ocean databases can be prepared. Just as with scientific theories and numerical models of the ocean and atmosphere, the development of global ocean databases is not carried out in one giant step, but proceeds in an incremental fashion.

In the acknowledgment section of this publication we have expressed our view that creation of global ocean databases is only possible through the cooperation of scientists, data managers, and scientific administrators throughout the international community. I would also like to thank my colleagues and the staff of the Ocean Climate Laboratory of NODC for their dedication to the project leading to publication of this atlas series. Their integrity and thoroughness have made this database possible. It is my belief that the development and management of national and international oceanographic data archives is best performed by scientists who are actively working with the historical data.

Sydney Levitus
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June 1998

IPCC, 1996: Impacts, Adaptations and Mitigation of Climate Change: Scientific Technical Analyses. Cambridge University Press, 872 pp.

Acknowledgments

This work was made possible by a grant from the NOAA Climate and Global Change Program which enabled the establishment of a research group at the National Oceanographic Data Center. The purpose of this group is to prepare research quality oceanographic databases, as well as to compute objective analyses of, and diagnostic studies based on, these databases.

The data made available as part of this atlas include the oceanographic data archives maintained by NODC/WDC-A as well as data acquired as a result of the NODC Oceanographic Data Archaeology and Rescue (NODAR) project and the IODE/IOC Global Oceanographic Data Archaeology and Rescue (GODAR) project. At NODC/WDC-A, "data archaeology and rescue" projects are supported with funding from the NOAA Environmental Science Data and Information Management (ESDIM) Program and NOAA Climate and Global Change Program. The majority of funding for these efforts is now provided by the ESDIM program. Support for some of the regional IOC/GODAR meetings was provided by the MAST program of the European Union (Levitus *et al.*, 1998).

We would like to acknowledge the scientists, technicians, and programmers who have submitted data to national and regional data centers as well as the managers and staff at the various data centers. Our database now allows for the storage of additional metadata including information about Principal Investigators to recognize their efforts as well as to provide information that may be useful in determining the quality of data.

The OCL expresses thanks to those who provided comments and helped develop an improved *World Ocean Database 1998* product. In particular, Dr. Steve Worley of NCAR, Dr. Harry Dooley of ICES, Dr. Norm Hall (NODC) for testing the CD-ROMs prior to distribution. John E. O'Reilly (NMFS/NOAA) contributed the program for converting from OCL ASCII format to IDL, Dr. Harry Dooley contributed the conversion program from OCL ASCII format to the ICES/OceanPC format. Any errors are the responsibility of the Ocean Climate Laboratory.

Ron Moffatt and Ervin Godfrey Trammell of the NODC International Data Exchange Team helped locate data in the WDC-A archives for digitization. The OCL would also like to acknowledge the help received over the last several years from colleagues in other NODC divisions. Francis Mitchell helped with all the code lists and accessions, Melanie Hamilton supplied GTSPP data, J.D. Hardy researched and documented the correct status of many plankton names, Sheri Phillips helped Olga Baranova design our CD-ROM graphics, Mike Simmons, Carla Bazemore, and Maggie Dunklee wrote the NODC P3 format description presented in the documentation of WOD98.

Recent declassification of substantial amounts of naval oceanographic data by the Russian Naval Ocean Research Center, the United Kingdom Hydrographic Office, and the Argentine Navy is acknowledged. The Intergovernmental Oceanographic Commission has requested such declassification efforts in recent years.

We appreciate the efforts of David Adamec, Jim Carton, and Gennady Chepurin in reviewing the manuscript version of this publication.

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World Ocean Database 1998, Volume 4: Temporal Distribution of Conductivity/Salinity-Temperature-Depth (Pressure) Stations

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ABSTRACT

This atlas describes a collection of scientifically quality controlled ocean Conductivity/Salinity-Temperature-Depth (Pressure) (CTD) Stations. Yearly distributions and seasonal data distributions for individual years of all CTD stations in the database are presented to provide information on the state of ocean CTD station observations.

1. INTRODUCTION

Conductivity-Temperature-Depth (CTD) instruments measure temperature and conductivity as a function of pressure (depth) at relatively high (often referred to as "continuous") vertical resolution. Salinity is computed from the conductivity measurement. CTD data may be submitted to NODC/WDC-A at sub-meter vertical resolution. These data are now archived at this resolution whereas in the past, electronic storage limitations resulted in only selected levels being stored. An earlier version of the CTD instrument was the STD (salinity-temperature-depth) which computed salinity from a conductivity sensor as the instrument was moving though the water column. Because of instrument problems that led to erroneous data values (spikes), this method was replaced by the CTD method for which conductivity measurements are recorded from the instrument and then salinity computed with appropriate calibration information. Dissolved oxygen content can now be measured "continuously" with sensors placed on CTD instruments. New sensors are being developed to make "continuous" measurements of other variables. We refer to CTD "stations" or "casts" to recognize that more than one variable is being measured when a CTD instrument is deployed.

2. CTD STATION DISTRIBUTIONS

Figure 1 shows the number of CTD stations contained in WOD98 for the World Ocean as a function of year. Figures 2 and 3 show the time series for the northern and southern hemispheres

respectively. There are a total of 189,555 CTD stations for the entire World Ocean with 21,074 profiles (11.1%) measured in the southern hemisphere and 168,481 profiles (88.9%) measured in the northern hemisphere. Table 1 provides the exact number of CTD stations included in WOD98 as a function of year. The geographic distribution of CTD stations for individual years for 1966-1996 are shown in Figures A1-A30. The geographic distribution of CTD stations for each season by individual years for 1966-1996 are shown in Figures B1-B124. Most profiles have been made in the northern hemisphere, but the southern hemisphere coverage has been increased due to international data archaeology and rescue efforts and the World Ocean Database project (Levitus *et al.* 1994, 1998).

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Table 1 National contributions of Conductivity/Temperature/Depth (CTD) casts sorted by percent contribution of each country

*NODC Country Code	Country Name	CTD Count	% of Total
31	UNITED STATES	71592	37.69
32	UNITED STATES	26520	13.99
33	UNITED STATES	1038	0.55
18	CANADA	51334	27.08
35	FRANCE	11468	6.05
74	UNITED KINGDOM	7267	3.83
9	AUSTRALIA	4870	2.56
90	RUSSIA	3192	1.68
58	NORWAY	2754	1.45
6	GERMANY, FED. REP.	2650	1.4
76	CHINA, PEOPLES REP	1749	0.92
64	NETHERLANDS	1056	0.56
67	POLAND	809	0.43
48	ITALY	618	0.33
99	UNKNOWN	537	0.28
ZZ	MISC. ORGANIZATIONS	537	0.28
49	JAPAN	444	0.23
7	GERMANY, DEM. REP.	340	0.18
8	ARGENTINA	183	0.1
77	SWEDEN	165	0.09
61	NEW ZEALAND	102	0.05
34	FINLAND	99	0.05
42	INDONESIA	88	0.05
57	MEXICO	59	0.03
21	TAIWAN	57	0.03
24	KOREA, REP. OF	27	0.01
	TOTAL	189555	

*The United States, Russia, and Japan have multiple country codes. This is because the NODC Institution Code is limited to two digits and these three countries each have more than 99 institutions that can potentially transfer data to NODC/WDC-A.

Table 2 The number of CTD casts in WOD98 as a function of year for the world ocean. The total number of casts = 189,555

YEAR	STATIONS	YEAR	STATIONS	YEAR	STATIONS	YEAR	STATIONS
1967	1530	1975	5051	1983	8339	1990	7824
1968	730	1976	5443	1984	10031	1991	9172
1969	2460	1977	6693	1985	8753	1992	9466
1970	551	1978	8172	1986	9795	1993	8656
1971	999	1979	7529	1987	12189	1994	4644
1972	3535	1980	5985	1988	9591	1995	3197
1973	5376	1981	8359	1989	10125	1996	1532
1974	6449	1982	7379				

Table 3 The number of CTD casts in WOD98 as a function of year for the southern hemisphere. The total number of casts = 21,074

YEAR	STATIONS	YEAR	STATIONS	YEAR	STATIONS	YEAR	STATIONS
1967	607	1974	323	1981	318	1988	818
1968	191	1975	481	1982	472	1989	1864
1969	57	1976	481	1983	1895	1990	1315
1970	0	1977	799	1984	1817	1991	891
1971	61	1978	789	1985	909	1992	1976
1972	57	1979	798	1986	1069	1993	808
1973	176	1980	621	1987	1394	1994	87

Table 4 The number of CTD casts in WOD98 as a function of year for the northern hemisphere. The total number of casts = 168,481

YEAR	STATIONS	YEAR	STATIONS	YEAR	STATIONS	YEAR	STATIONS
1967	923	1975	4570	1983	6444	1990	6509
1968	539	1976	4962	1984	8214	1991	8281
1969	2403	1977	5894	1985	7844	1992	7490
1970	551	1978	7383	1986	8726	1993	7848
1971	938	1979	6731	1987	10795	1994	4557
1972	3478	1980	5364	1988	8773	1995	3197
1973	5200	1981	8041	1989	8261	1996	1532
1974	6126	1982	6907				

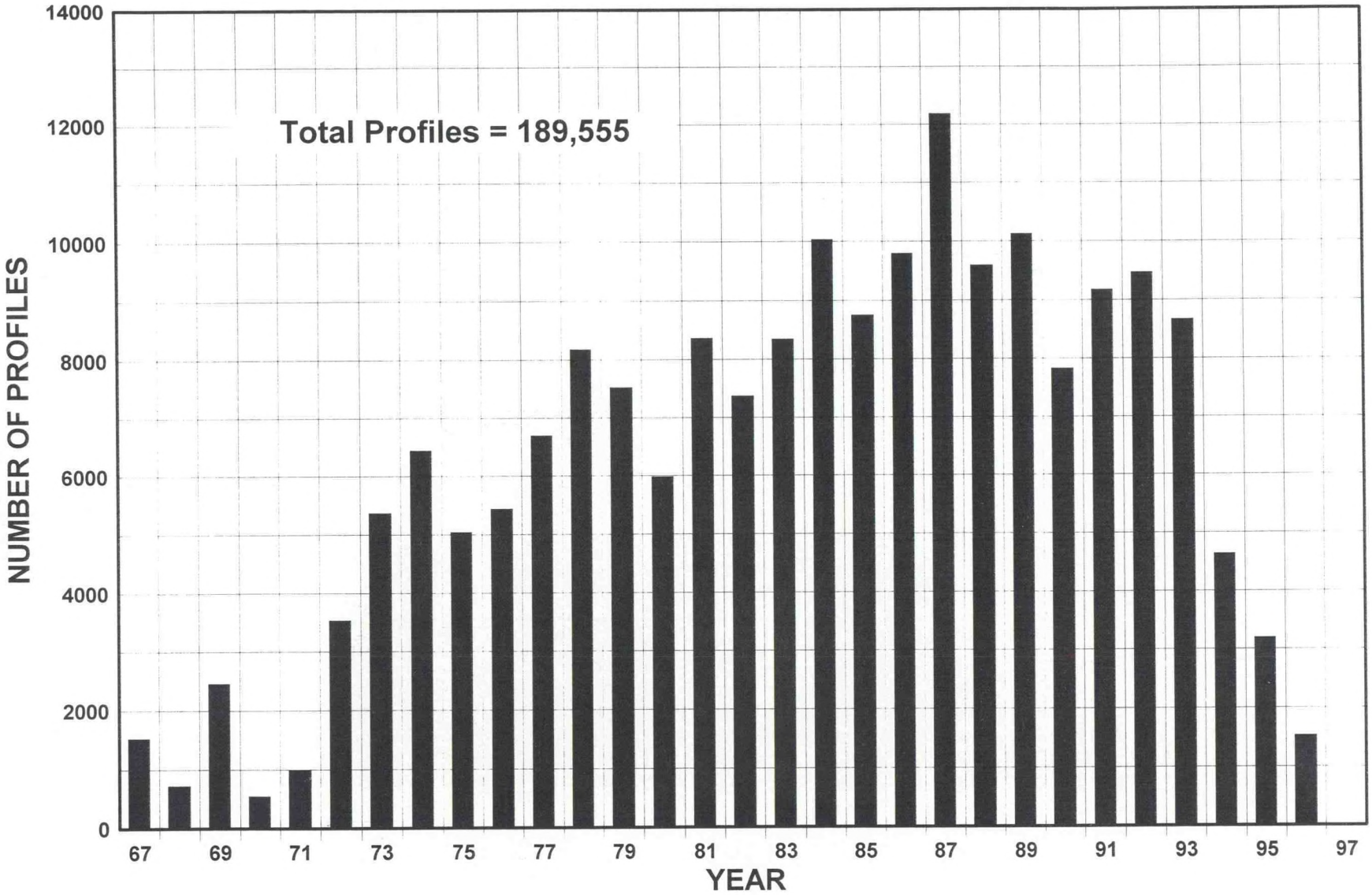


Fig. 1 Time series of CTD casts in WOD98 for the world ocean as a function of year

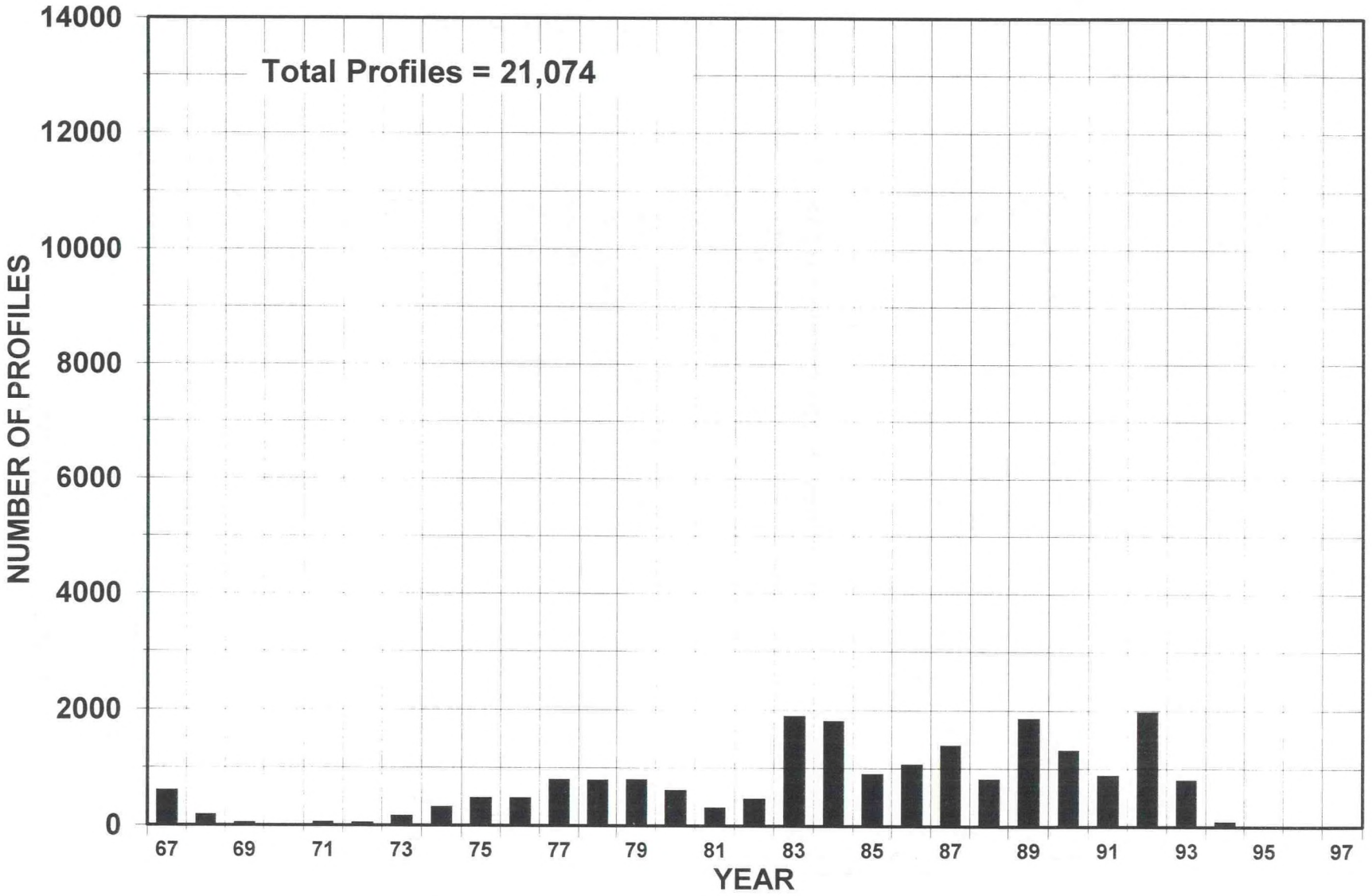


Fig. 2 Time series of CTD casts in WOD98 for the southern hemisphere as a function of year

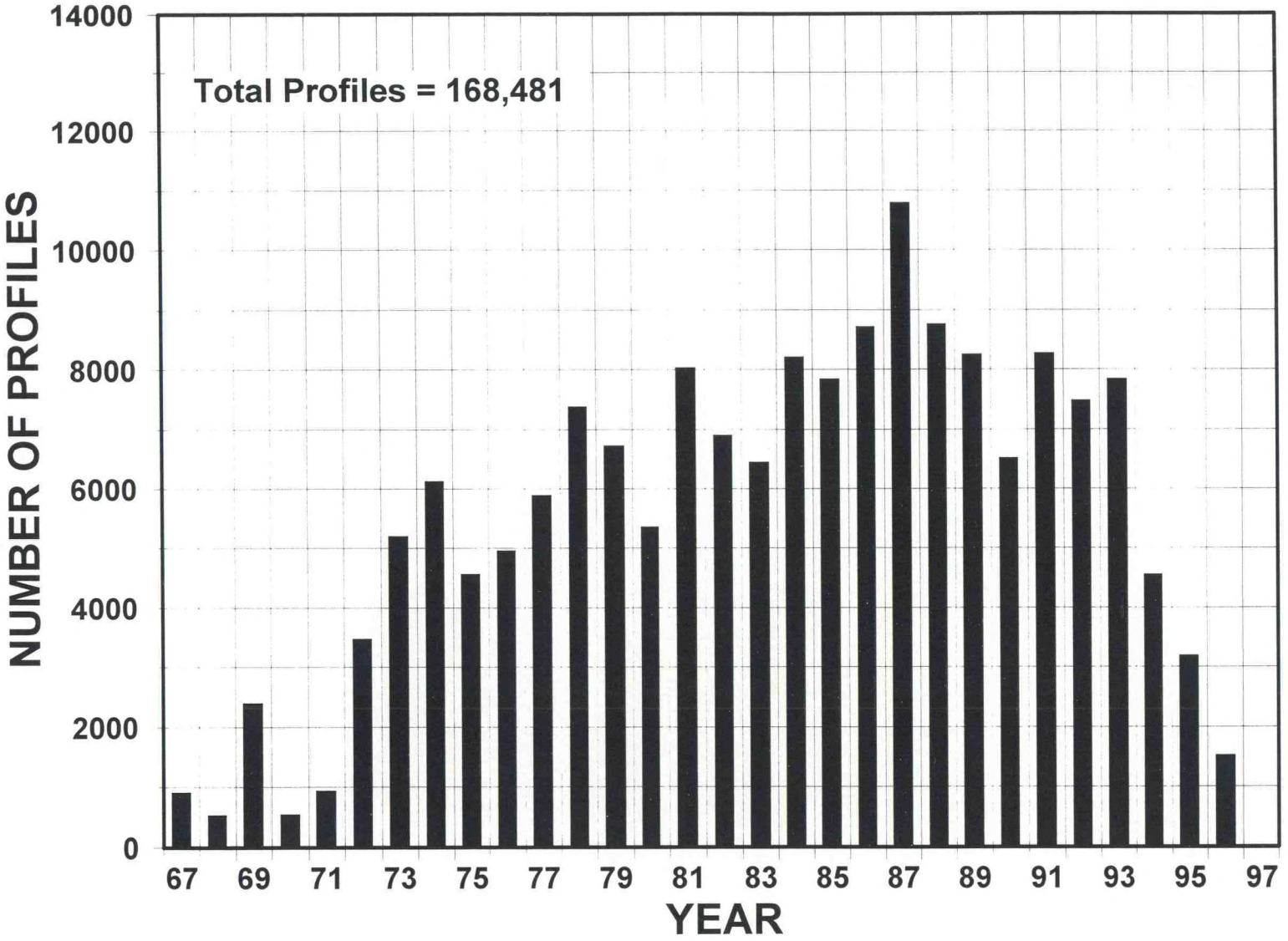


Fig. 3 Time series of CTD casts in WOD98 for the northern hemisphere as a function of year

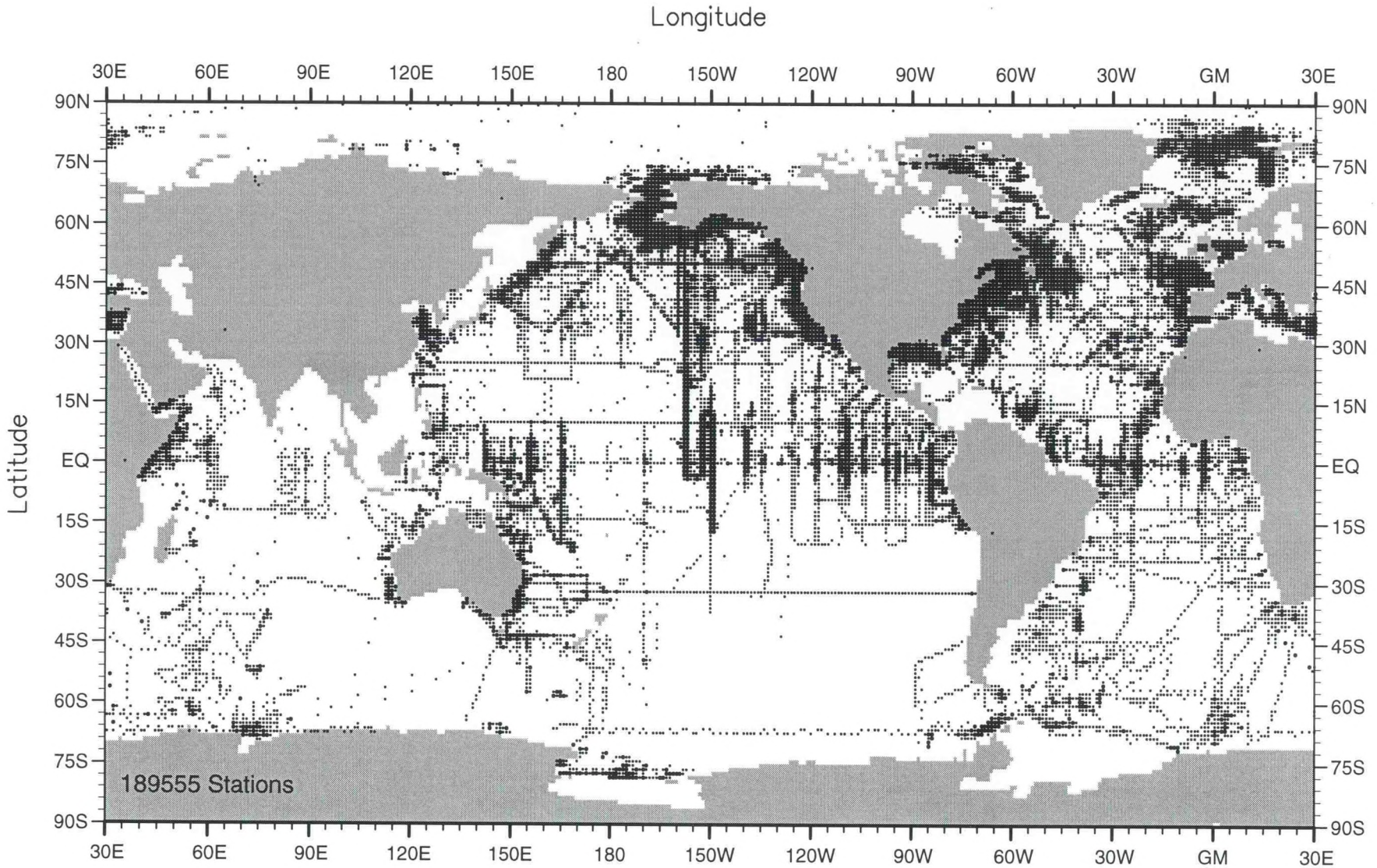


Fig. 4 Distribution of all casts in the CTD files of WOD98

4. APPENDIX A: DISTRIBUTIONS FOR INDIVIDUAL YEARS OF ALL CTD STATIONS IN WOD98

This appendix contains yearly station distributions of all CTD stations contained in WOD98. These maps provide some history of the observational progress of the field of oceanography. They also serve as indicators of whether or not a particular data set from a scientist or institution is part of the NODC/WDC-A archive. The exchange of information provided by the publication of such maps has provided us with valuable information about deficiencies in the database. The locations of all WOD98 CTD stations are plotted including stations that may be erroneously located over land. However, WOD98 contains some stations from various lakes so care should be exercised in the use of these stations and the determination as to whether they represent errors in locations.

For all figures in Appendix A, a small dot indicates a one-degree square containing from one to four stations and a large dot indicates five or more stations.

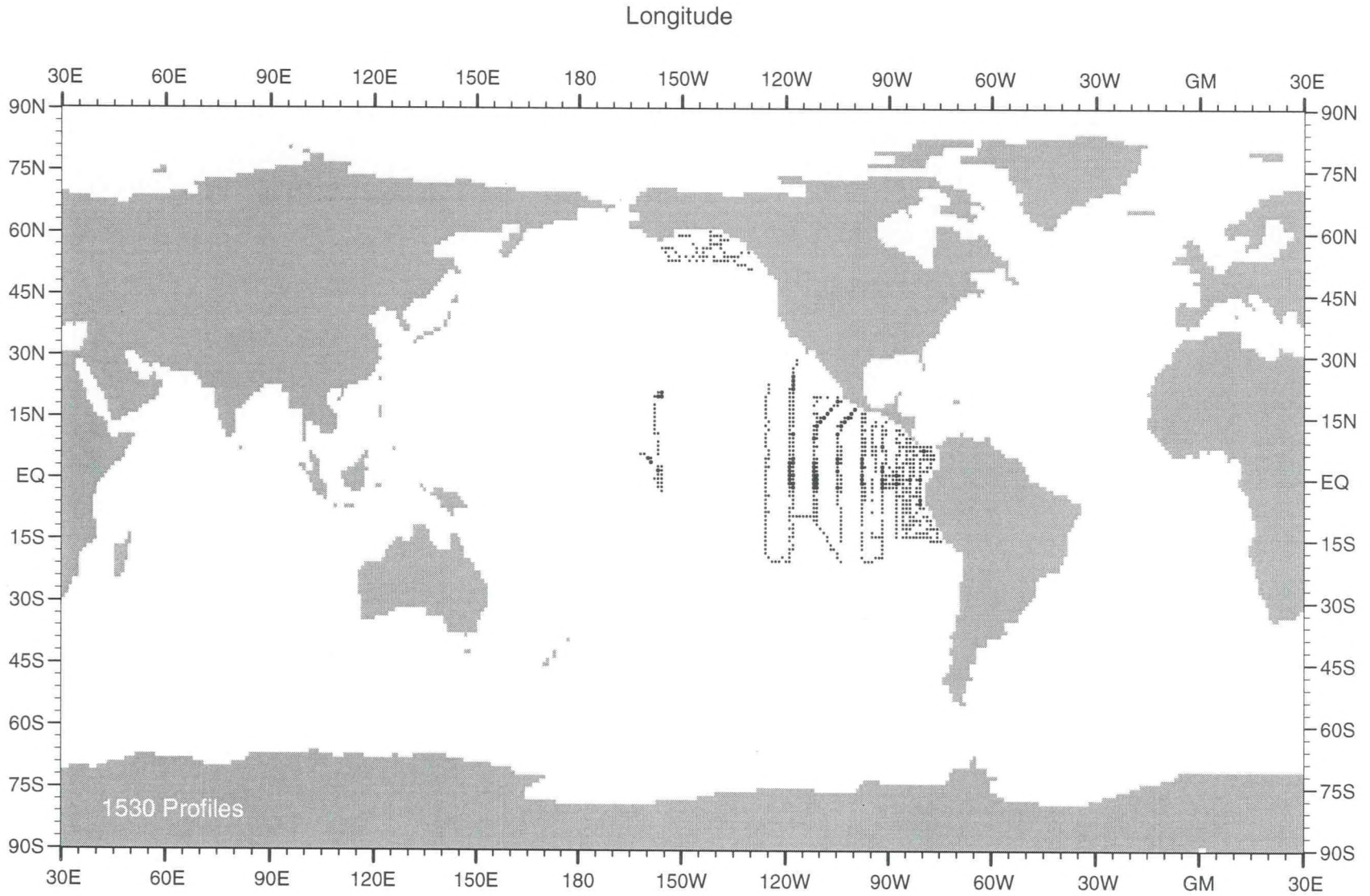


Fig. A1 WOD98 CTD station distribution for 1967

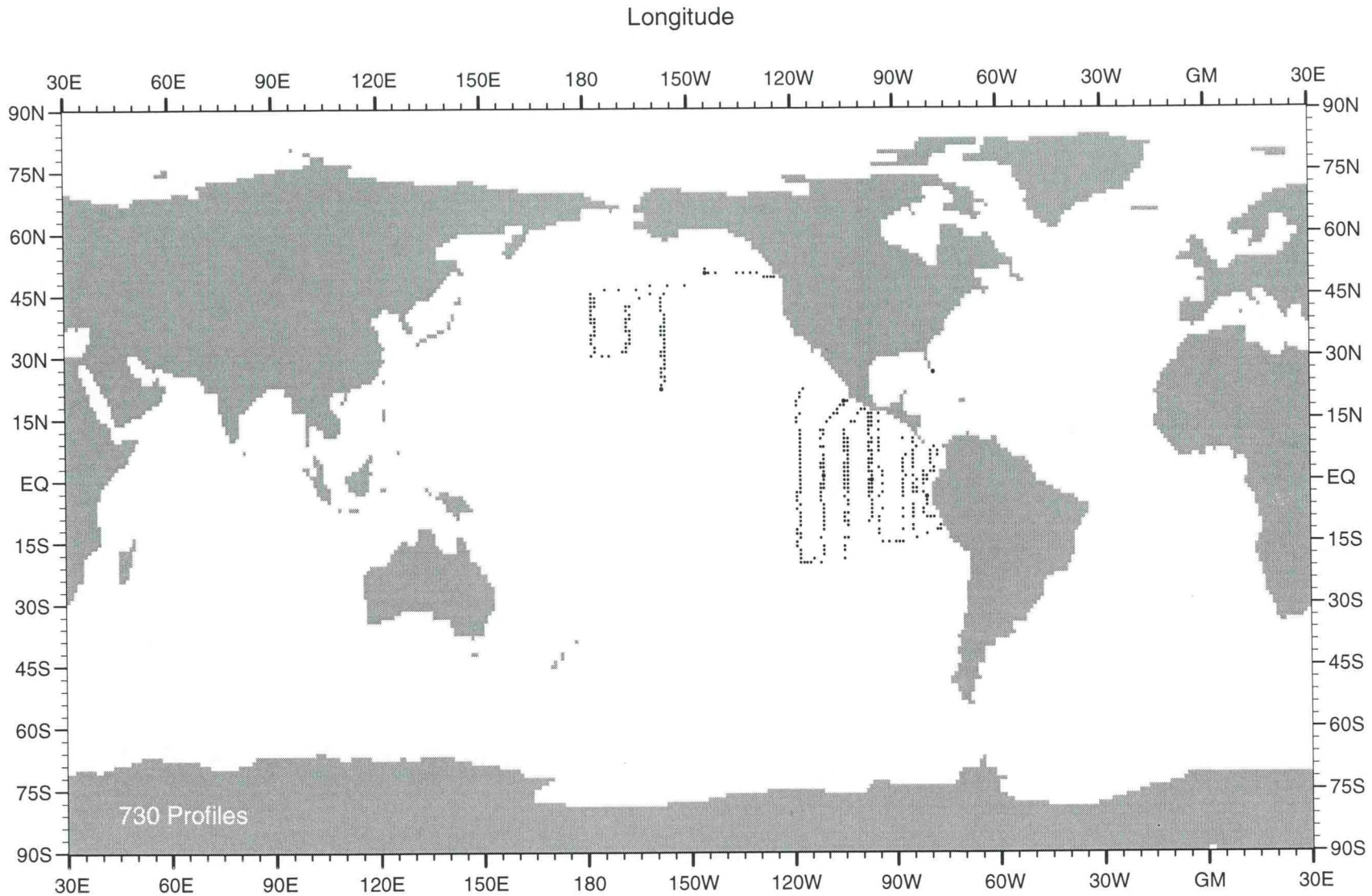


Fig. A2 WOD98 CTD station distribution for 1968

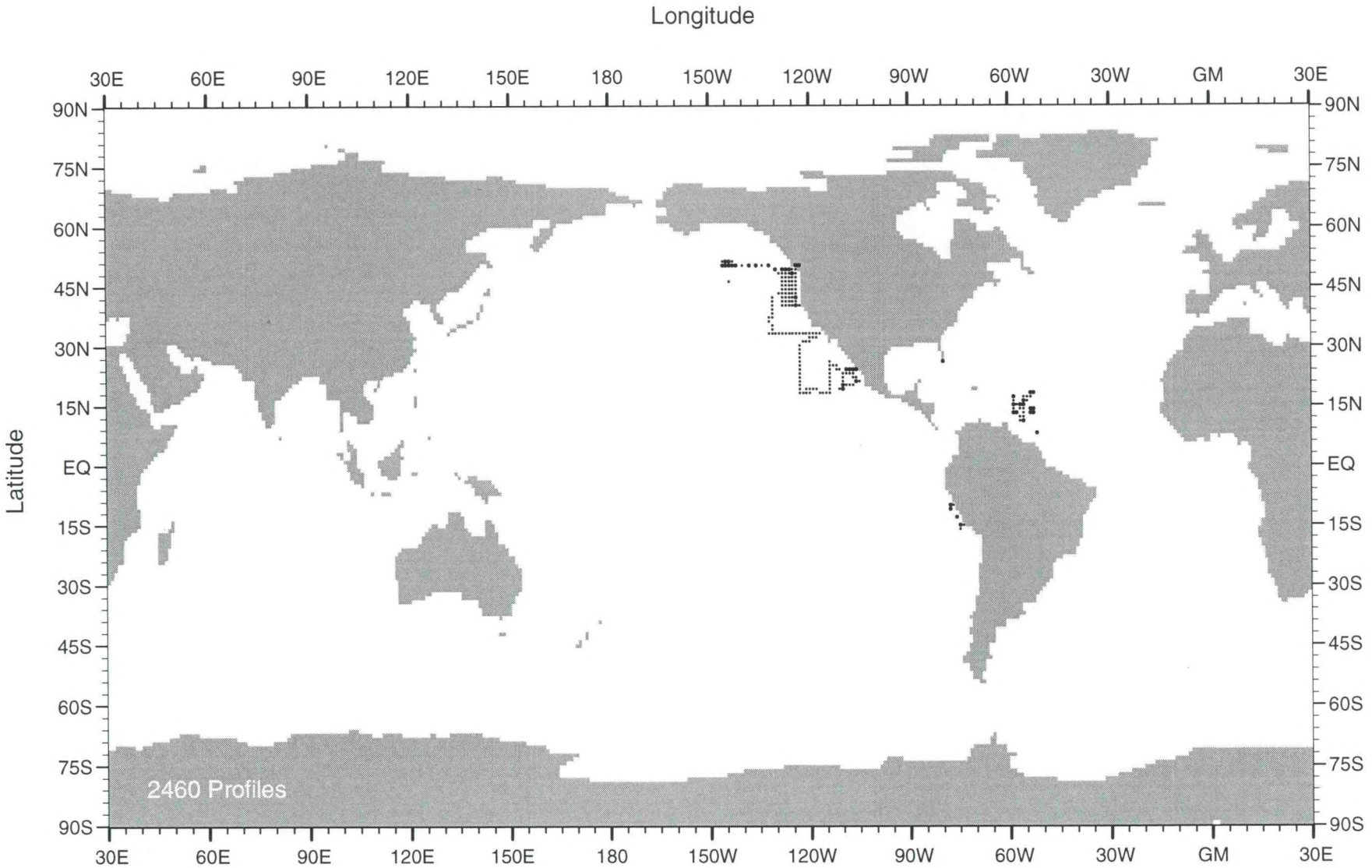


Fig. A3 WOD98 CTD station distribution for 1969

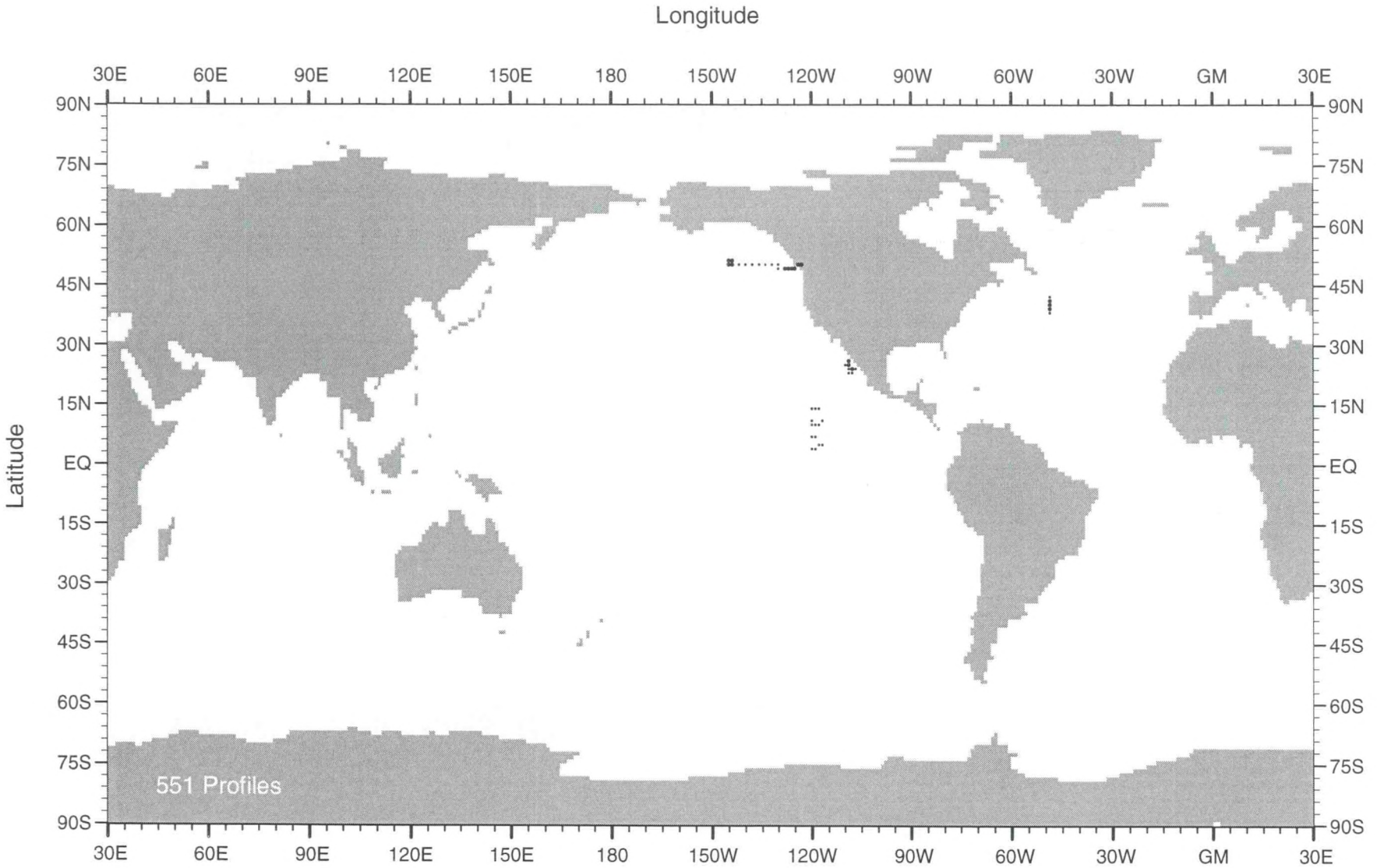


Fig. A4 WOD98 CTD station distribution for 1970

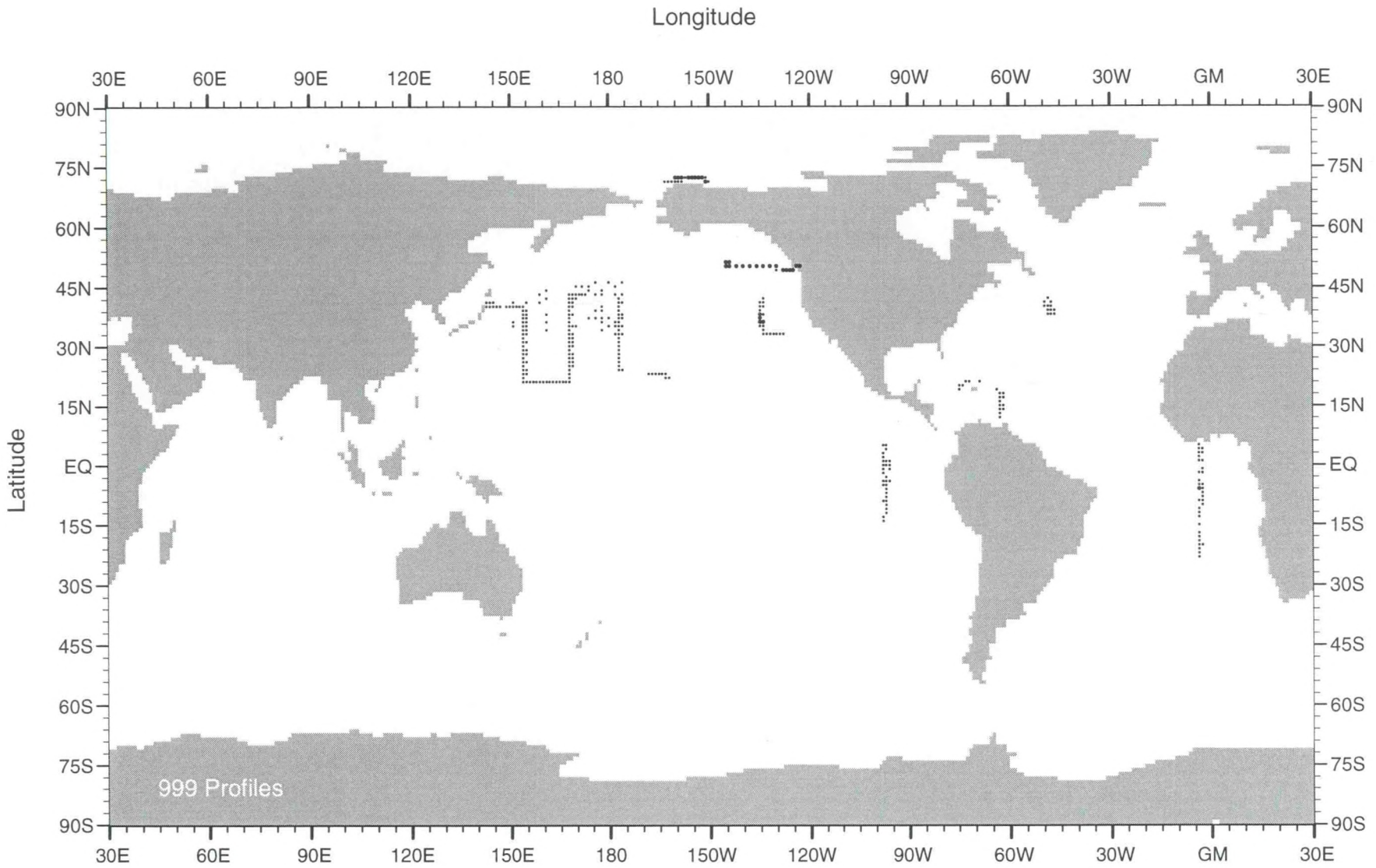


Fig. A5 WOD98 CTD station distribution for 1971

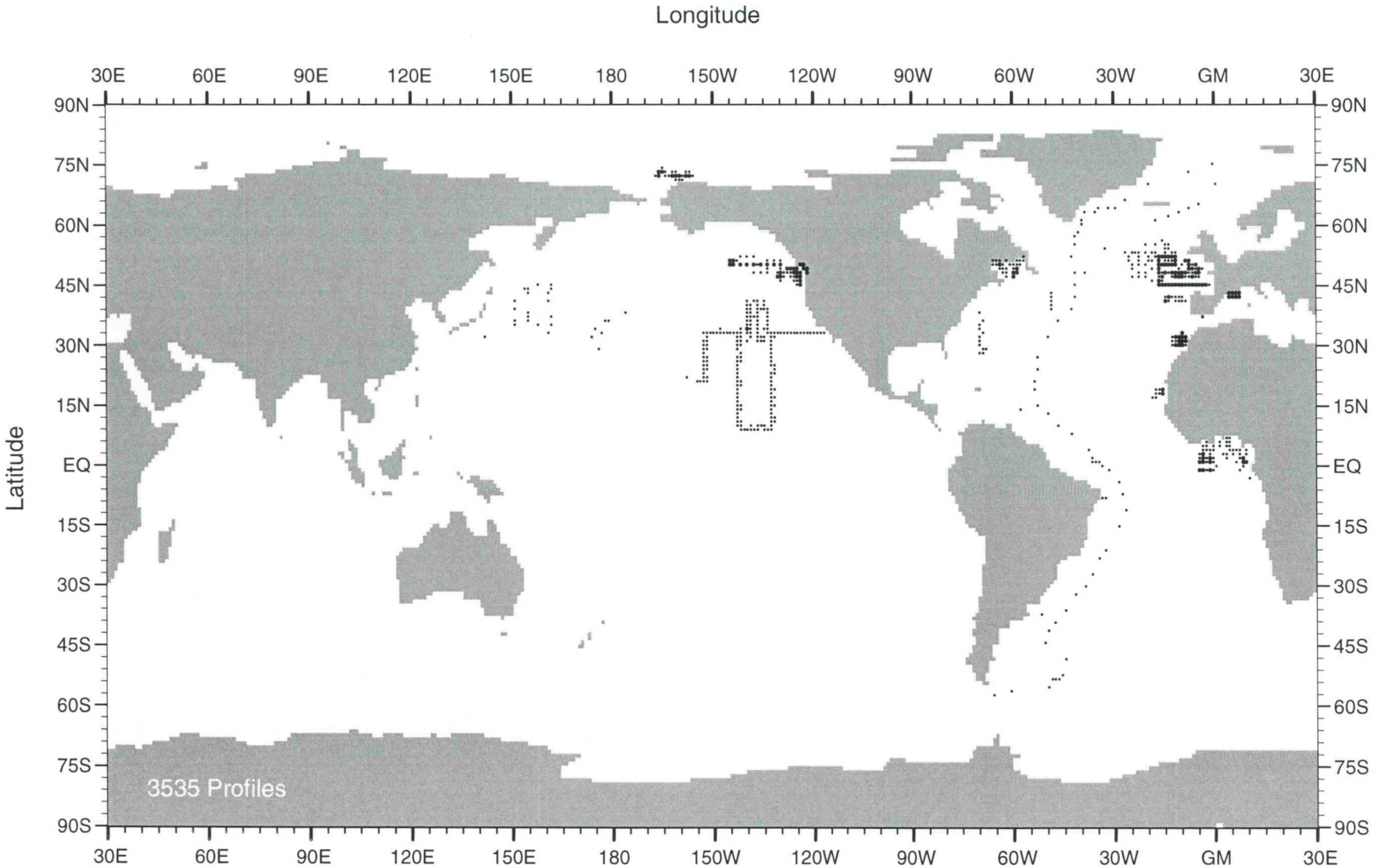


Fig. A6 WOD98 CTD station distribution for 1972

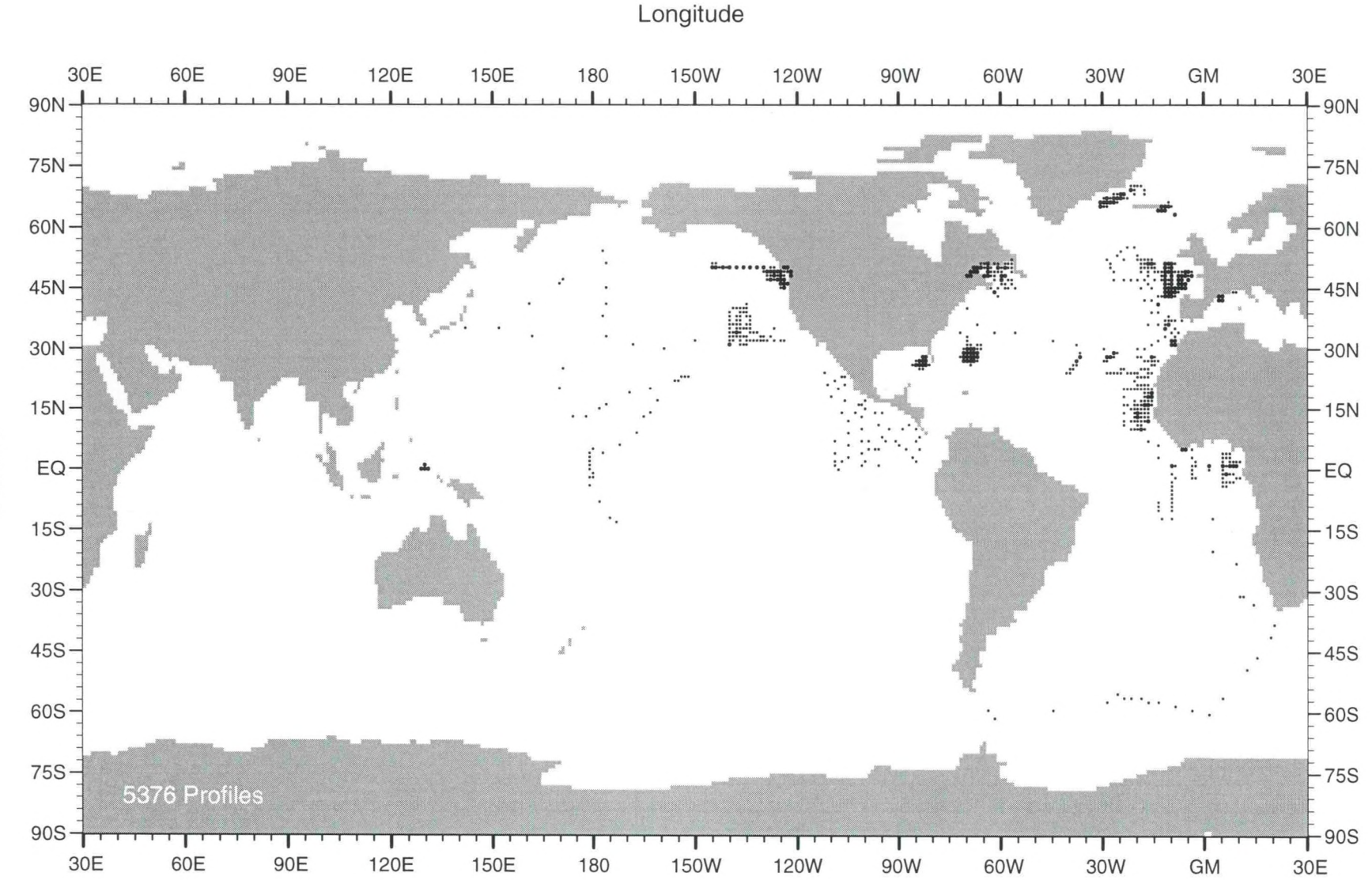


Fig. A7 WOD98 CTD station distribution for 1973

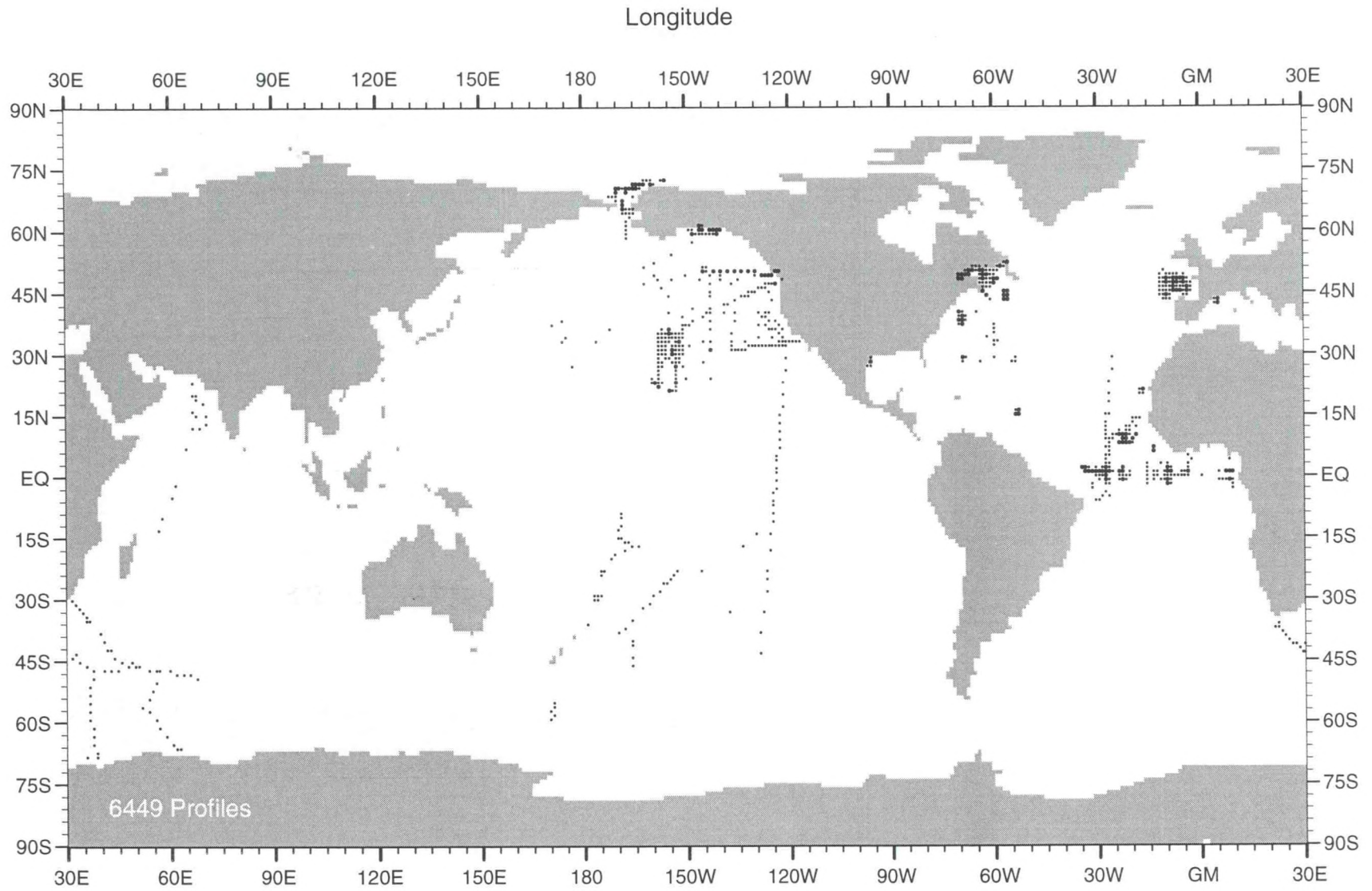


Fig. A8 WOD98 CTD station distribution for 1974

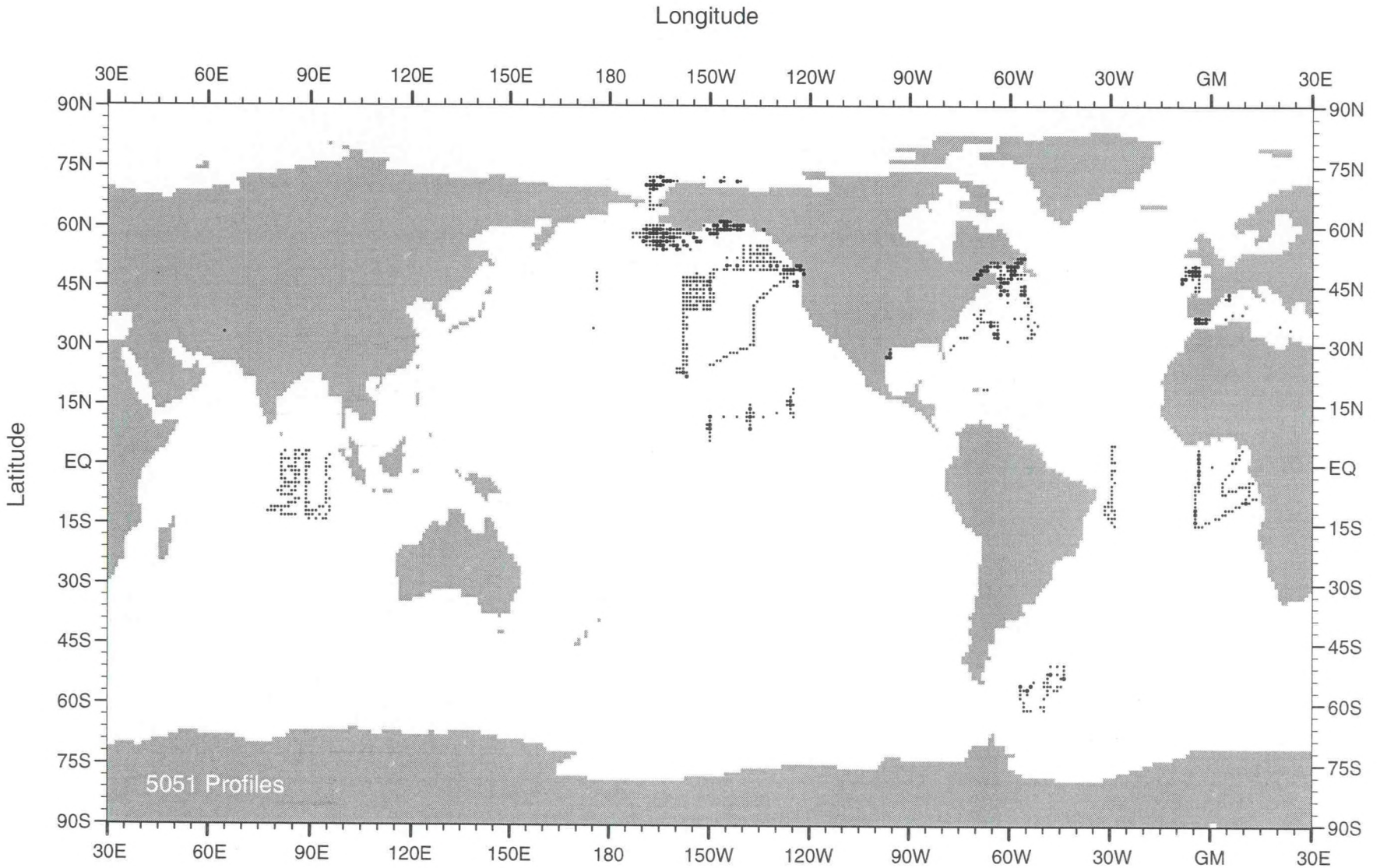


Fig. A9 WOD98 CTD station distribution for 1975

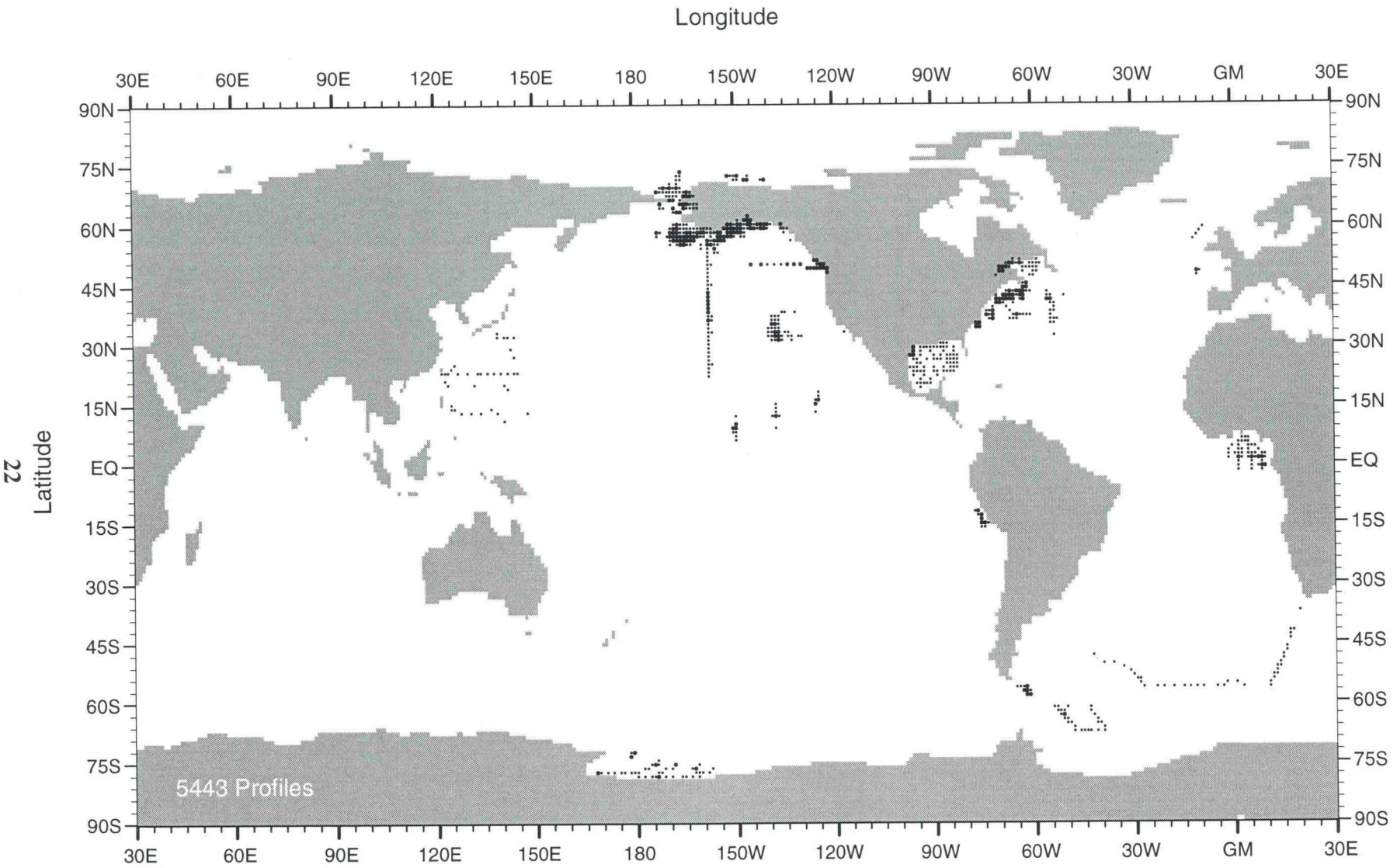


Fig. A10 WOD98 CTD station distribution for 1976

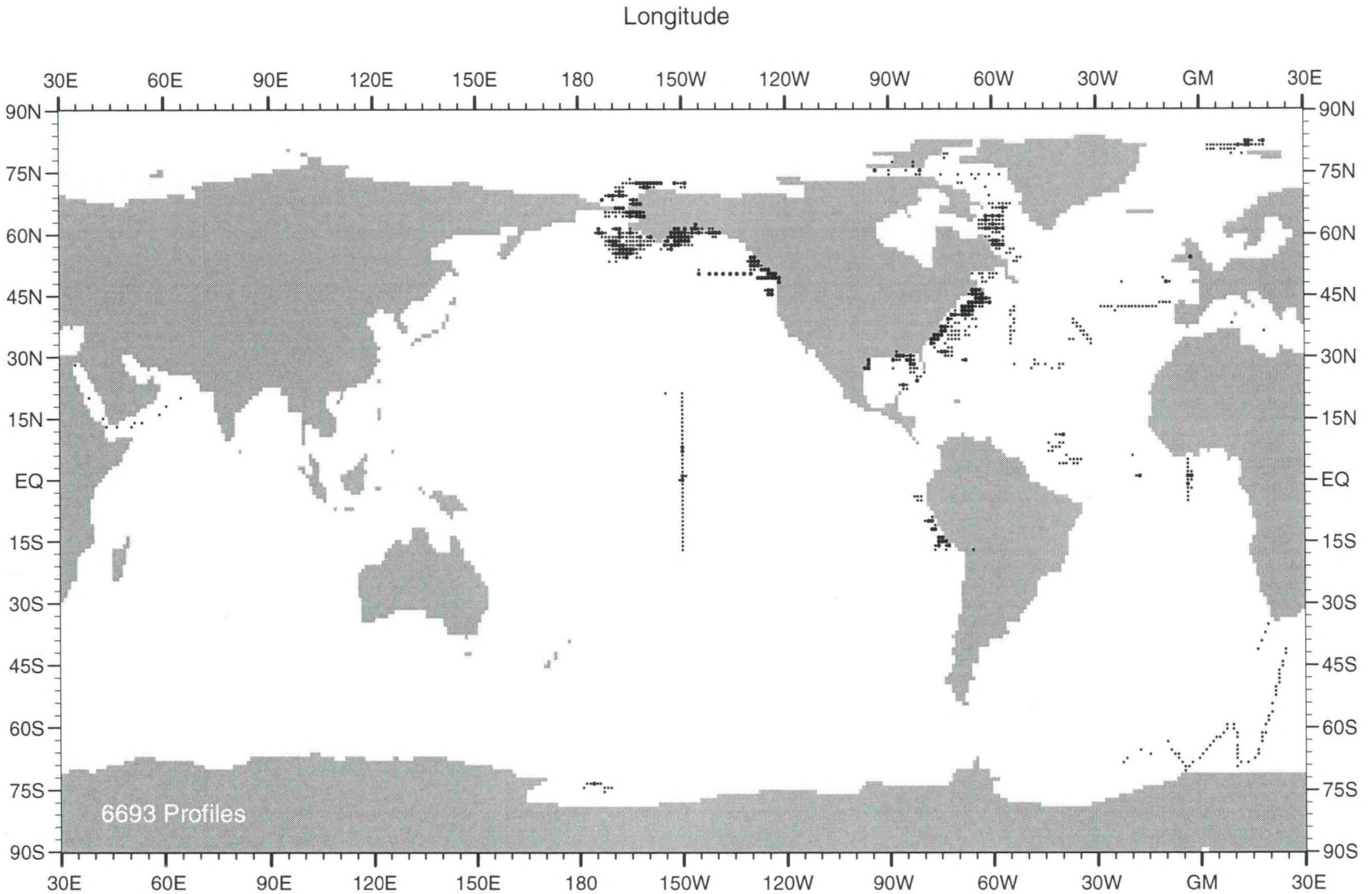


Fig. A11 WOD98 CTD station distribution for 1977

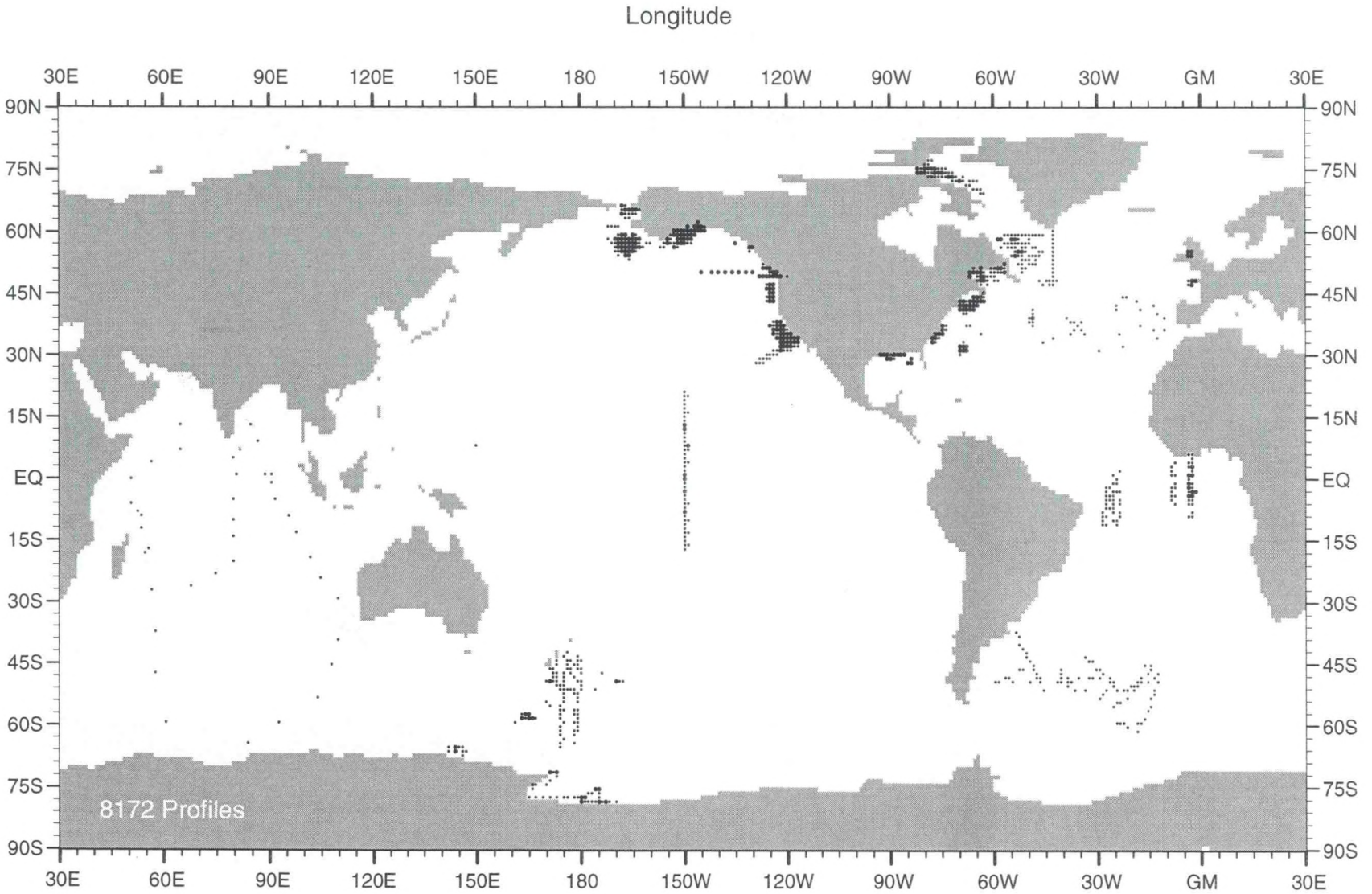


Fig. A12 WOD98 CTD station distribution for 1978

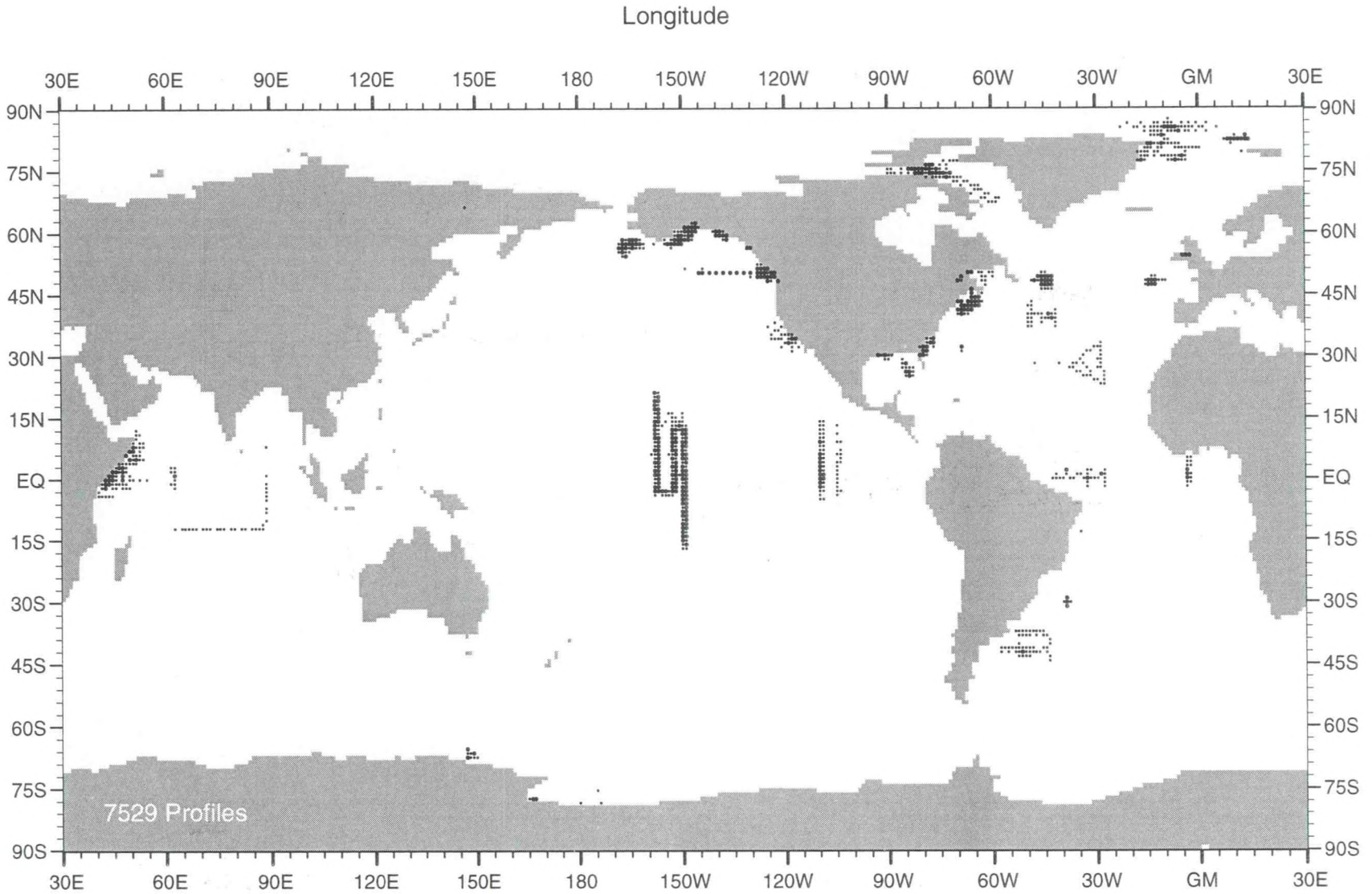


Fig. A13 WOD98 CTD station distribution for 1979

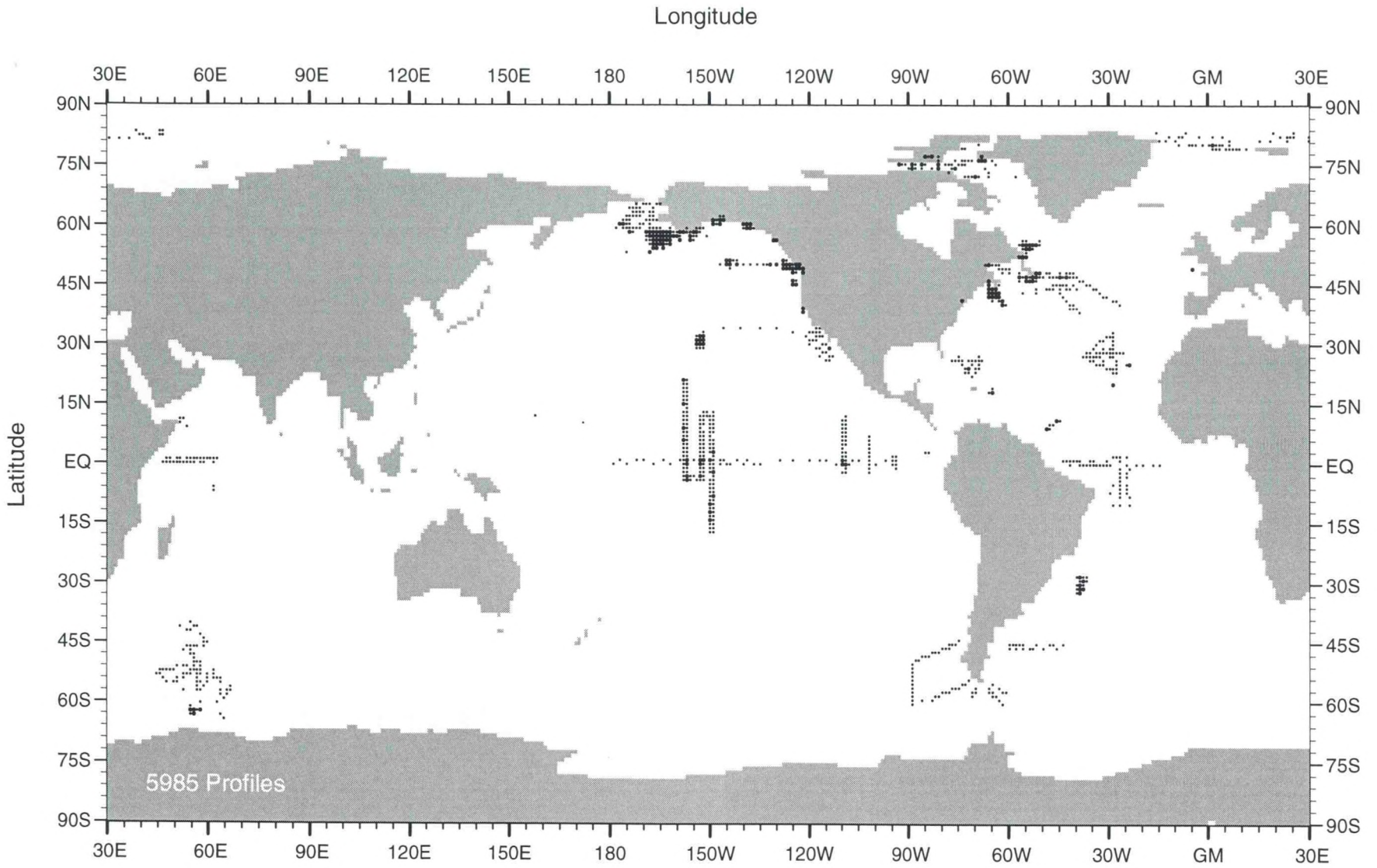


Fig. A14 WOD98 CTD station distribution for 1980

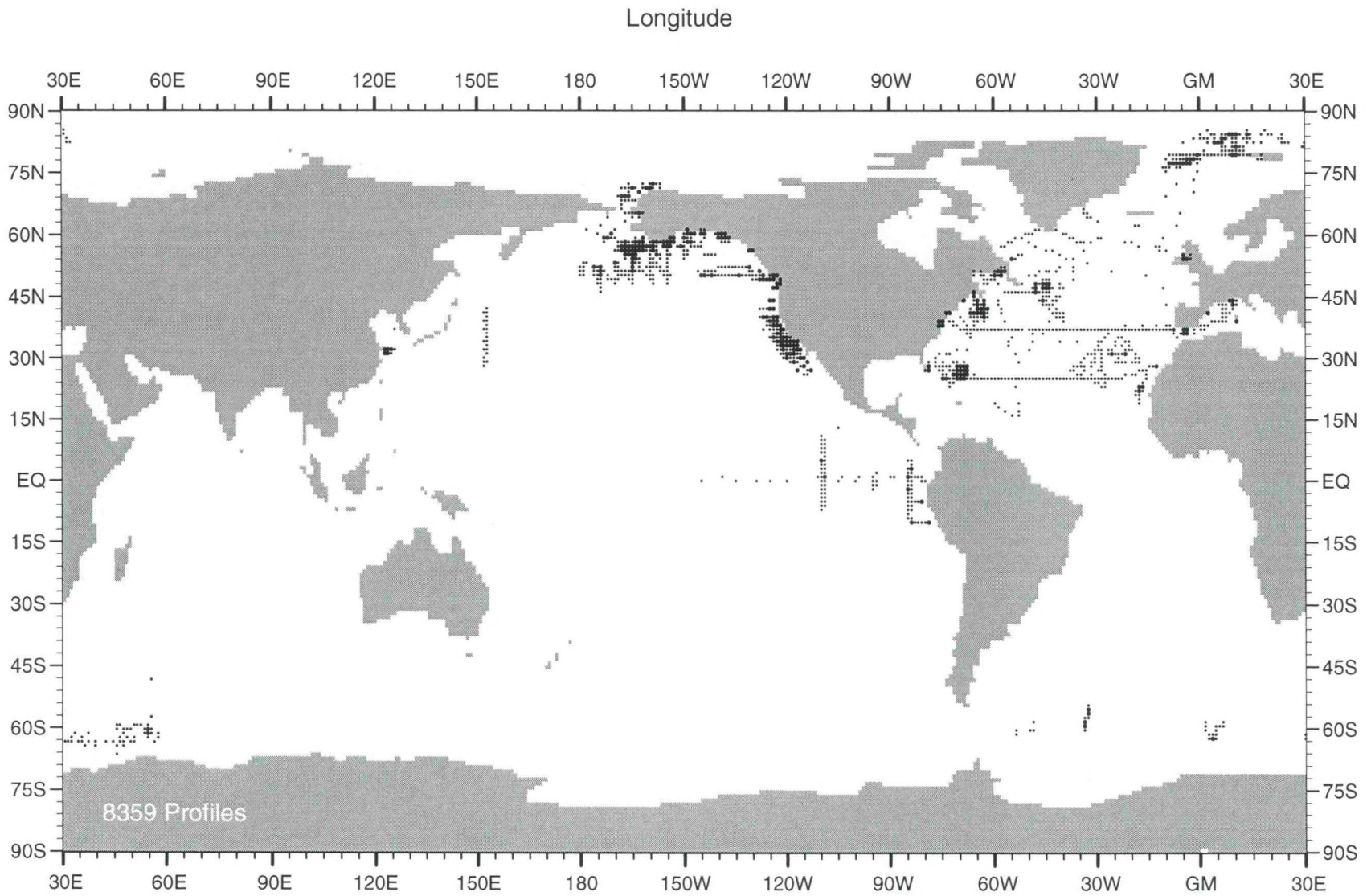


Fig. A15 WOD98 CTD station distribution for 1981

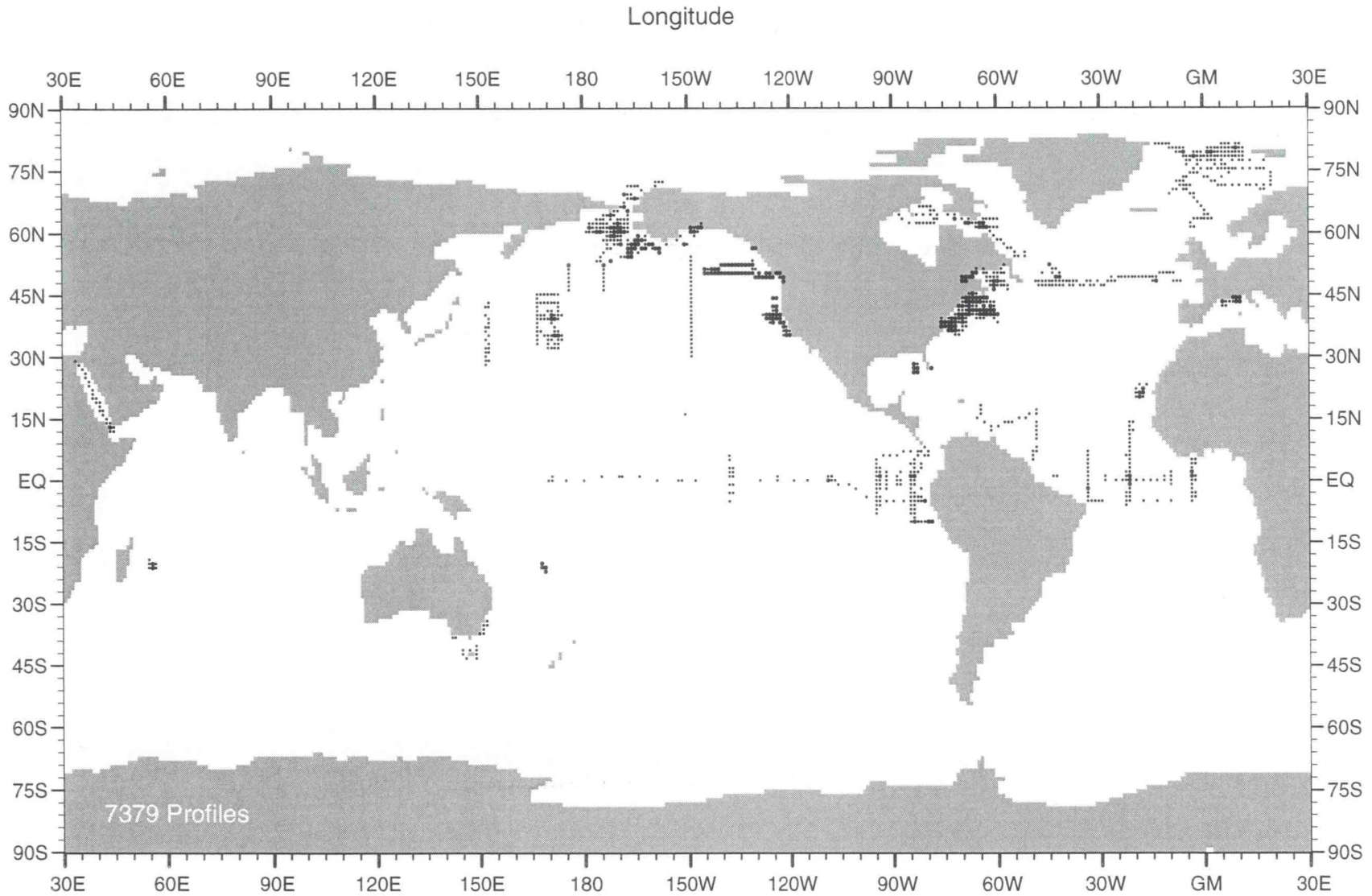


Fig. A16 WOD98 CTD station distribution for 1982

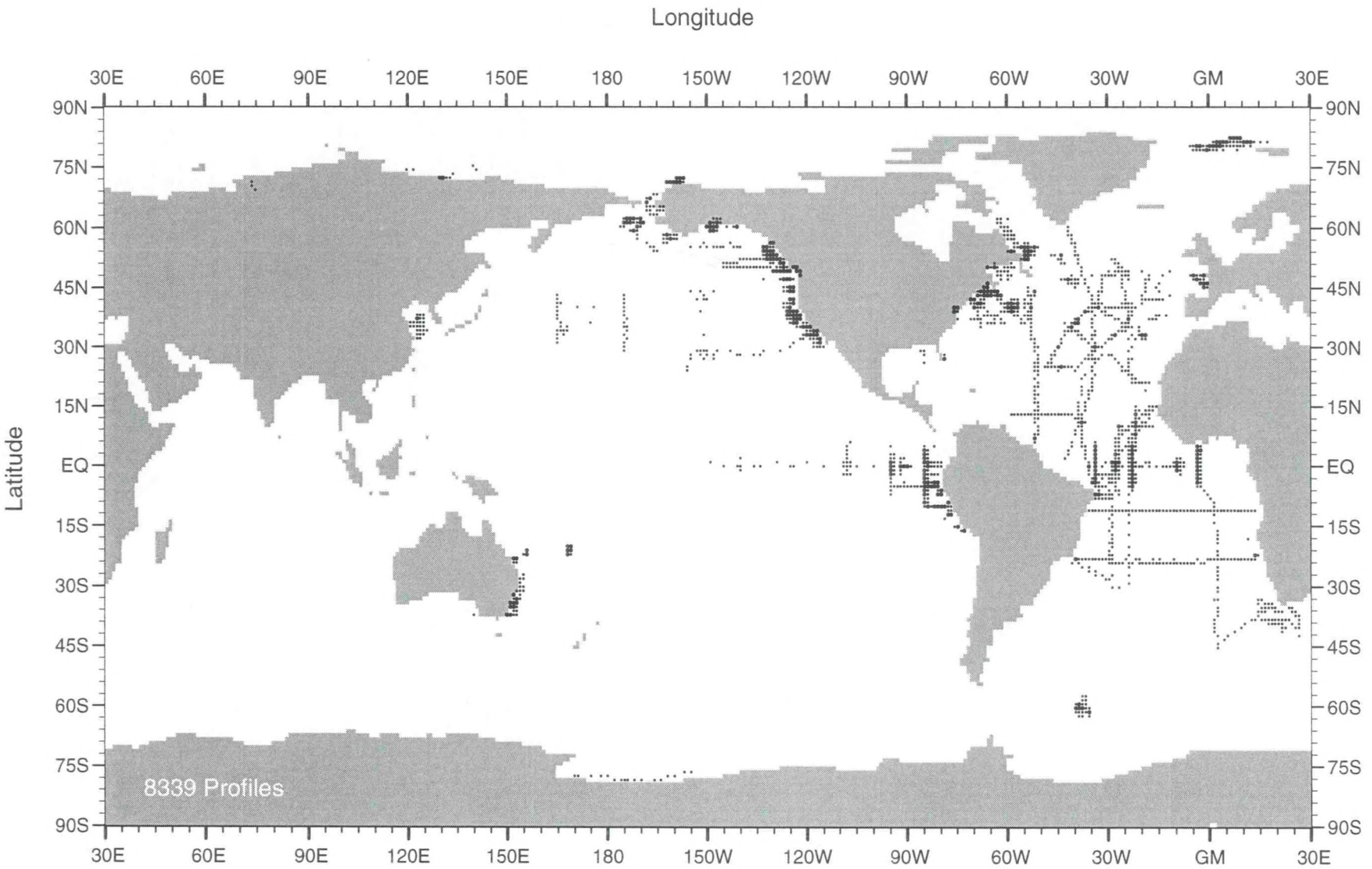


Fig. A17 WOD98 CTD station distribution for 1983

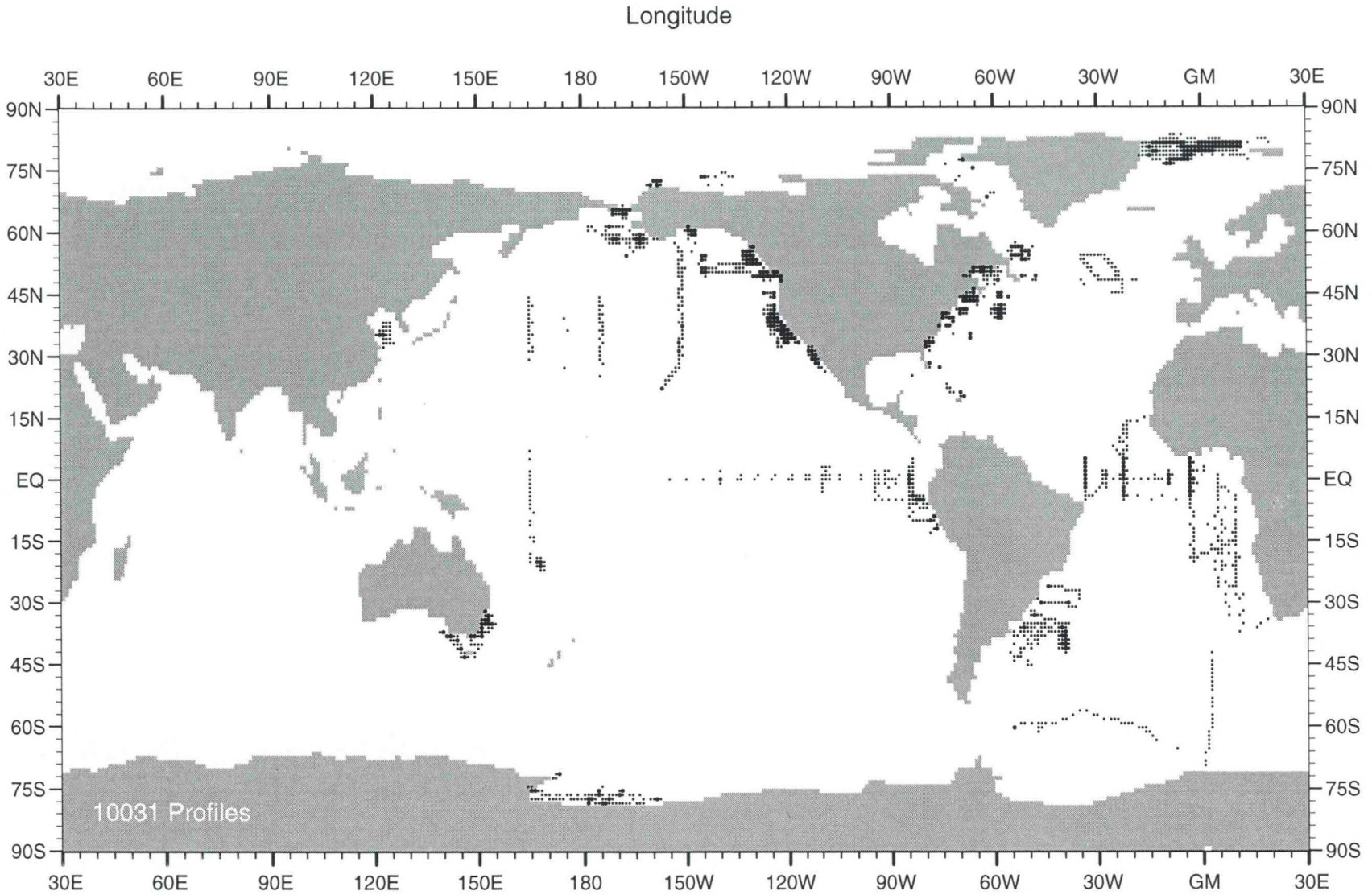


Fig. A18 WOD98 CTD station distribution for 1984

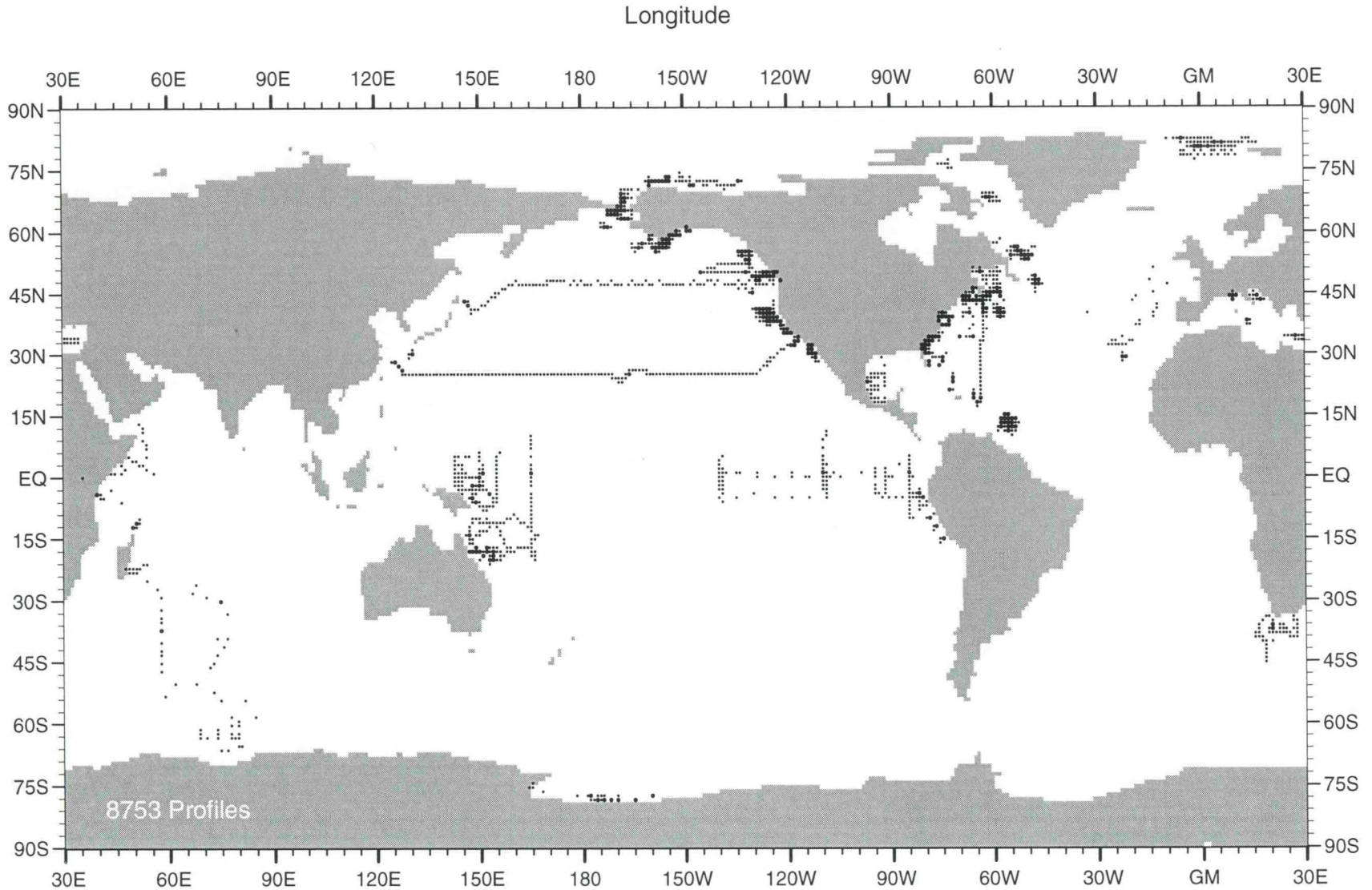
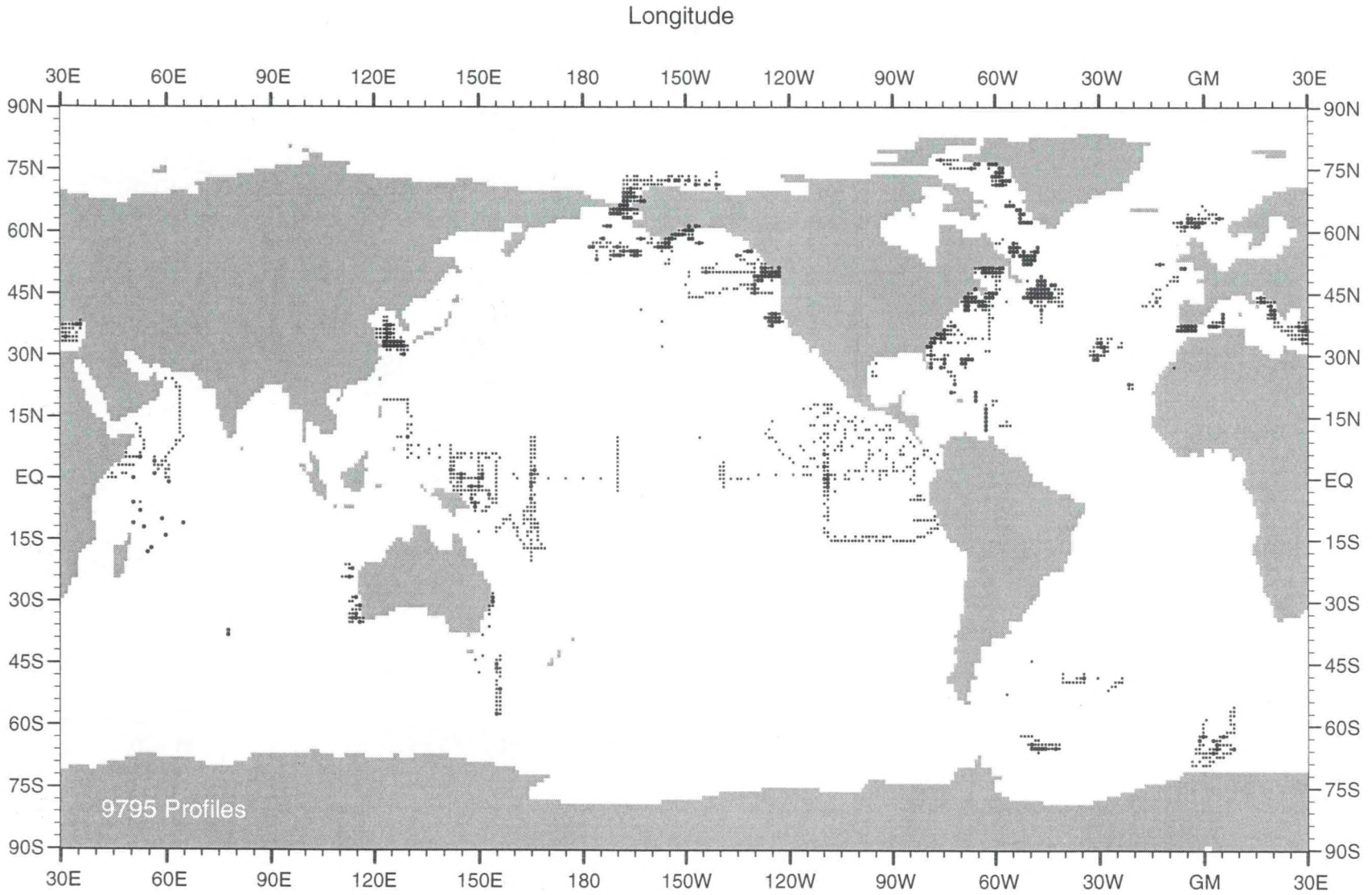


Fig. A19 WOD98 CTD station distribution for 1985



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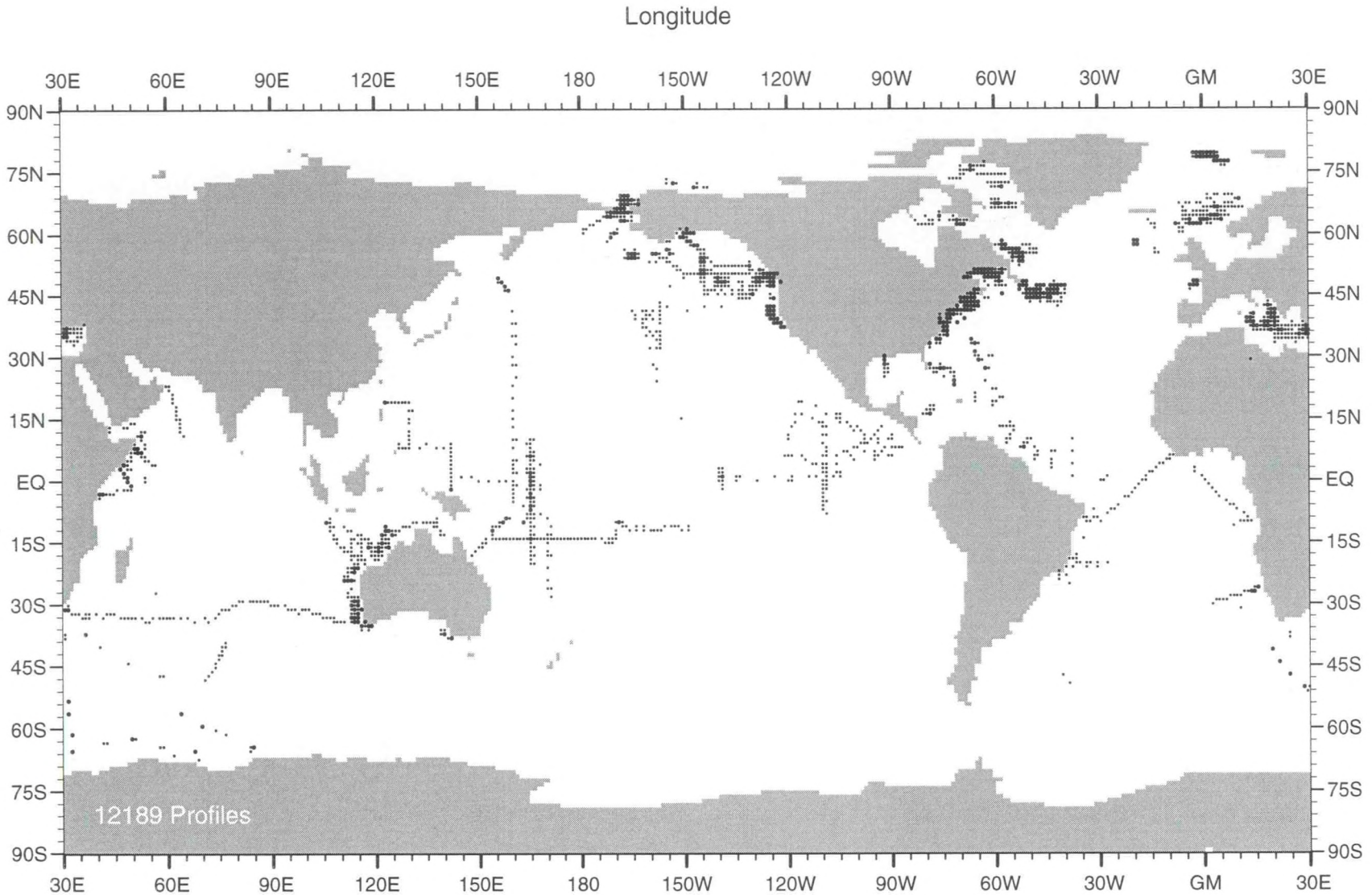

Fig. A21 WOD98 CTD station distribution for 1987

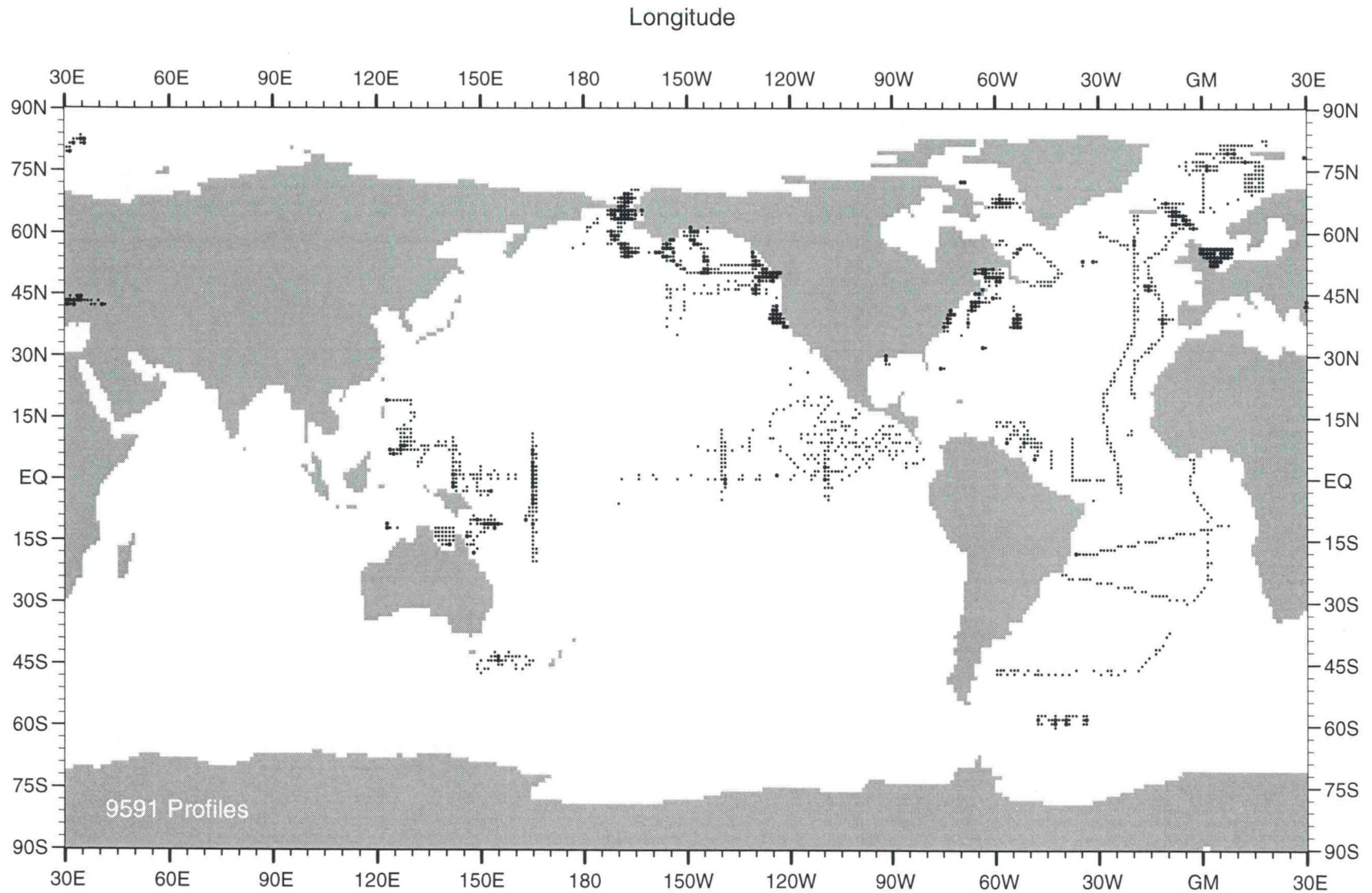

Fig. A22 WOD98 CTD station distribution for 1988

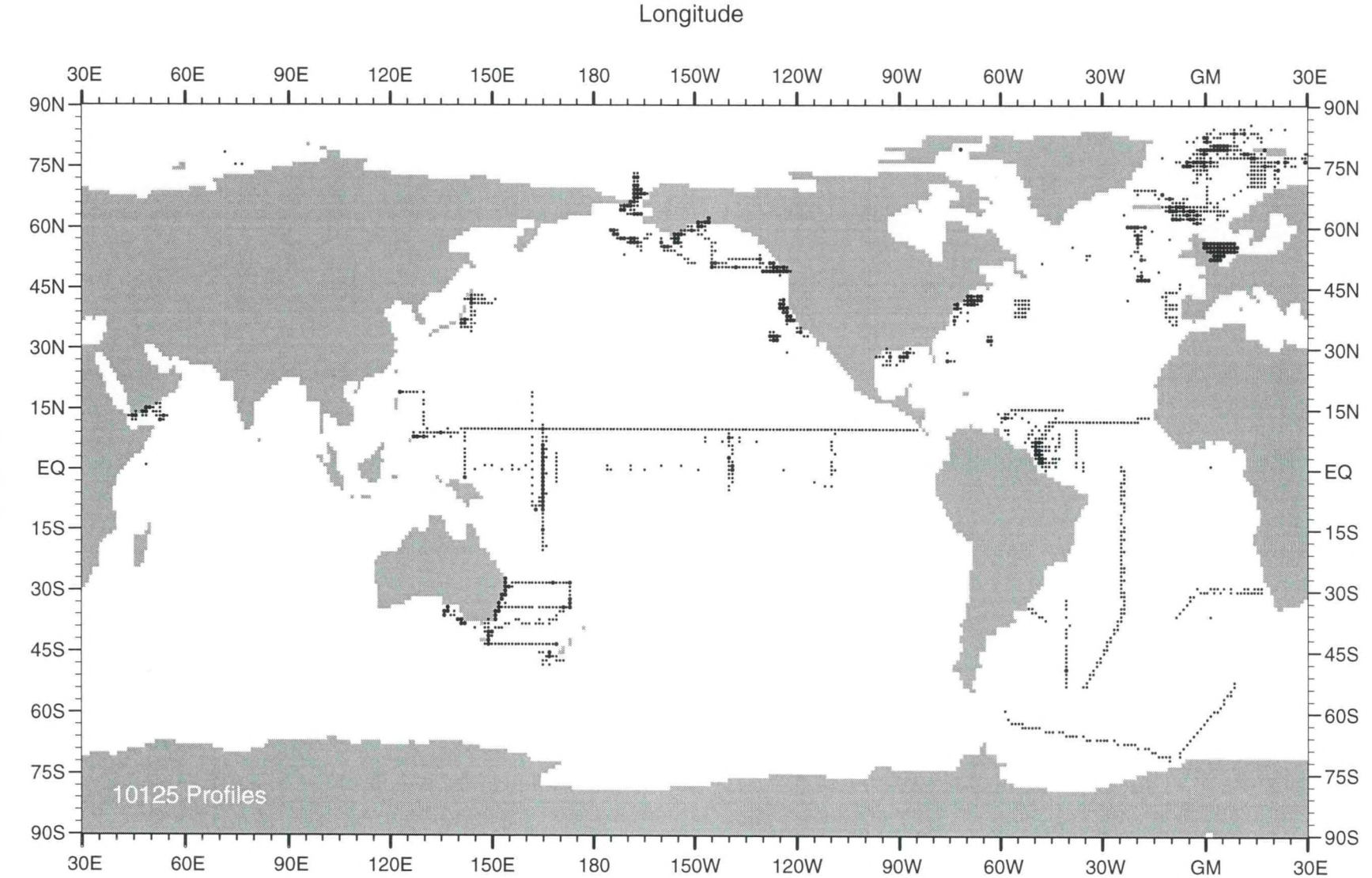

Fig. A23 WOD98 CTD station distribution for 1989

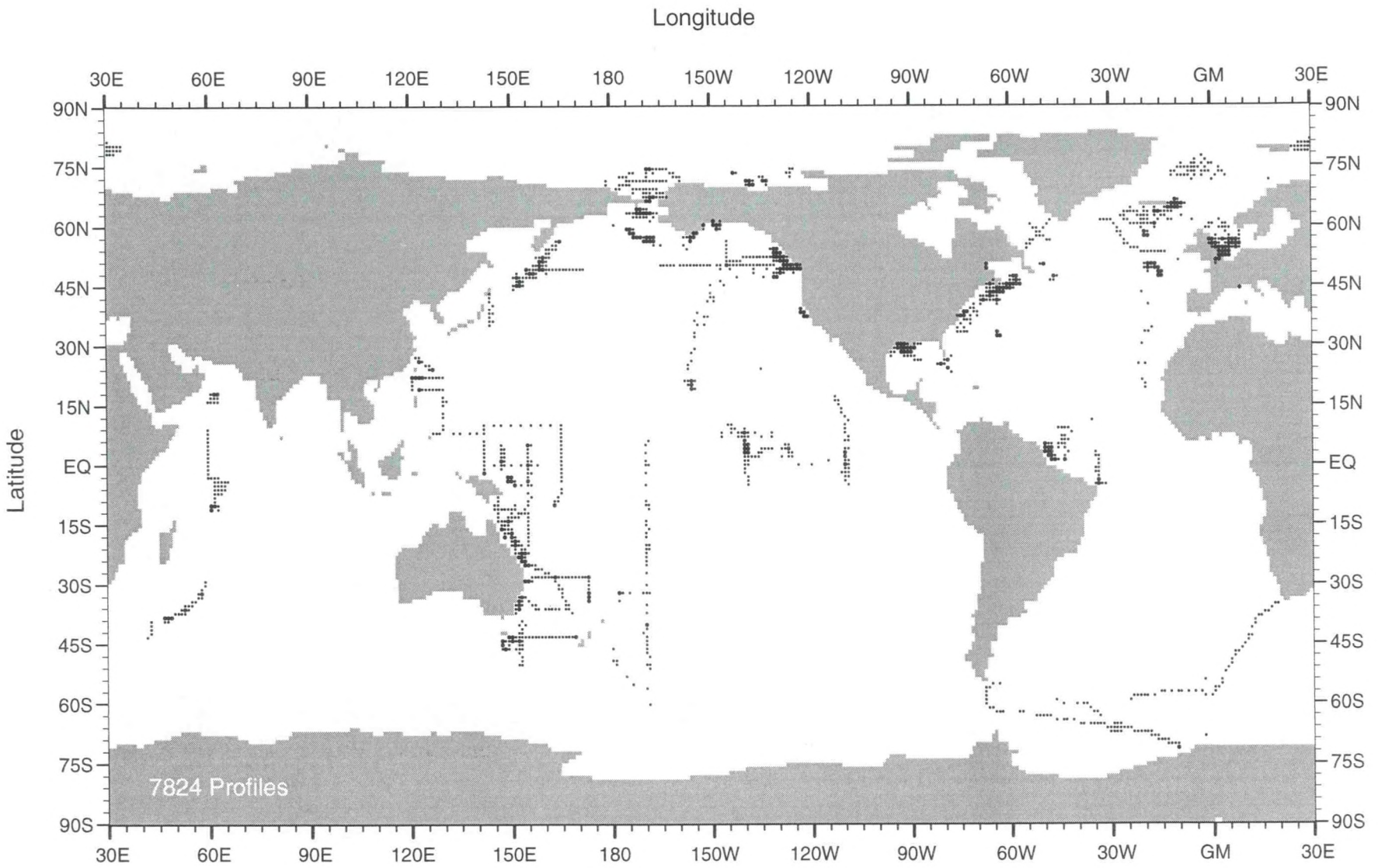

Fig. A24 WOD98 CTD station distribution for 1990

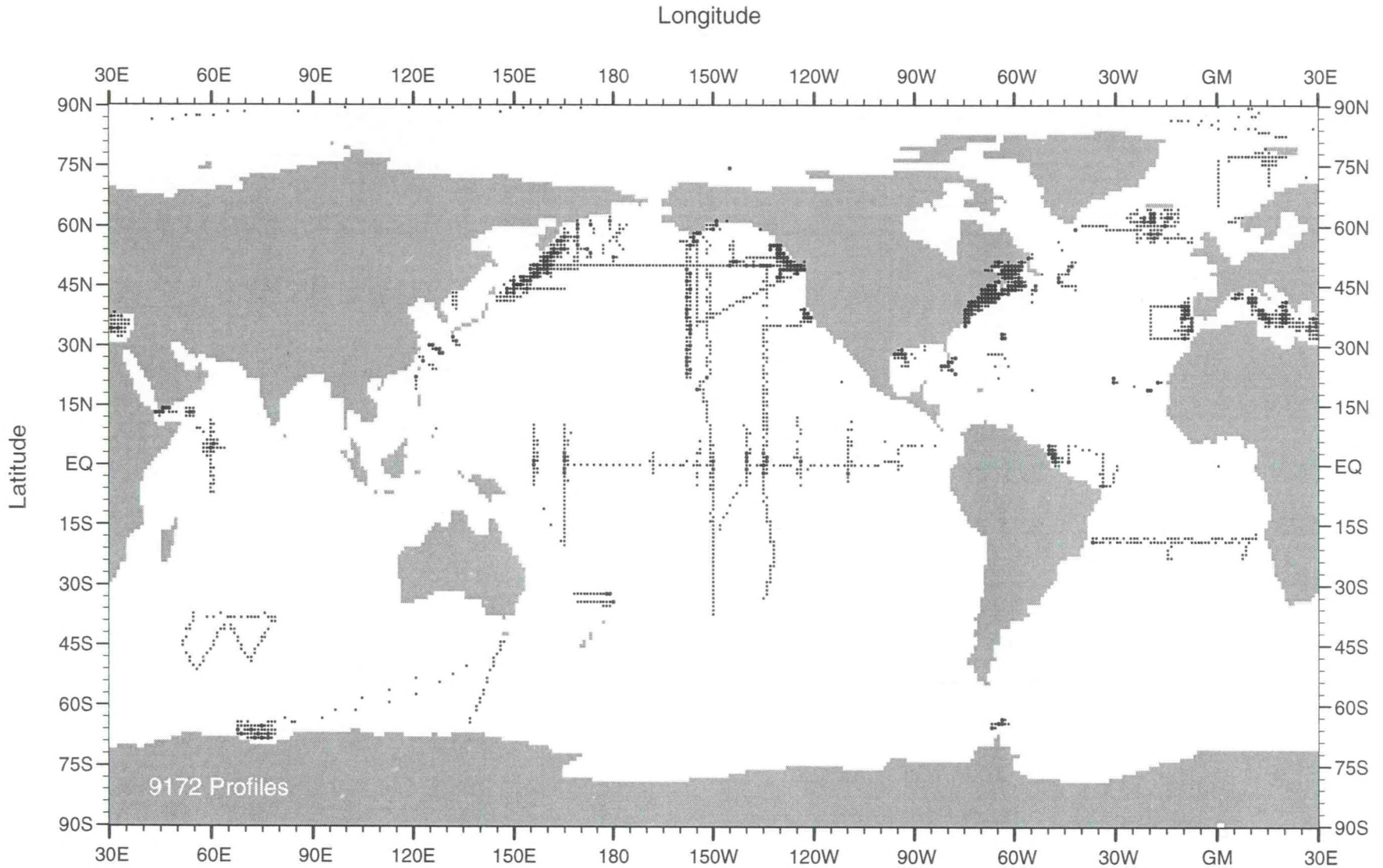

Fig. A25 WOD98 CTD station distribution for 1991

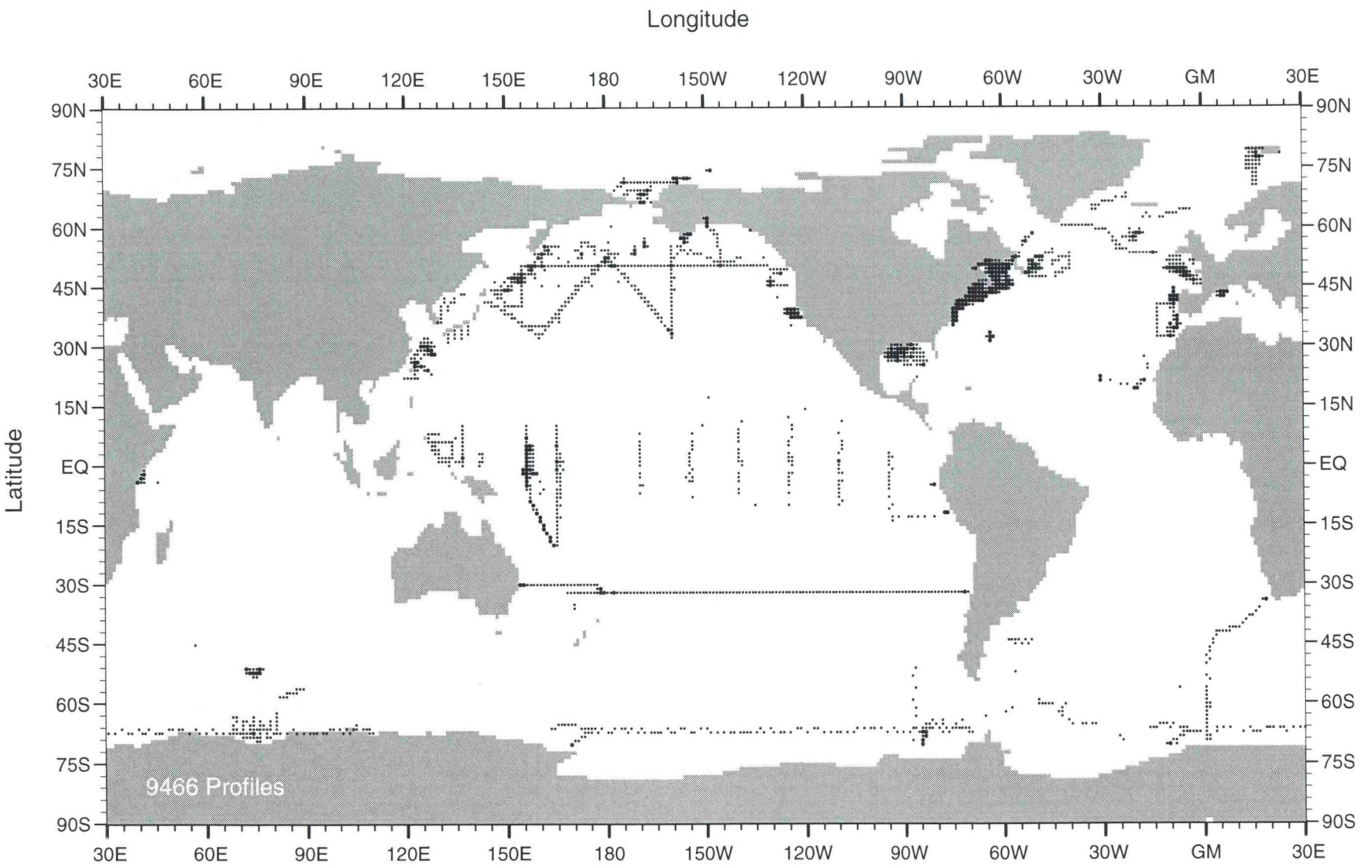

Fig. A26 WOD98 CTD station distribution for 1992

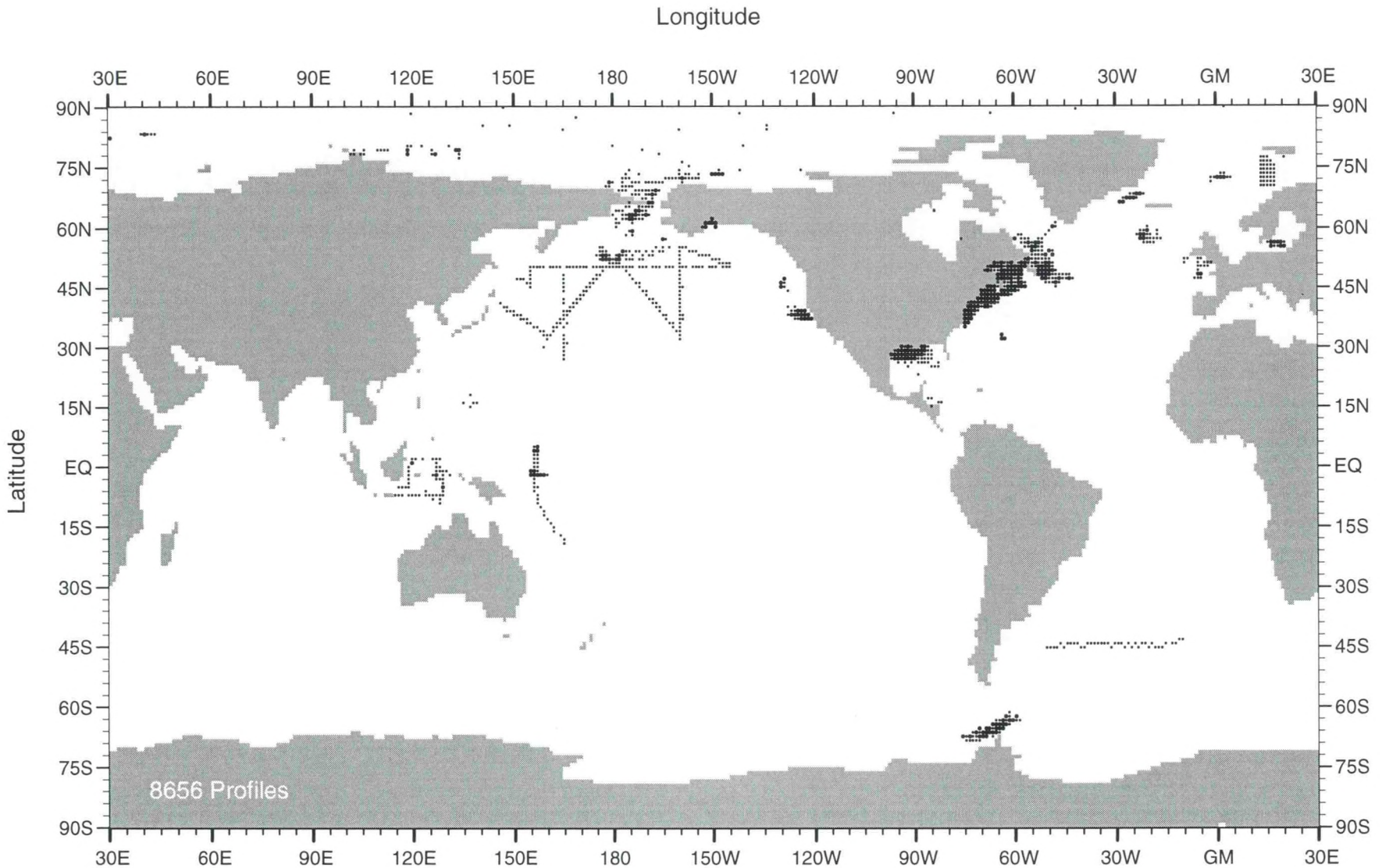

Fig. A27 WOD98 CTD station distribution for 1993

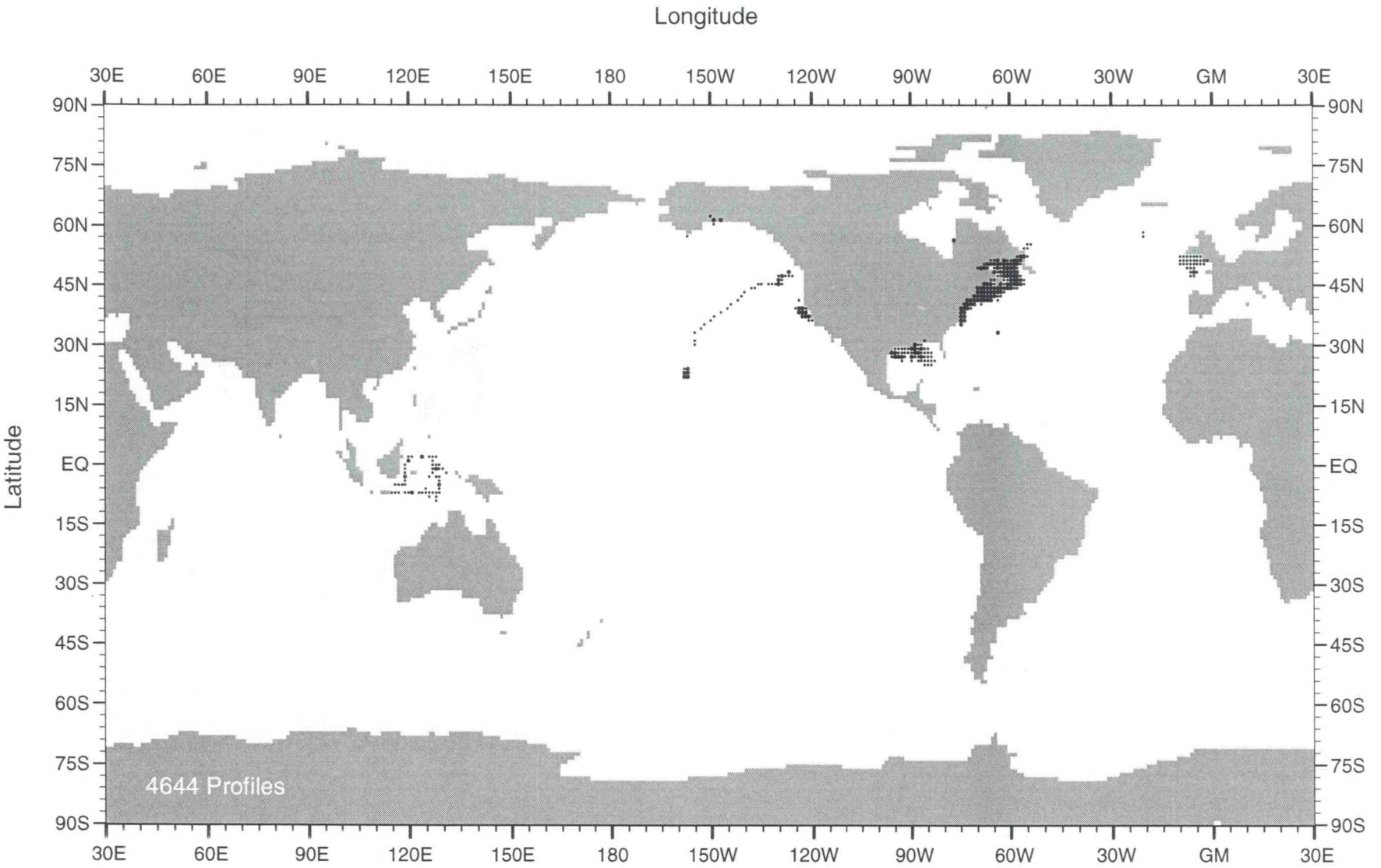

Fig. A28 WOD98 CTD station distribution for 1994

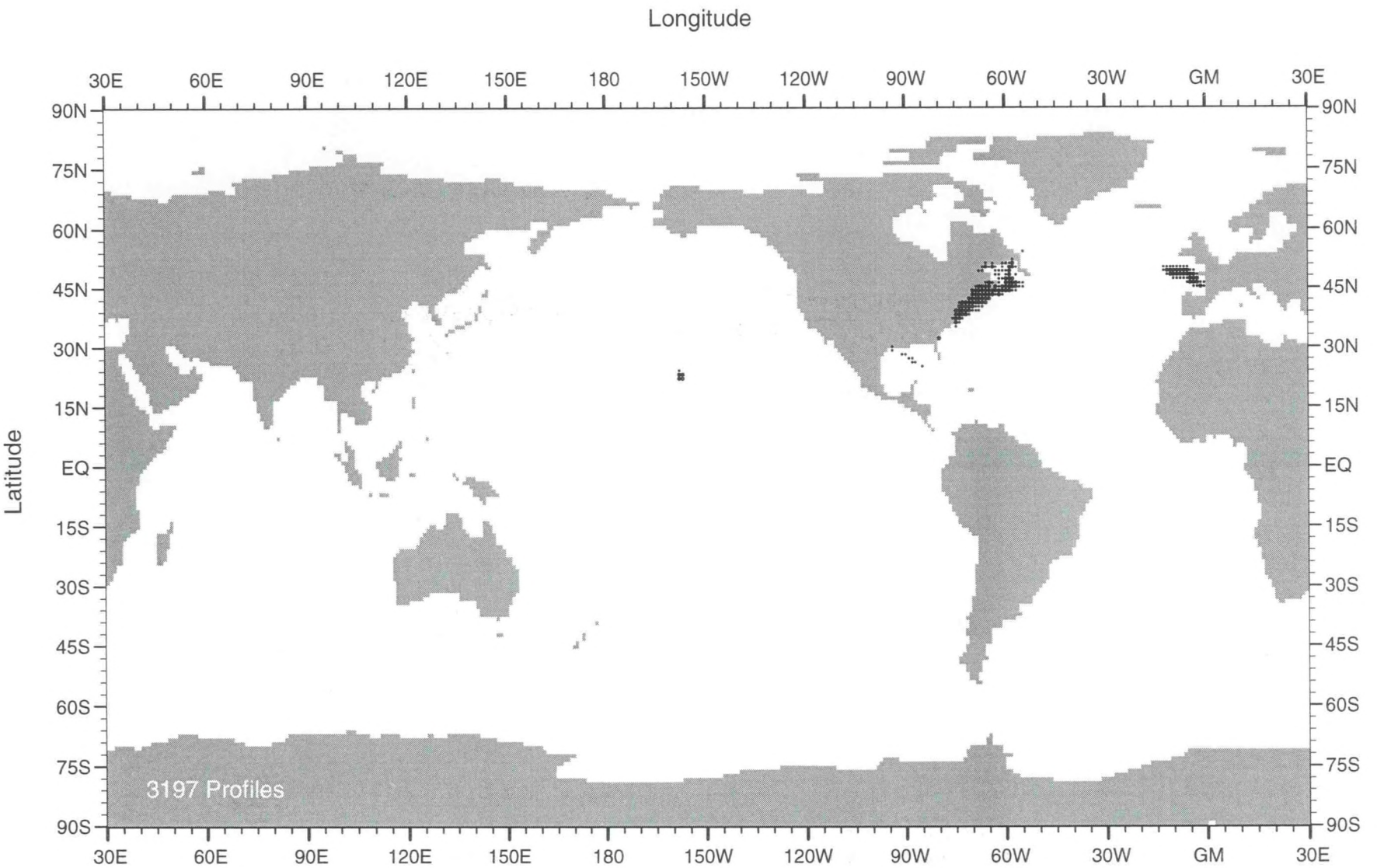

Fig. A29 WOD98 CTD station distribution for 1995

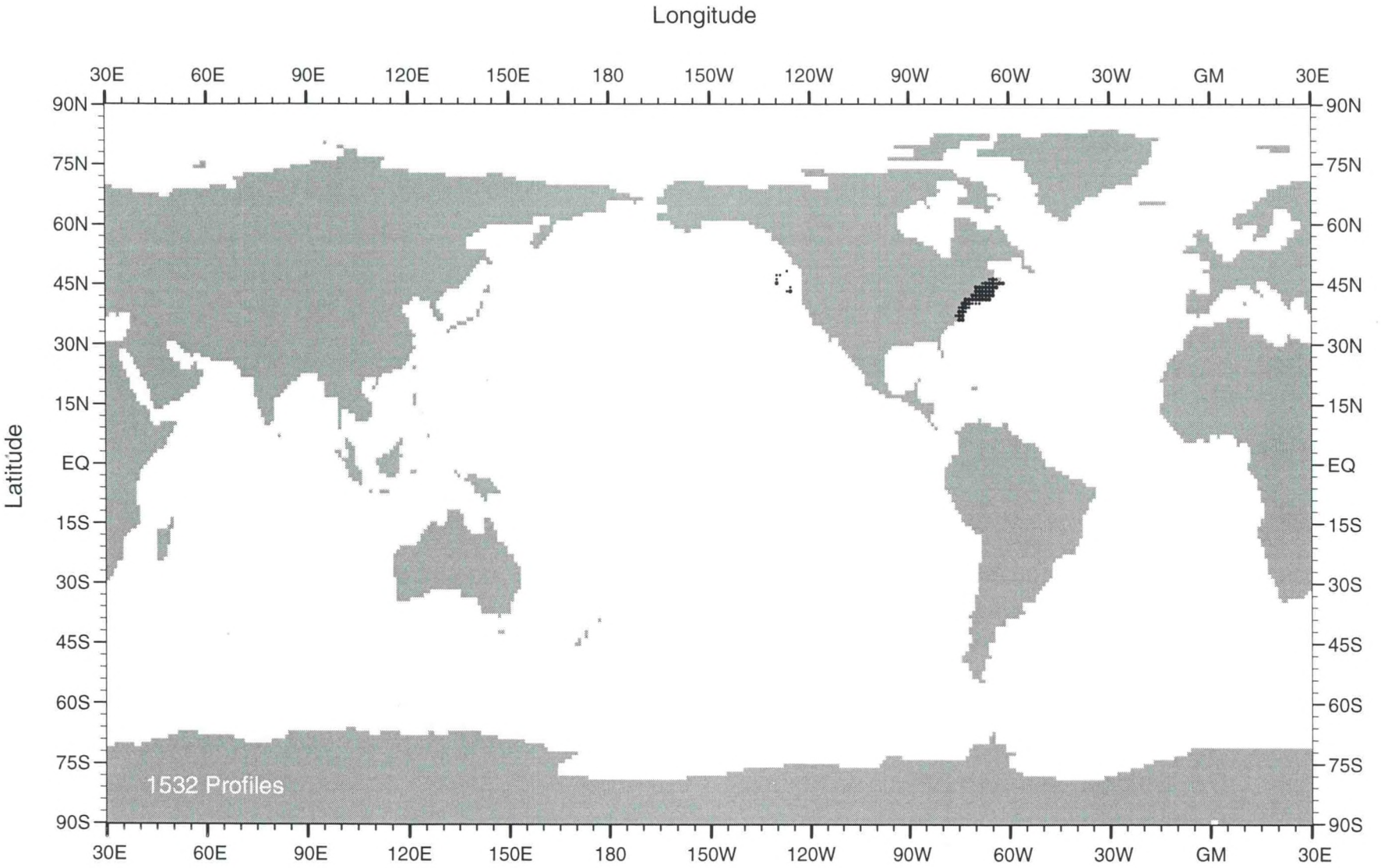

Fig. A30 WOD98 CTD station distribution for 1996

5. APPENDIX B: SEASONAL DISTRIBUTIONS FOR INDIVIDUAL YEARS OF ALL CTD STATIONS IN WOD98

This appendix contains seasonal distributions for individual years of all CTD stations contained in WOD98.

For all figures in Appendix B, a small dot indicates a one-degree square containing from one to four stations and a large dot indicates five or more stations.

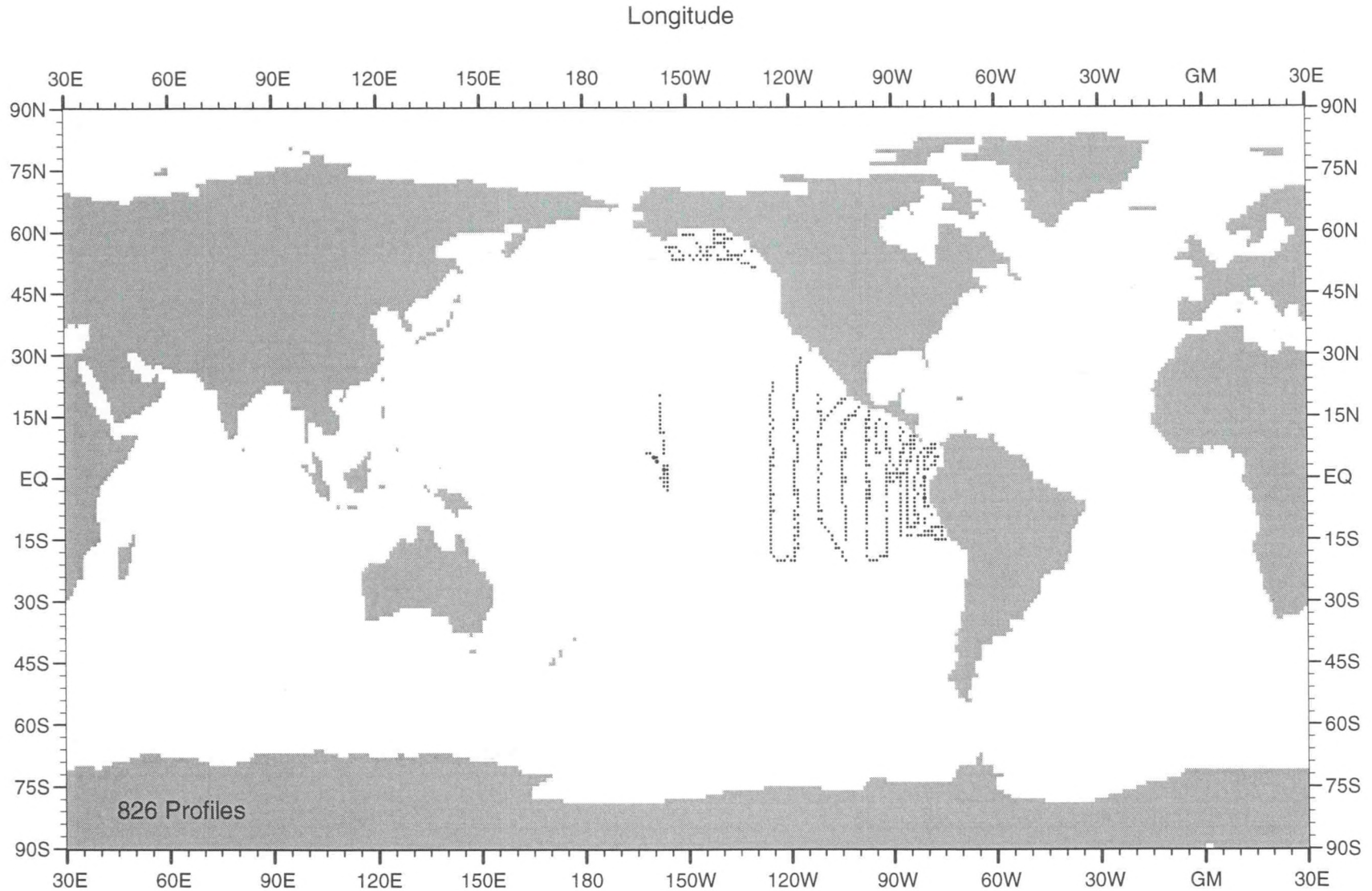

Fig. B1 WOD98 CTD station distribution for January-March for 1967

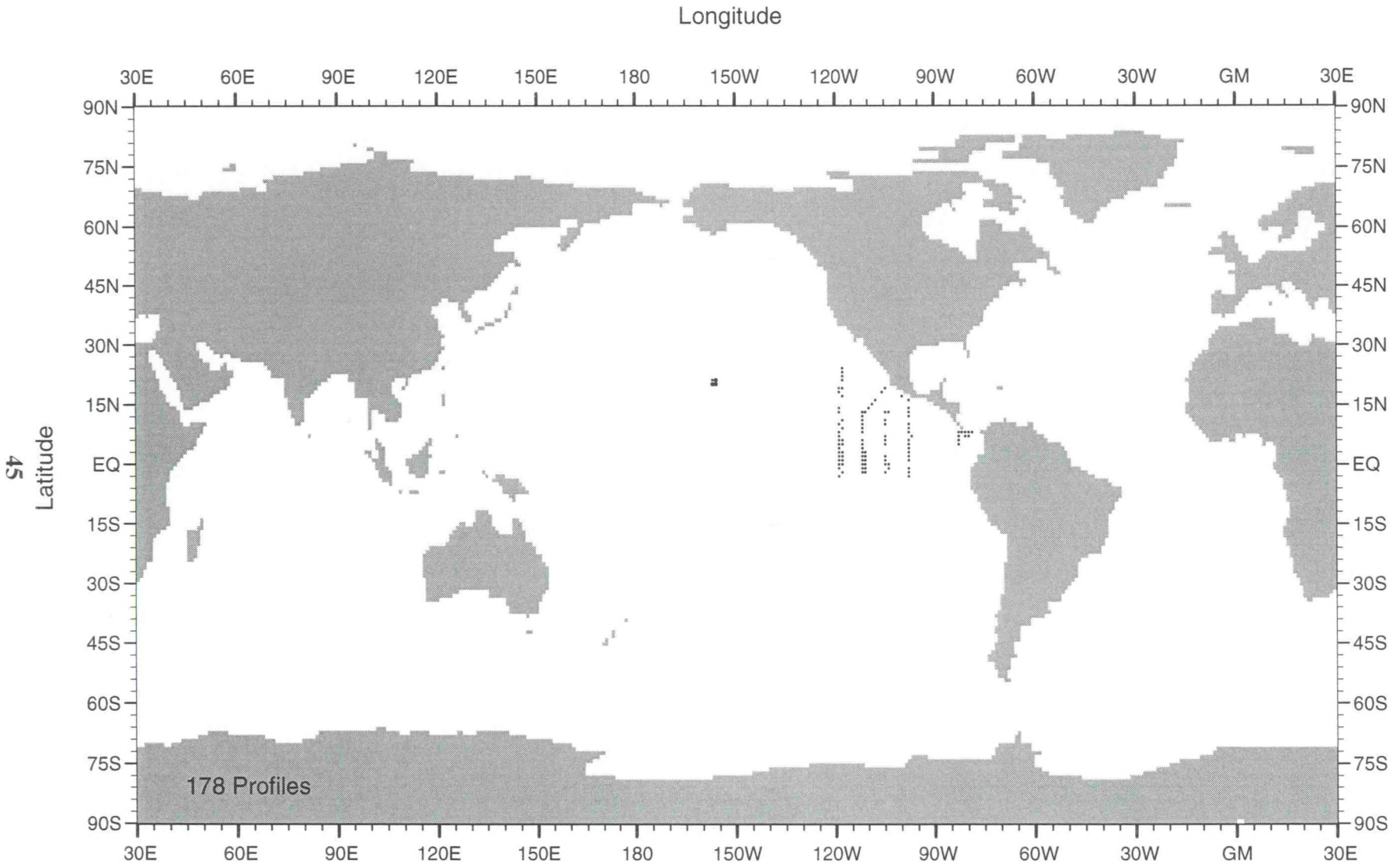

Fig. B2 WOD98 CTD station distribution for April-June for 1967

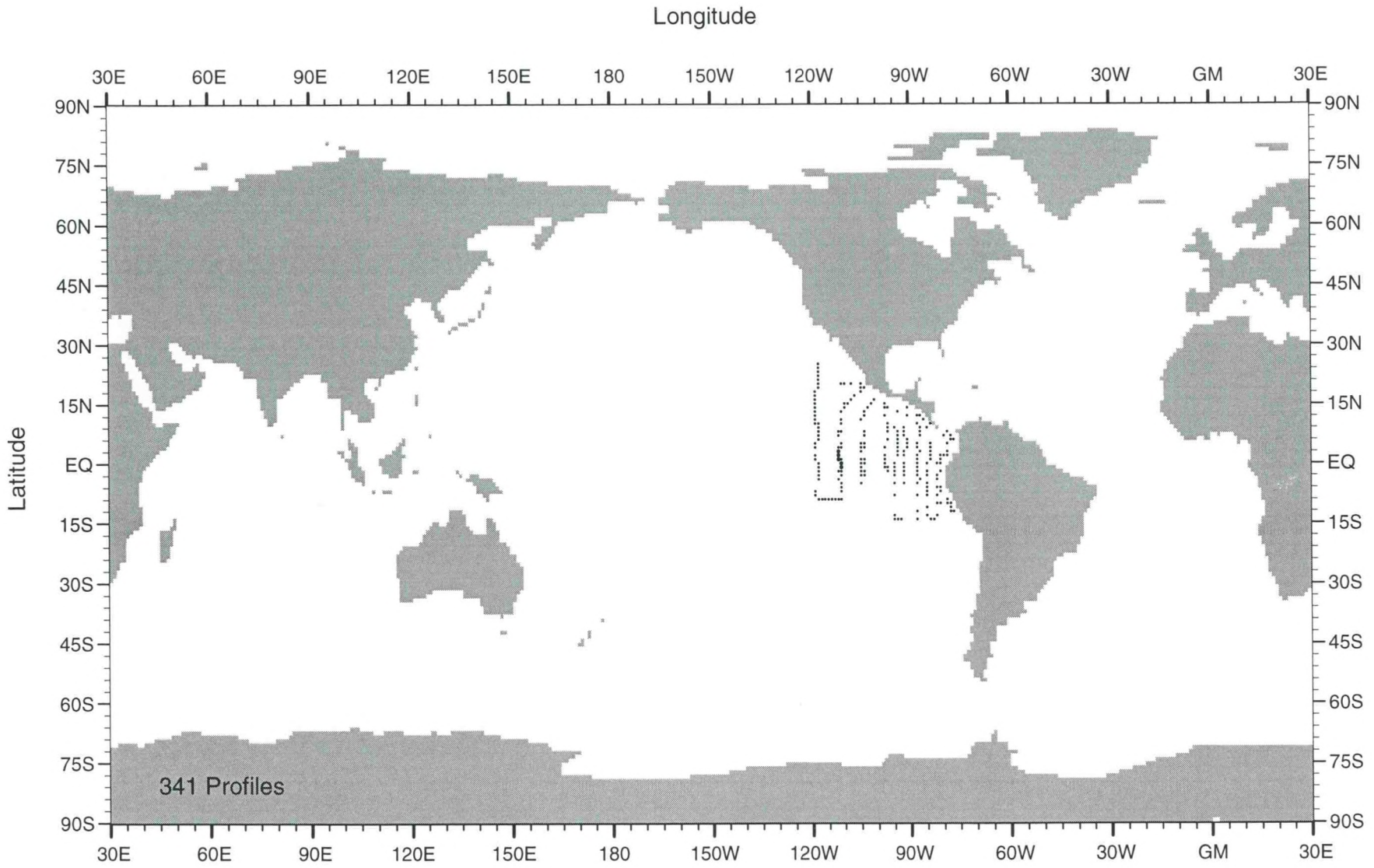

Fig. B3 WOD98 CTD station distribution for July-September for 1967

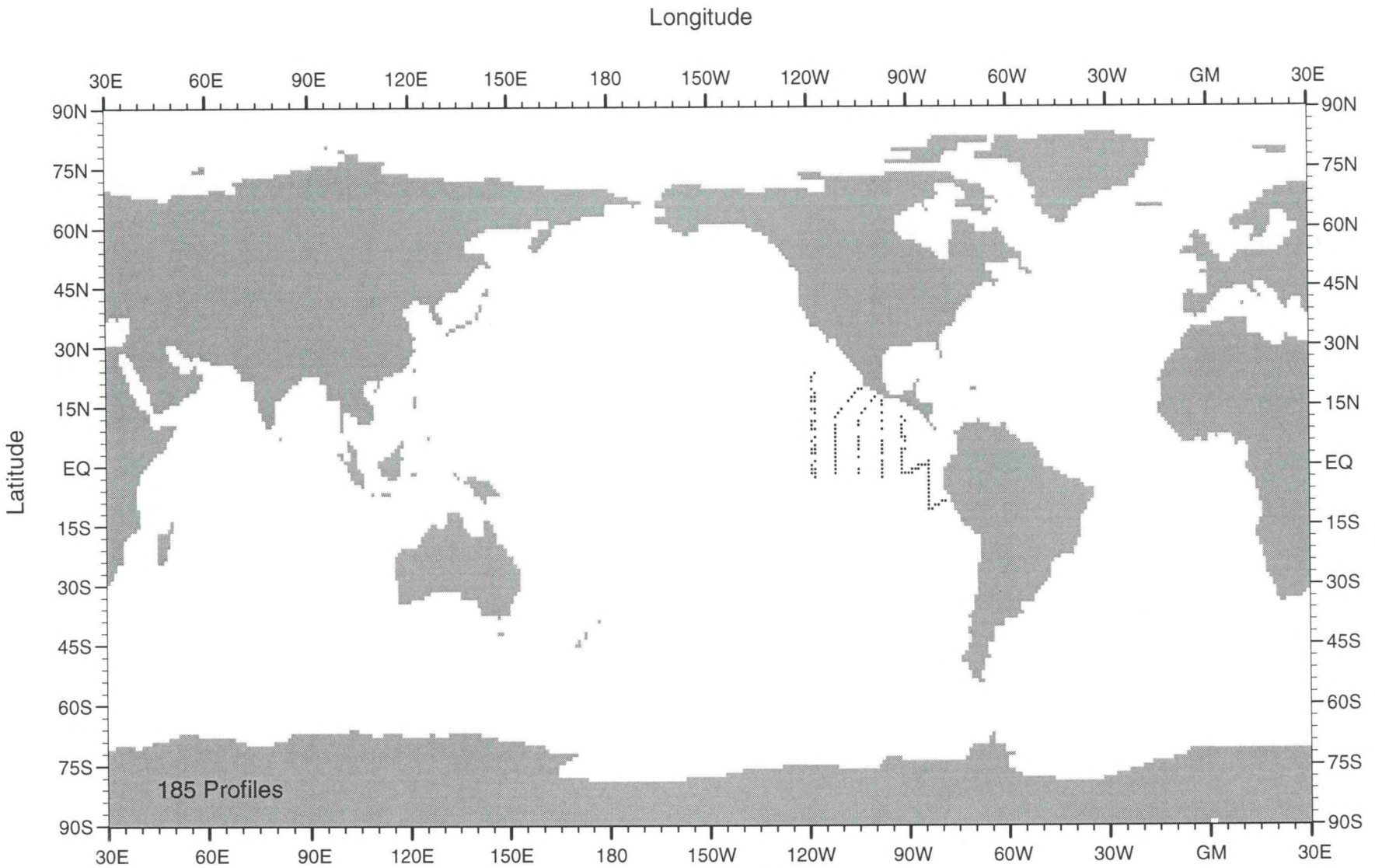

Fig. B4 WOD98 CTD station distribution for October-December for 1967

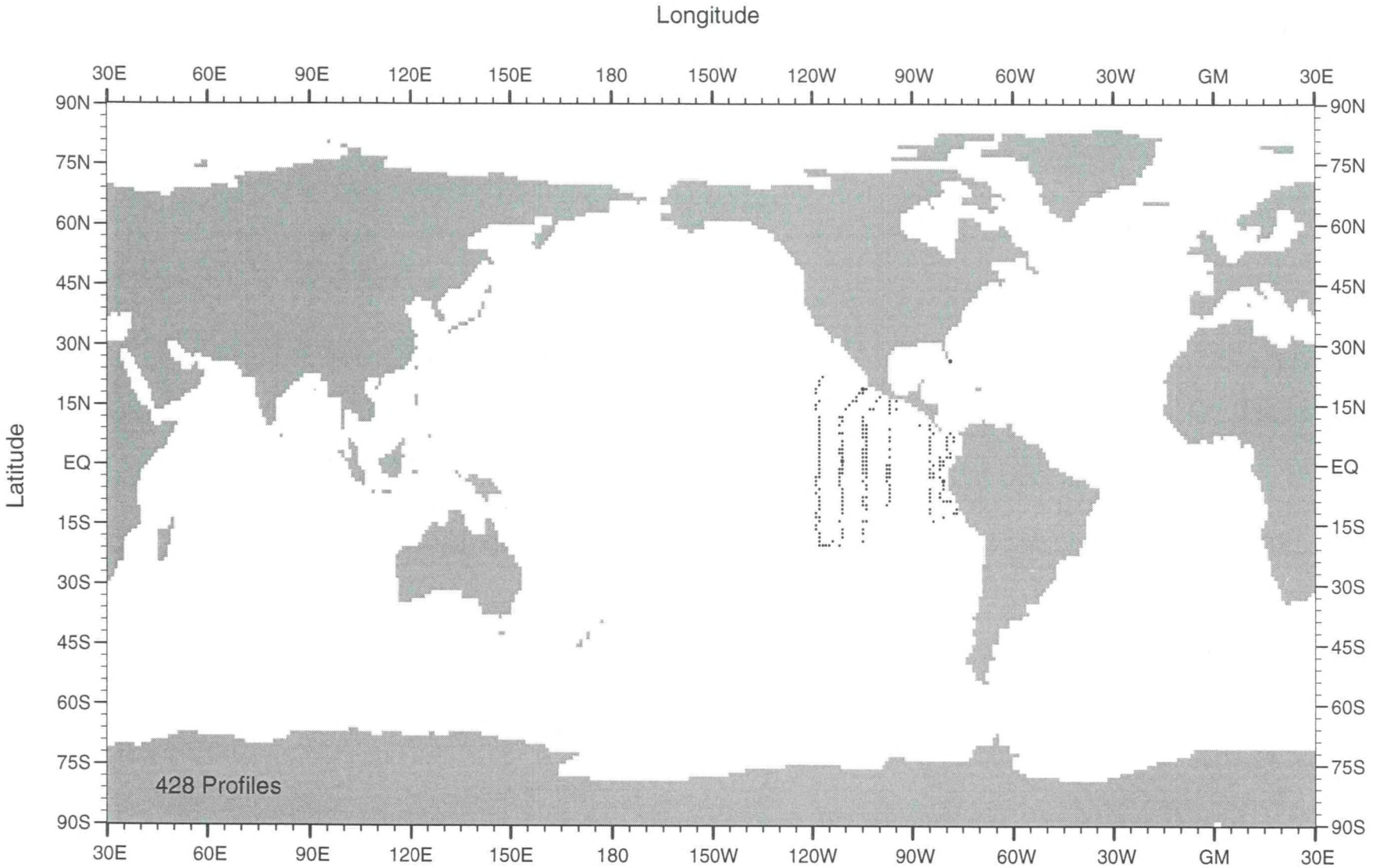

Fig. B5 WOD98 CTD station distribution for January-March for 1968

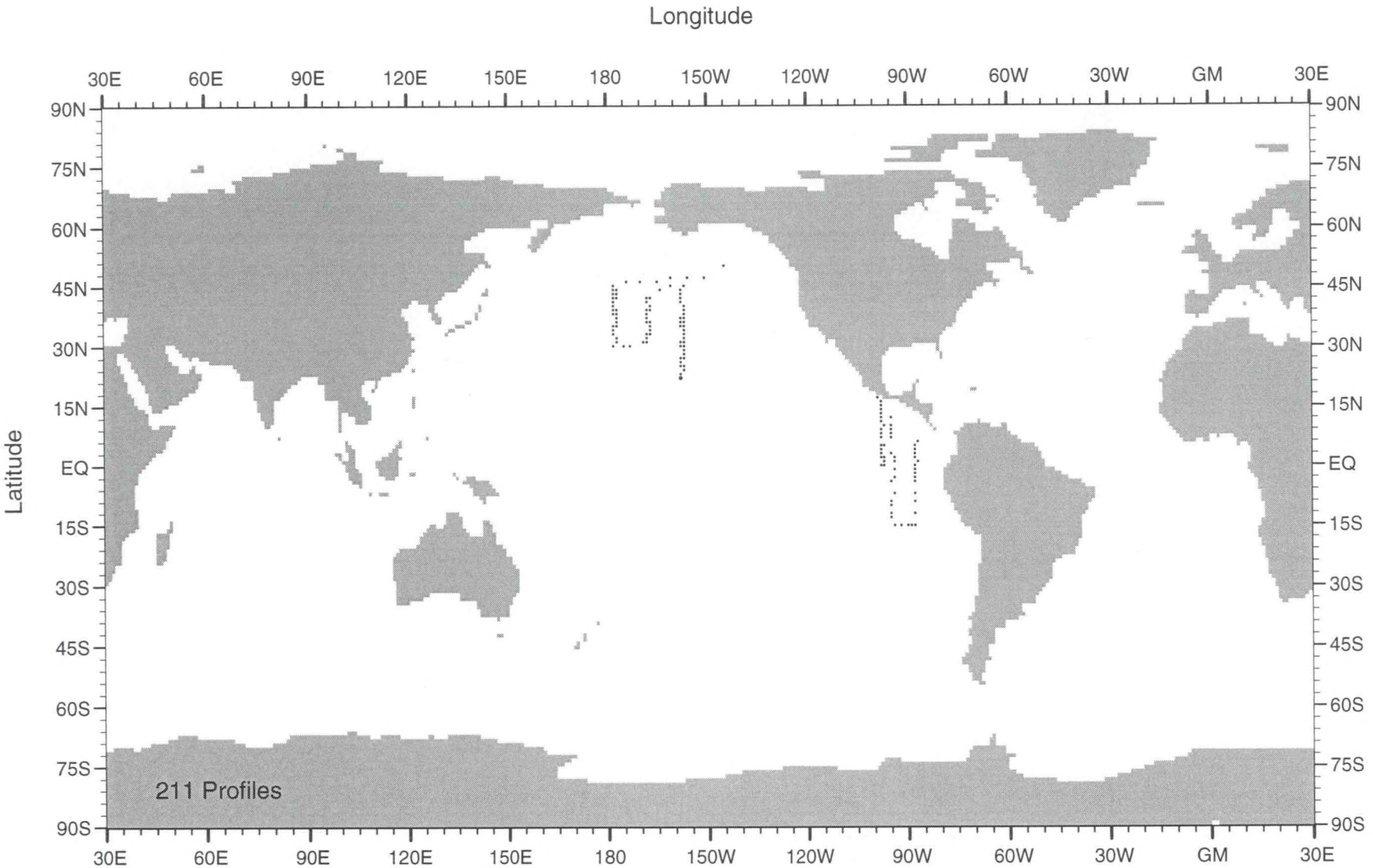

Fig. B6 WOD98 CTD station distribution for April-June for 1968

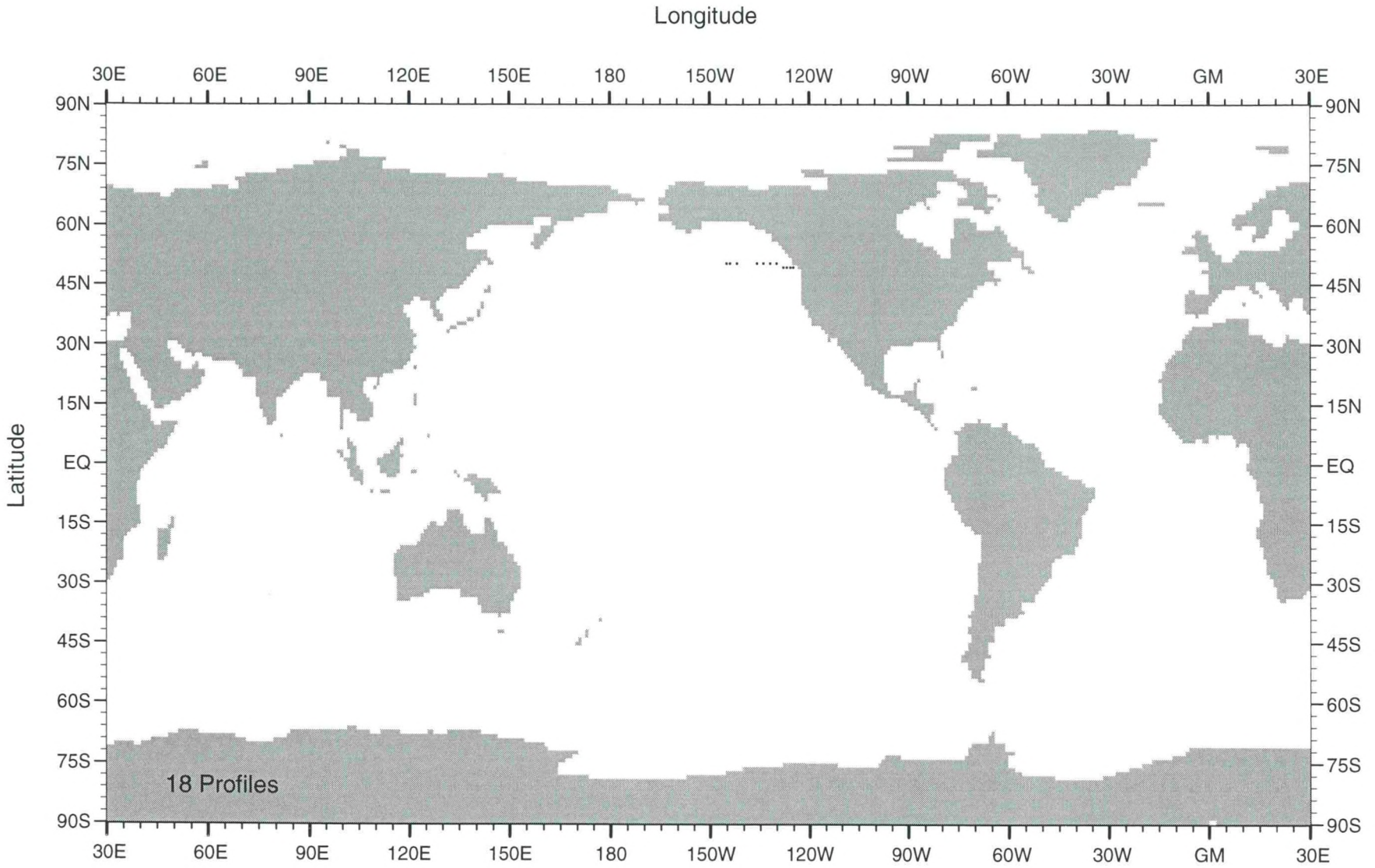

Fig. B7 WOD98 CTD station distribution for July-September for 1968

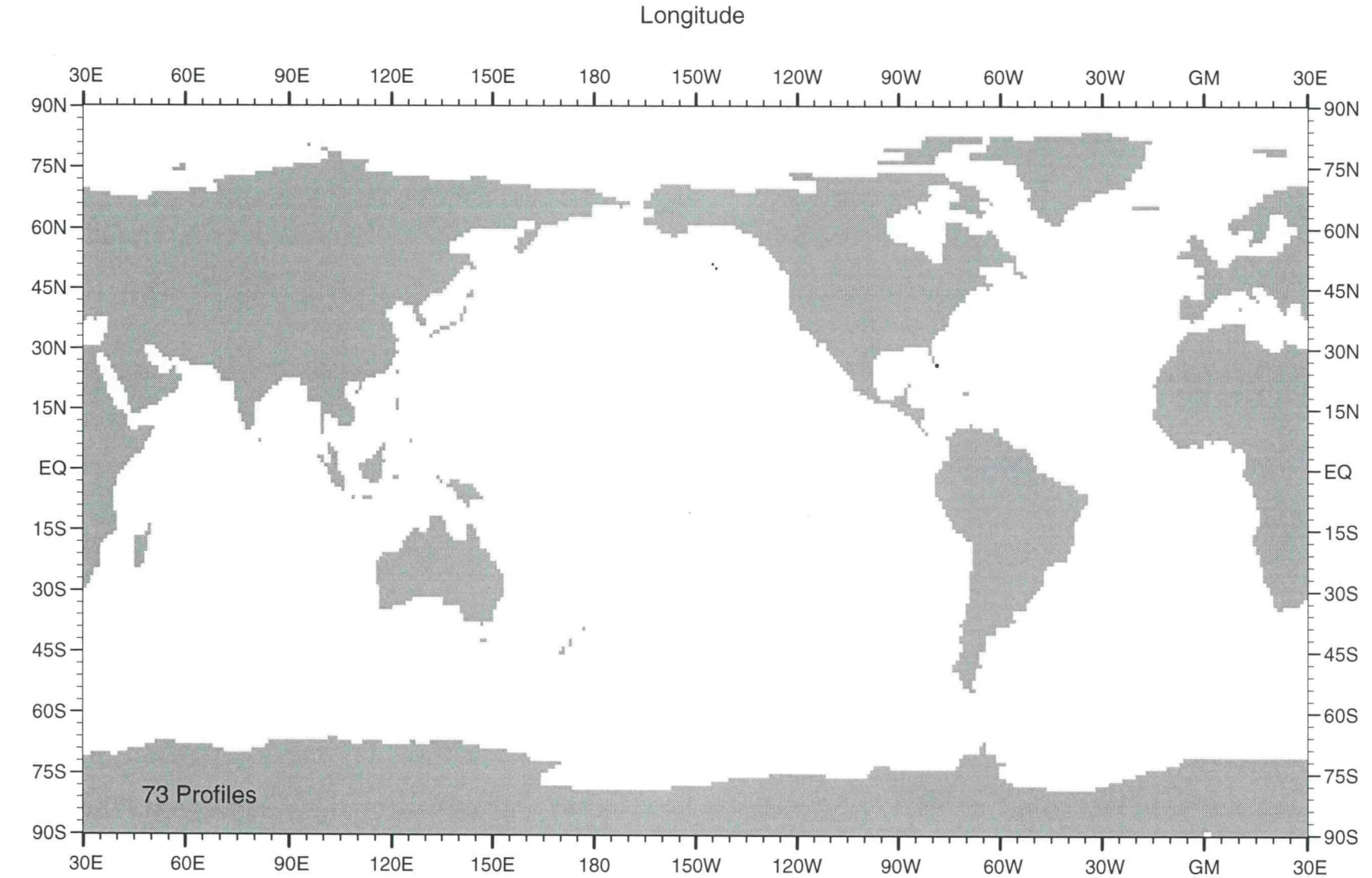

Fig. B8 WOD98 CTD station distribution for October-December for 1968

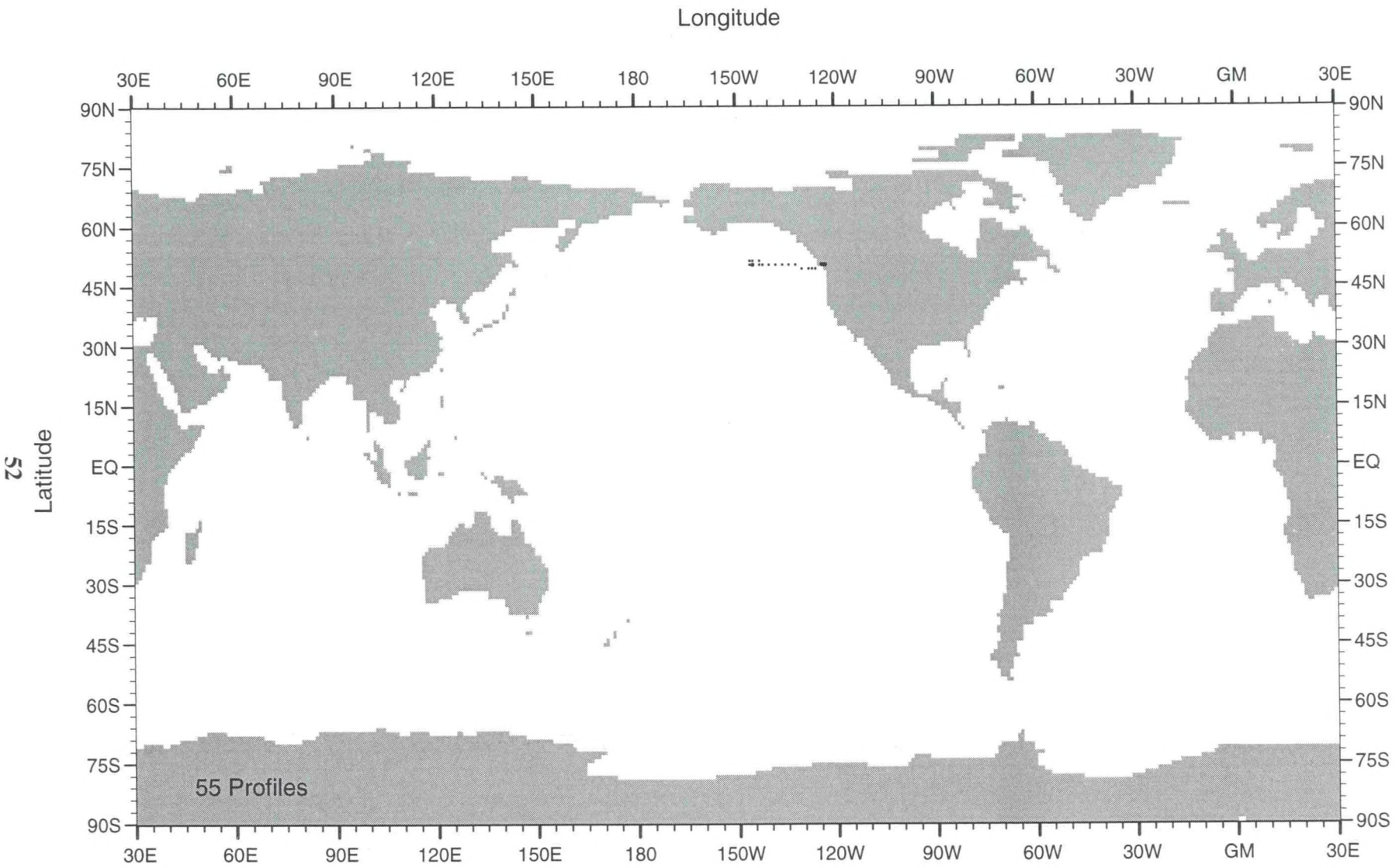

Fig. B9 WOD98 CTD station distribution for January-March for 1969

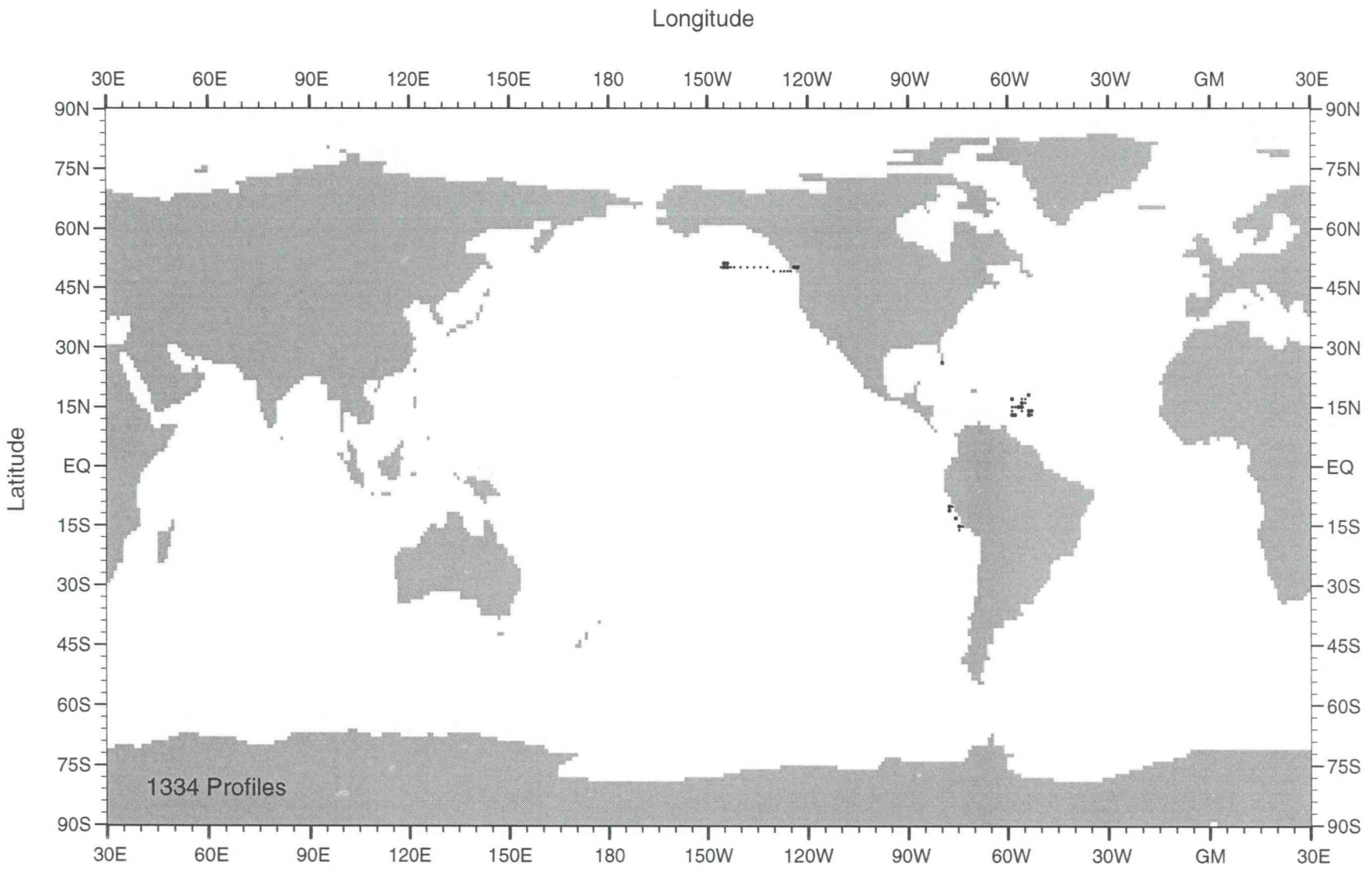

Fig. B10 WOD98 CTD station distribution for April-June for 1969

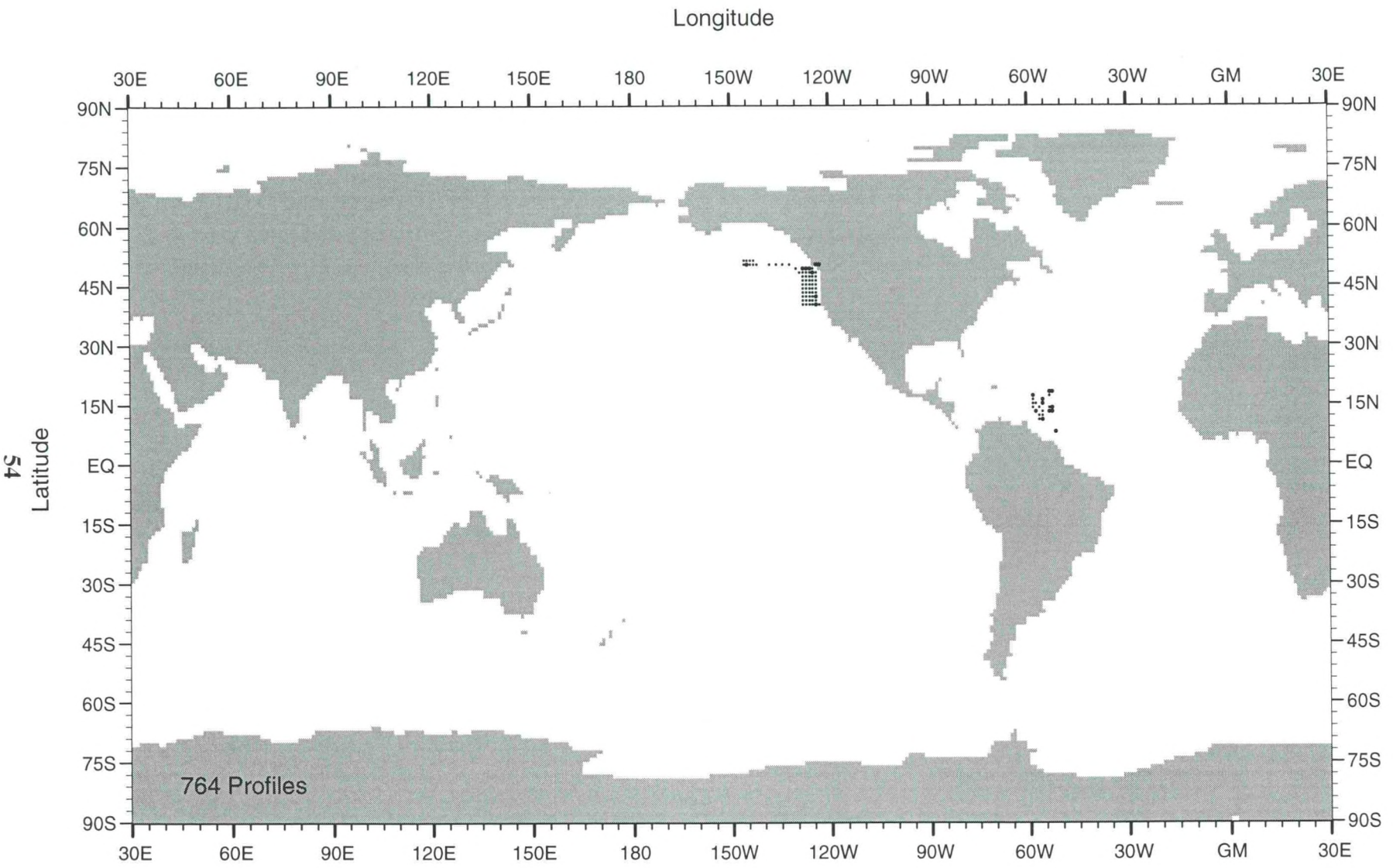

Fig. B11 WOD98 CTD station distribution for July-September for 1969

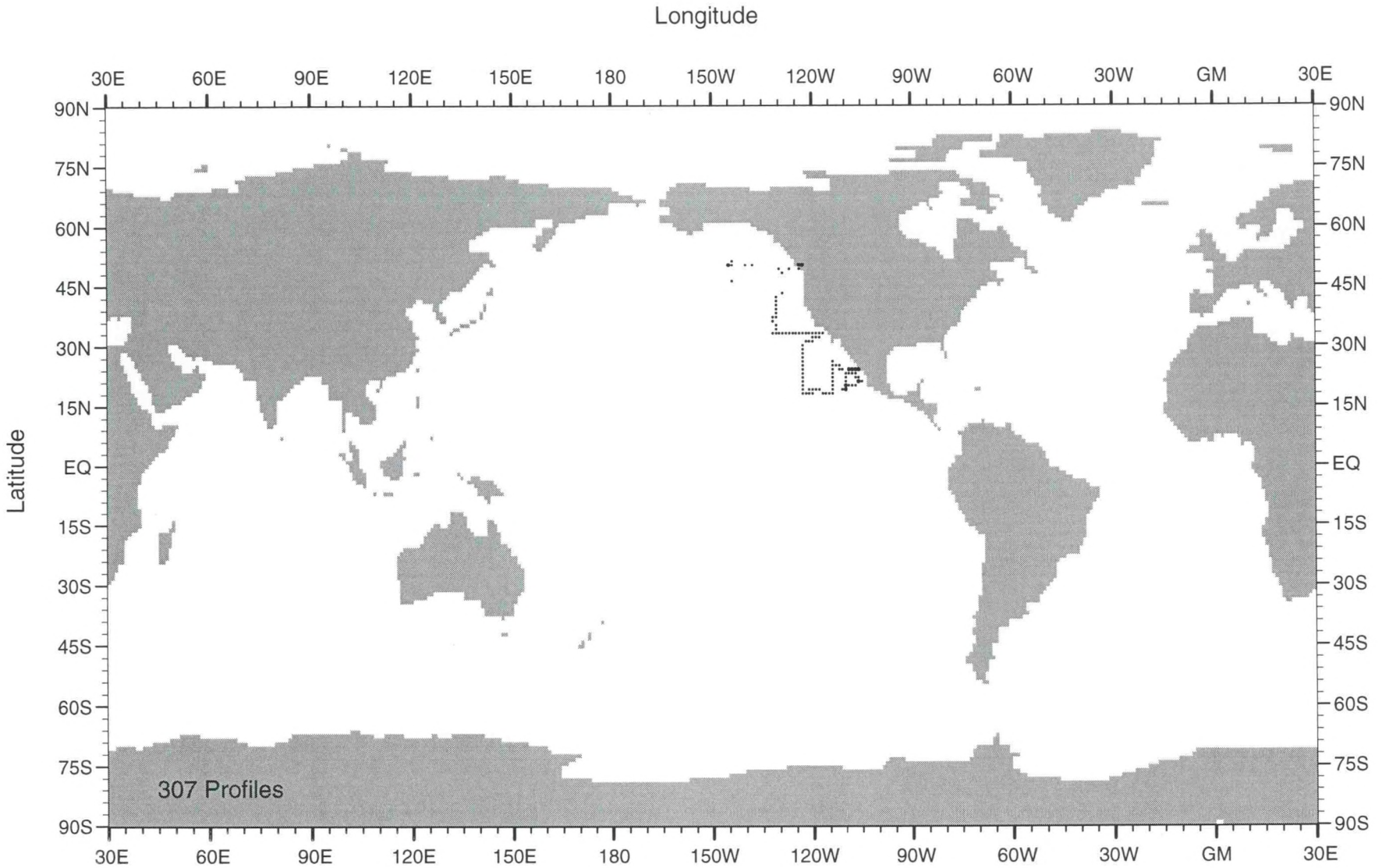

Fig. B12 WOD98 CTD station distribution for October-December for 1969

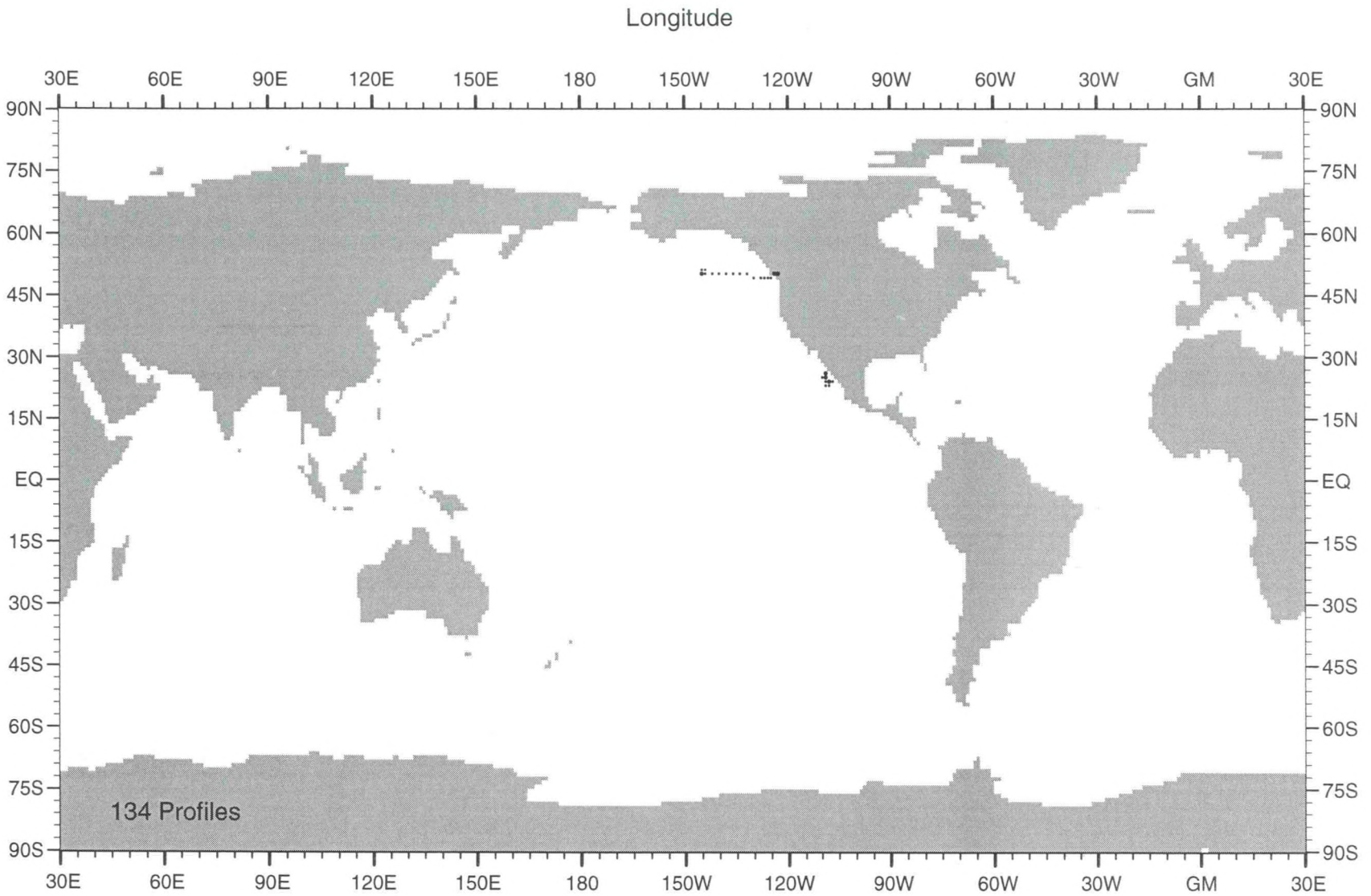

Fig. B13 WOD98 CTD station distribution for January-March for 1970

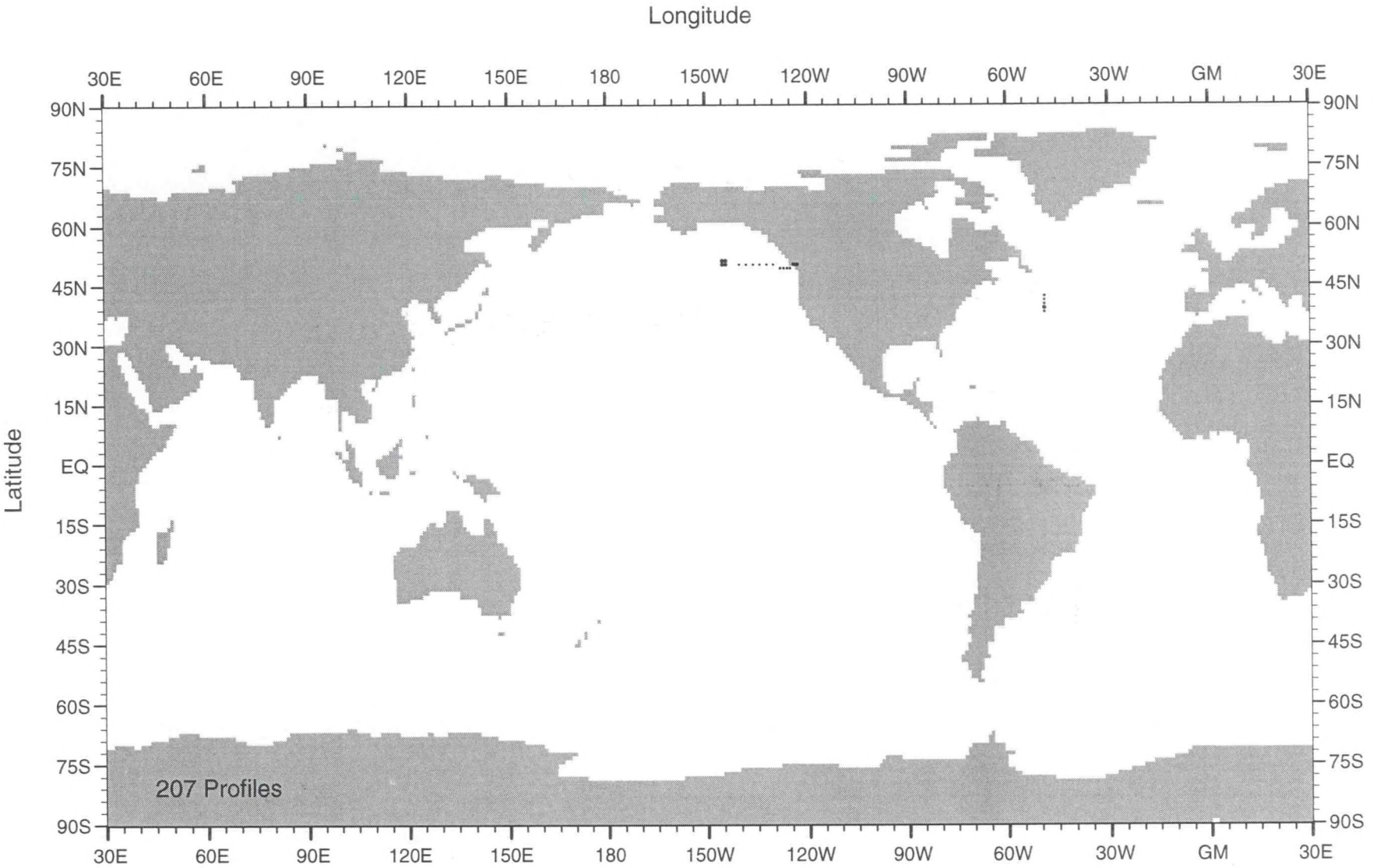

Fig. B14 WOD98 CTD station distribution for April-June for 1970

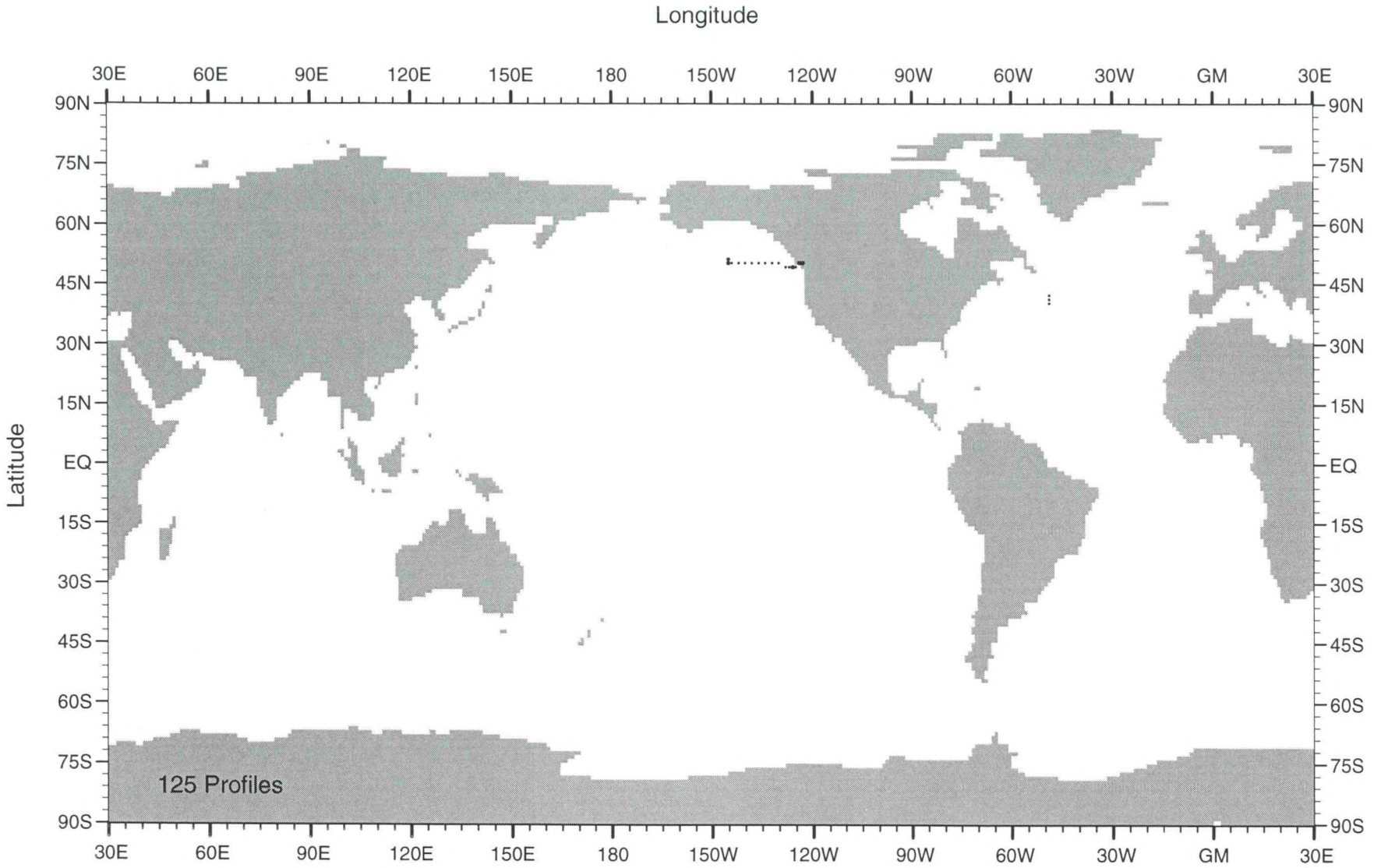

Fig. B15 WOD98 CTD station distribution for July-September for 1970

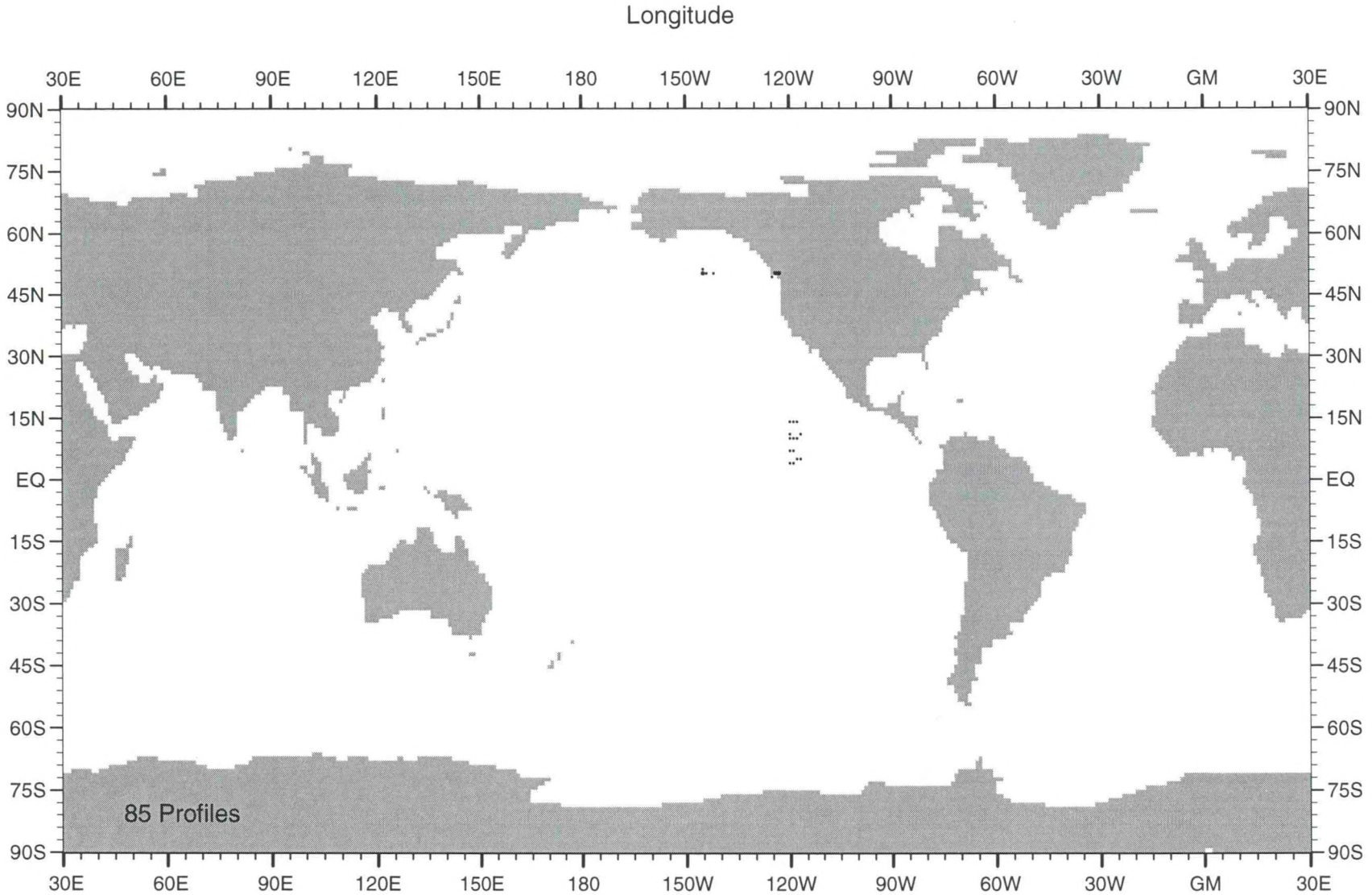

Fig. B16 WOD98 CTD station distribution for October-December for 1970

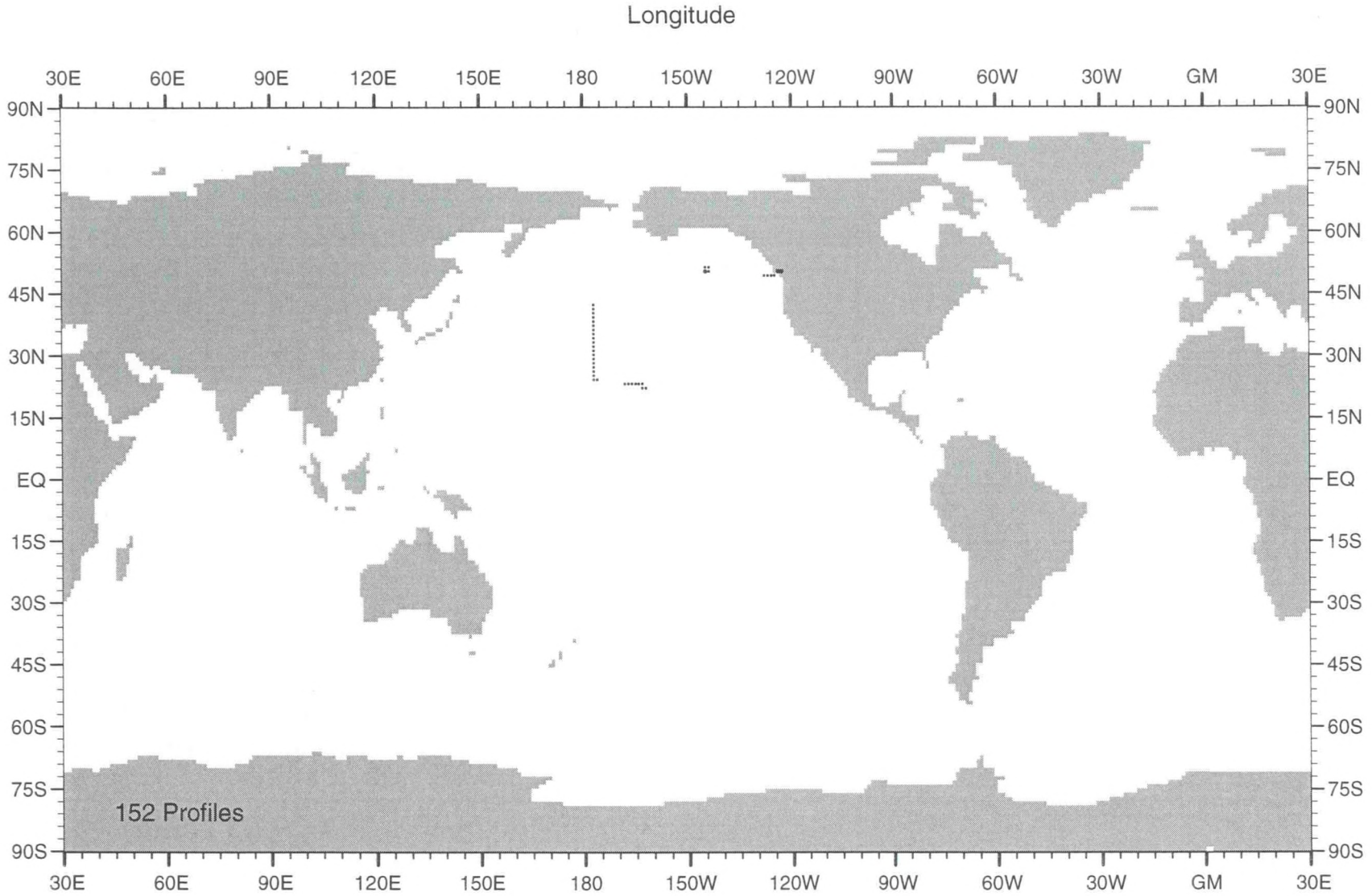

Fig. B17 WOD98 CTD station distribution for January-March for 1971

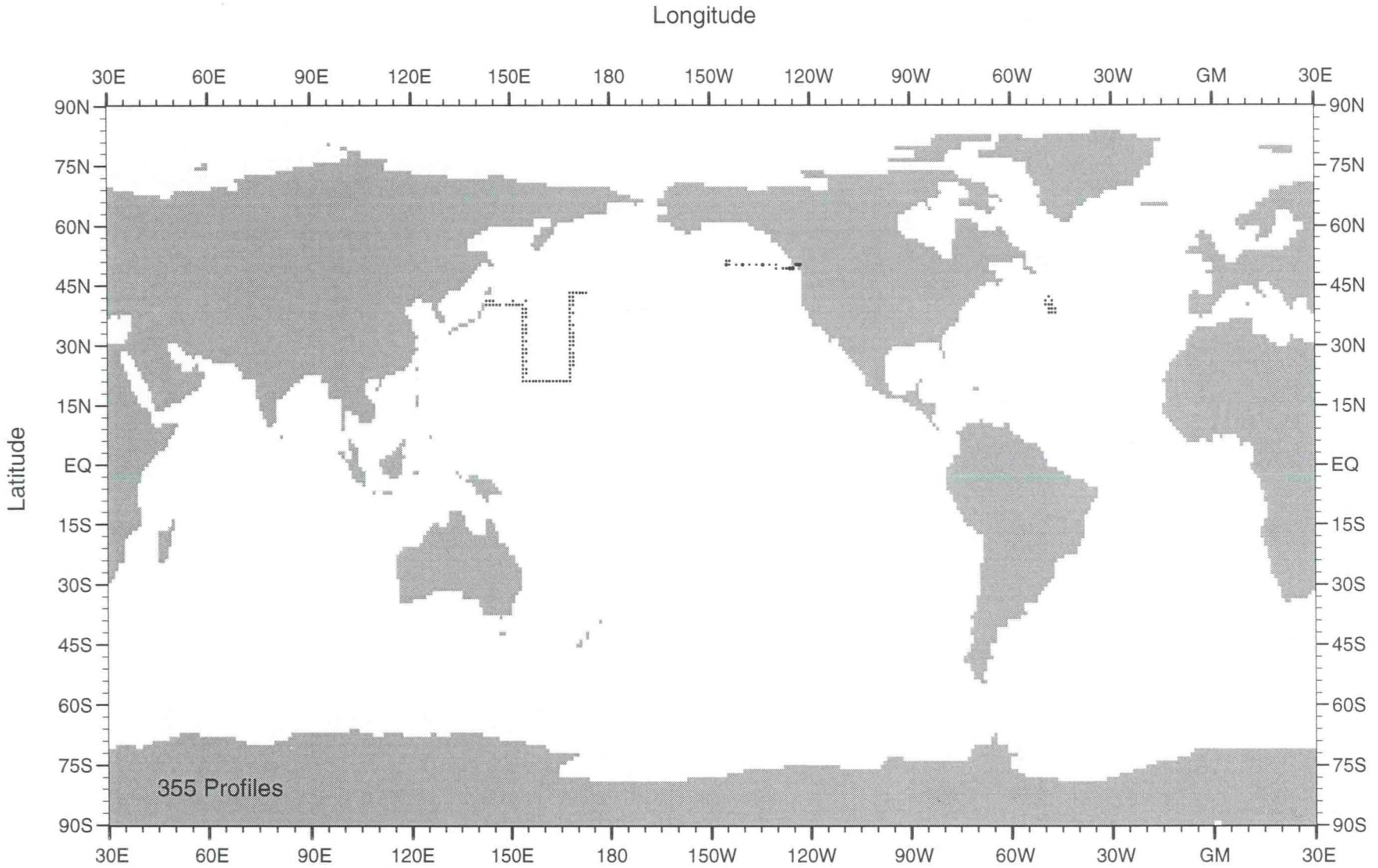

Fig. B18 WOD98 CTD station distribution for April-June for 1971

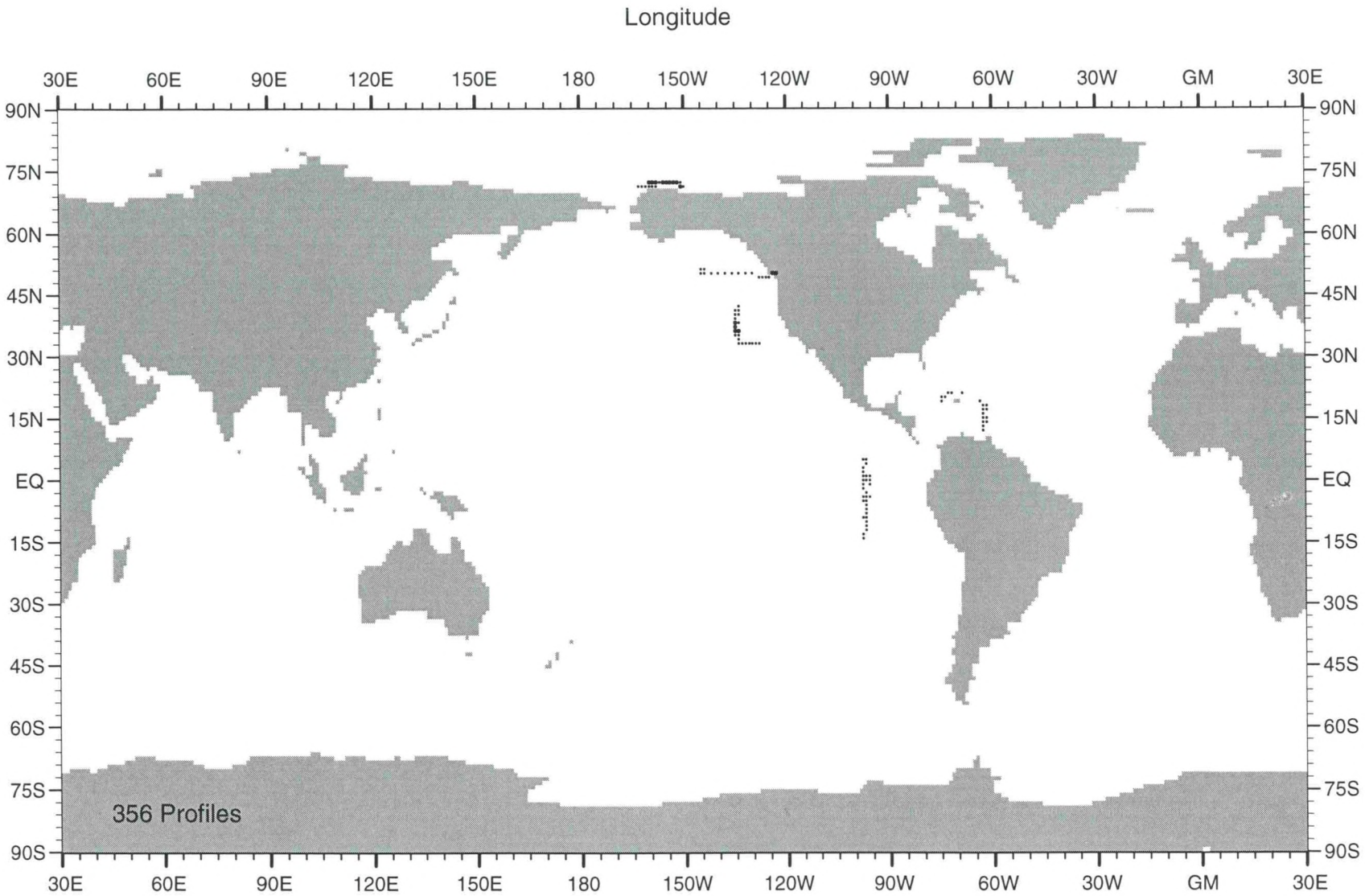

Fig. B19 WOD98 CTD station distribution for July-September for 1971

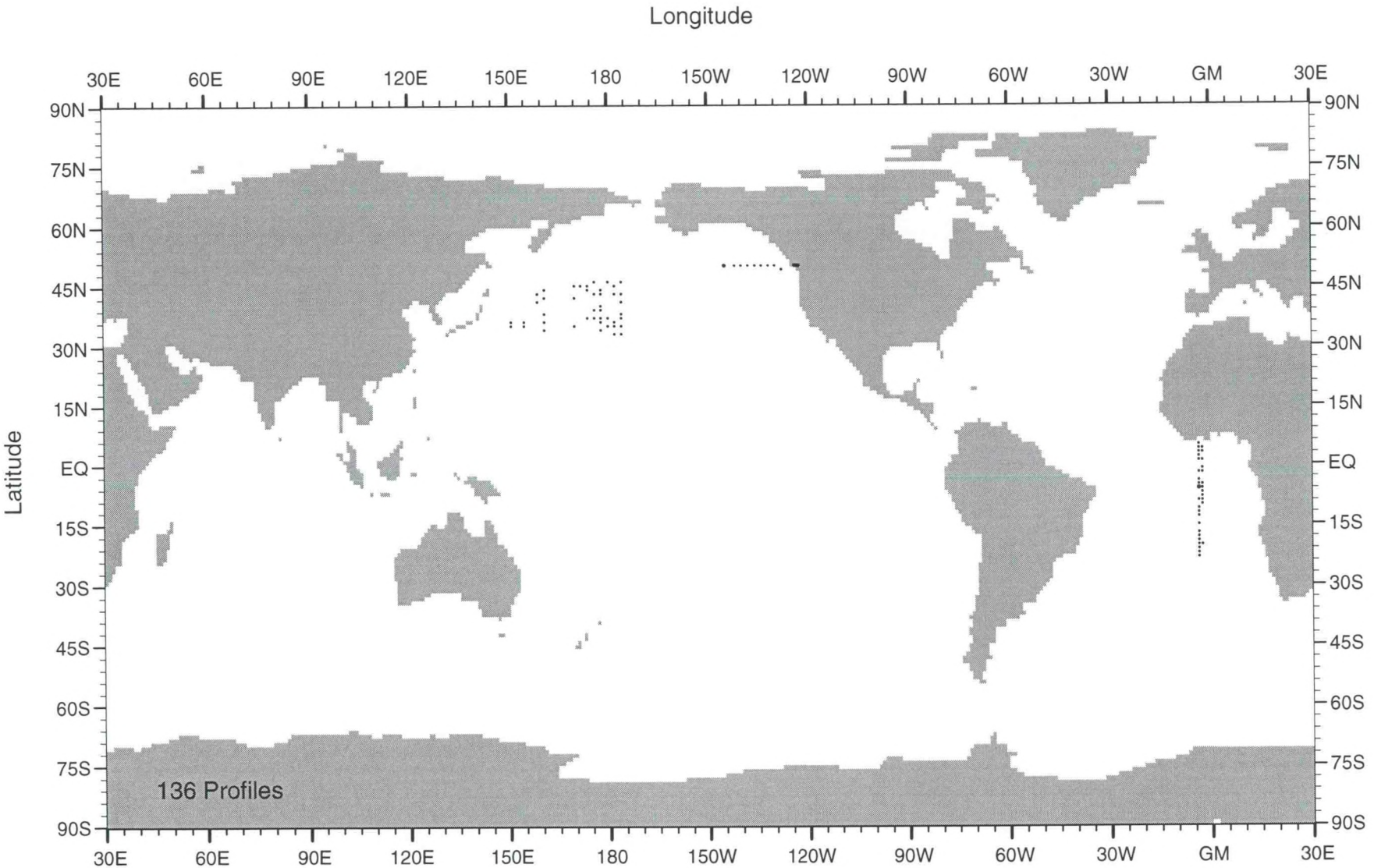

Fig. B20 WOD98 CTD station distribution for October-December for 1971

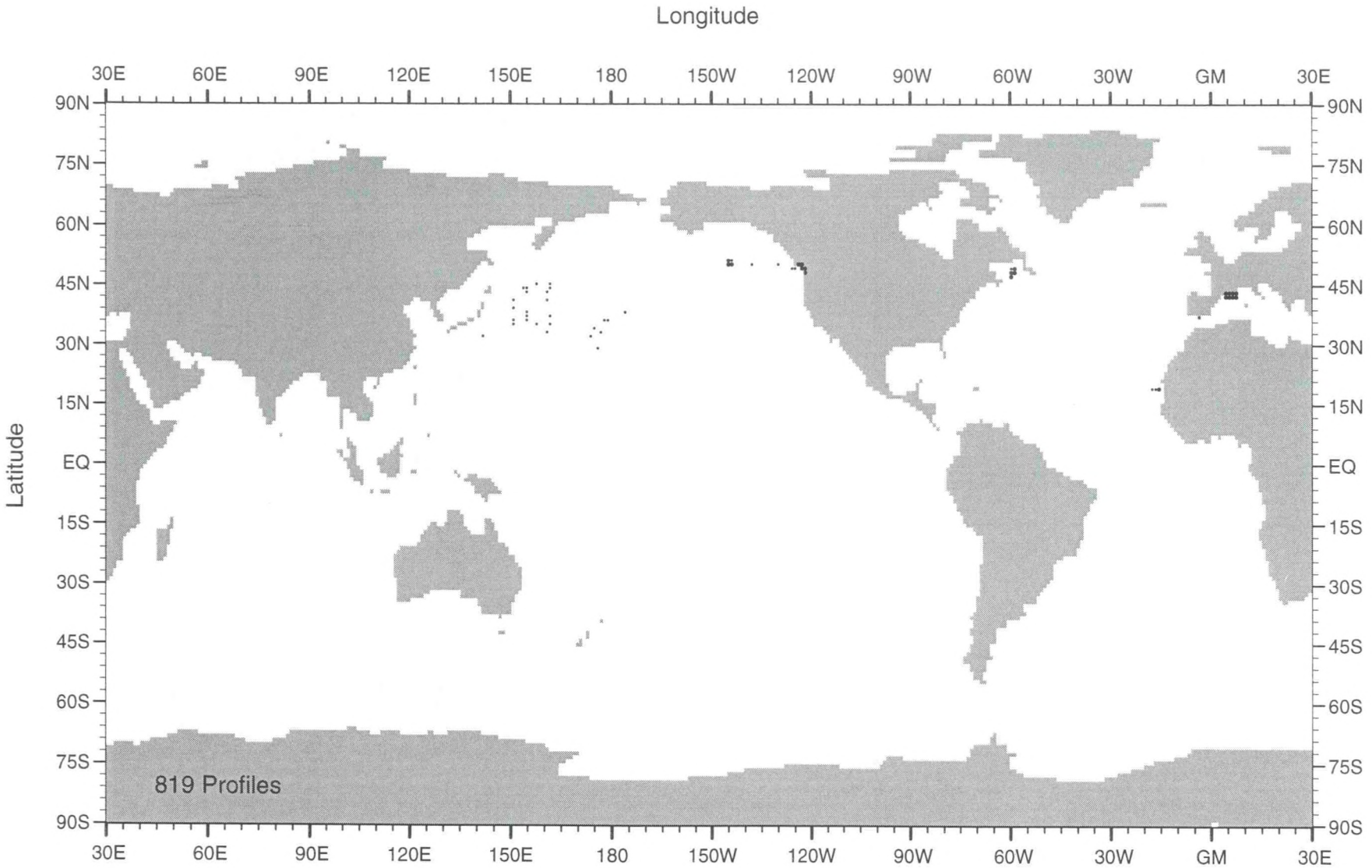

Fig. B21 WOD98 CTD station distribution for January-March for 1972

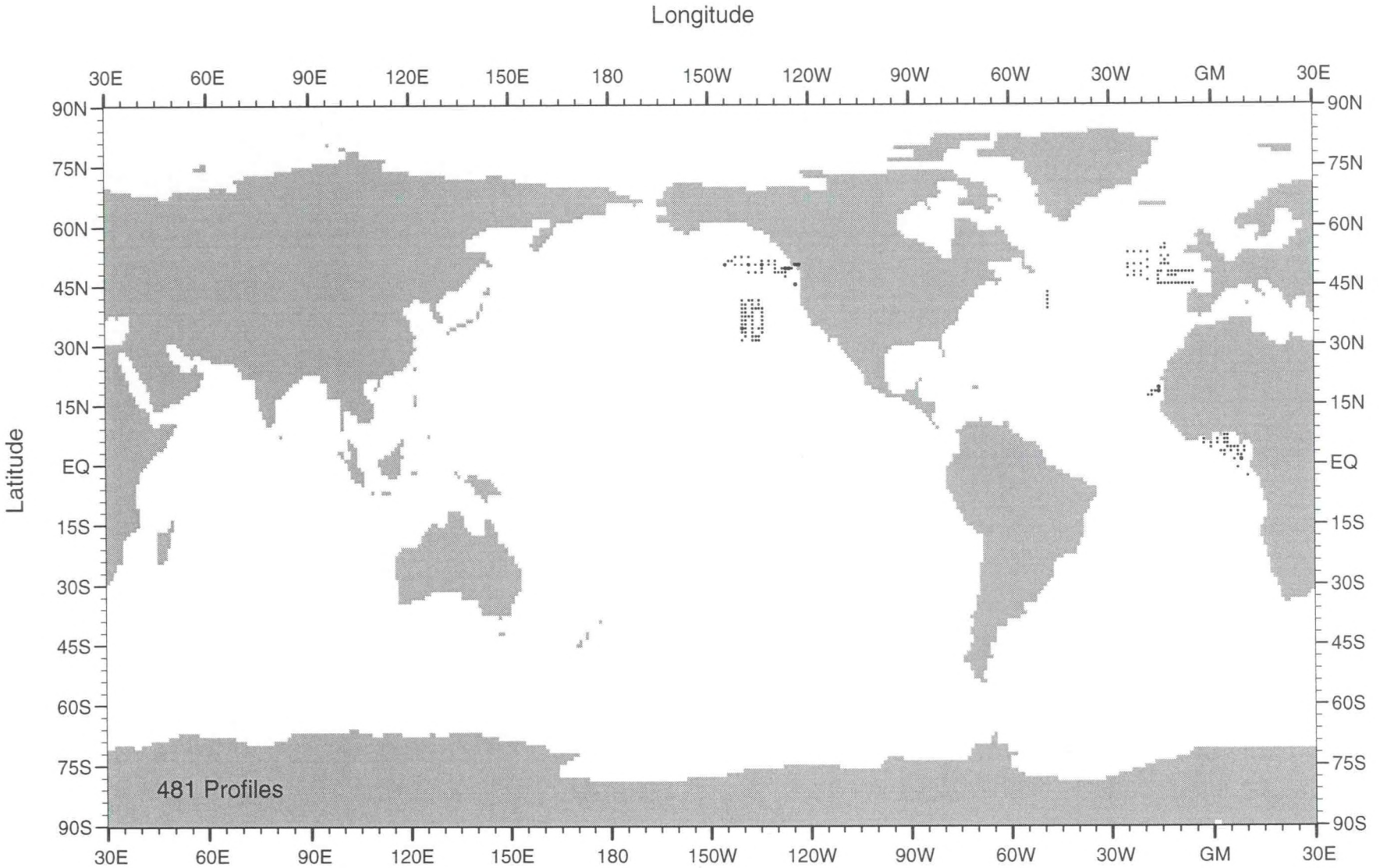

Fig. B22 WOD98 CTD station distribution for April-June for 1972

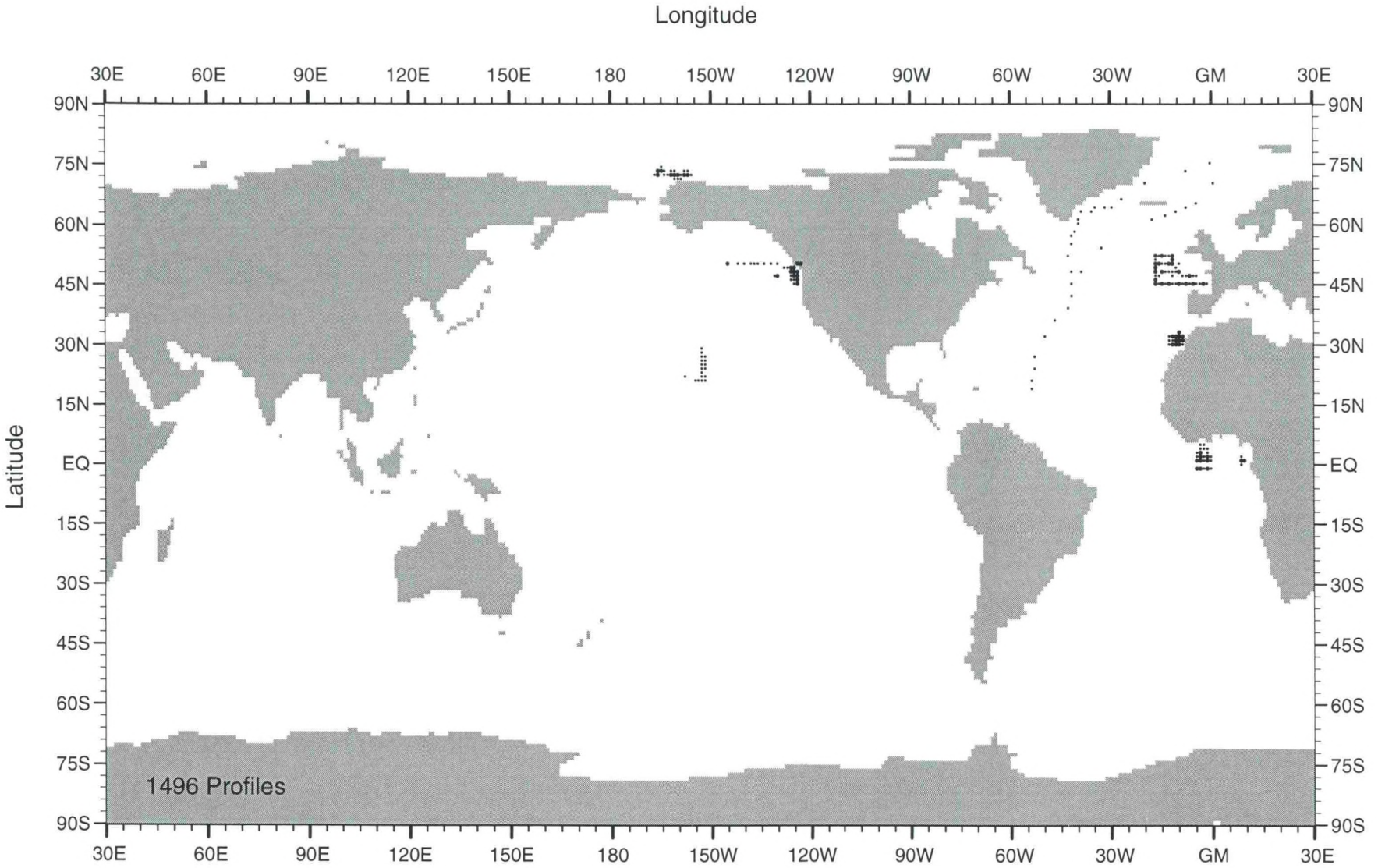

Fig. B23 WOD98 CTD station distribution for July-September for 1972

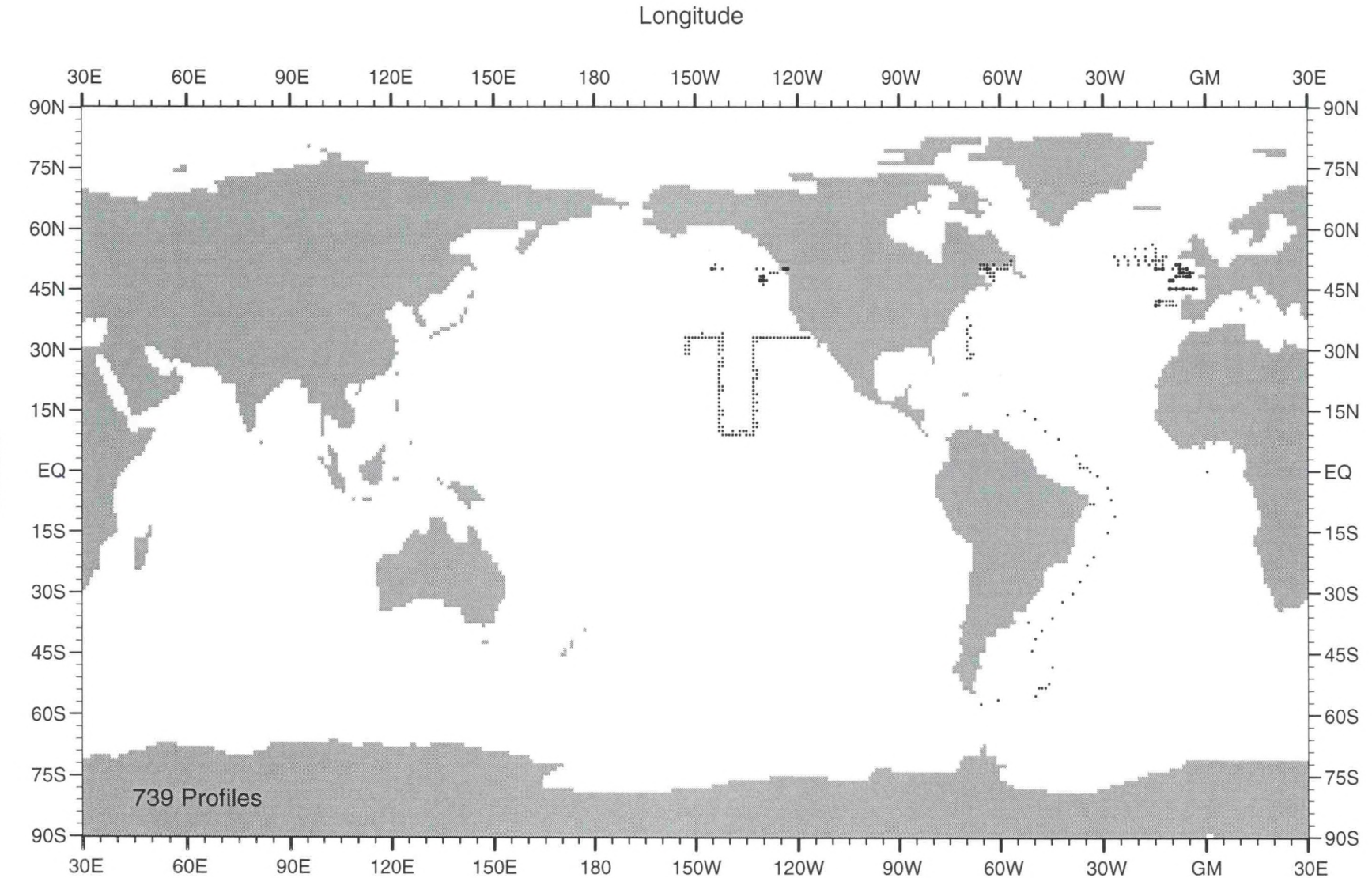

Fig. B24 WOD98 CTD station distribution for October-December for 1972

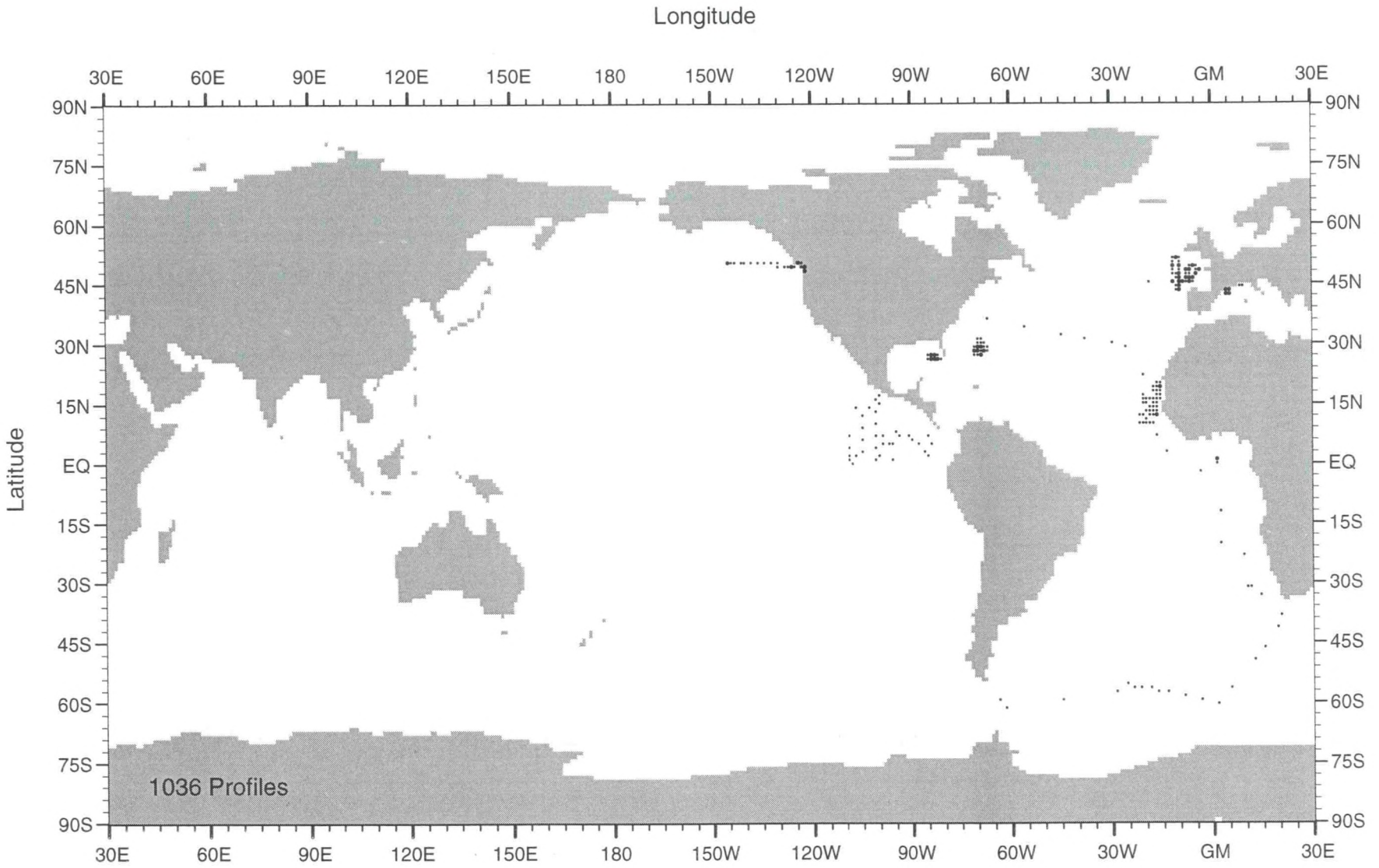

Fig. B25 WOD98 CTD station distribution for January-March for 1973

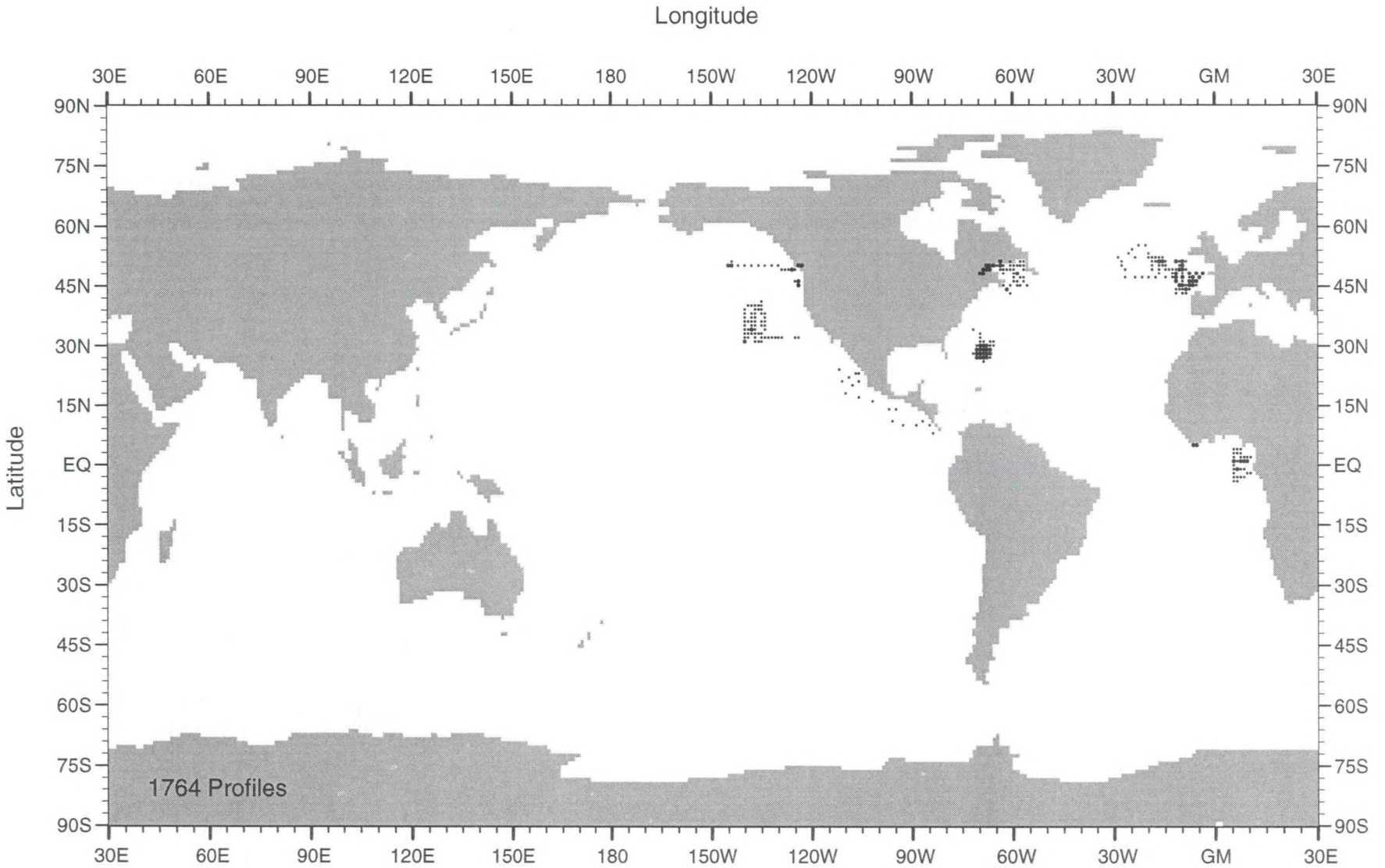

Fig. B26 WOD98 CTD station distribution for April-June for 1973

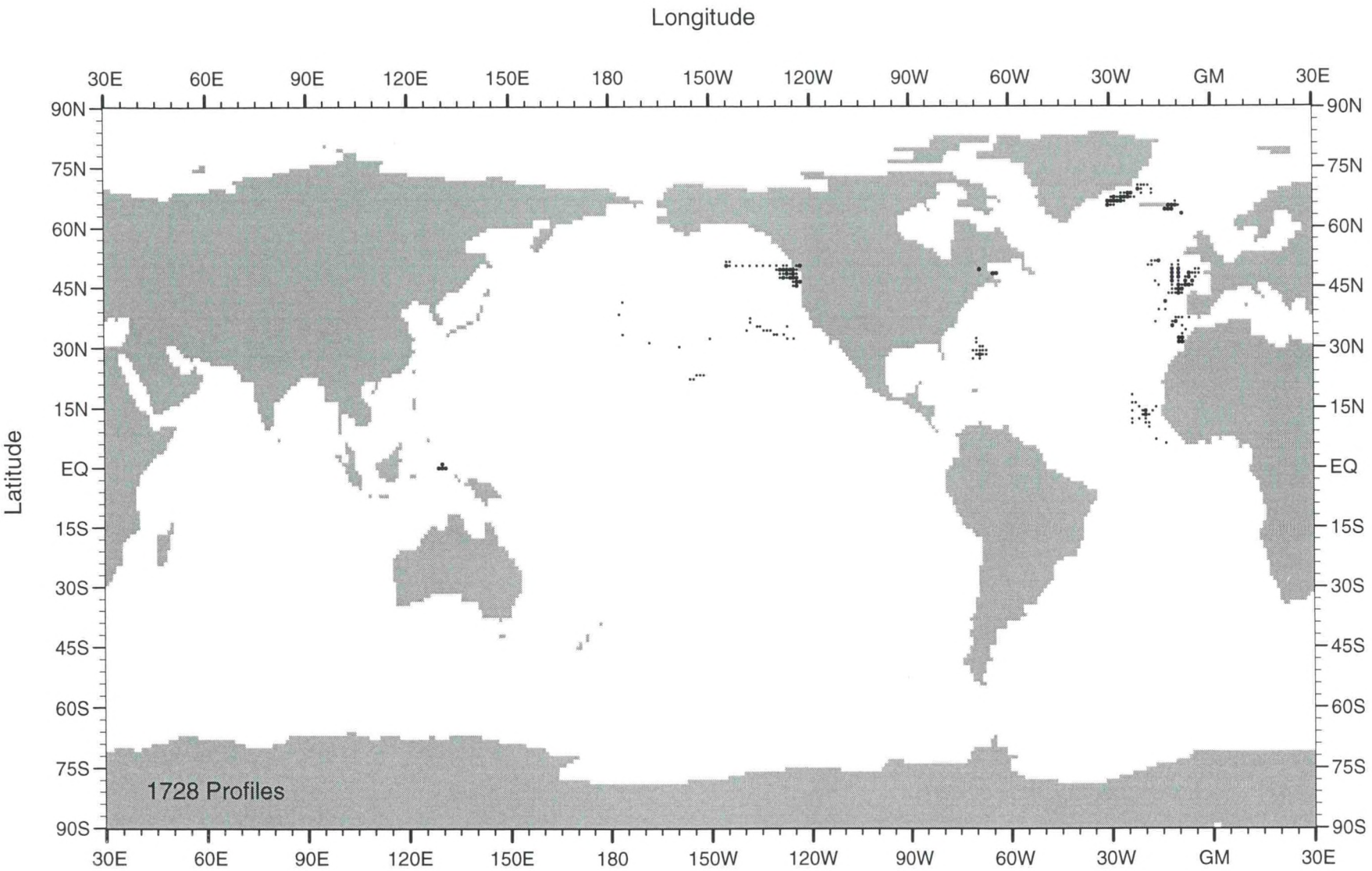

Fig. B27 WOD98 CTD station distribution for July-September for 1973

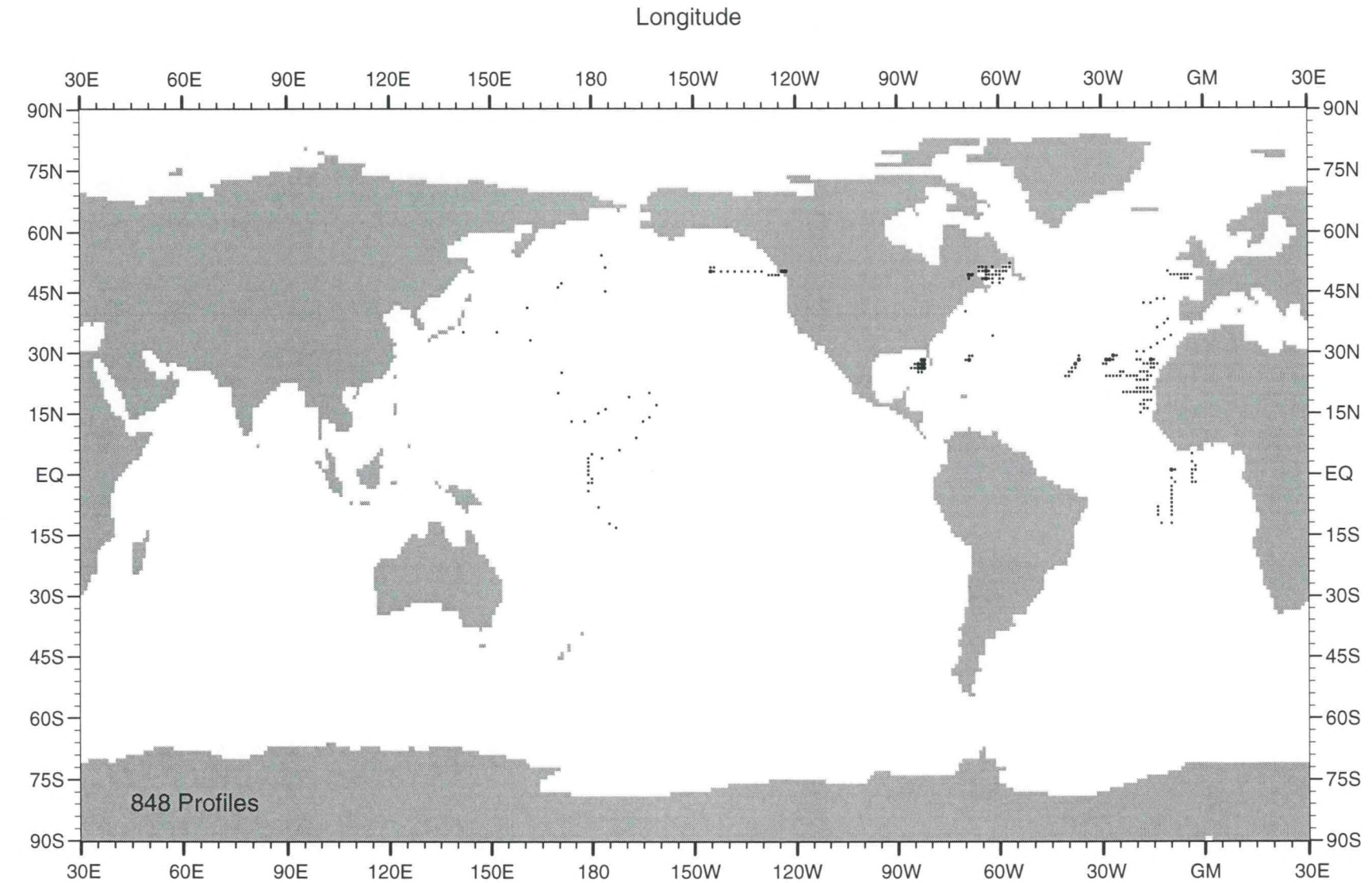

Fig. B28 WOD98 CTD station distribution for October-December for 1973

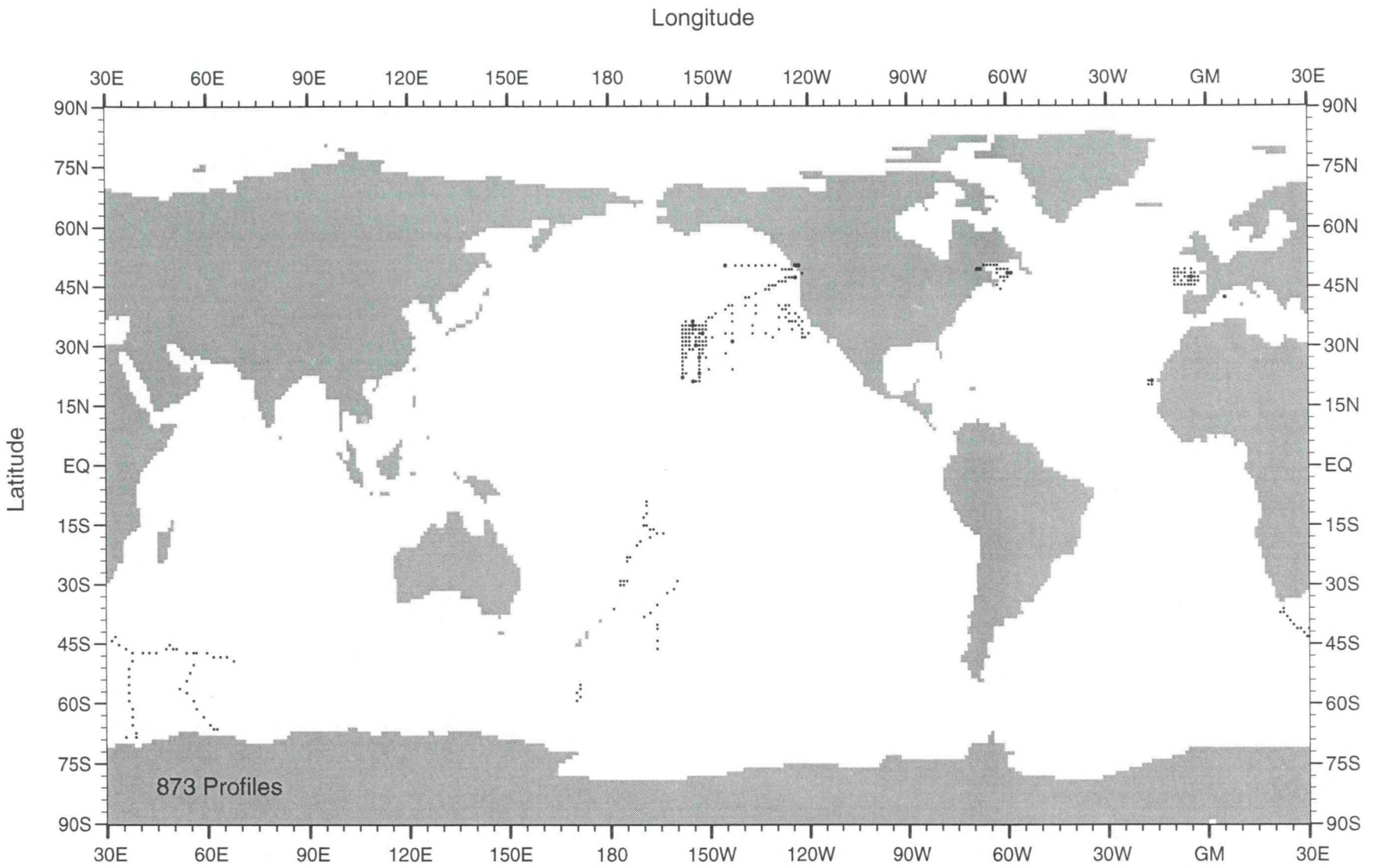

Fig. B29 WOD98 CTD station distribution for January-March for 1974

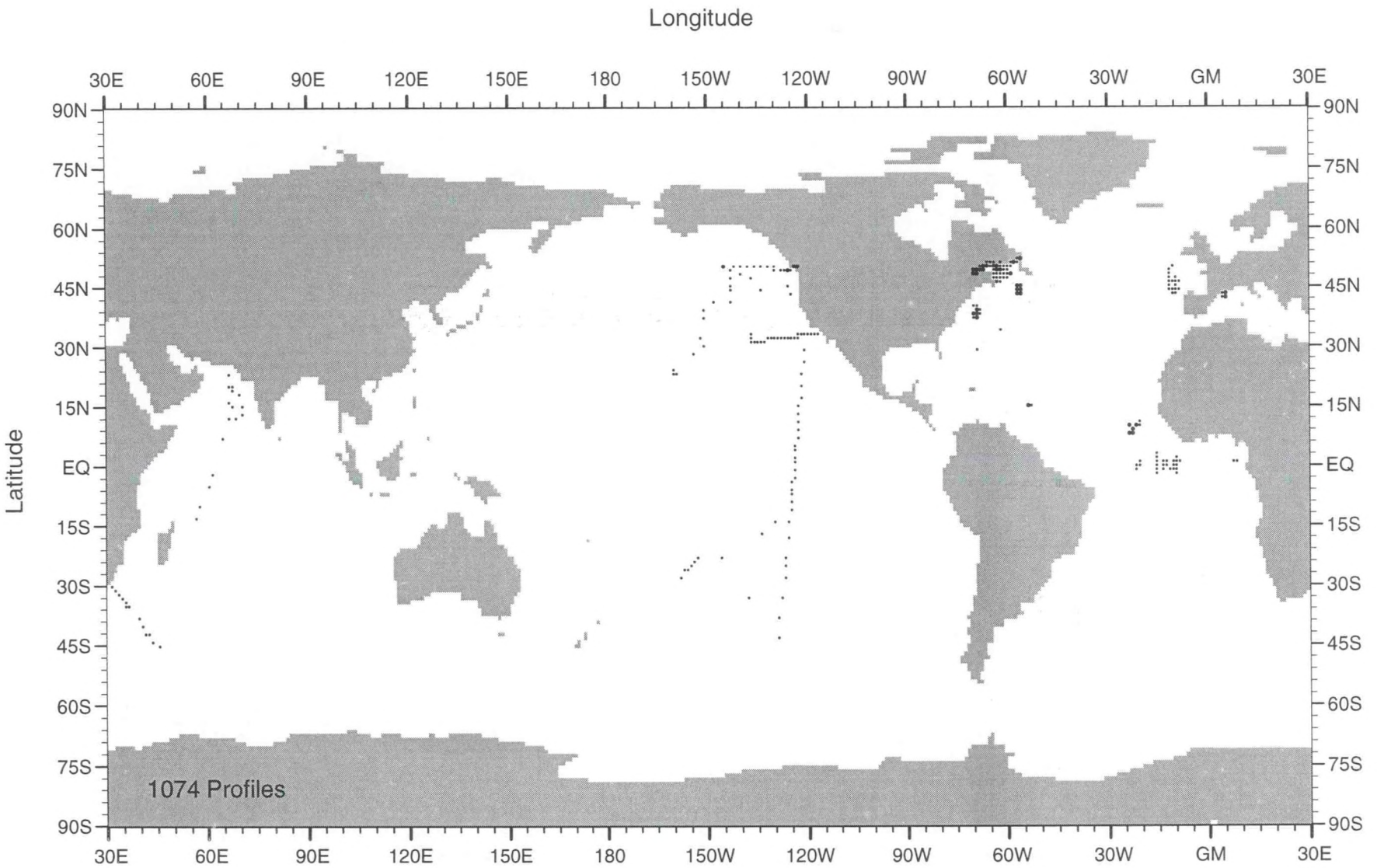

Fig. B30 WOD98 CTD station distribution for April-June for 1974

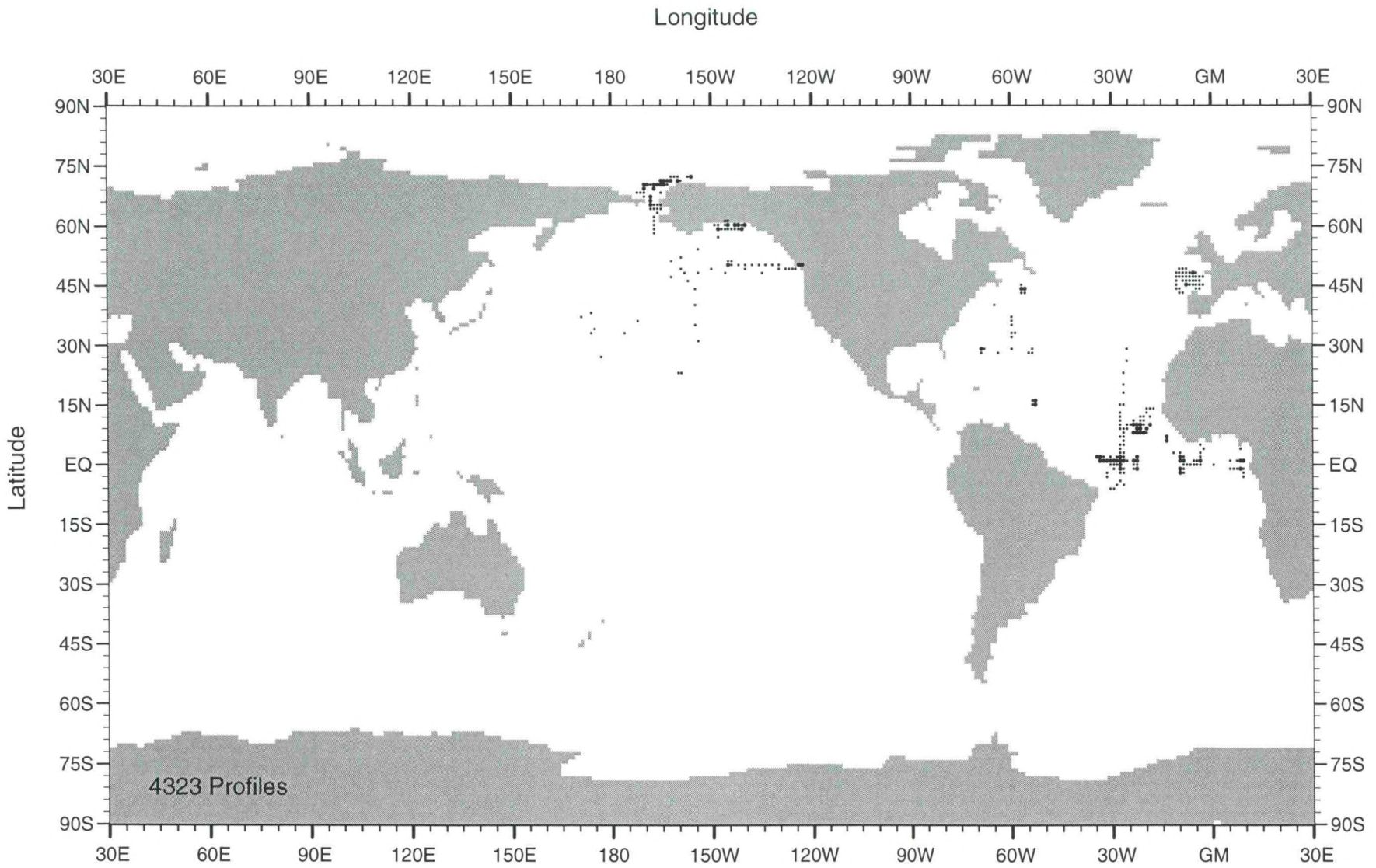

Fig. B31 WOD98 CTD station distribution for July-September for 1974

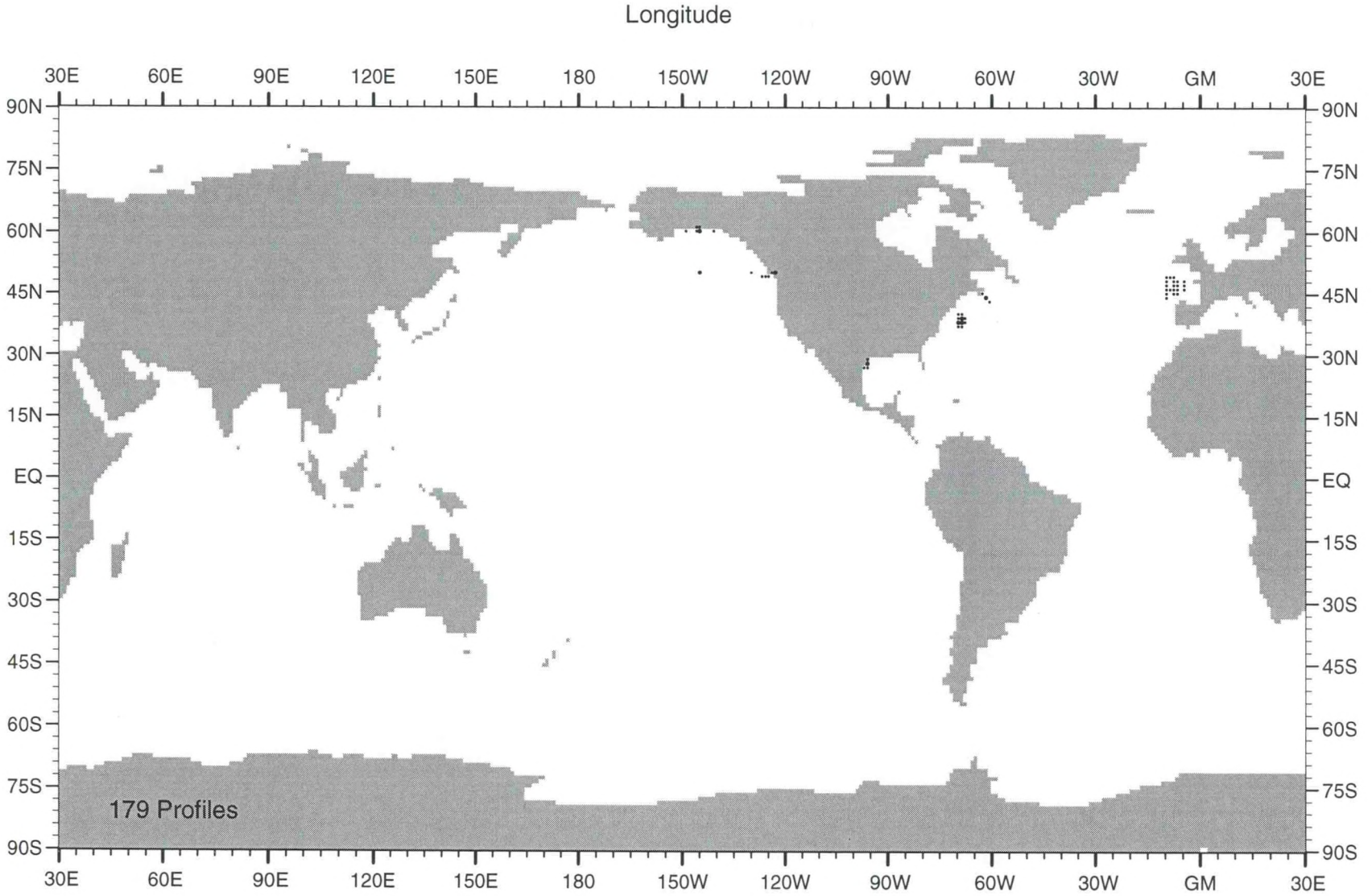

Fig. B32 WOD98 CTD station distribution for October-December for 1974

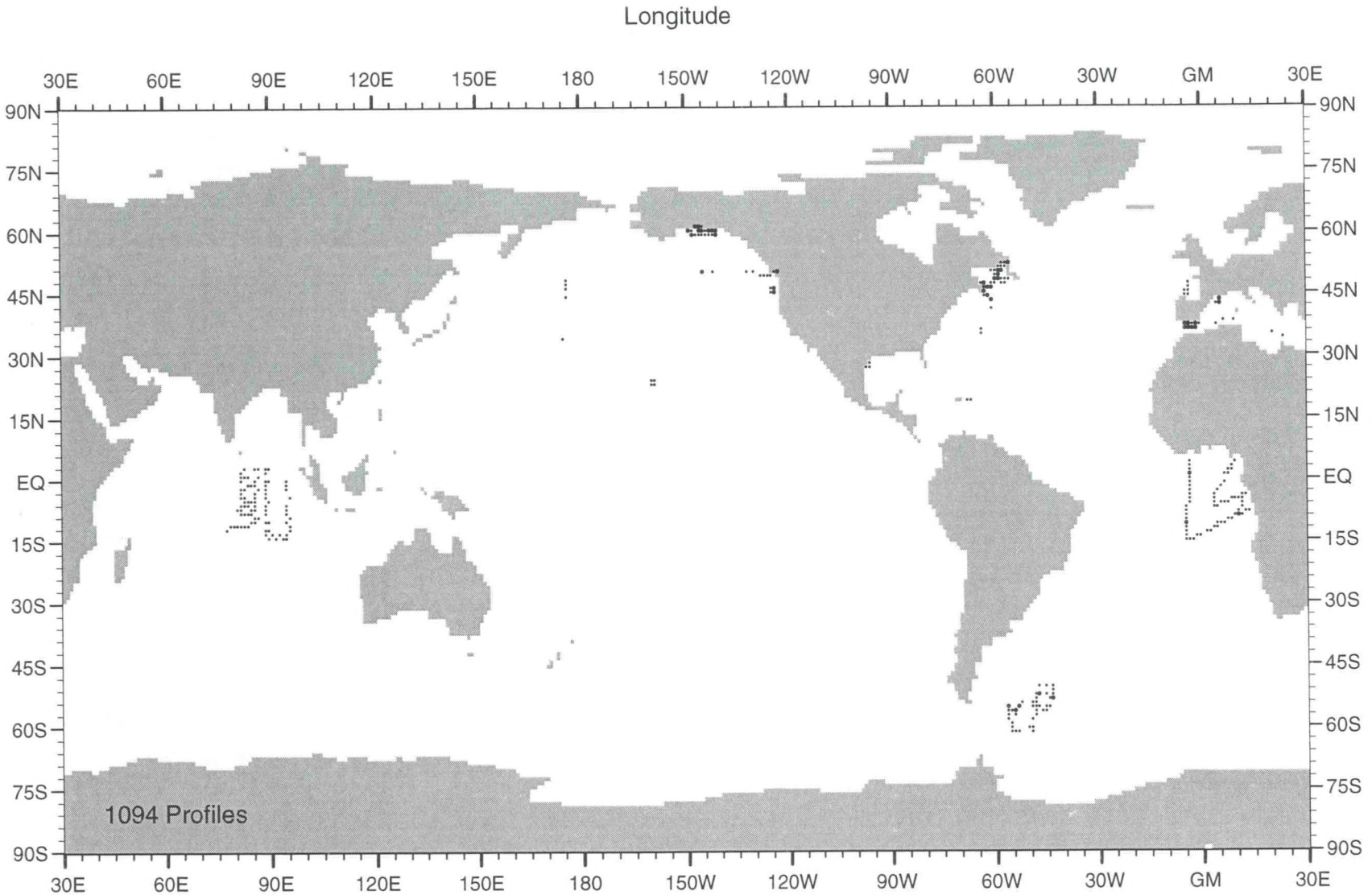

Fig. B33 WOD98 CTD station distribution for January-March for 1975

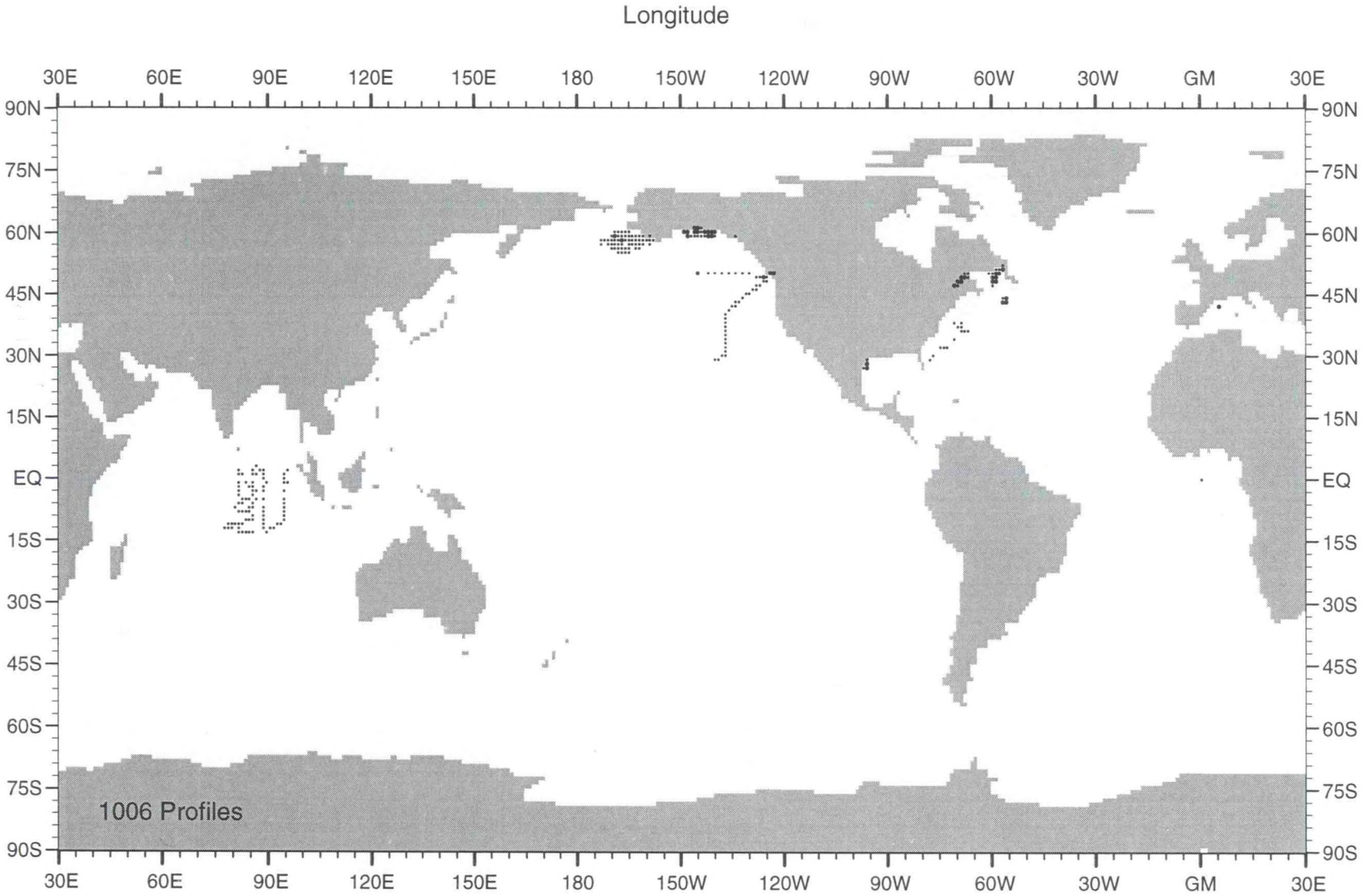

Fig. B34 WOD98 CTD station distribution for April-June for 1975

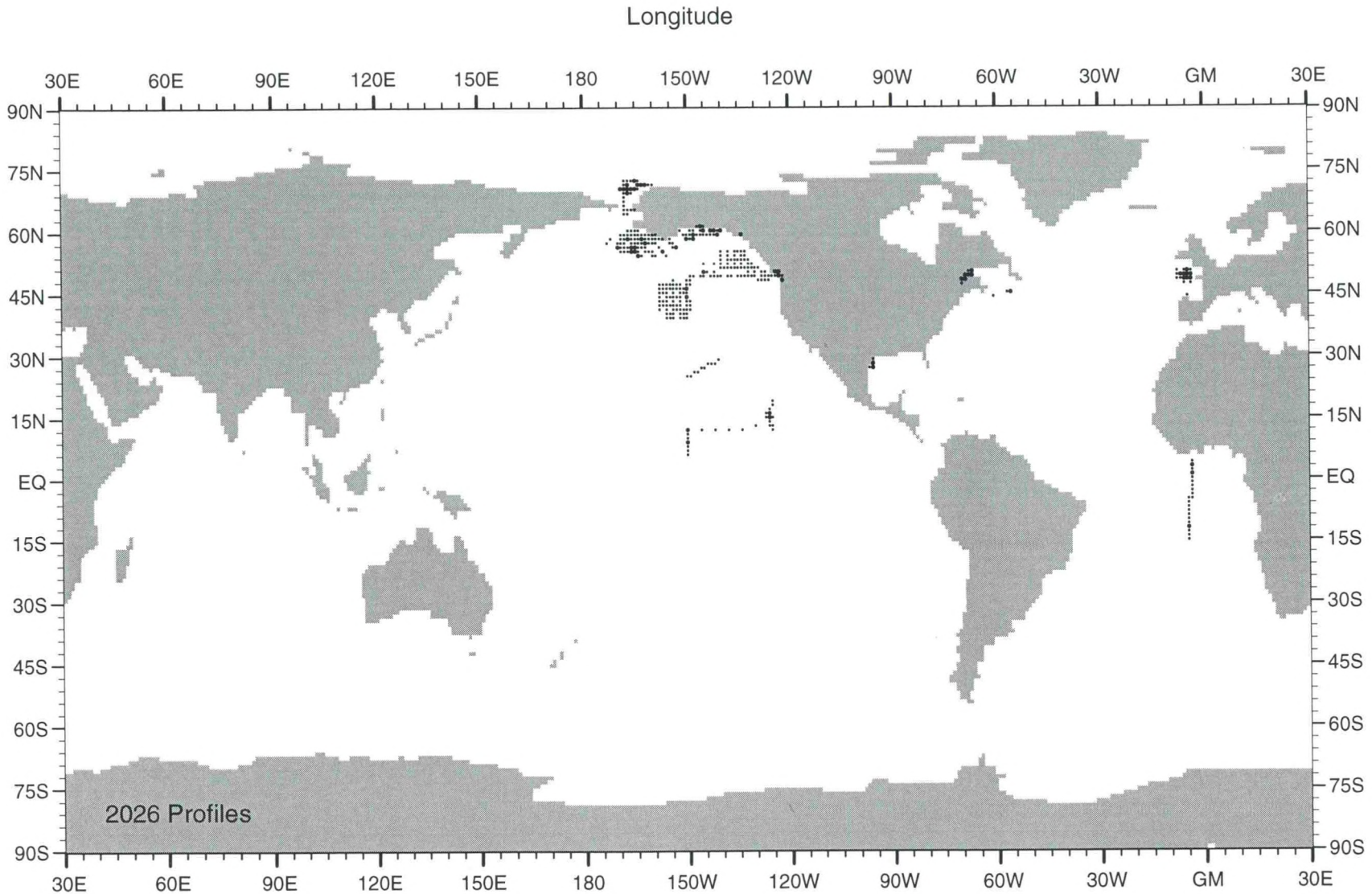

Fig. B35 WOD98 CTD station distribution for July-September for 1975

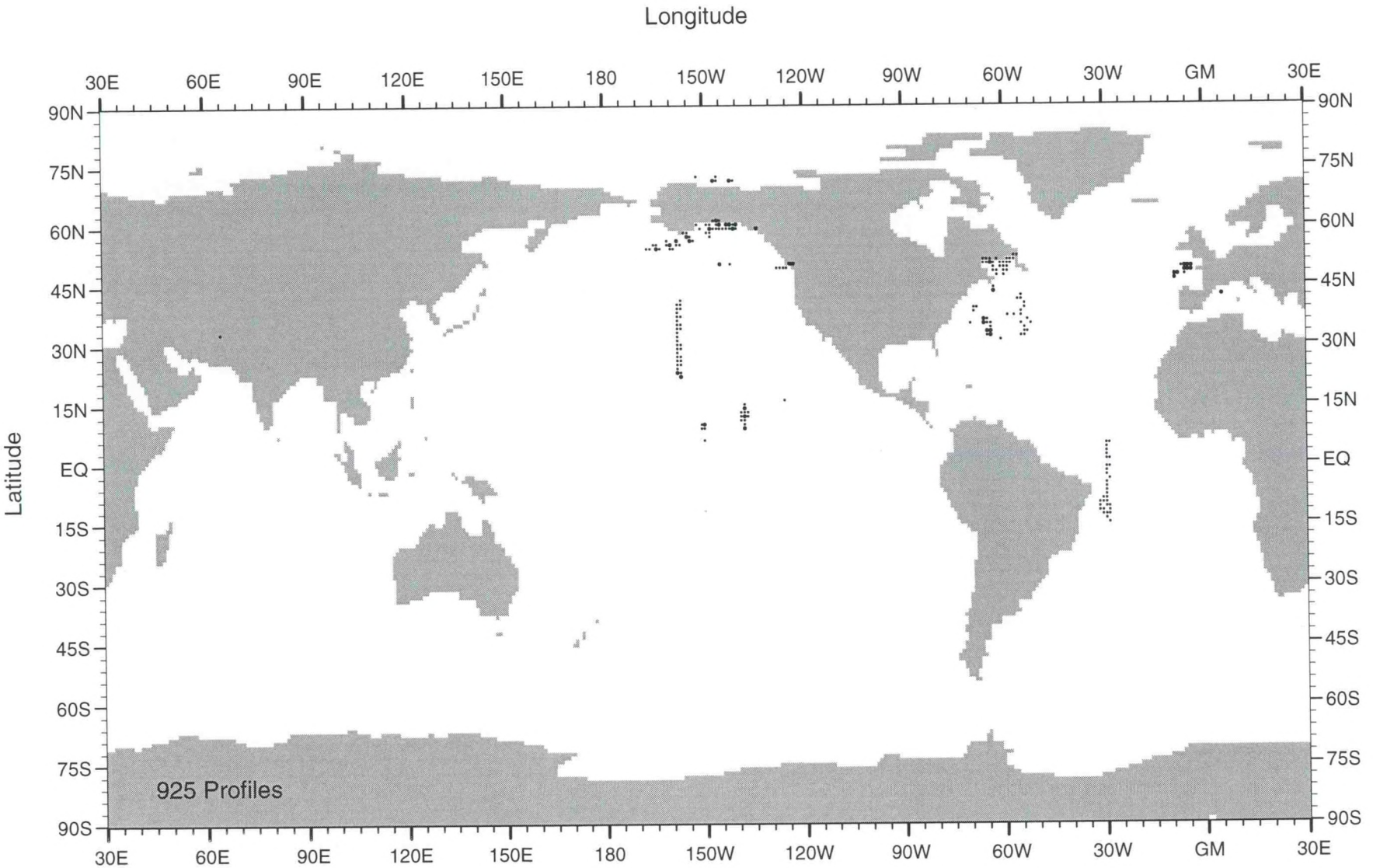

Fig. B36 WOD98 CTD station distribution for October-December for 1975

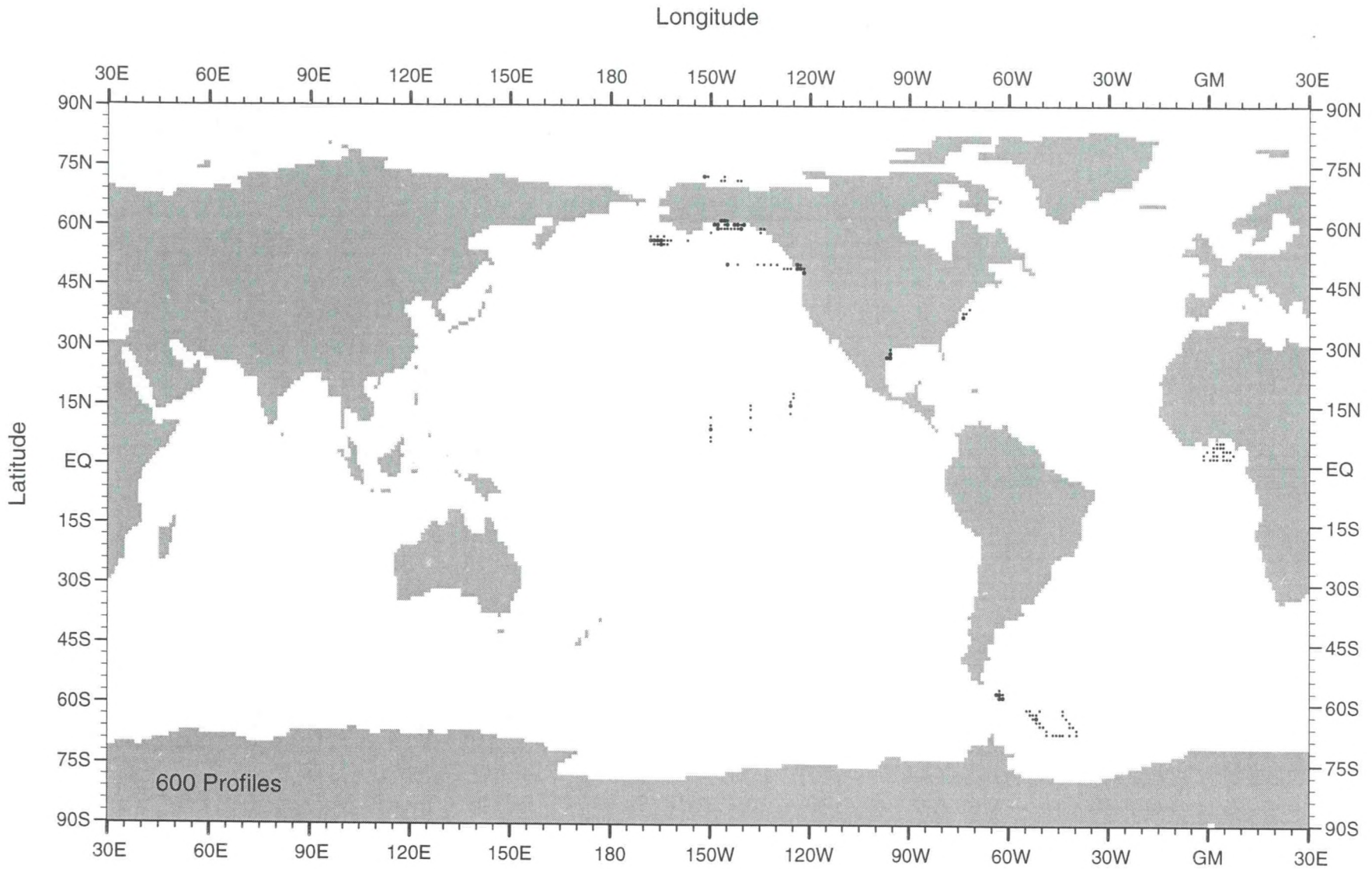

Fig. B37 WOD98 CTD station distribution for January-March for 1976

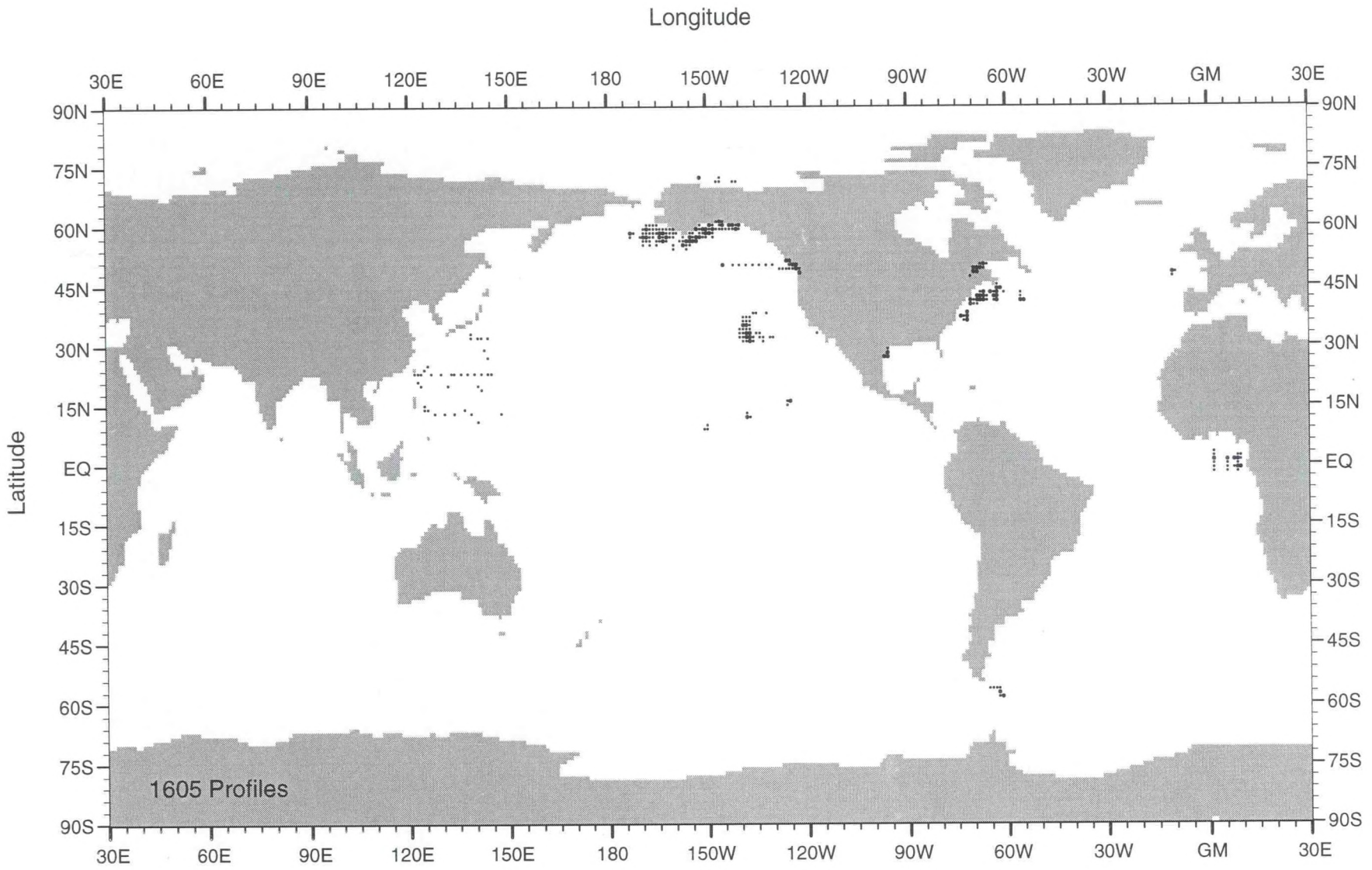

Fig. B38 WOD98 CTD station distribution for April-June for 1976

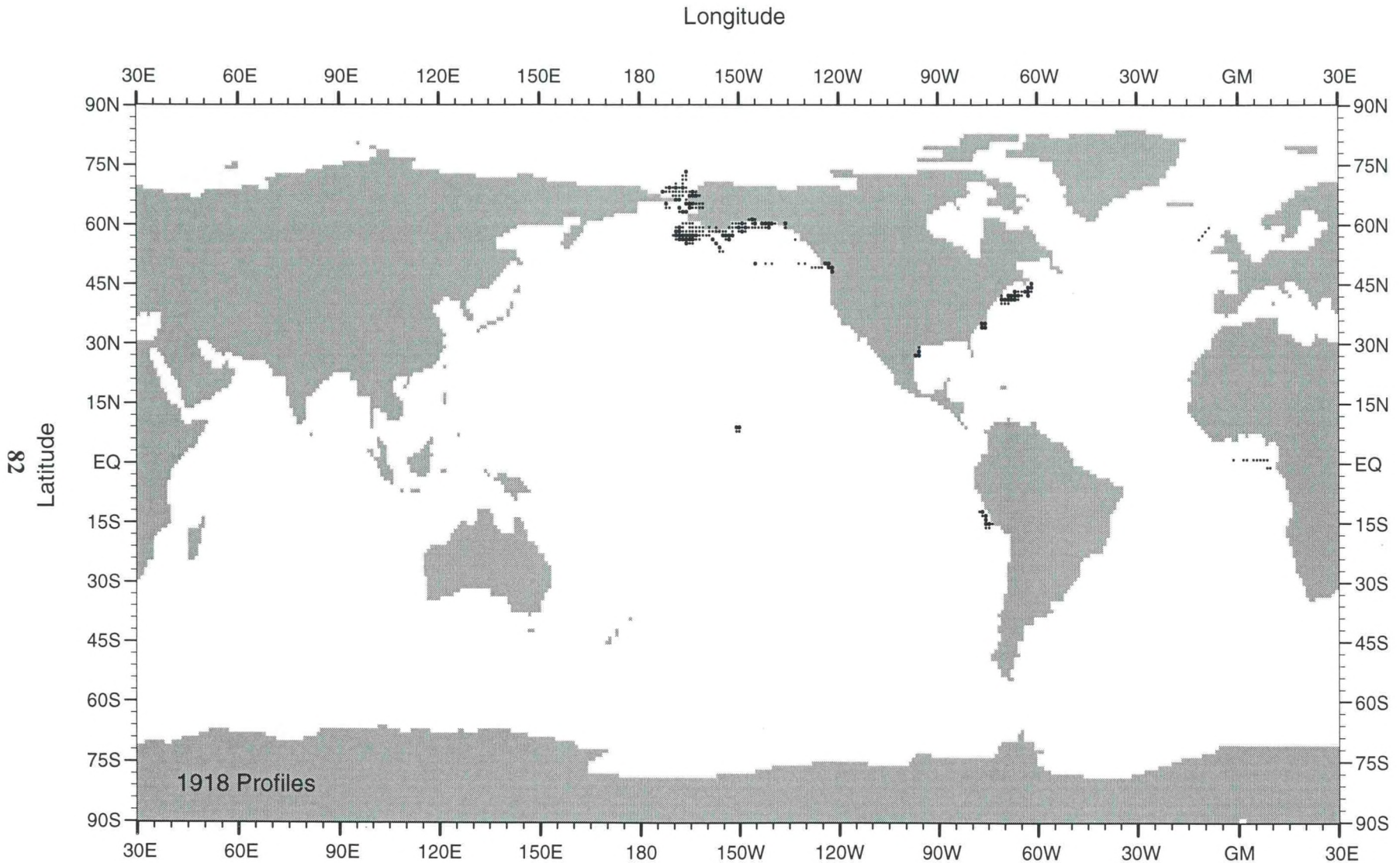

Fig. B39 WOD98 CTD station distribution for July-September for 1976

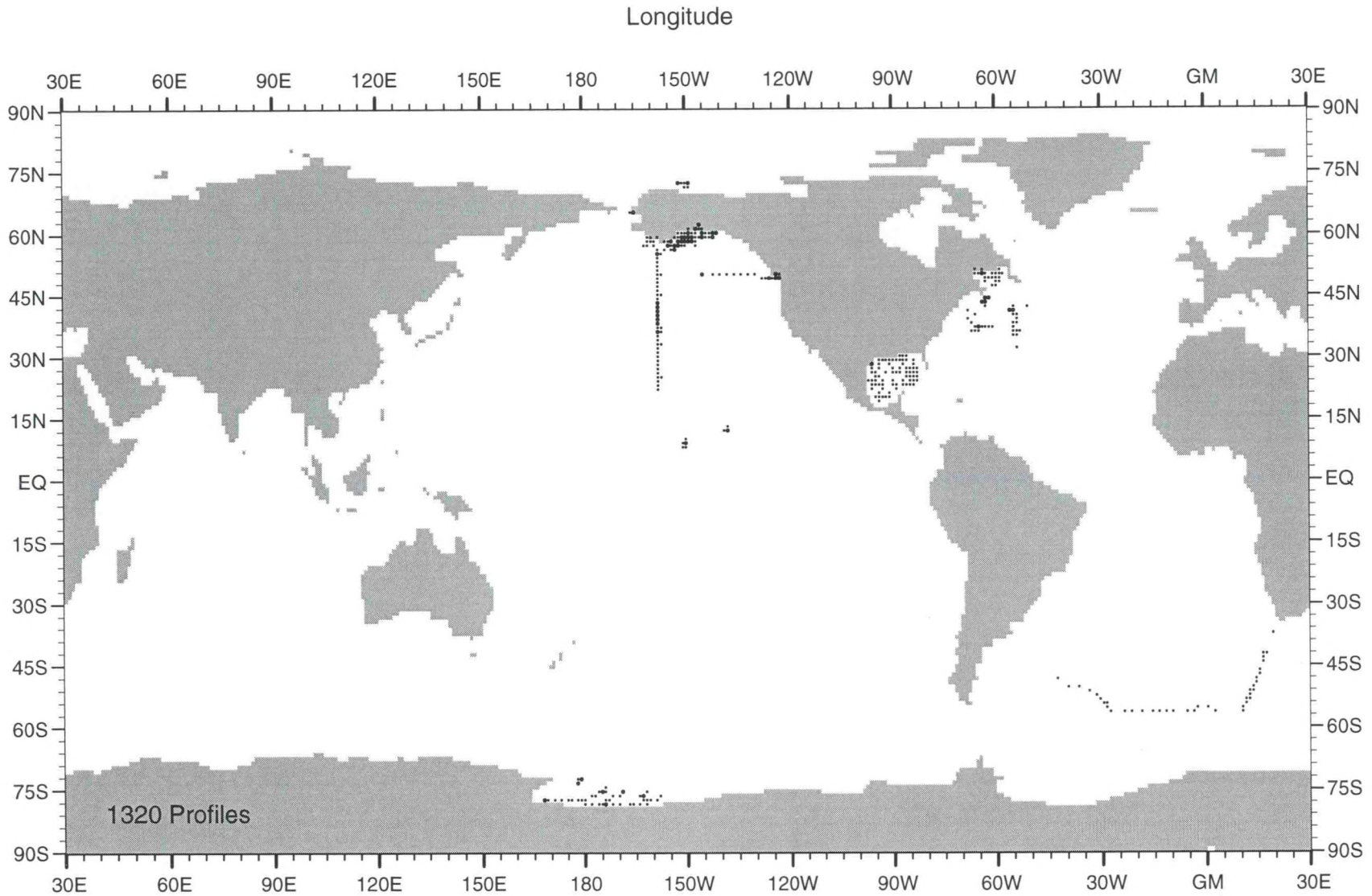

Fig. B40 WOD98 CTD station distribution for October-December for 1976

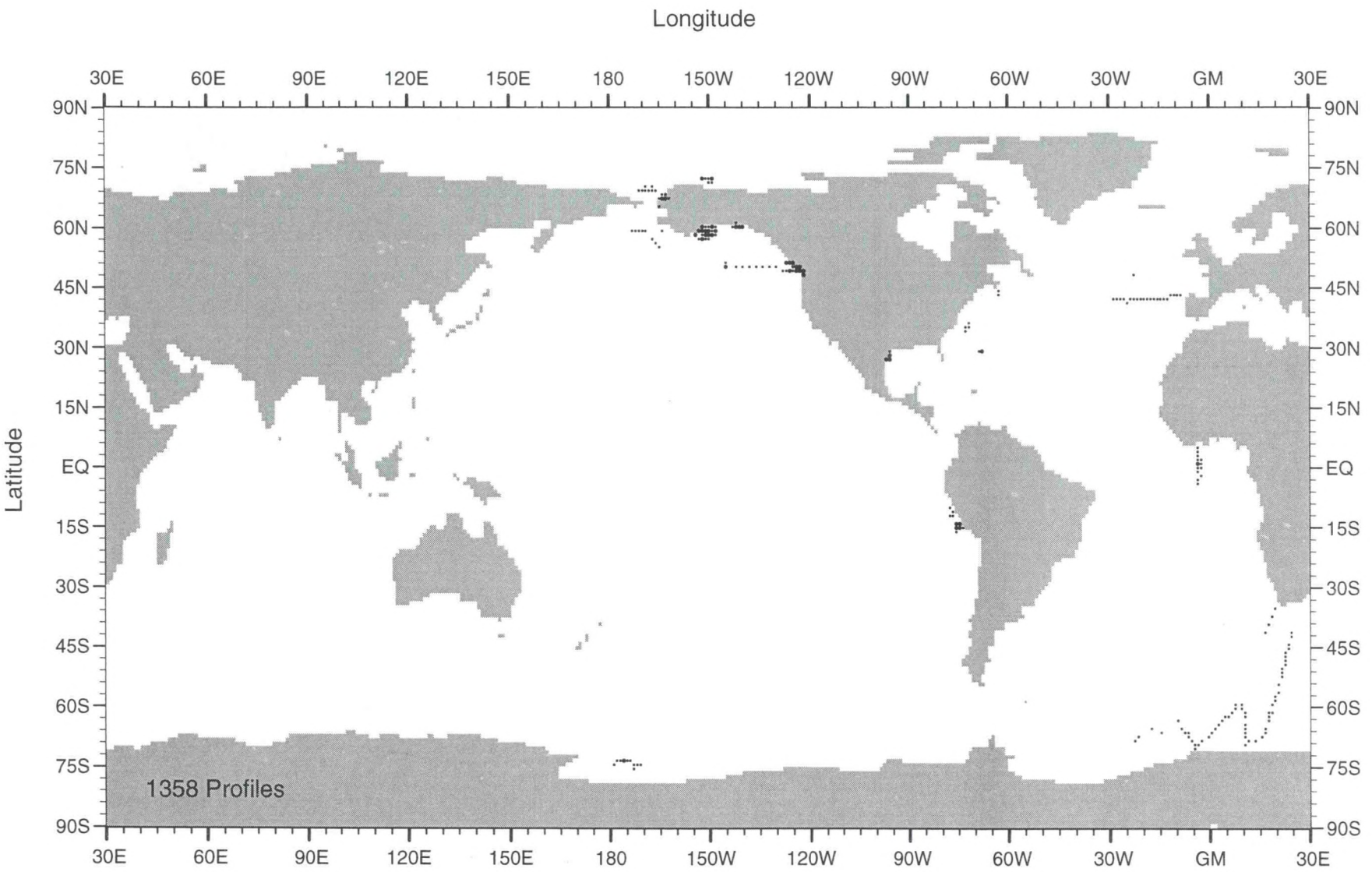

Fig. B41 WOD98 CTD station distribution for January-March for 1977

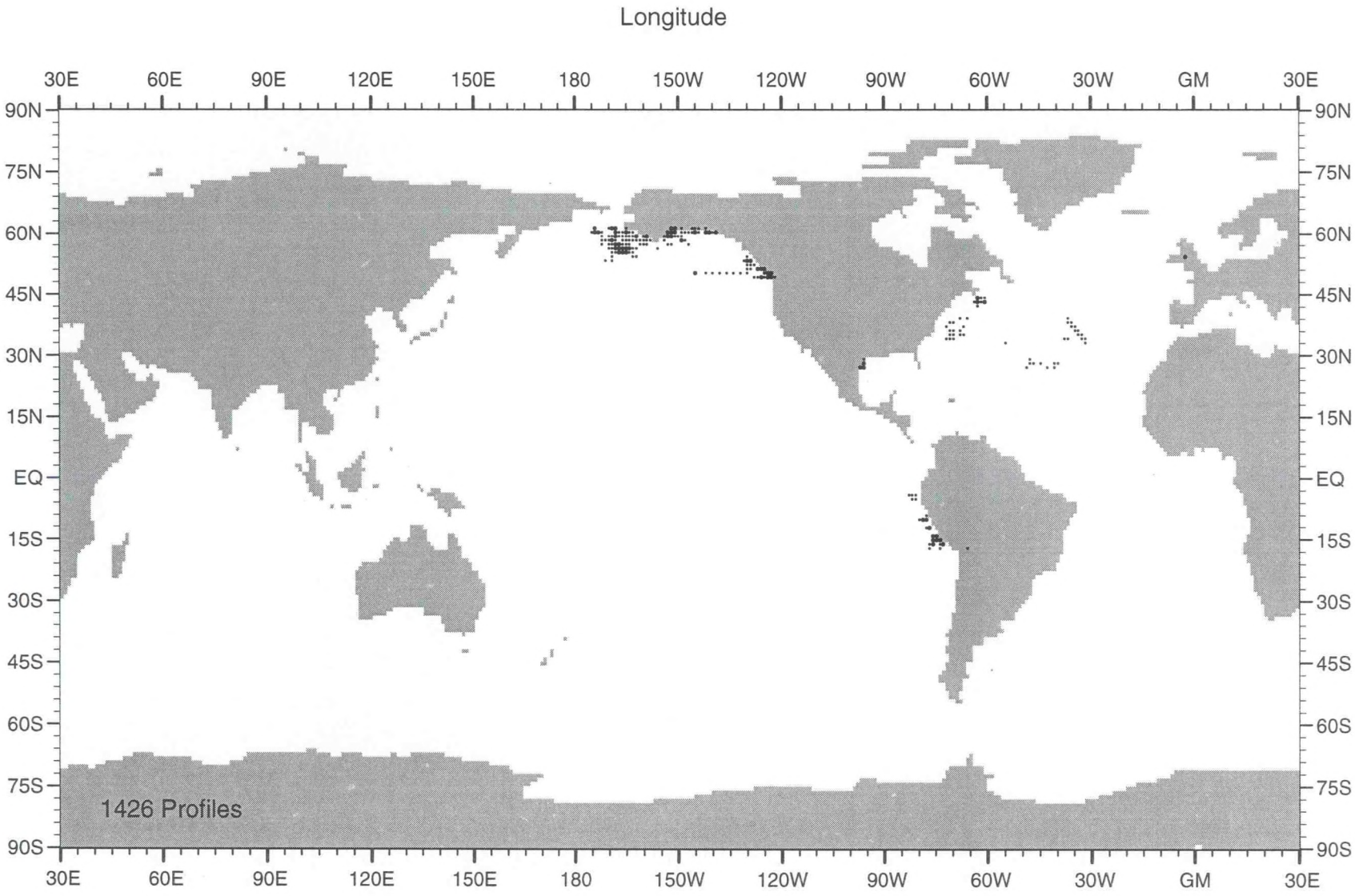

Fig. B42 WOD98 CTD station distribution for April-June for 1977

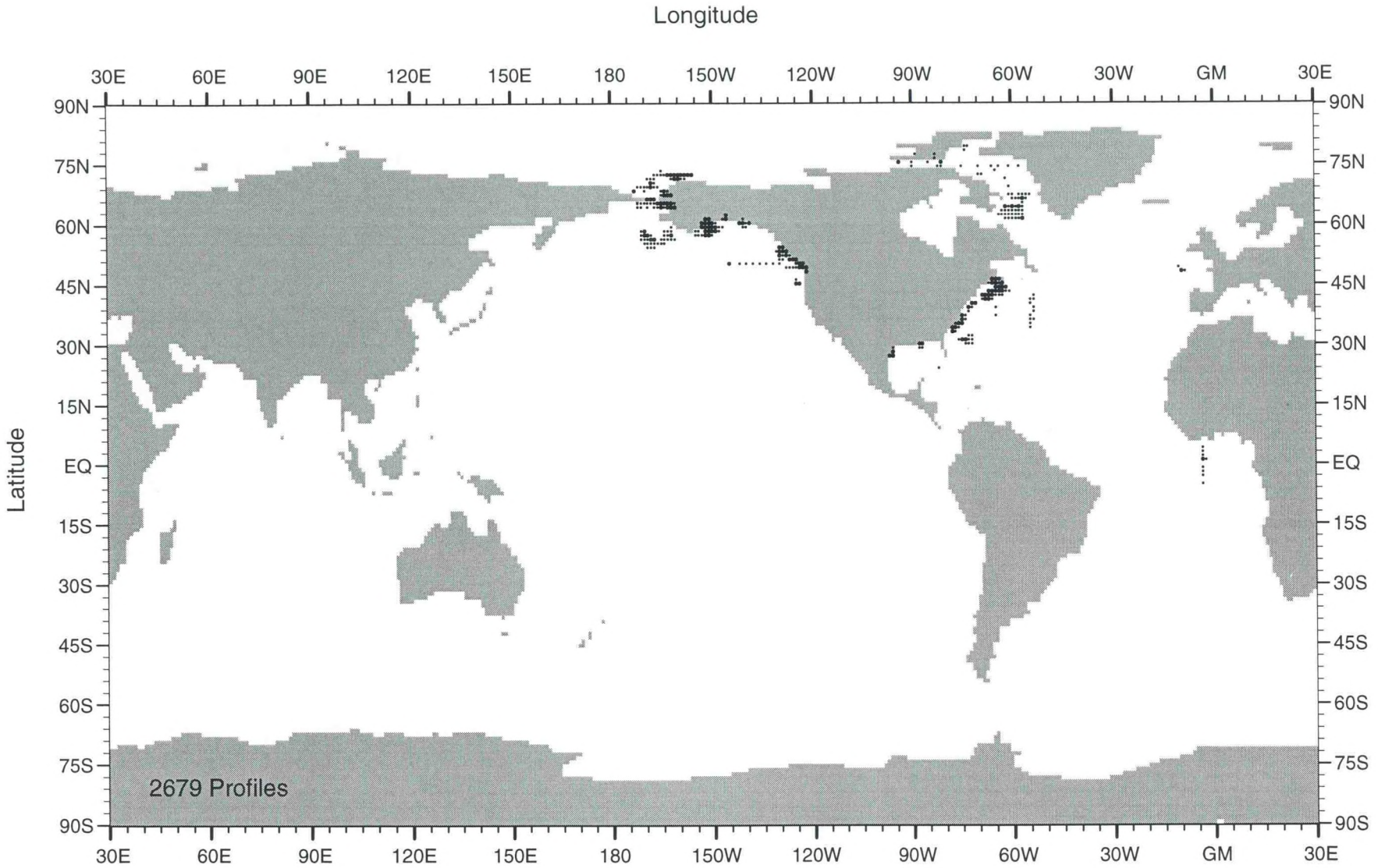

Fig. B43 WOD98 CTD station distribution for July-September for 1977

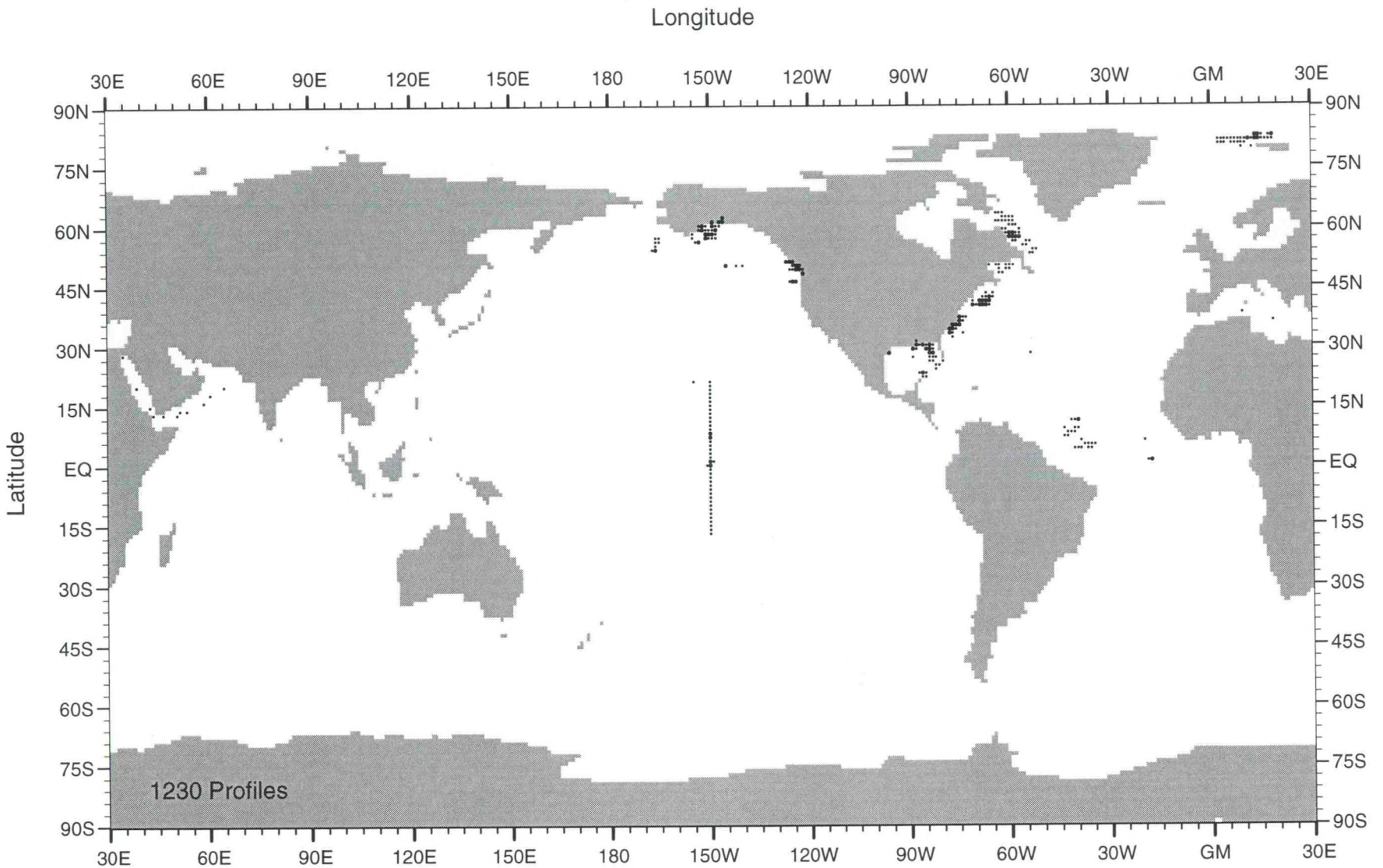

Fig. B44 WOD98 CTD station distribution for October-December for 1977

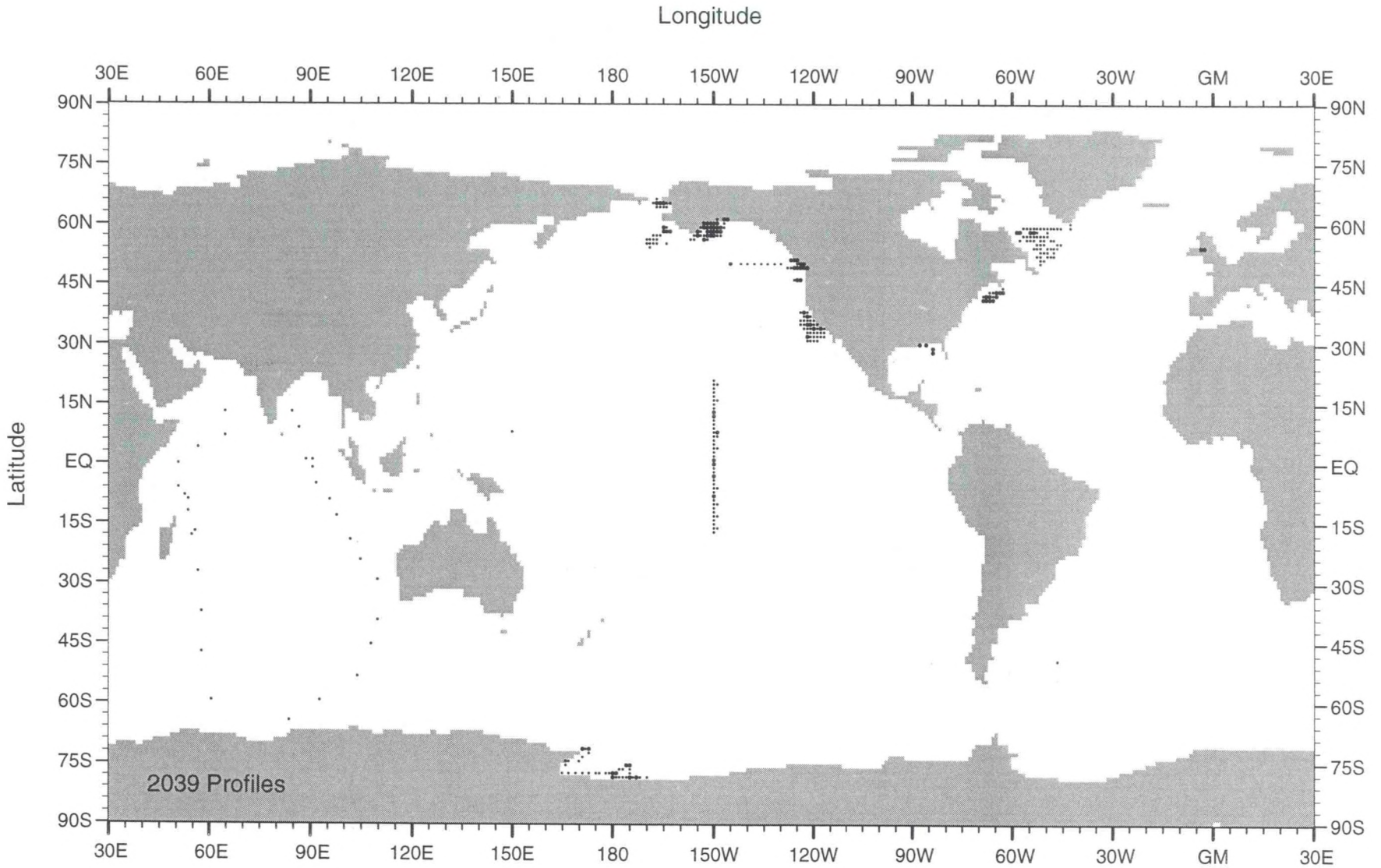

Fig. B45 WOD98 CTD station distribution for January-March for 1978

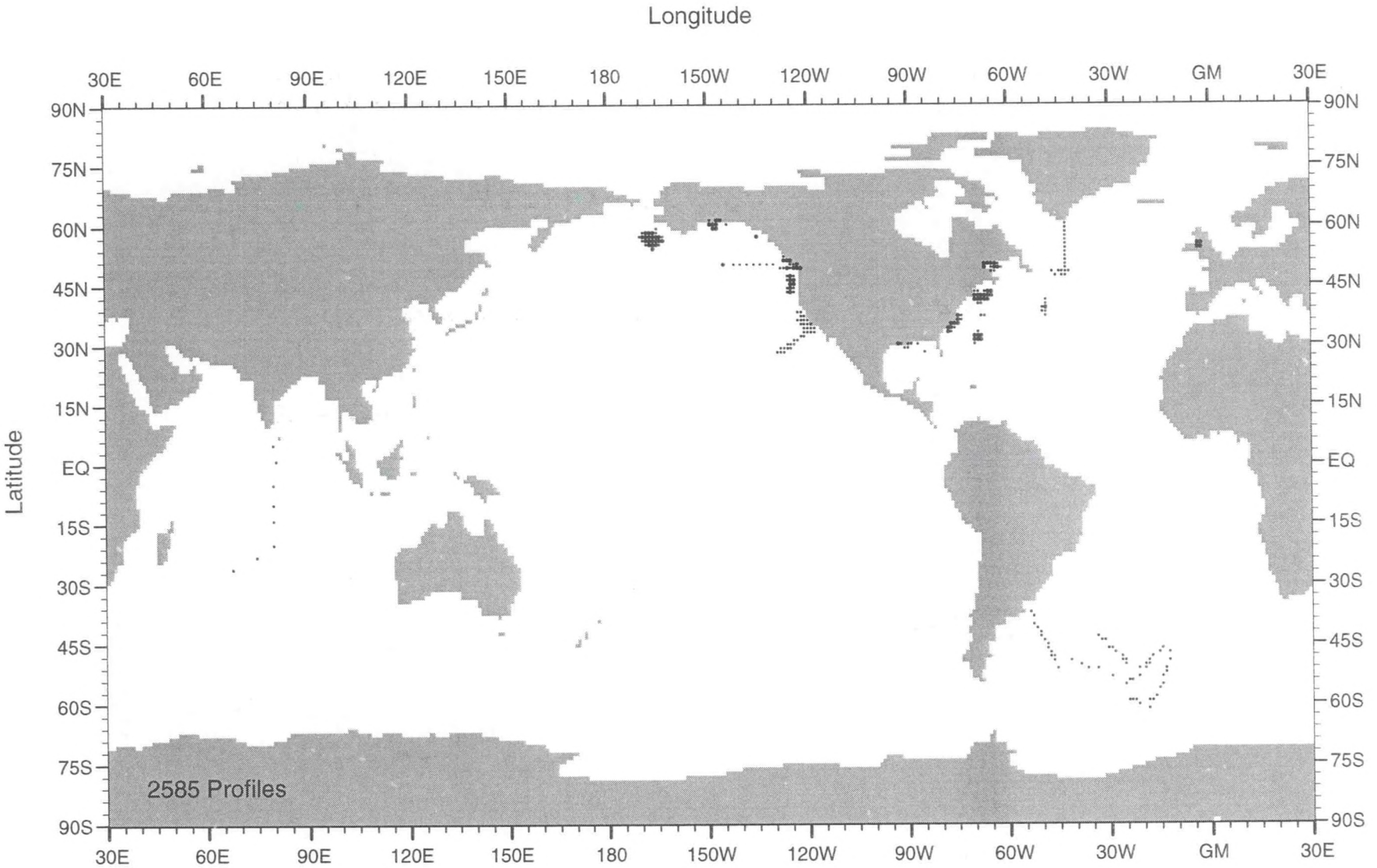

Fig. B46 WOD98 CTD station distribution for April-June for 1978

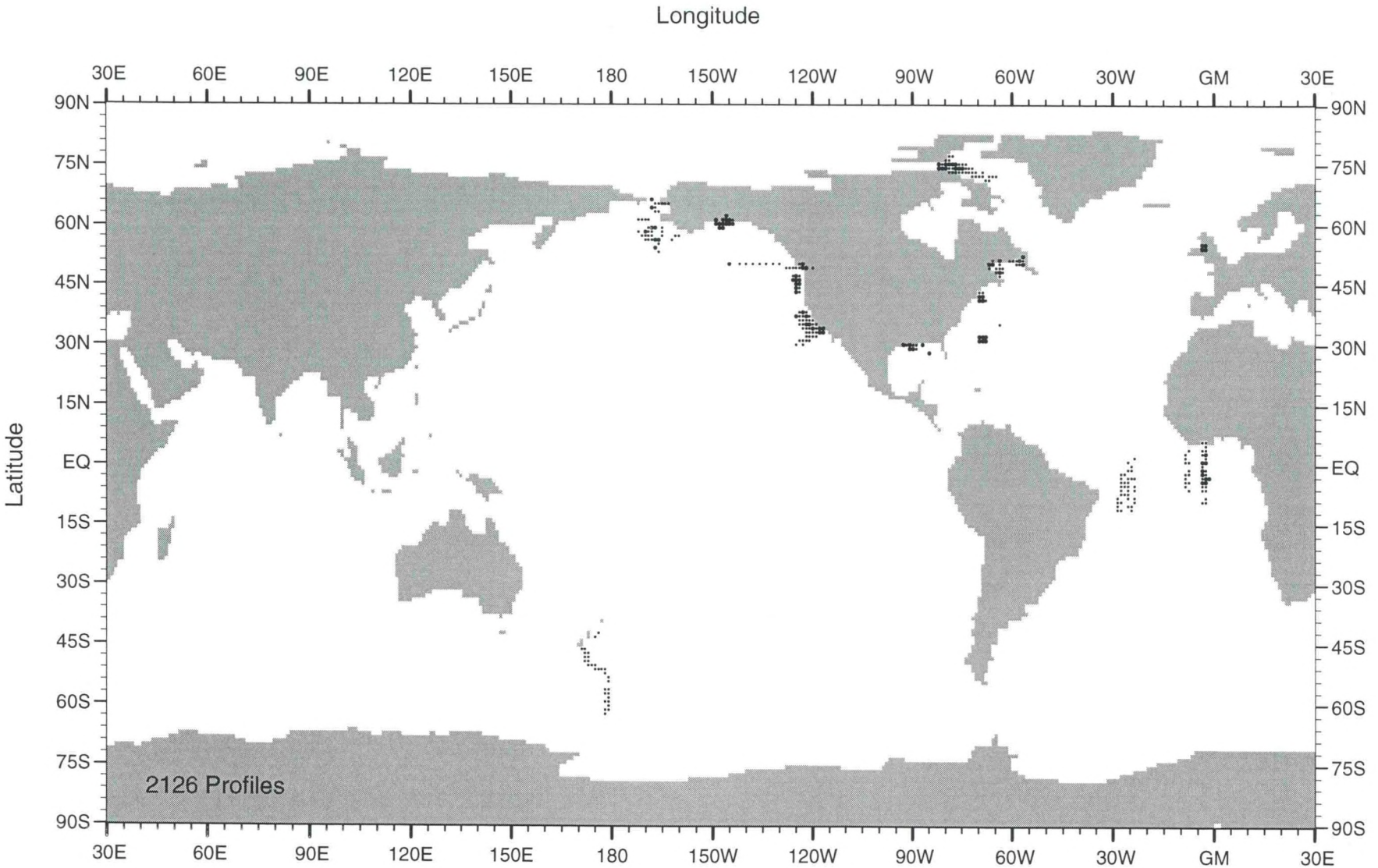

Fig. B47 WOD98 CTD station distribution for July-September for 1978

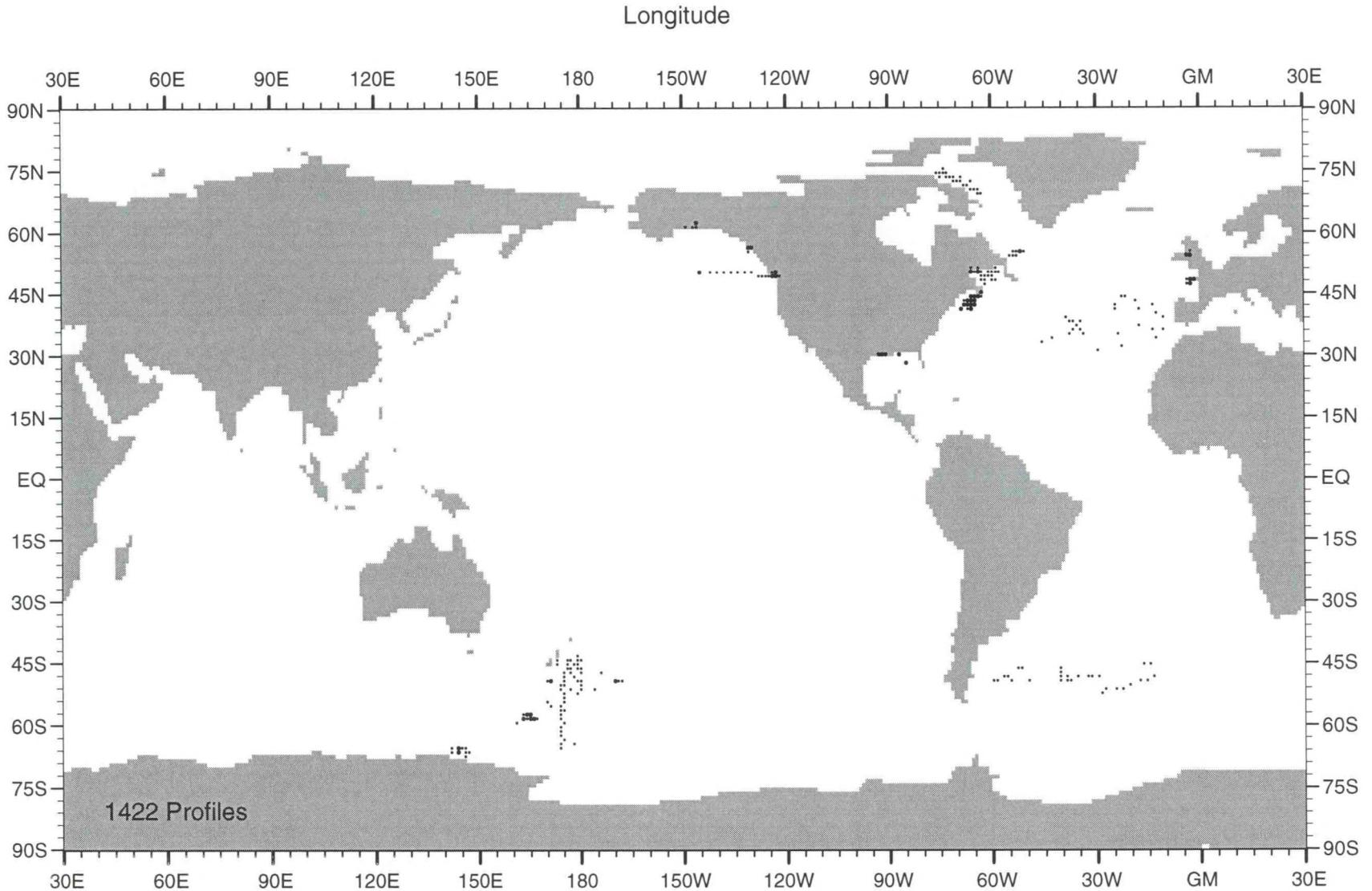

Fig. B48 WOD98 CTD station distribution for October-December for 1978

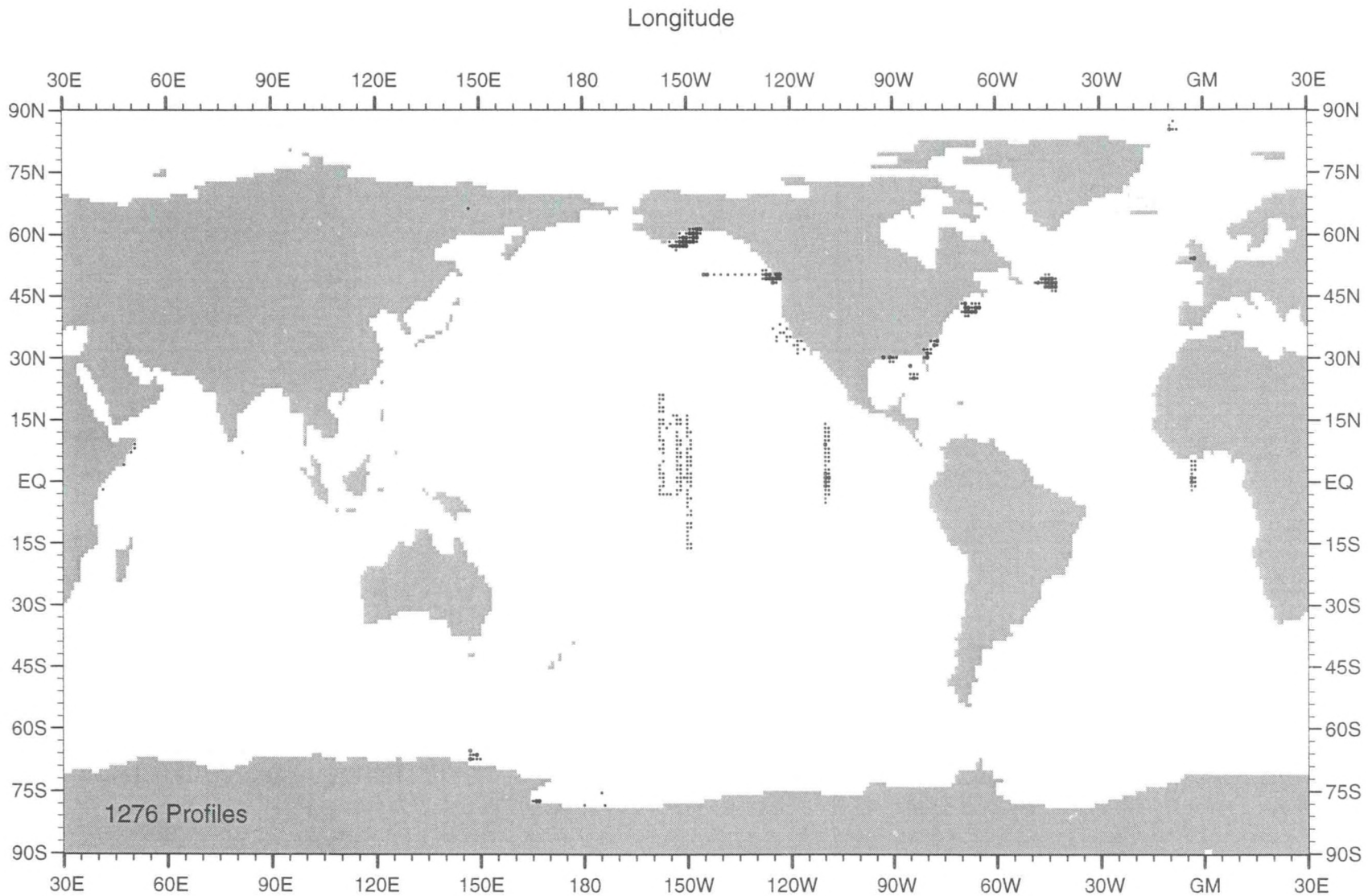

Fig. B49 WOD98 CTD station distribution for January-March for 1979

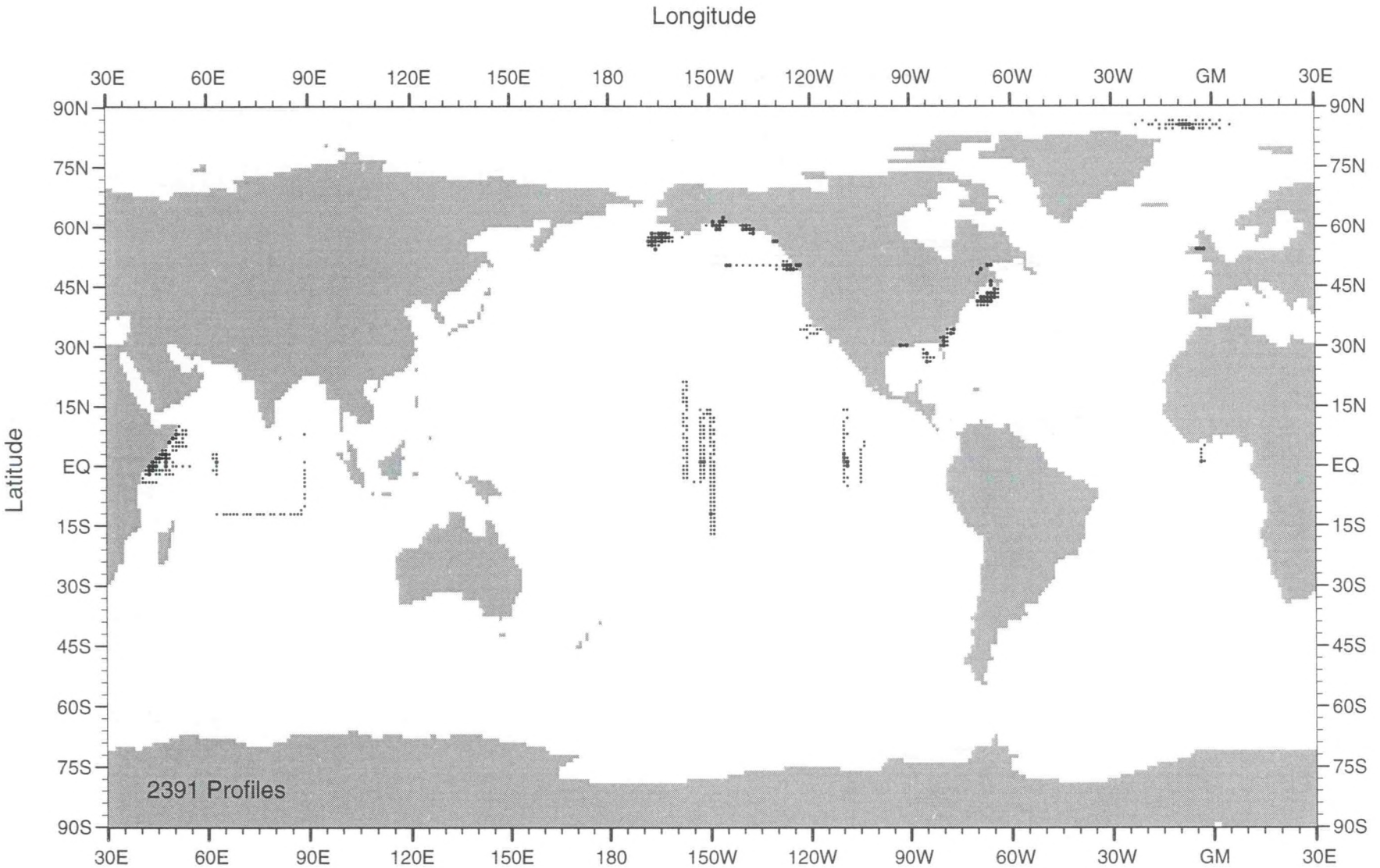

Fig. B50 WOD98 CTD station distribution for April-June for 1979

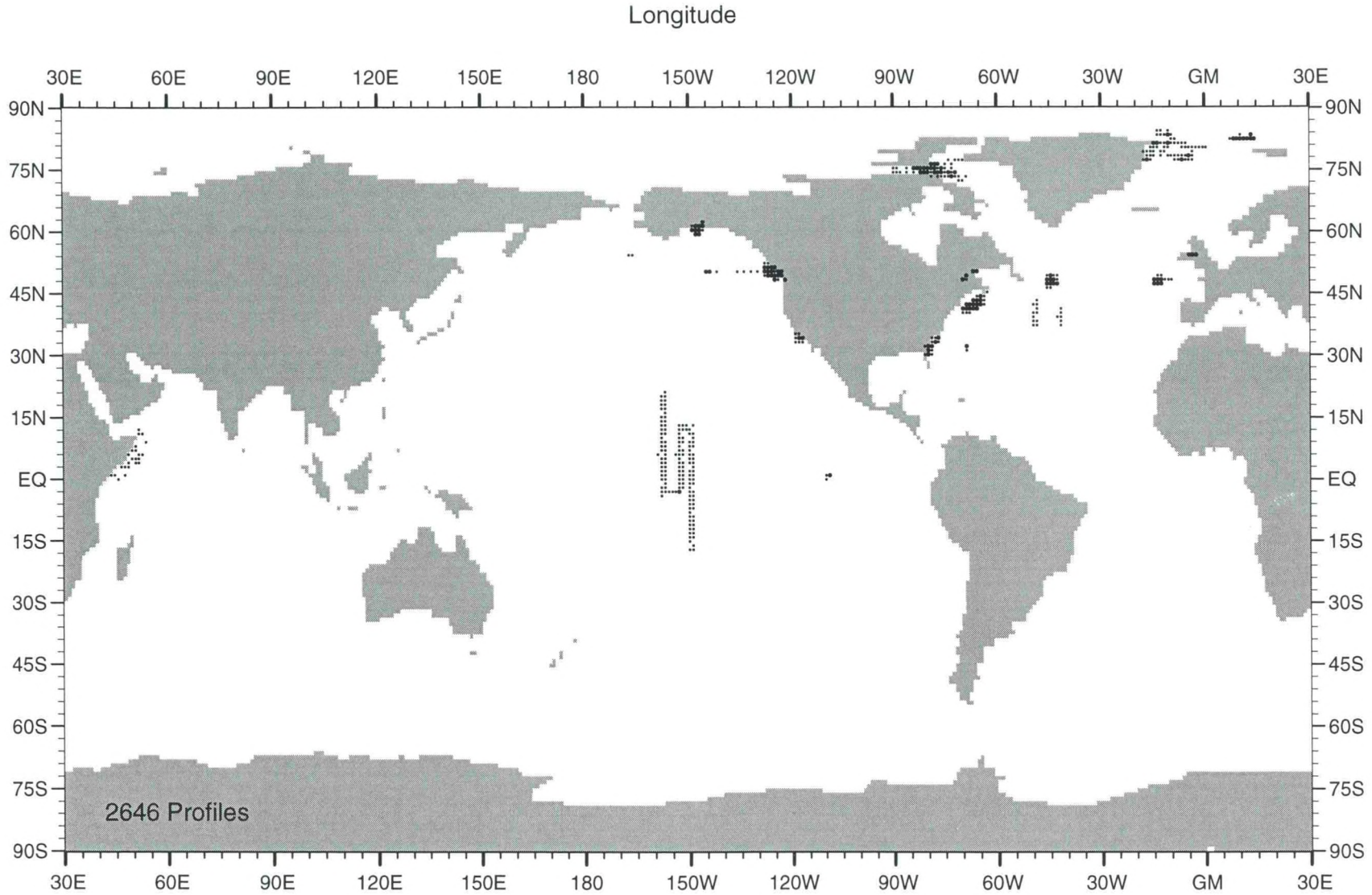

Fig. B51 WOD98 CTD station distribution for July-September for 1979

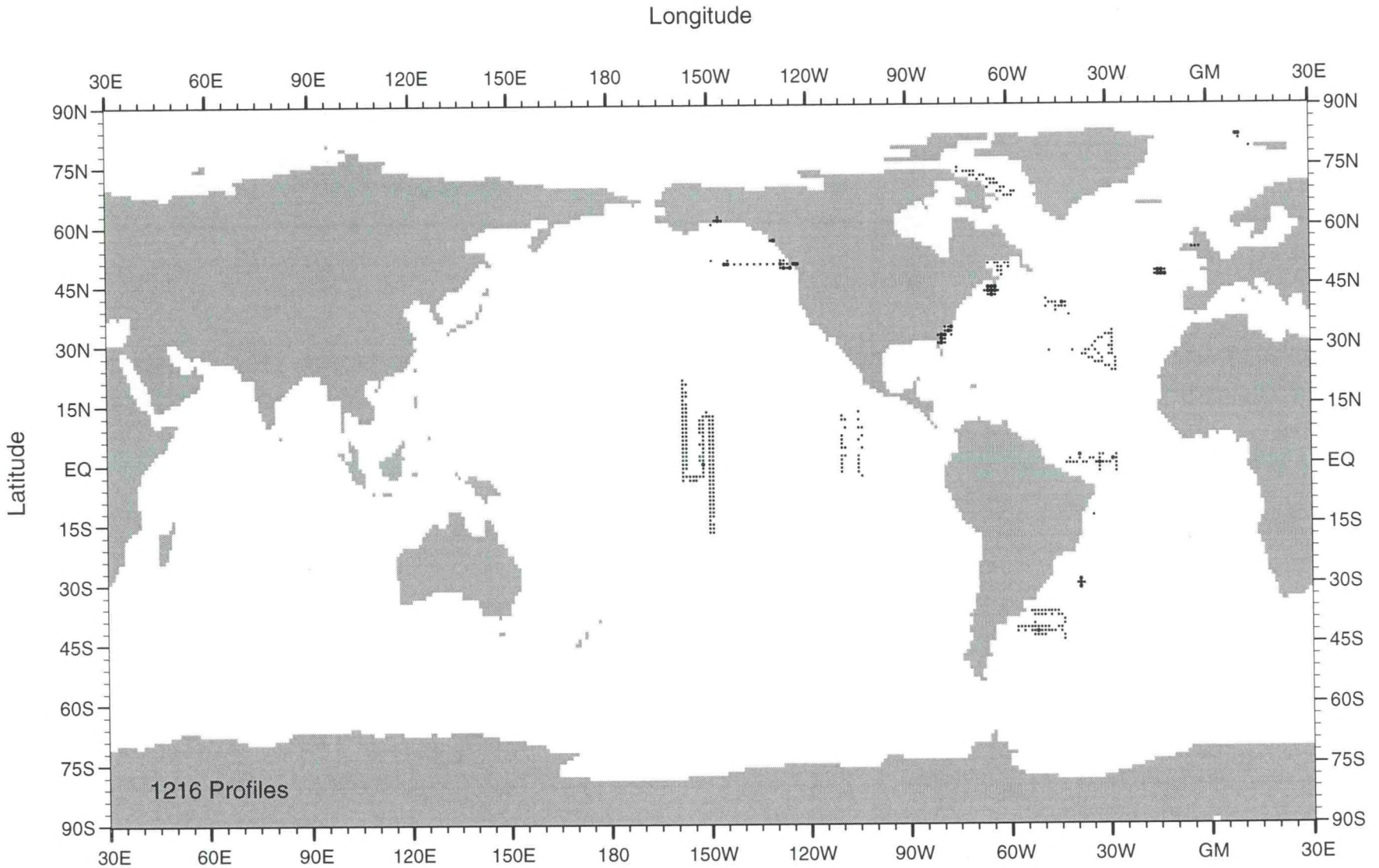

Fig. B52 WOD98 CTD station distribution for October-December for 1979

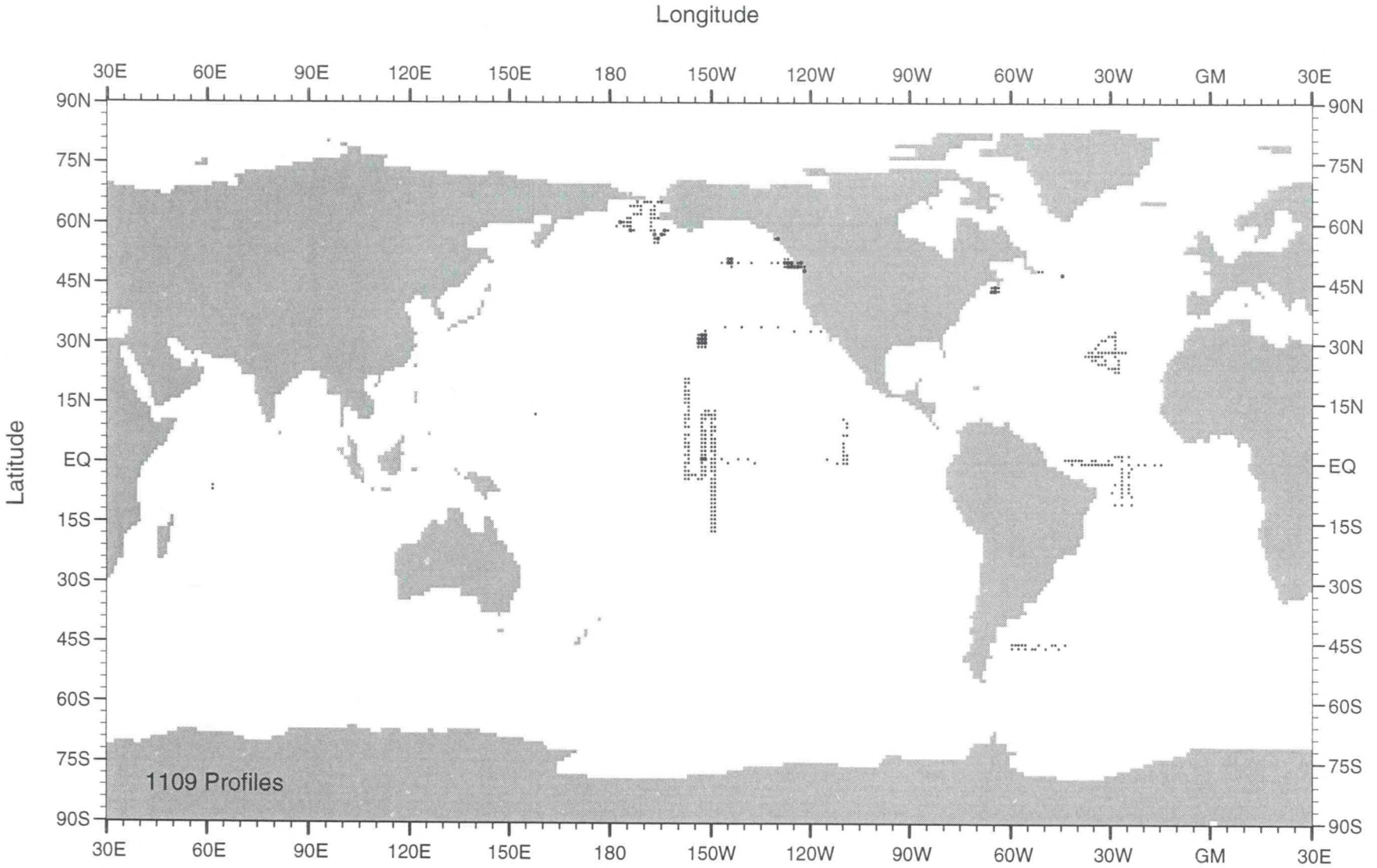

Fig. B53 WOD98 CTD station distribution for January-March for 1980

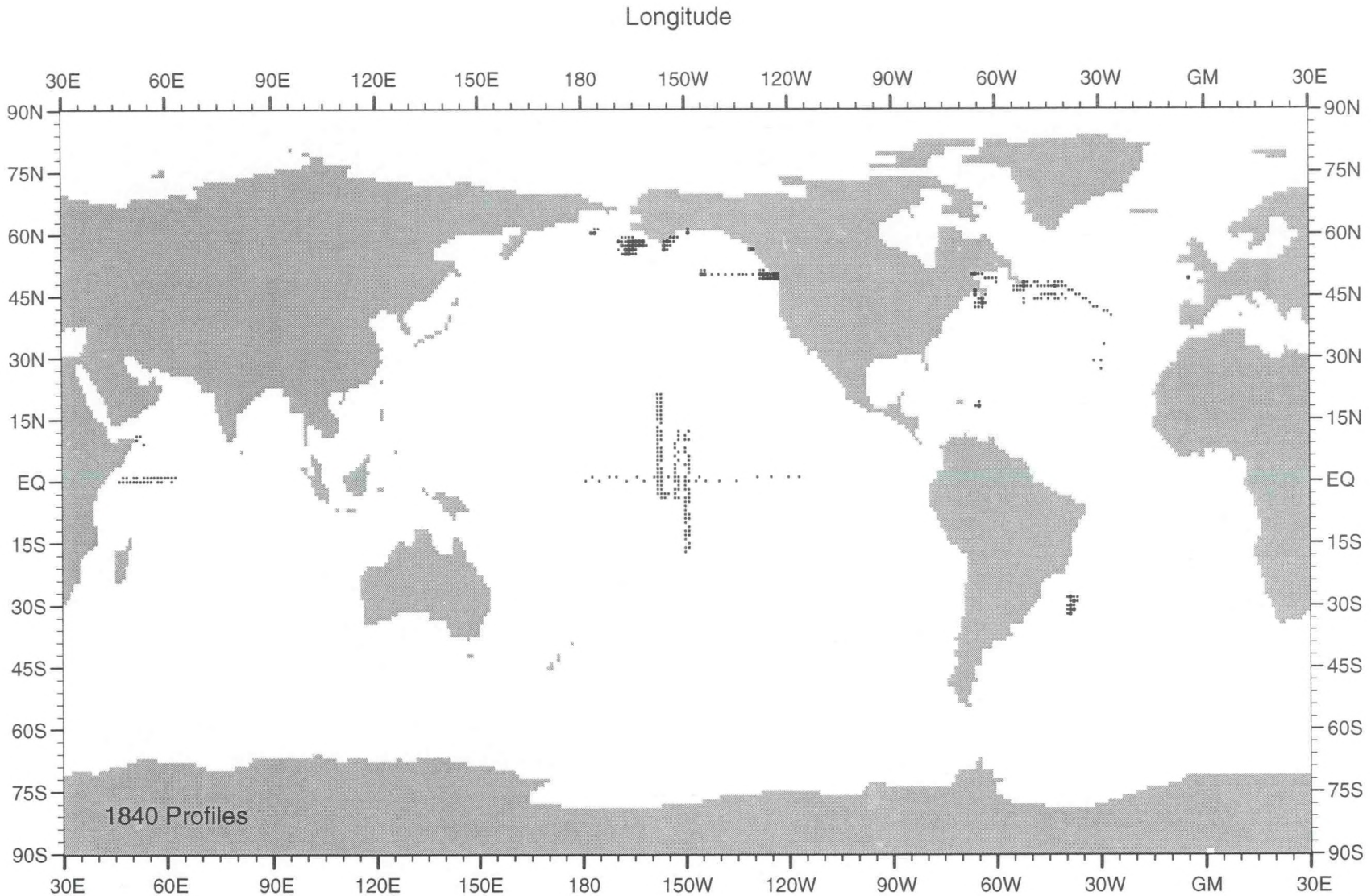

Fig. B54 WOD98 CTD station distribution for April-June for 1980

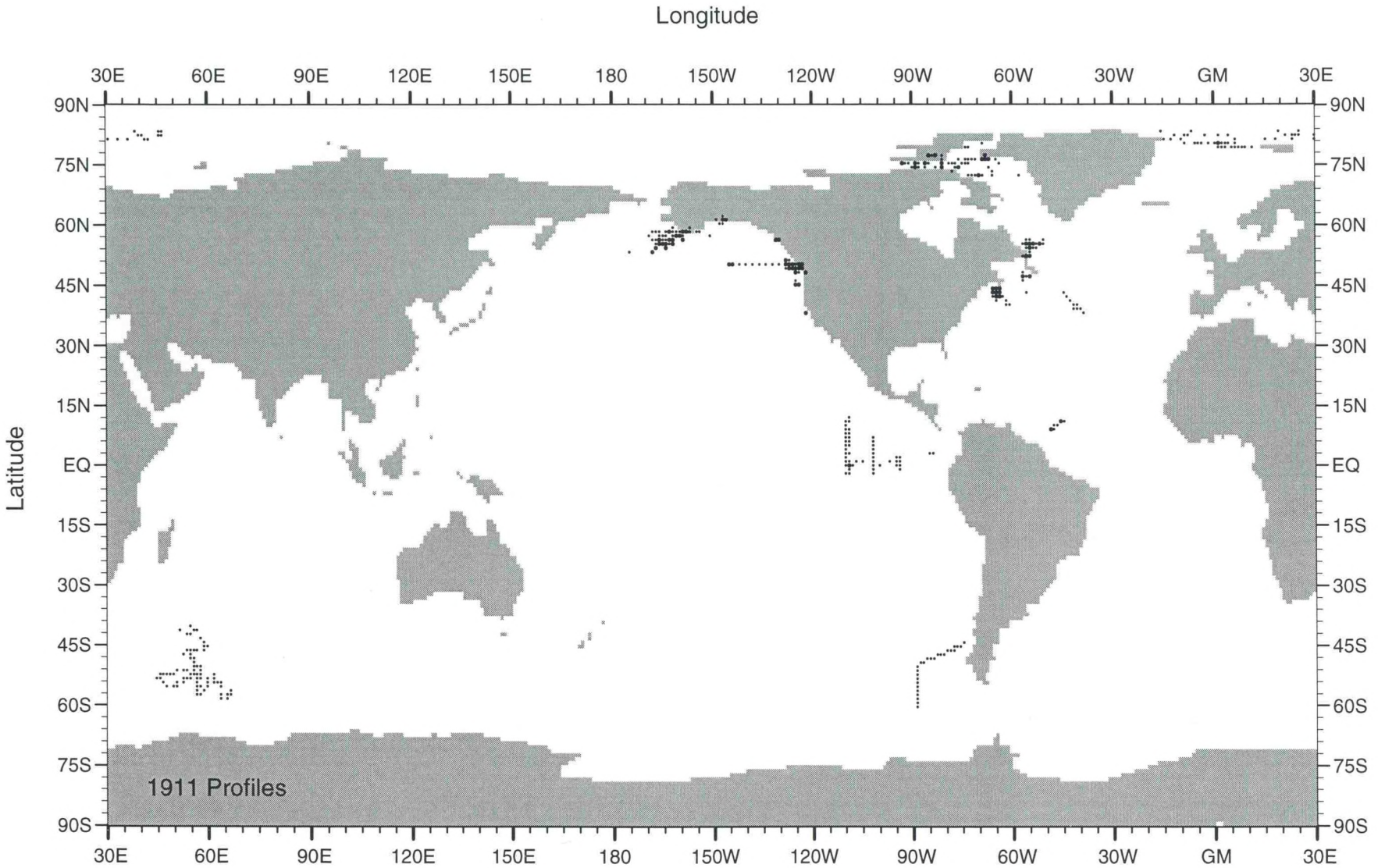

Fig. B55 WOD98 CTD station distribution for July-September for 1980

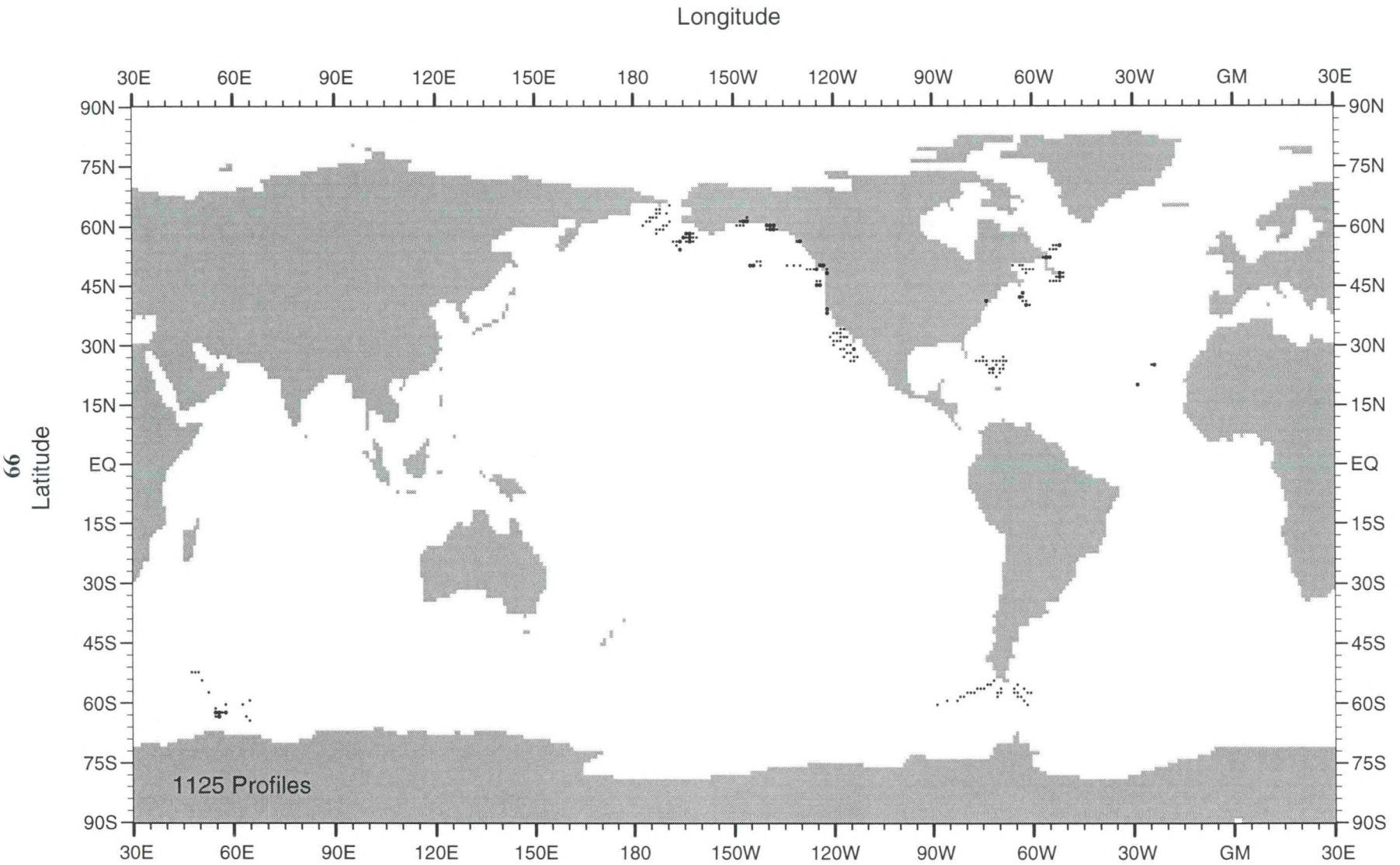

Fig. B56 WOD98 CTD station distribution for October-December for 1980

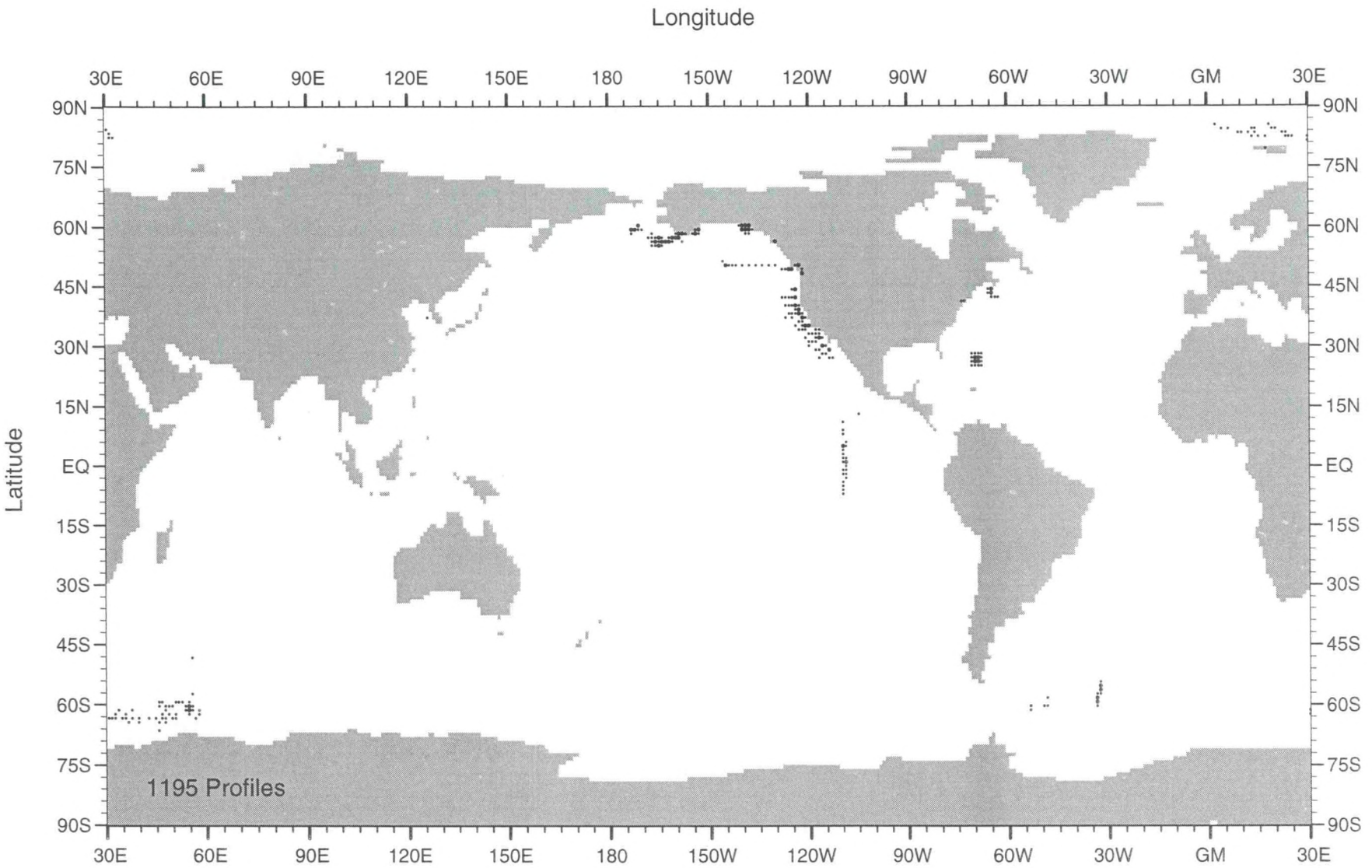

Fig. B57 WOD98 CTD station distribution for January-March for 1981

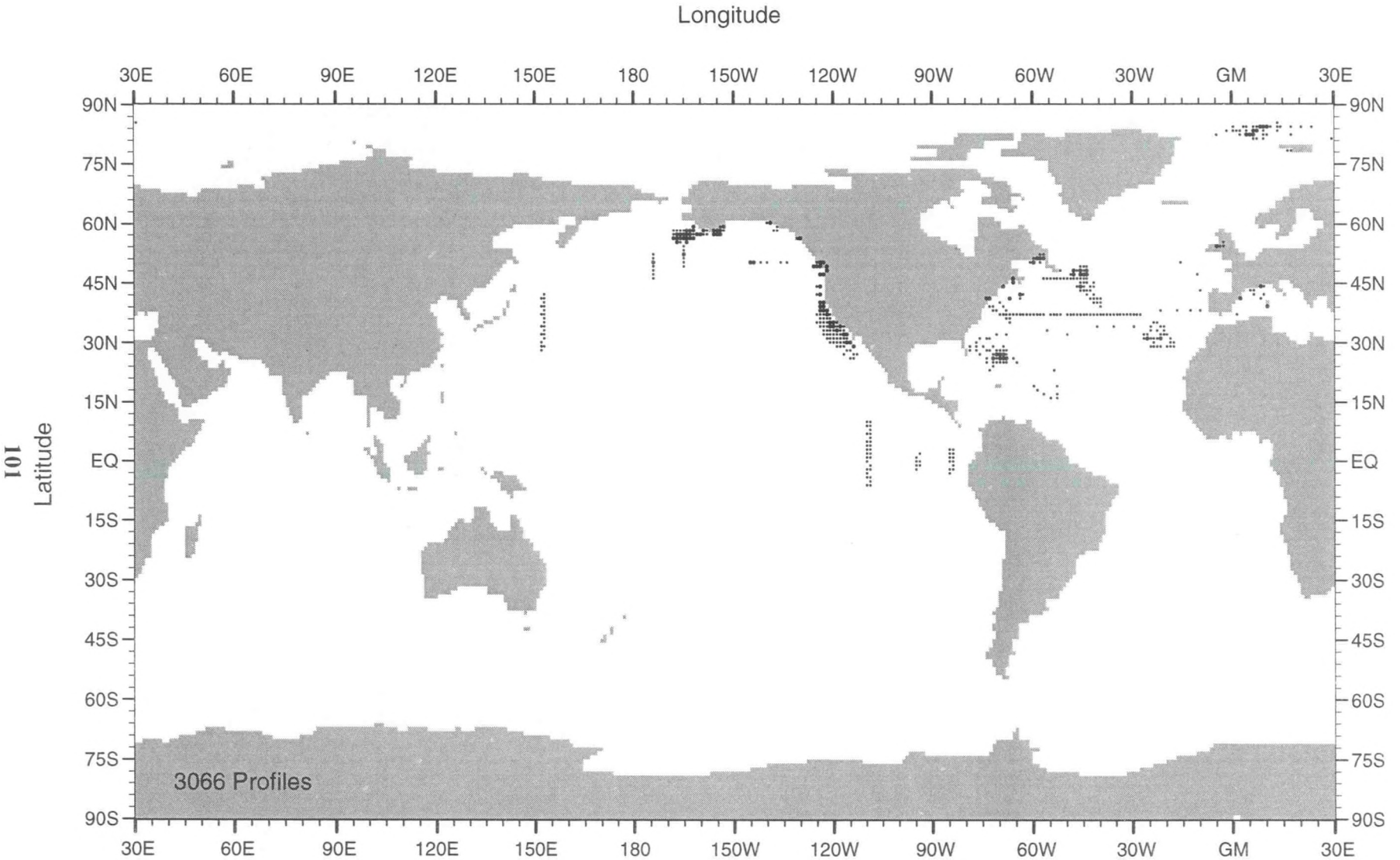

Fig. B58 WOD98 CTD station distribution for April-June for 1981

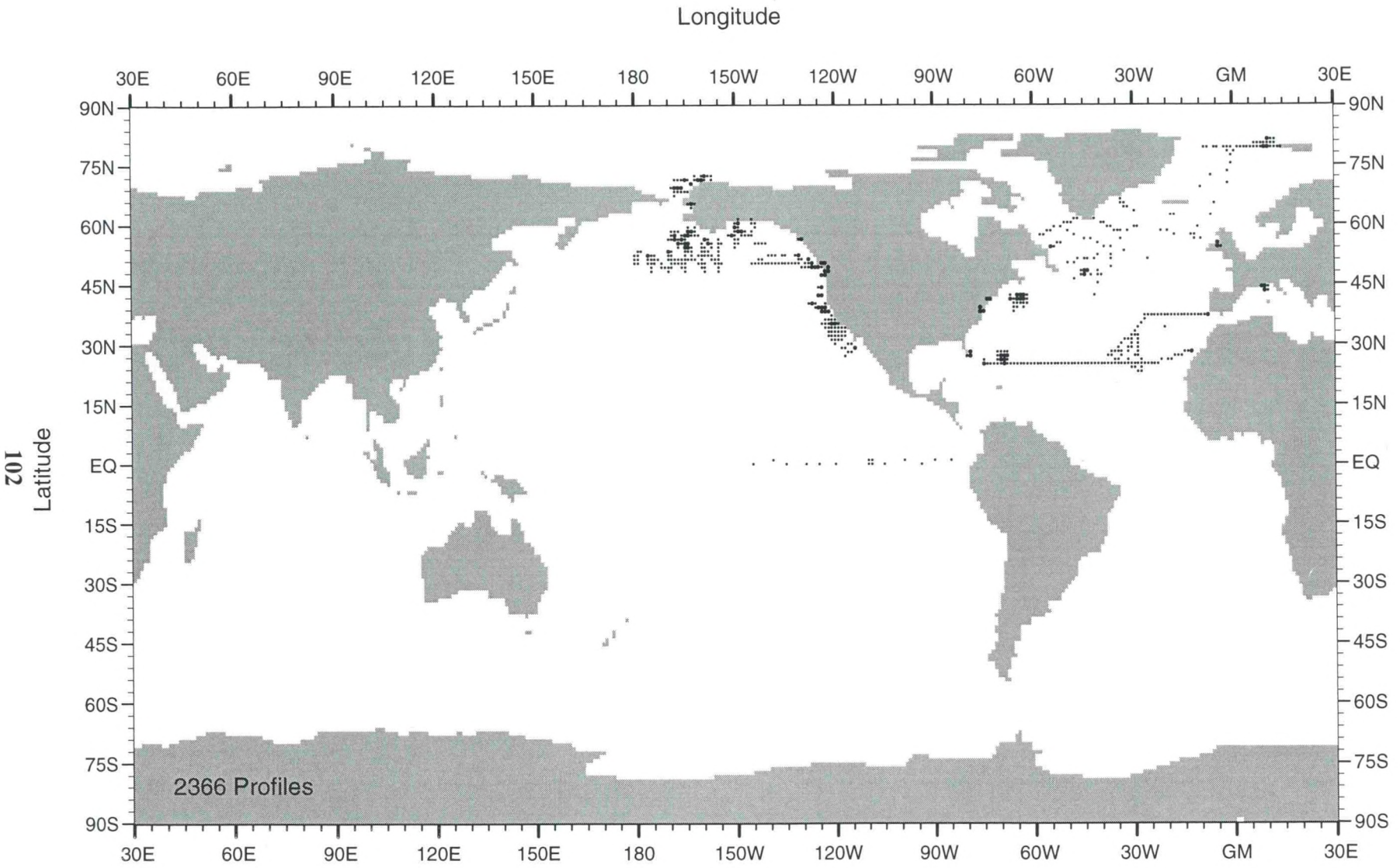

Fig. B59 WOD98 CTD station distribution for July-September for 1981

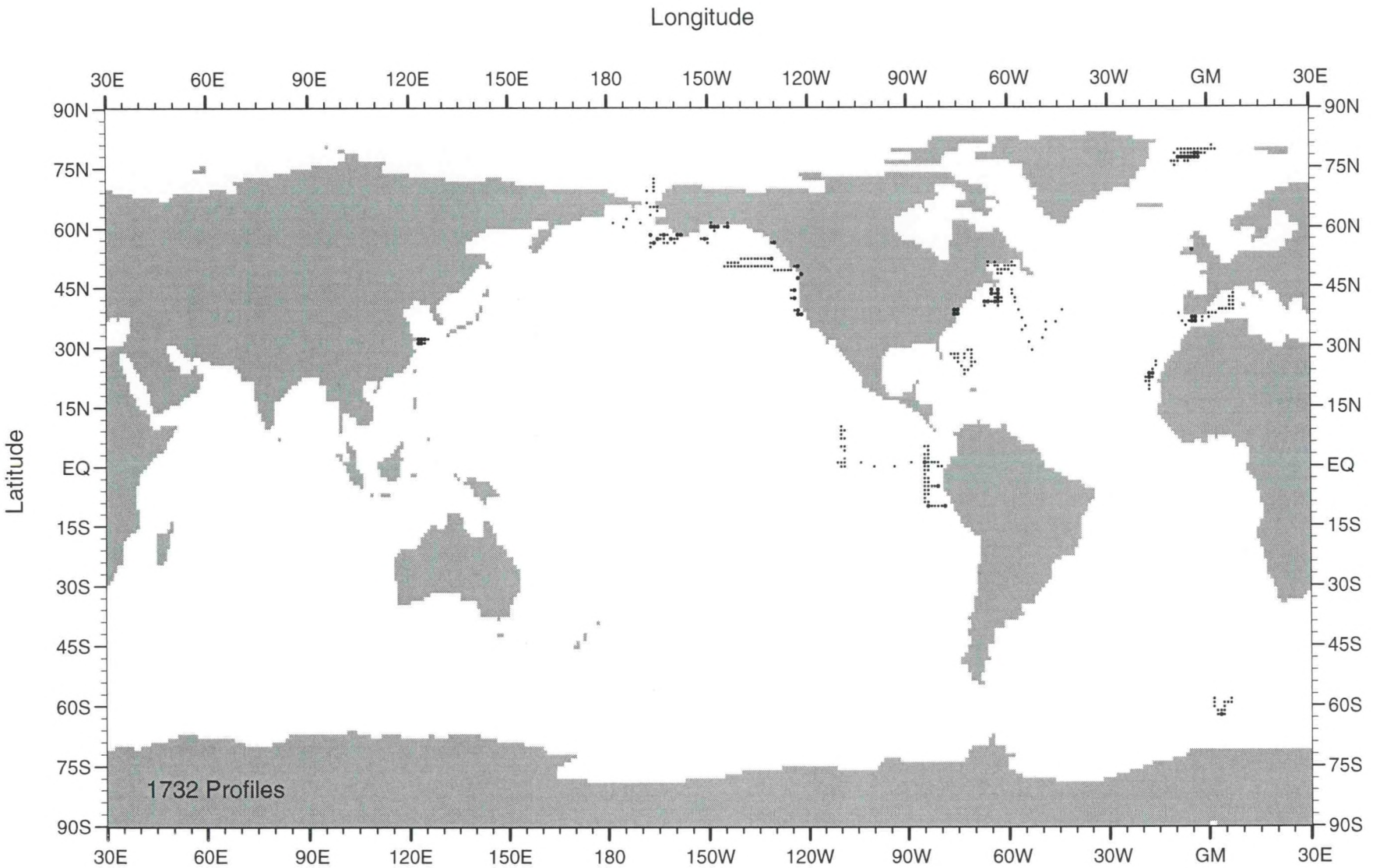

Fig. B60 WOD98 CTD station distribution for October-December for 1981

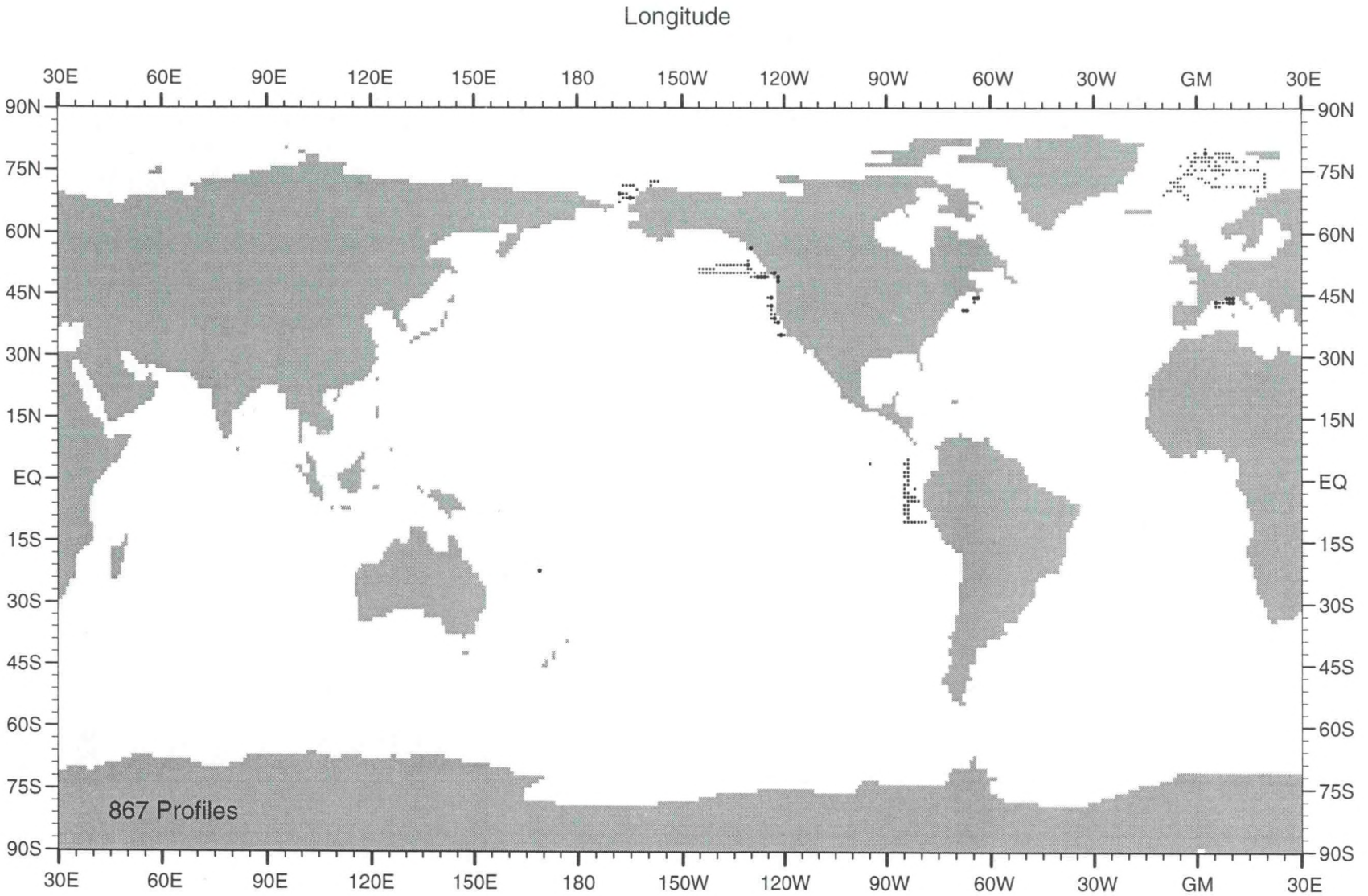

Fig. B61 WOD98 CTD station distribution for January-March for 1982

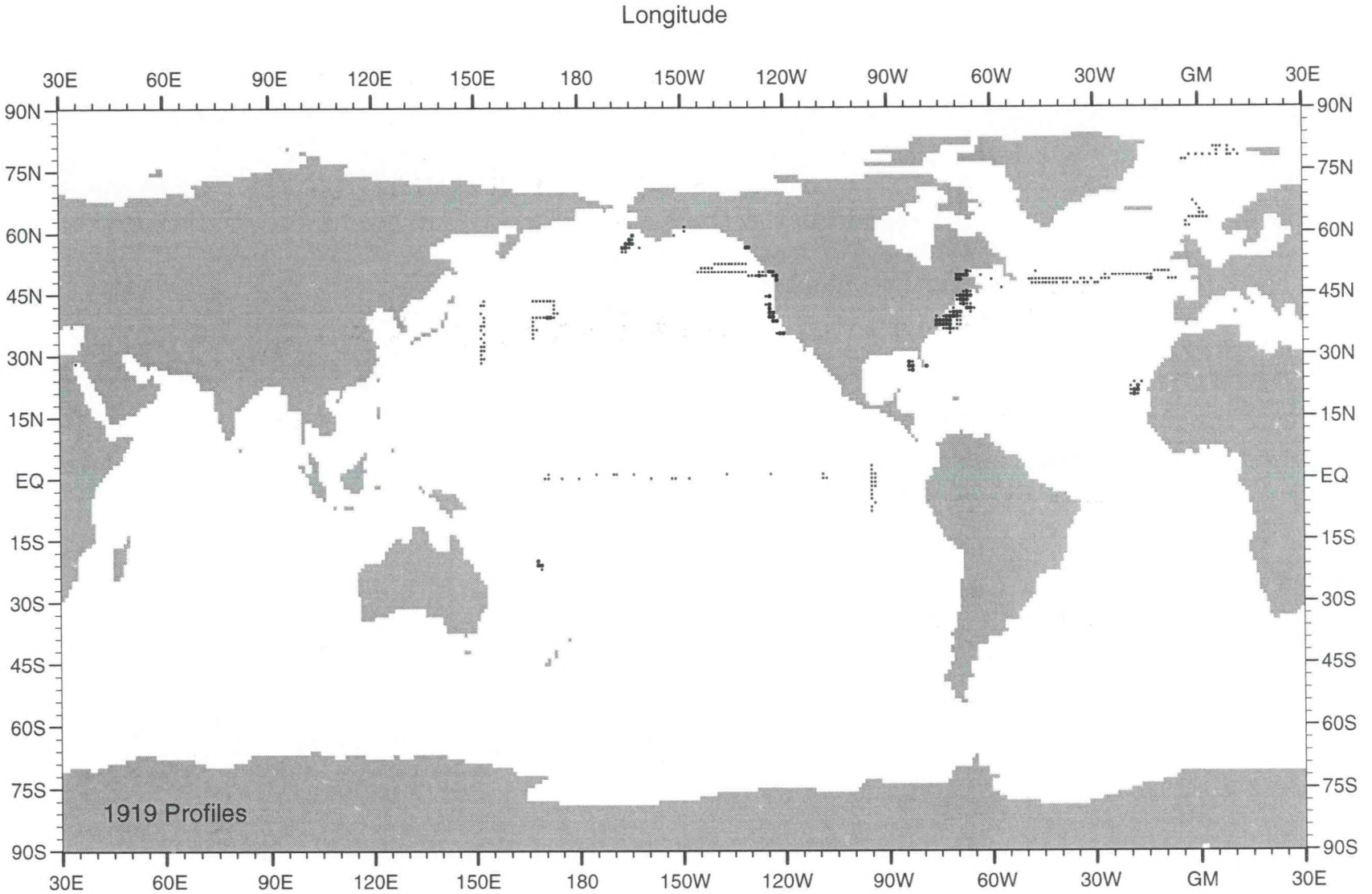

Fig. B62 WOD98 CTD station distribution for April-June for 1982

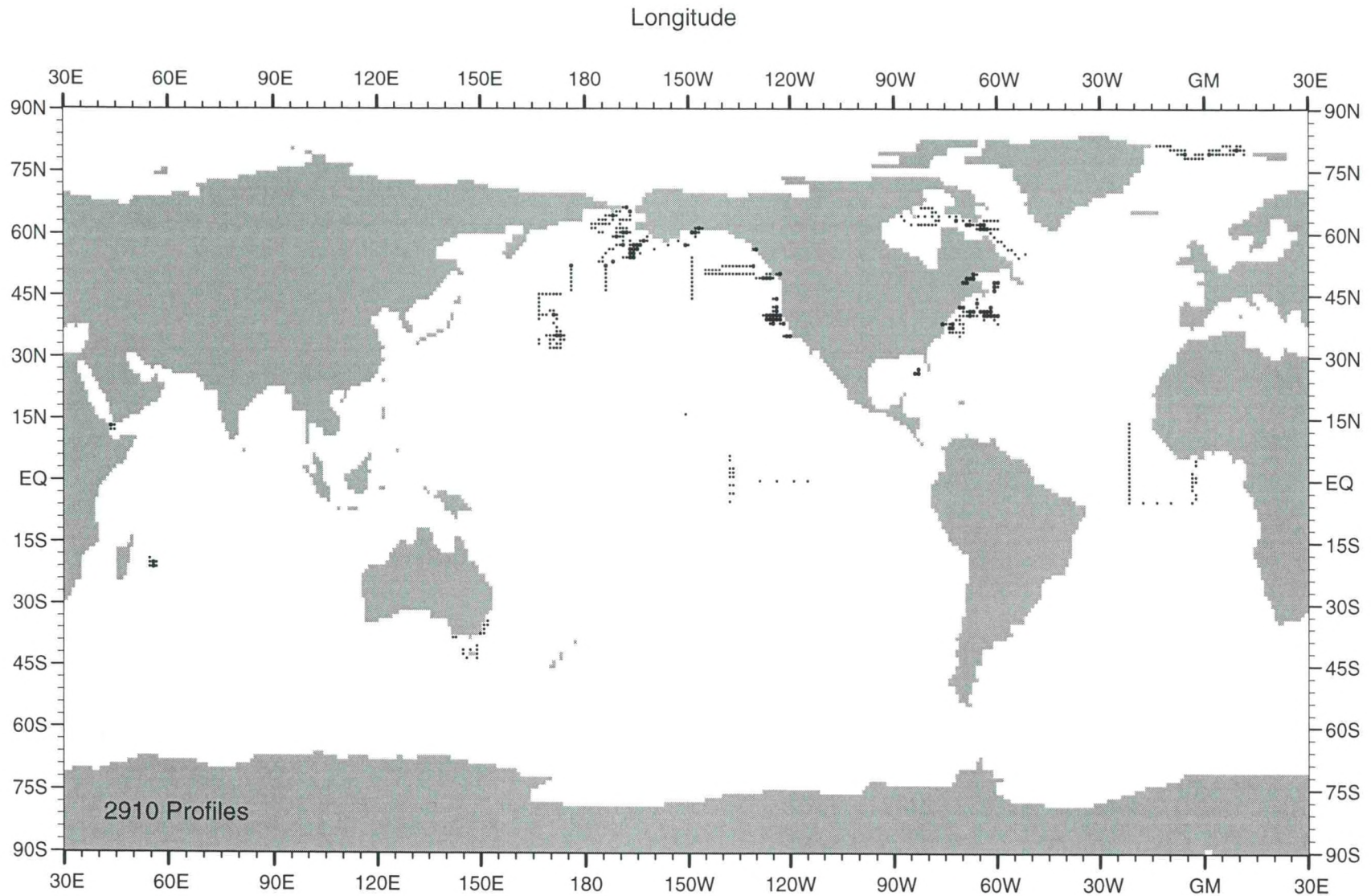

Fig. B63 WOD98 CTD station distribution for July-September for 1982

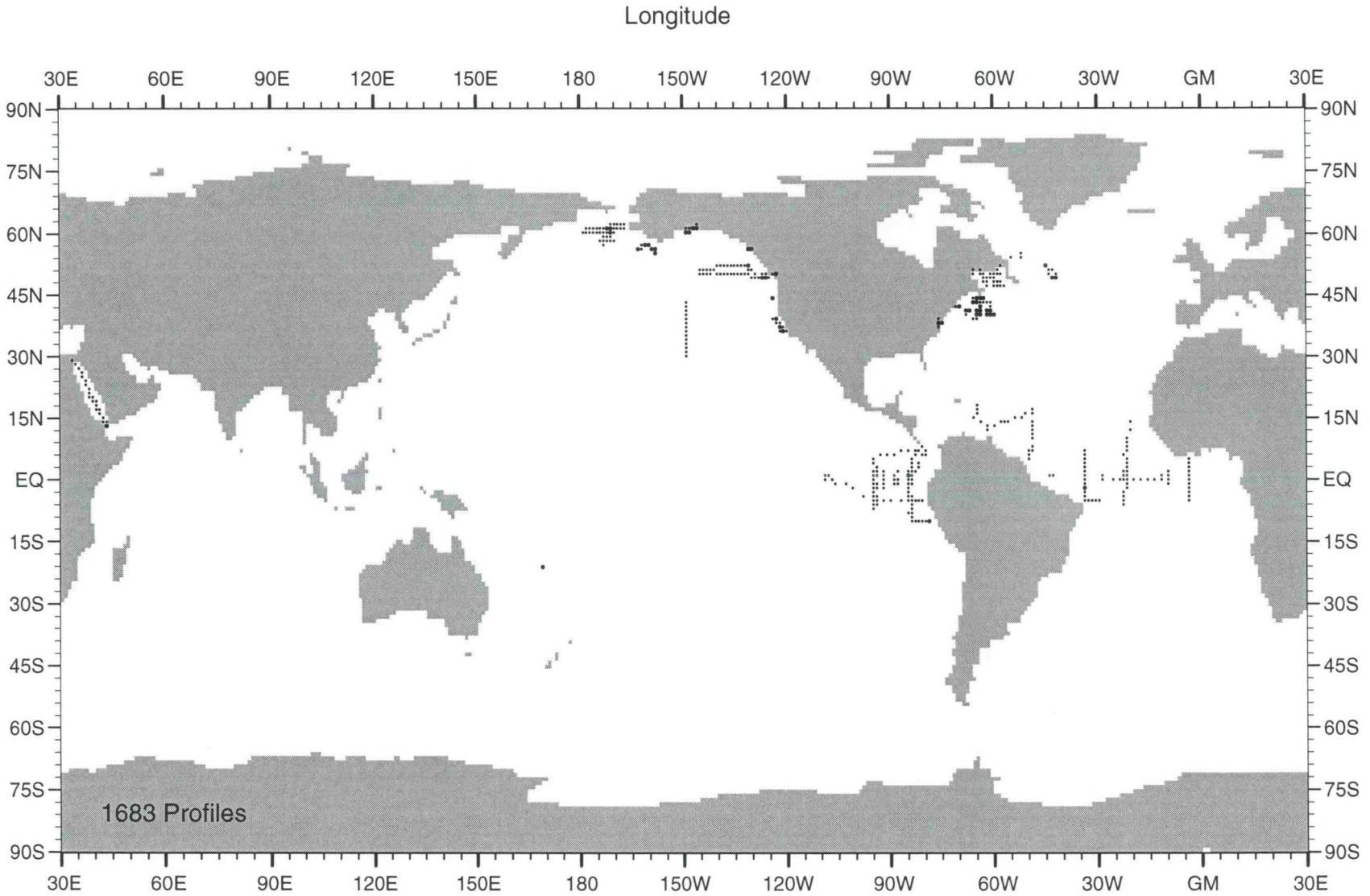

Fig. B64 WOD98 CTD station distribution for October-December for 1982

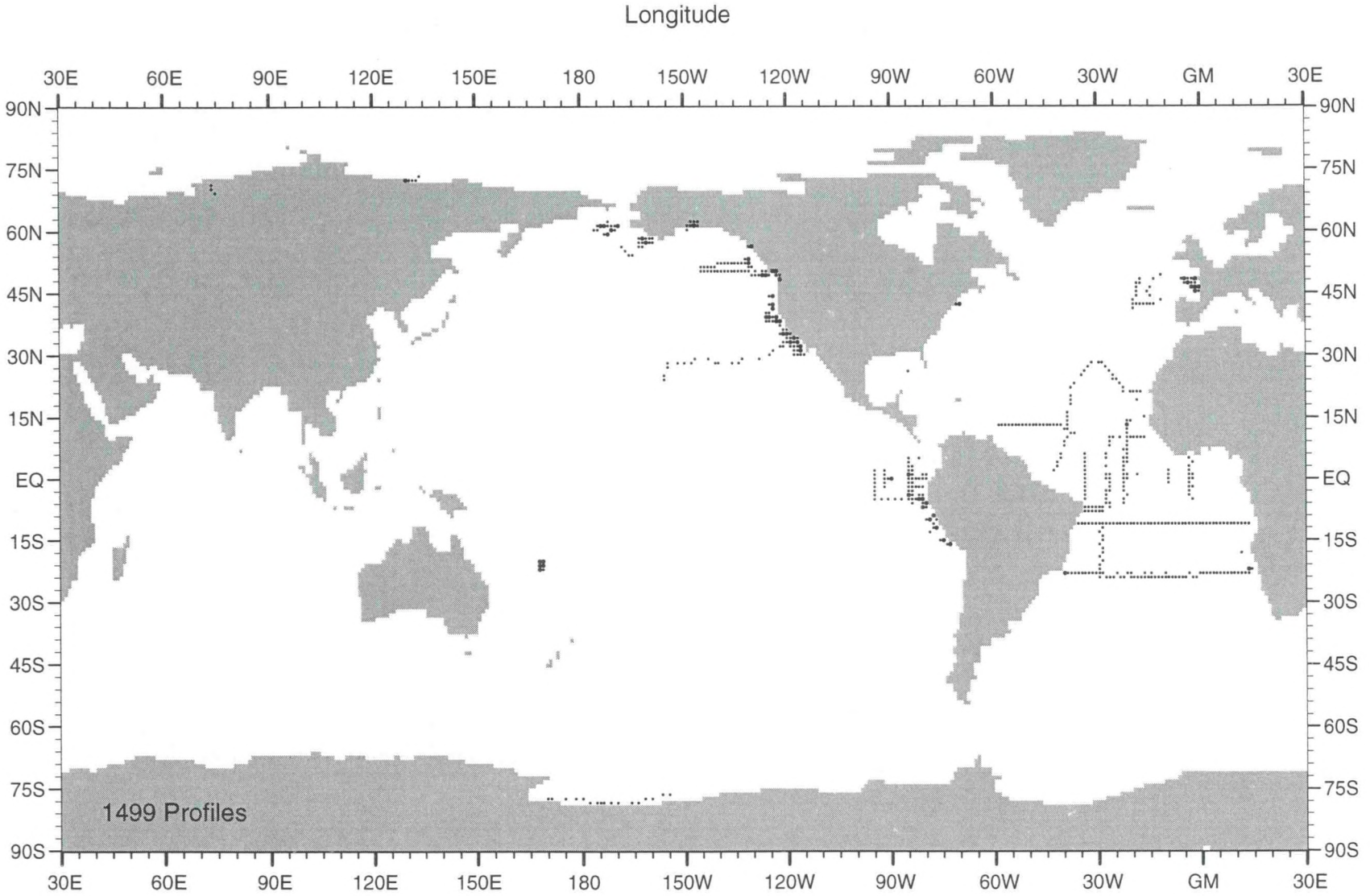

Fig. B65 WOD98 CTD station distribution for January-March for 1983

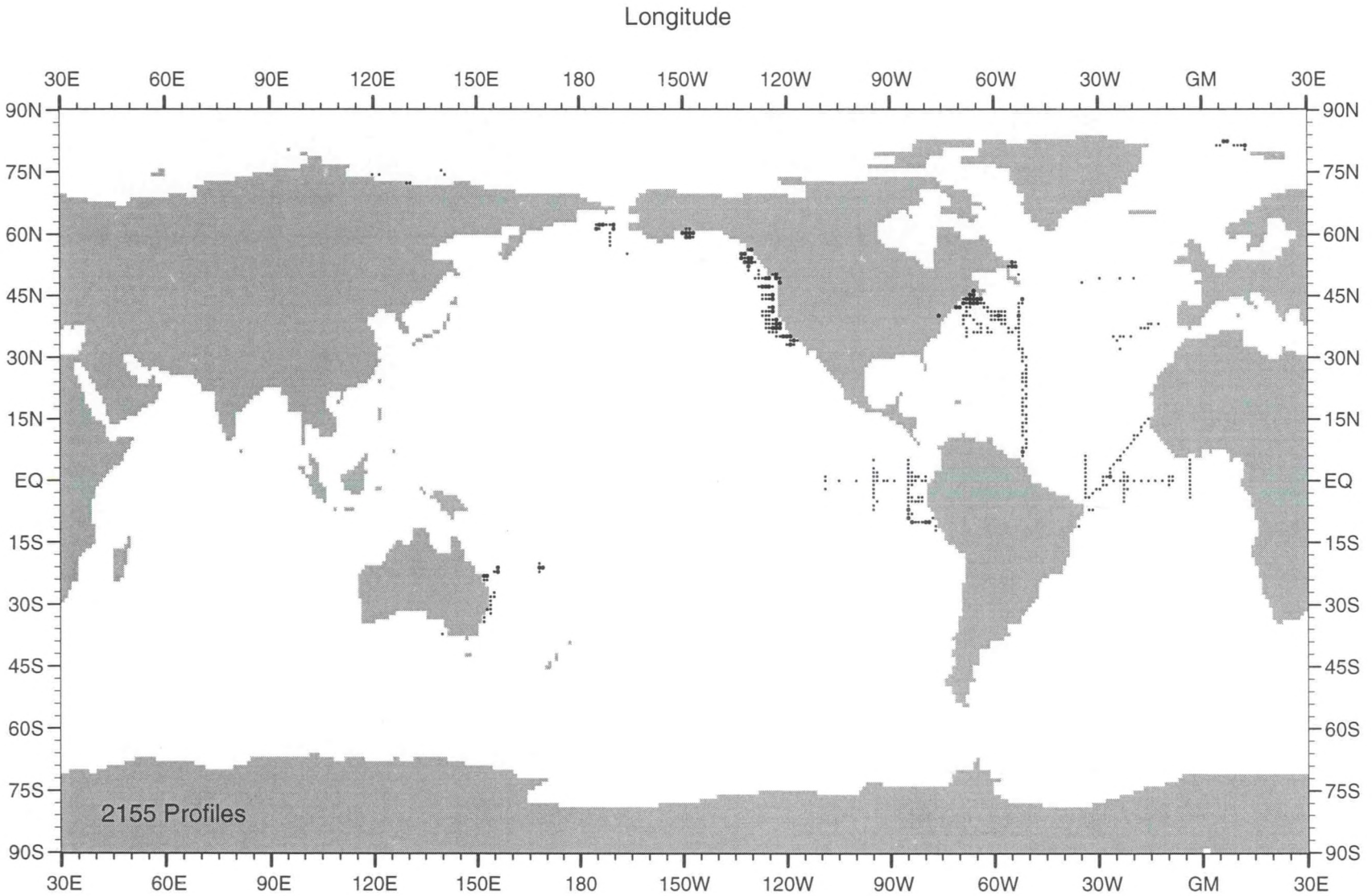

Fig. B66 WOD98 CTD station distribution for April-June for 1983

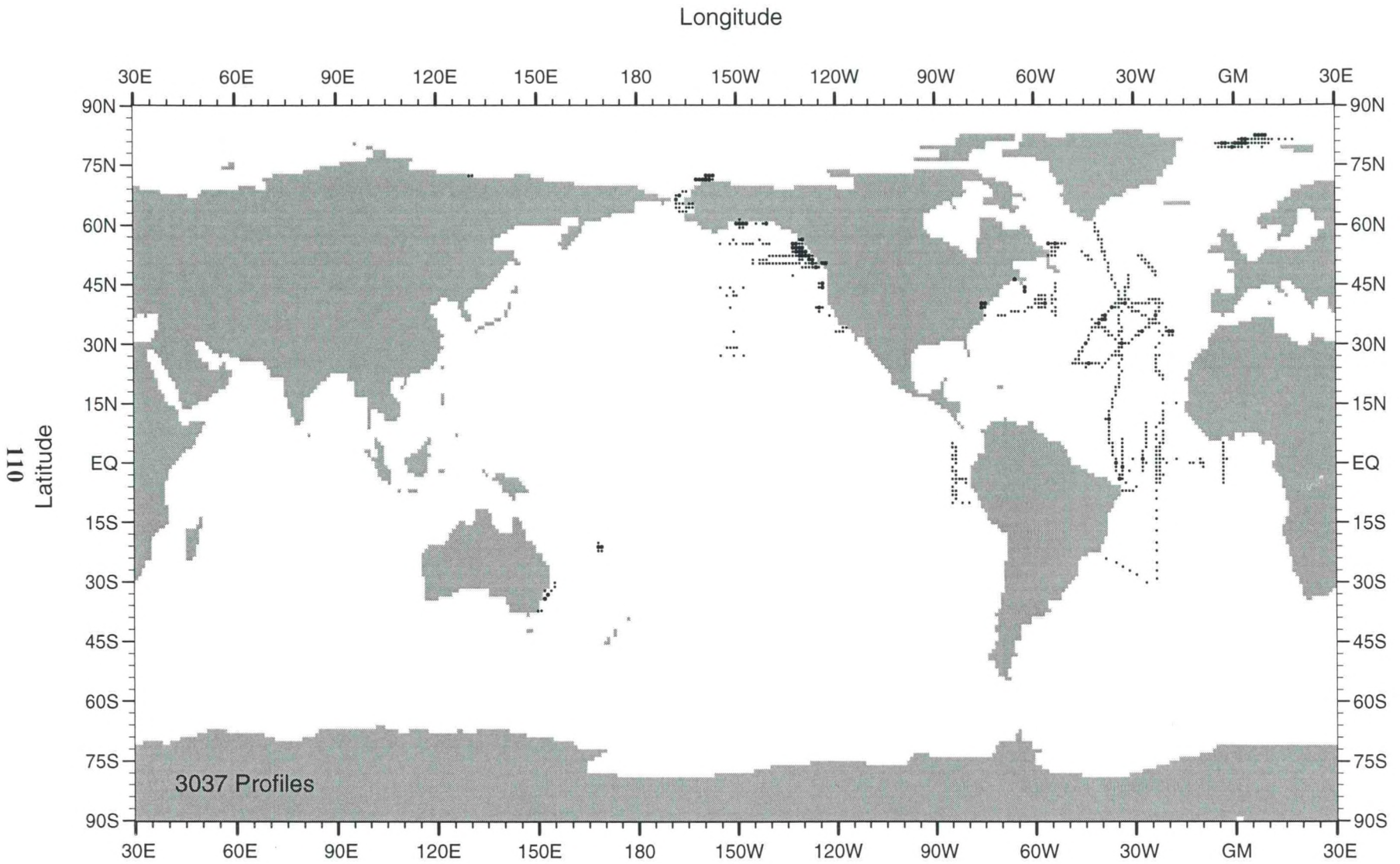

Fig. B67 WOD98 CTD station distribution for July-September for 1983

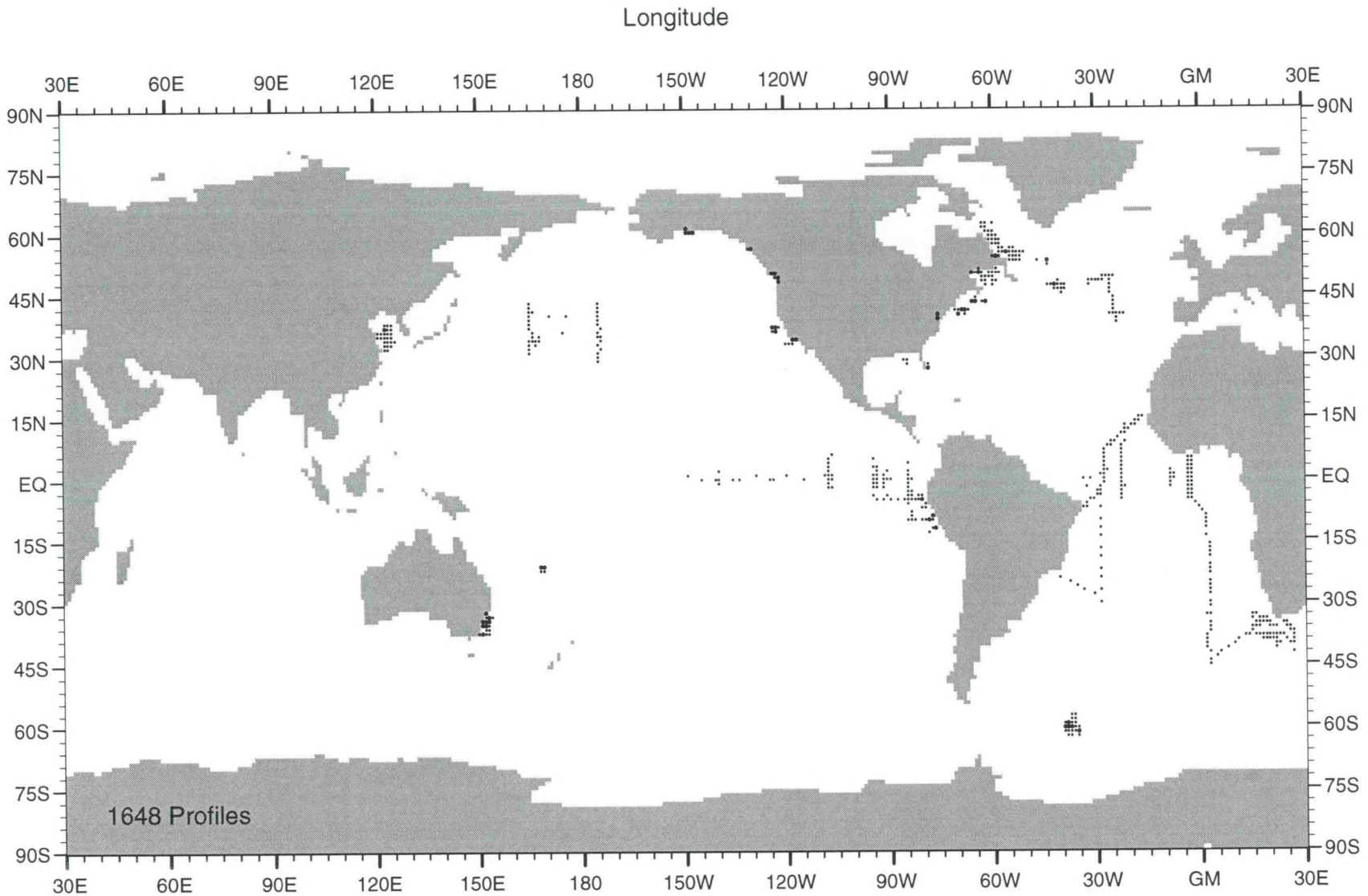

Fig. B68 WOD98 CTD station distribution for October-December for 1983

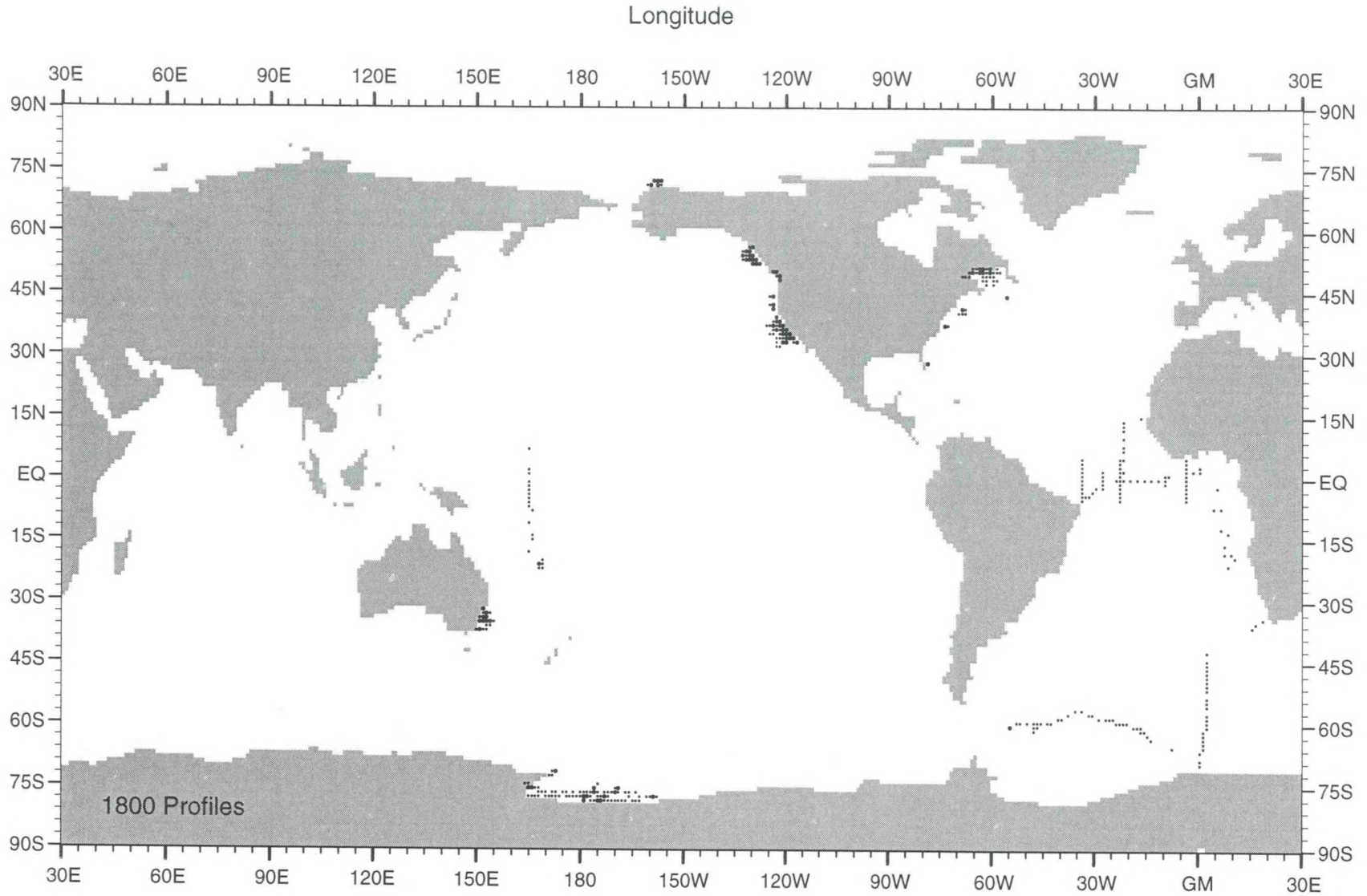

Fig. B69 WOD98 CTD station distribution for January-March for 1984

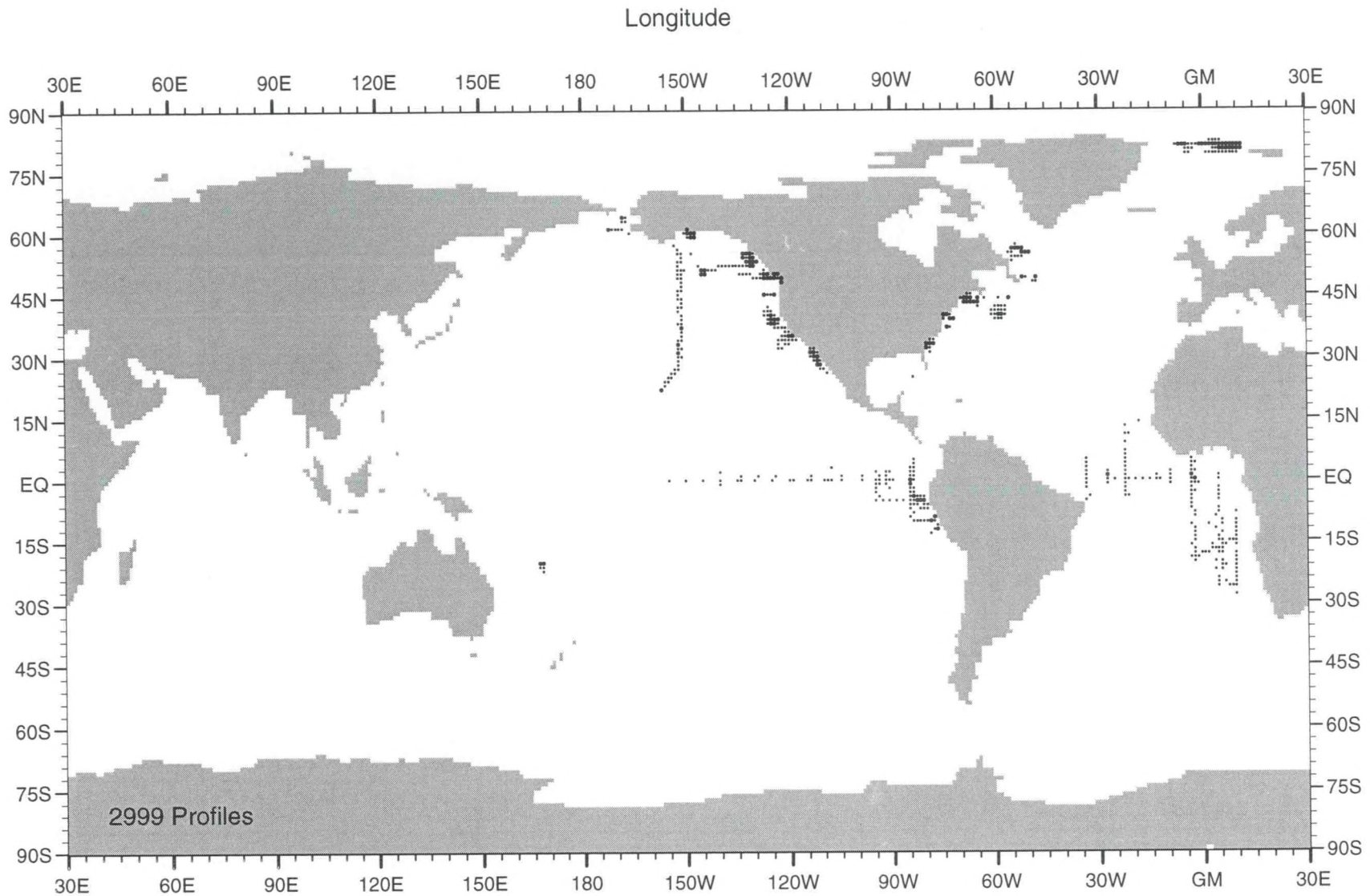

Fig. B70 WOD98 CTD station distribution for April-June for 1984

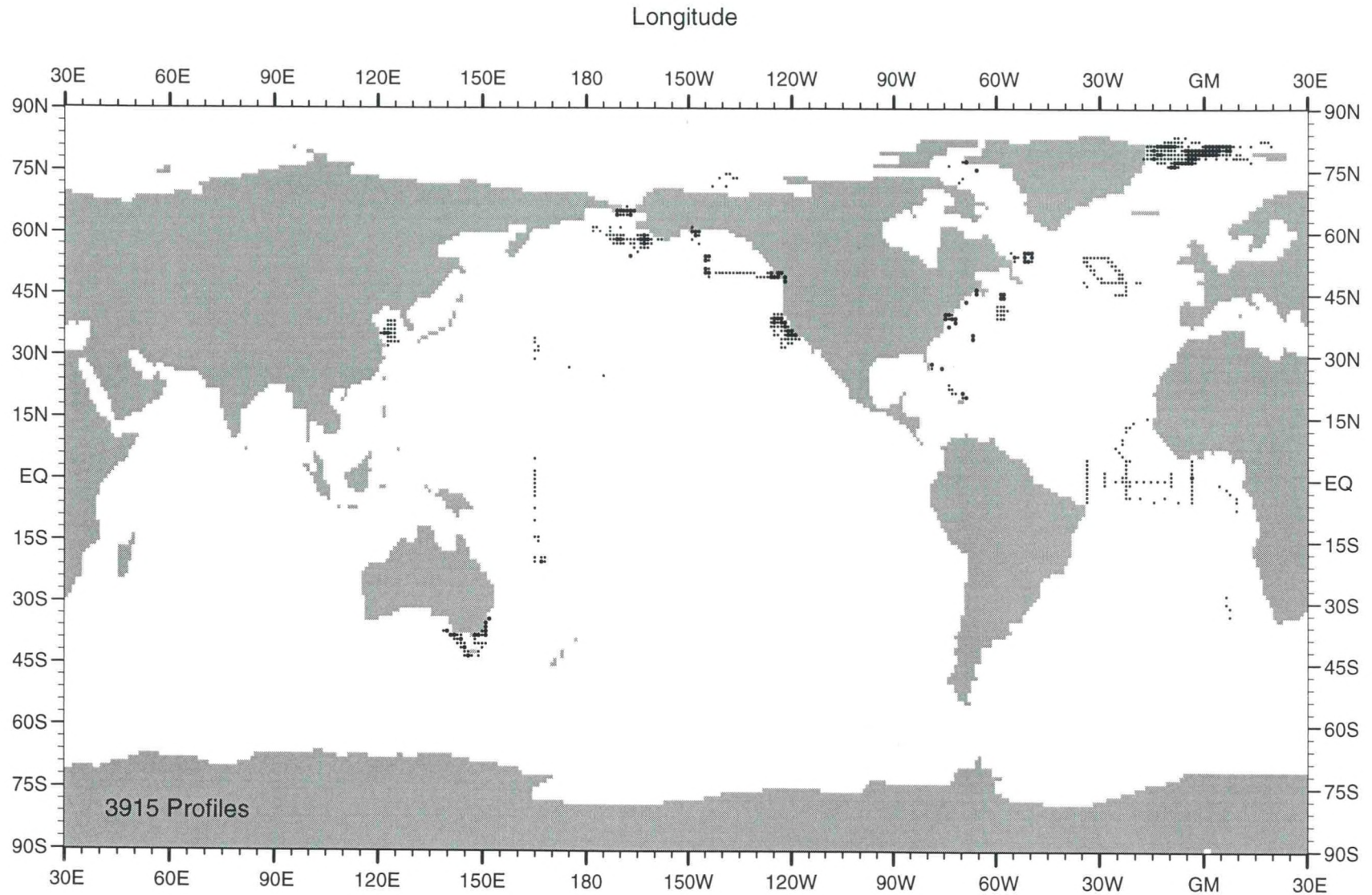

Fig. B71 WOD98 CTD station distribution for July-September for 1984

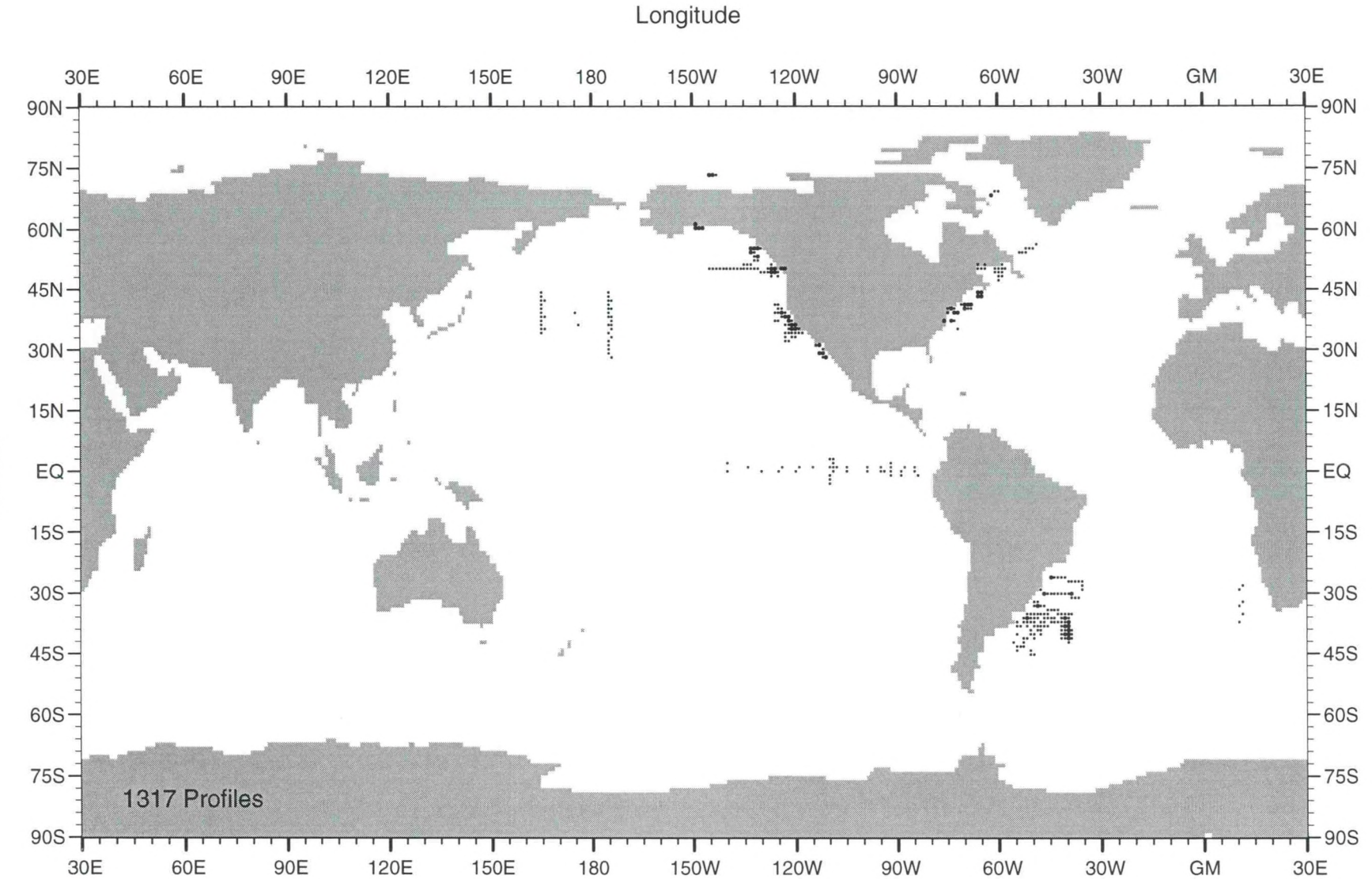

Fig. B72 WOD98 CTD station distribution for October-December for 1984

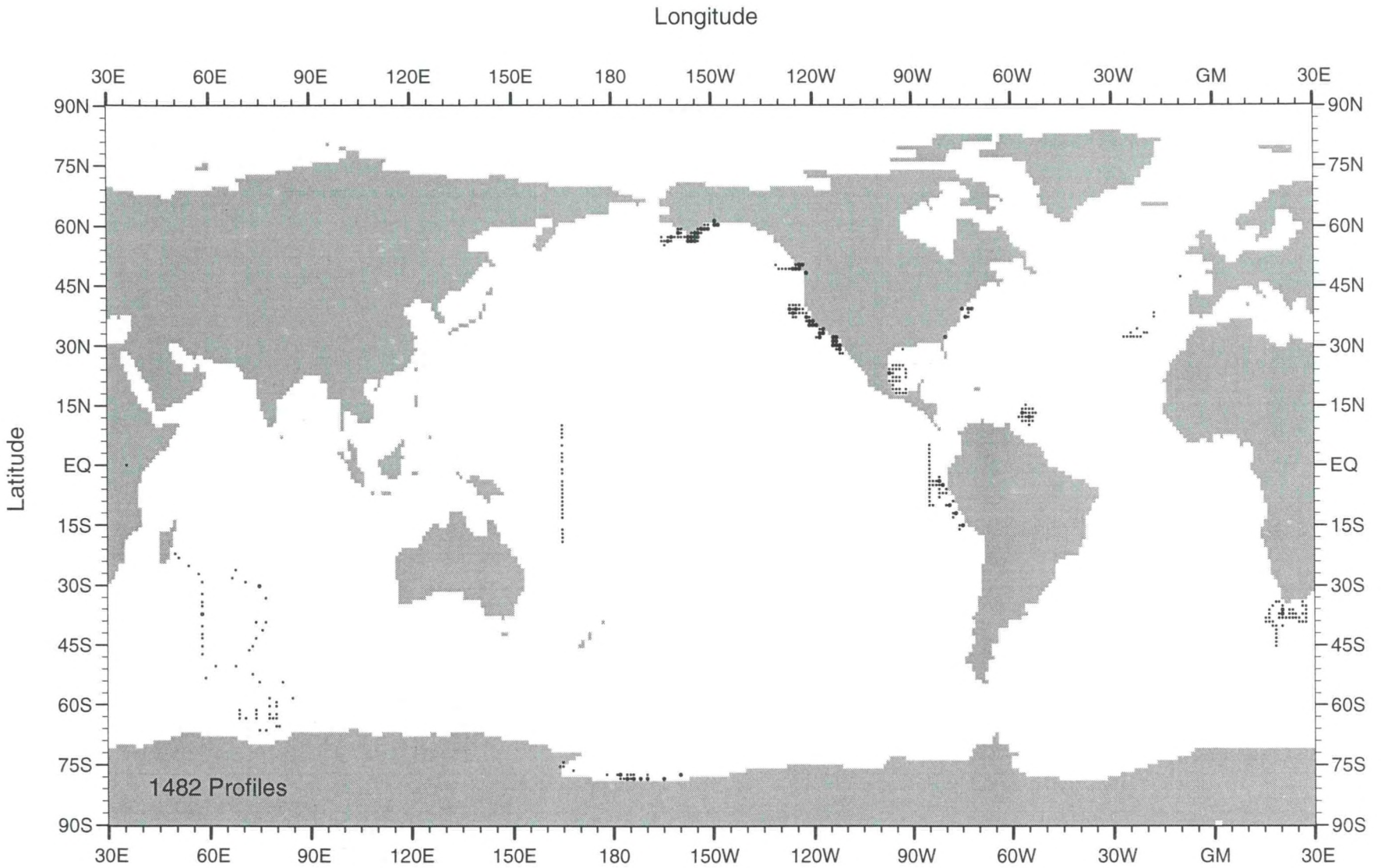

Fig. B73 WOD98 CTD station distribution for January-March for 1985

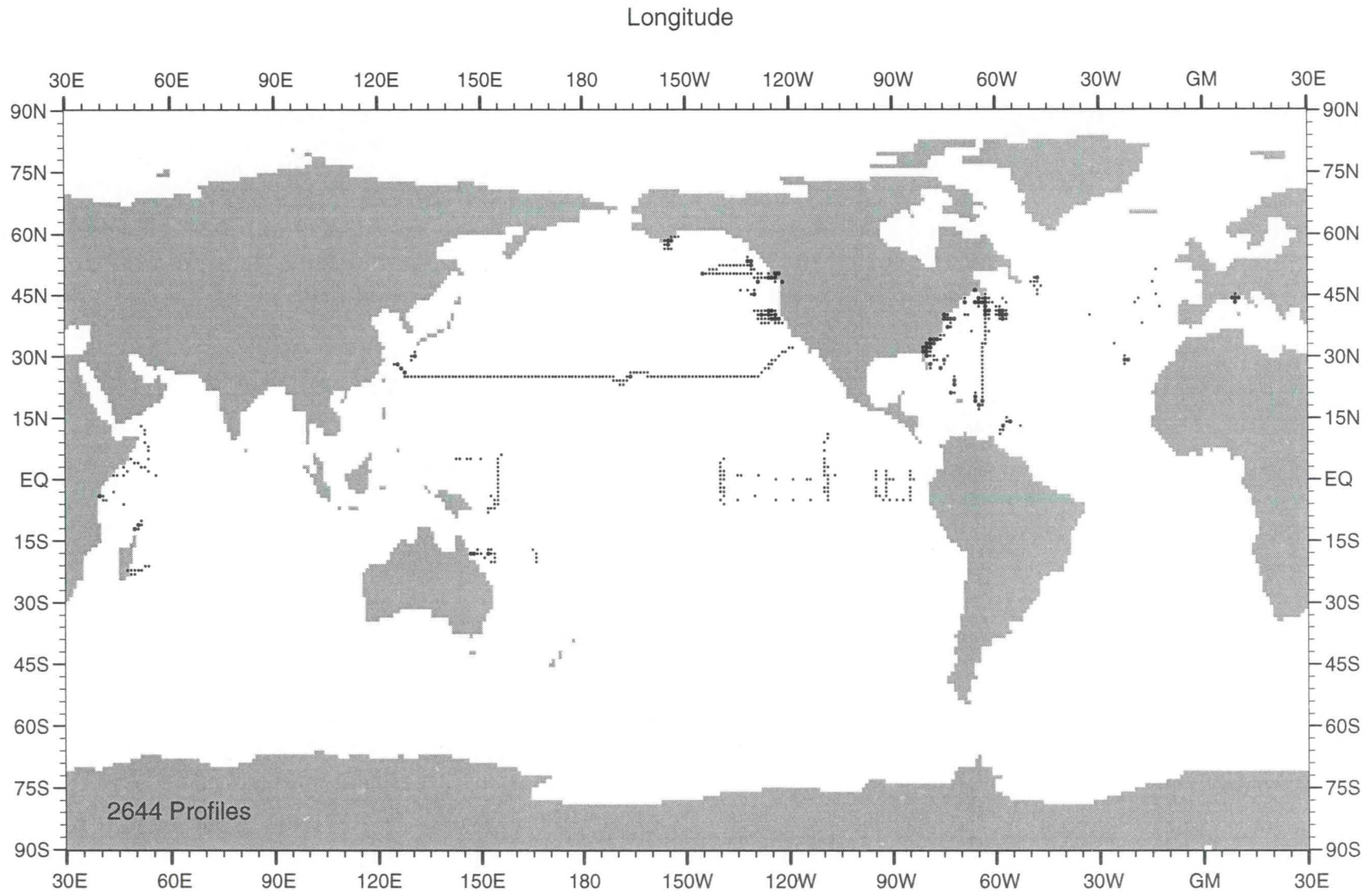

Fig. B74 WOD98 CTD station distribution for April-June for 1985

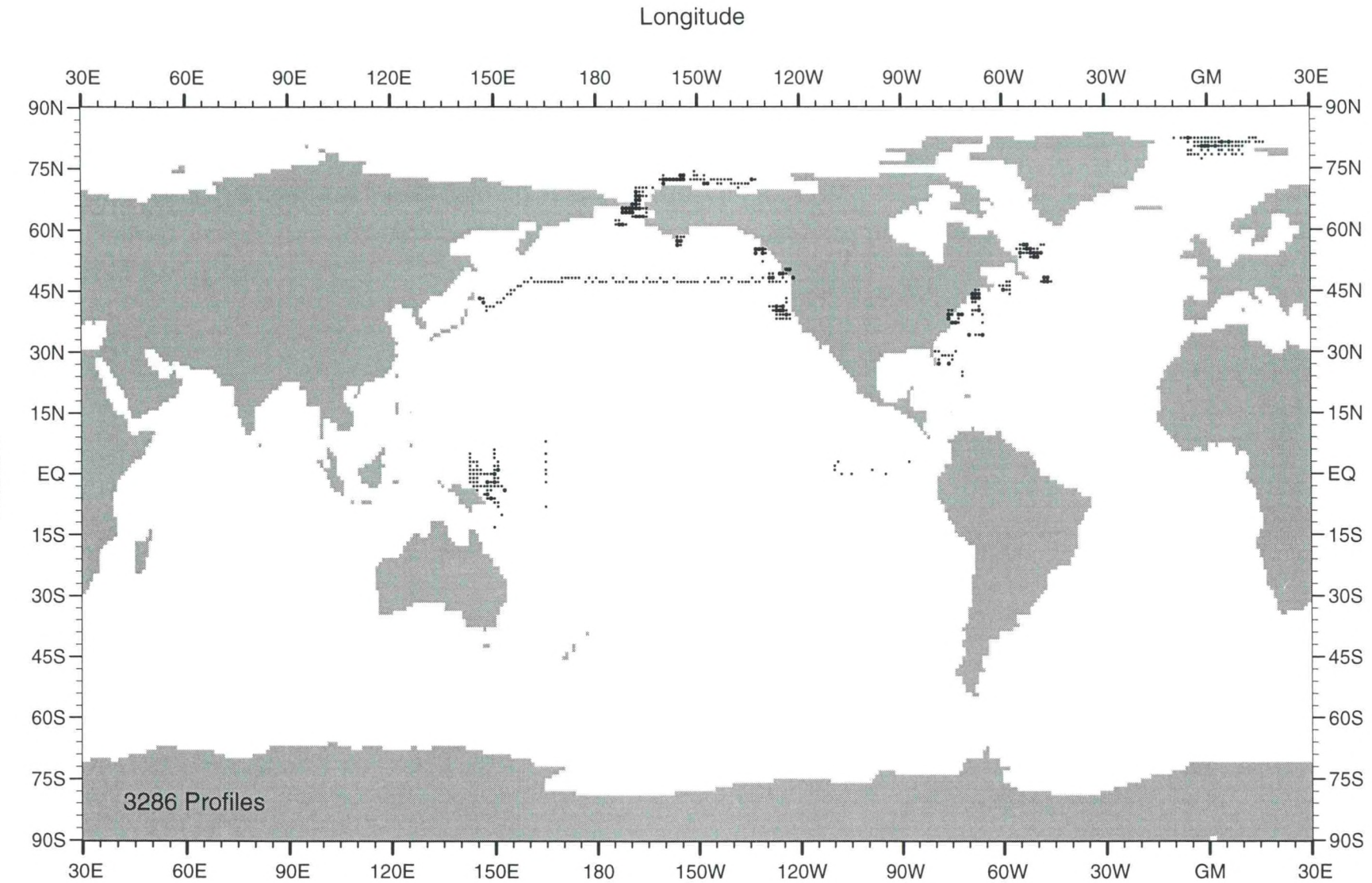

Fig. B75 WOD98 CTD station distribution for July-September for 1985

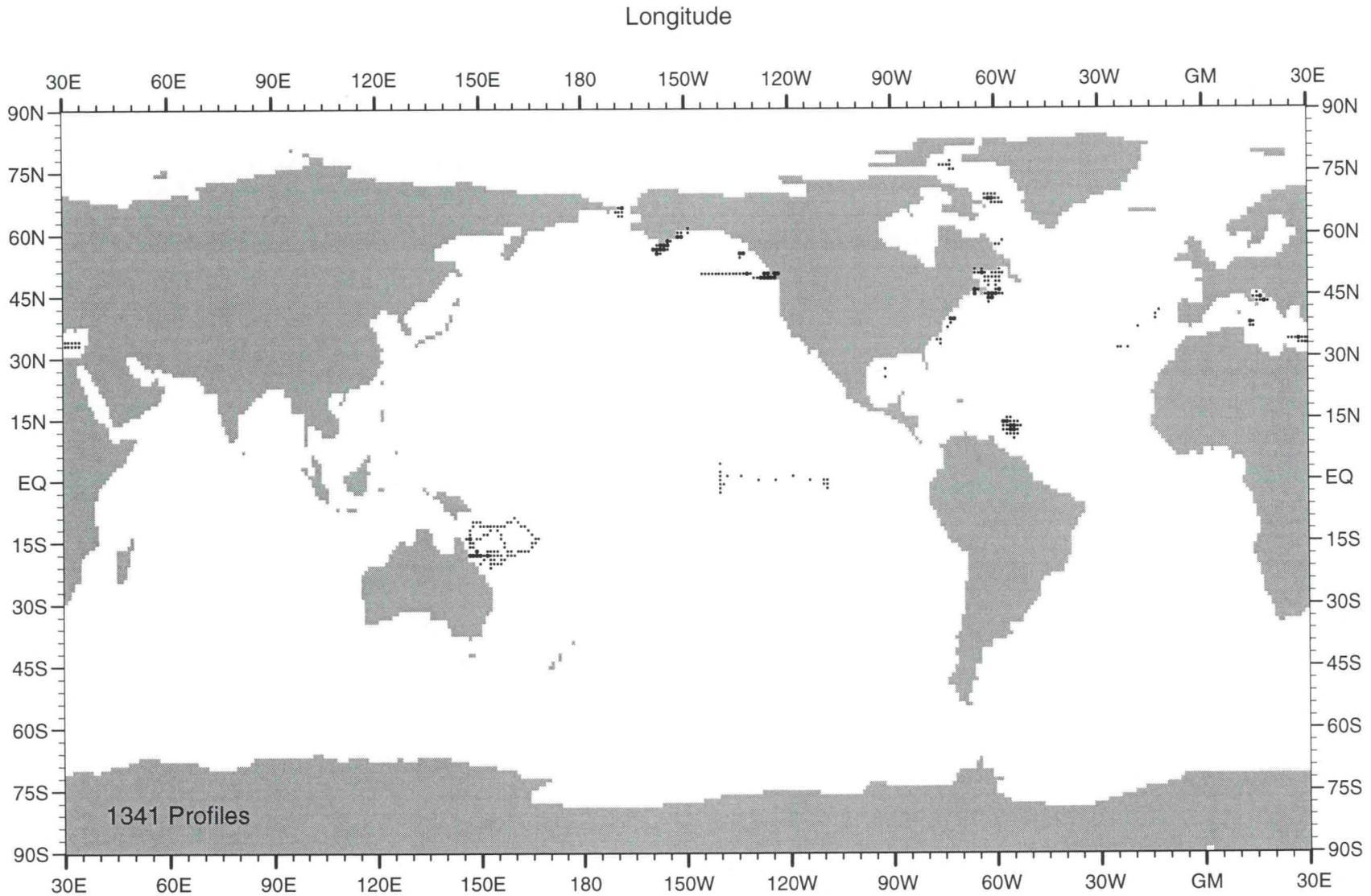

Fig. B76 WOD98 CTD station distribution for October-December for 1985

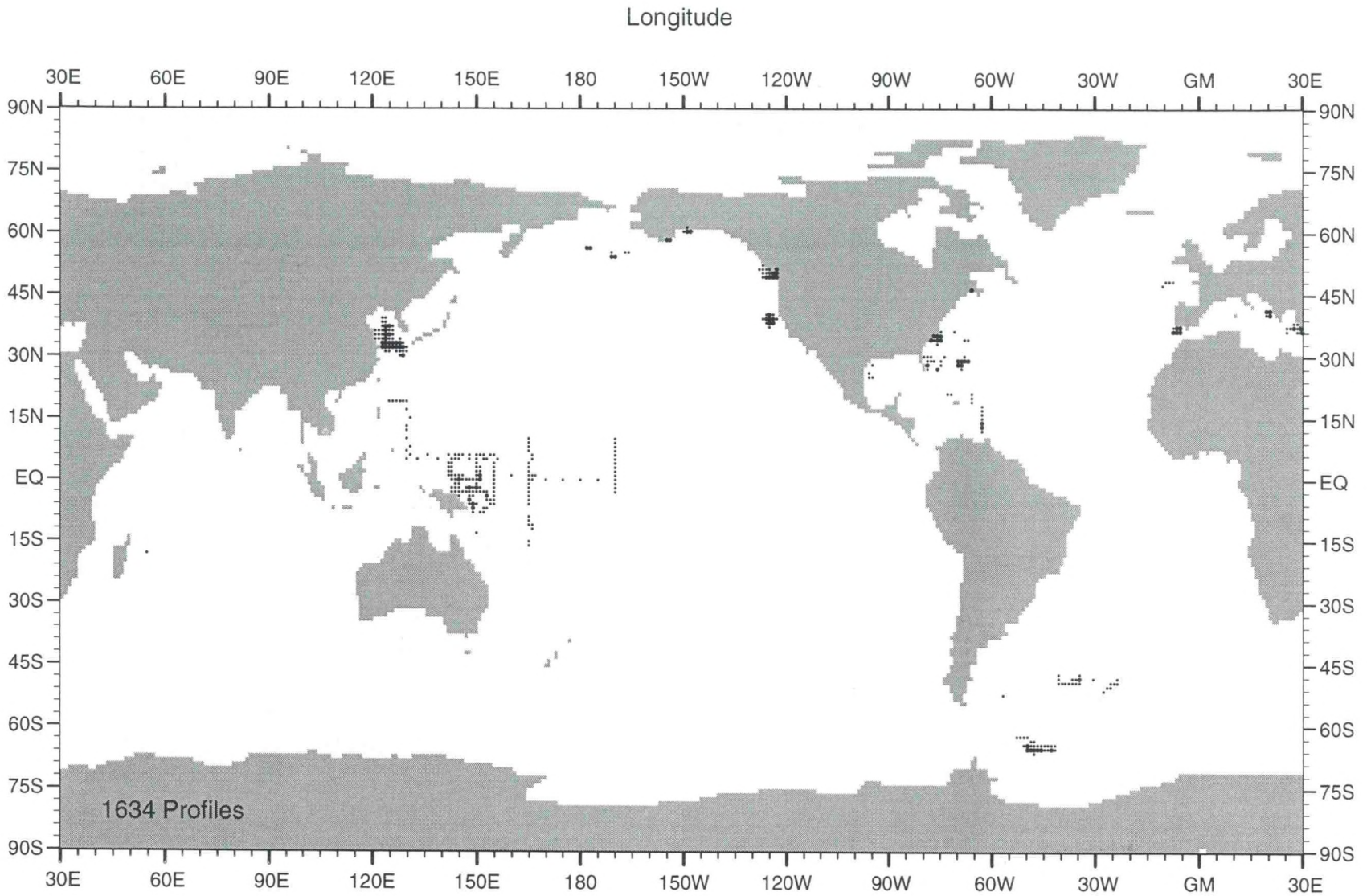

Fig. B77 WOD98 CTD station distribution for January-March for 1986

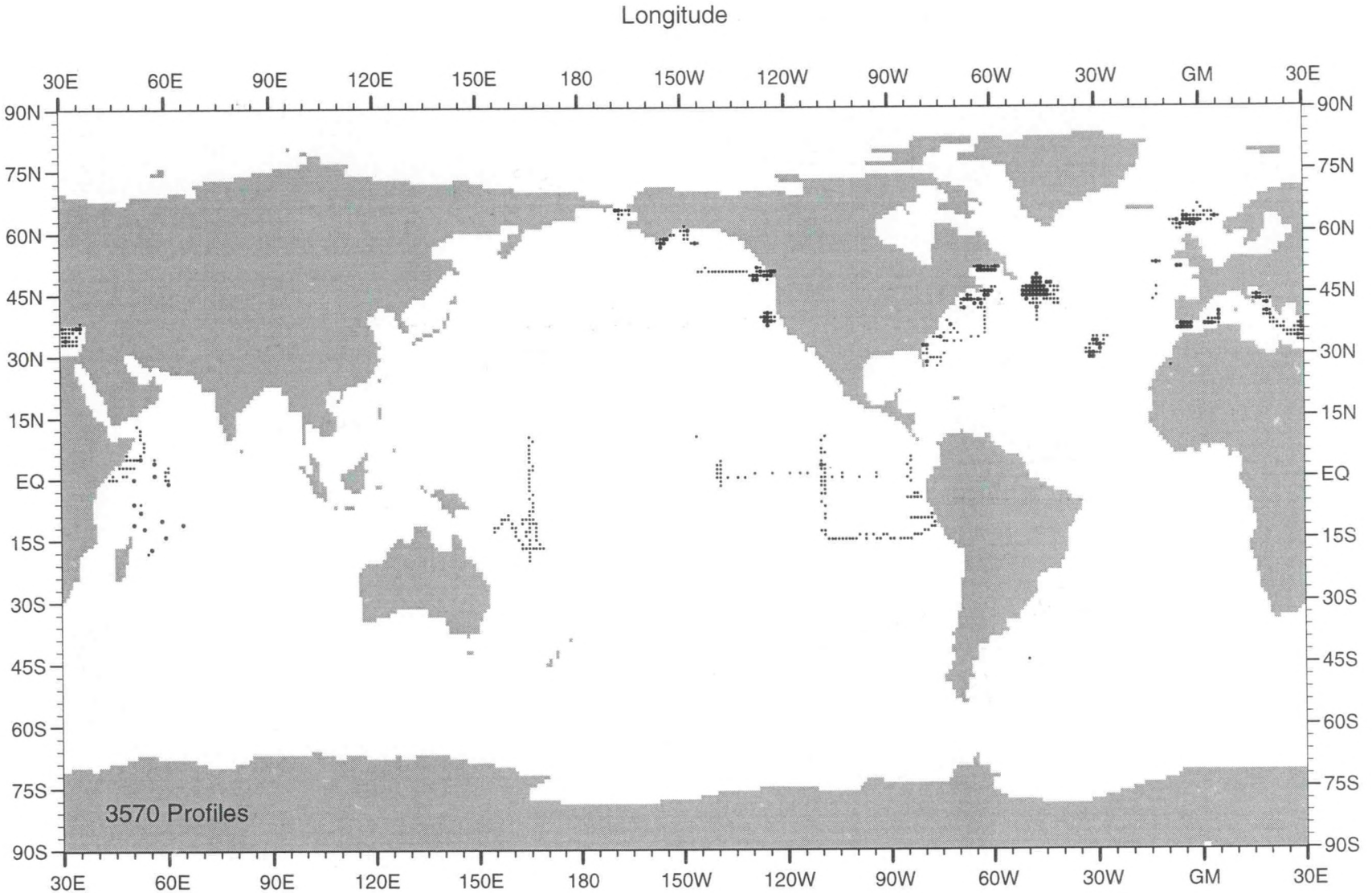

Fig. B78 WOD98 CTD station distribution for April-June for 1986

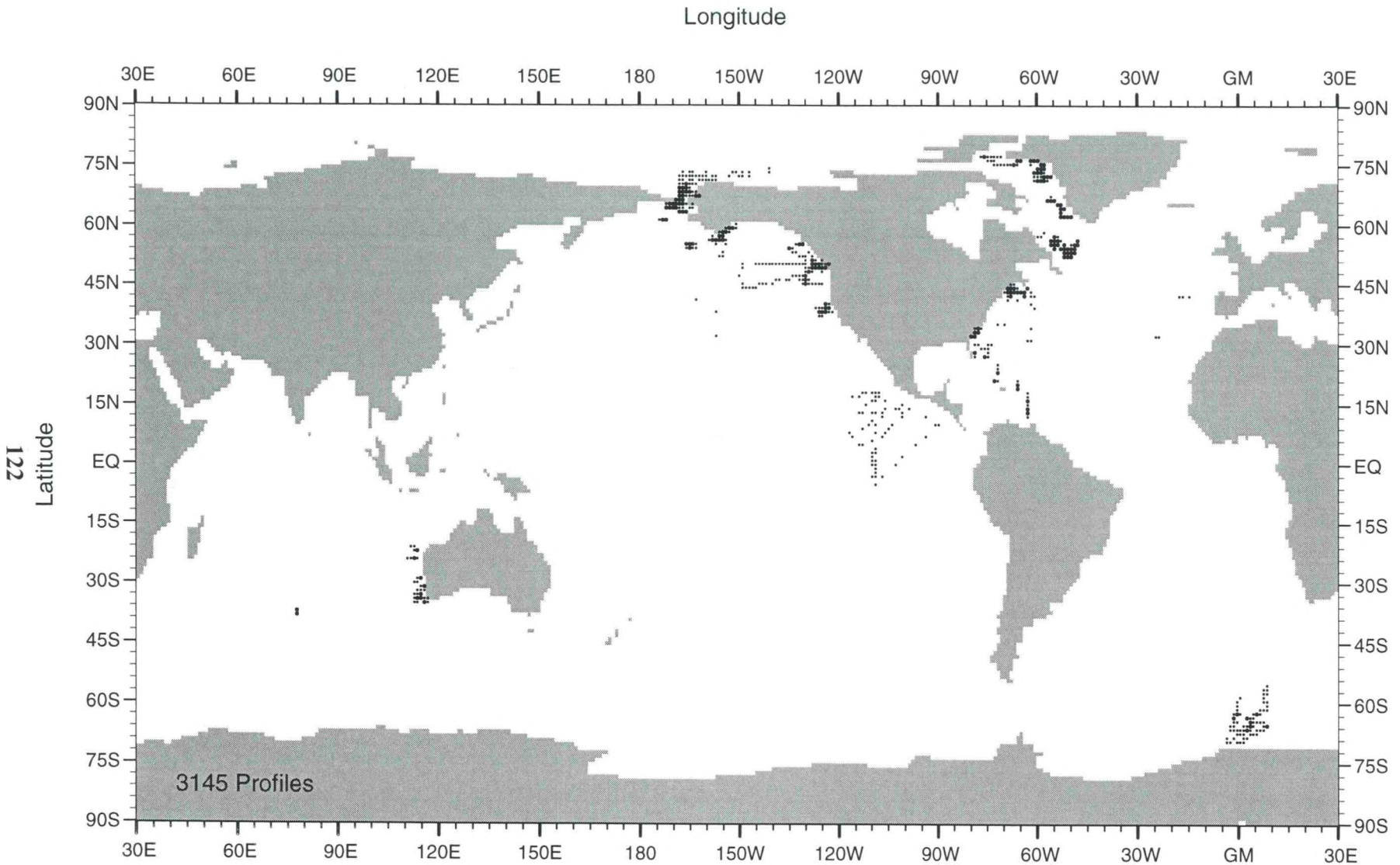

Fig. B79 WOD98 CTD station distribution for July-September for 1986

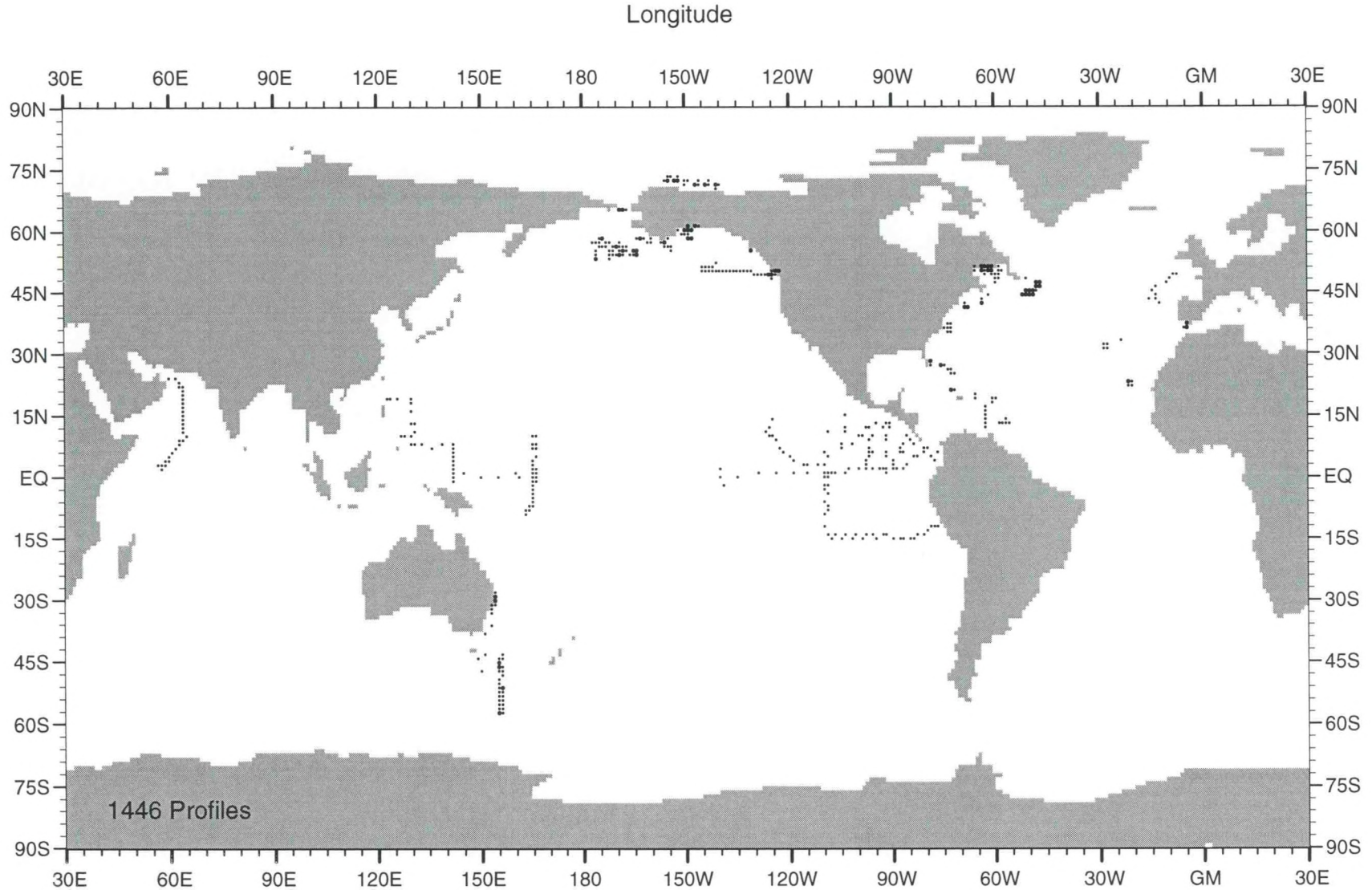

Fig. B80 WOD98 CTD station distribution for October-December for 1986

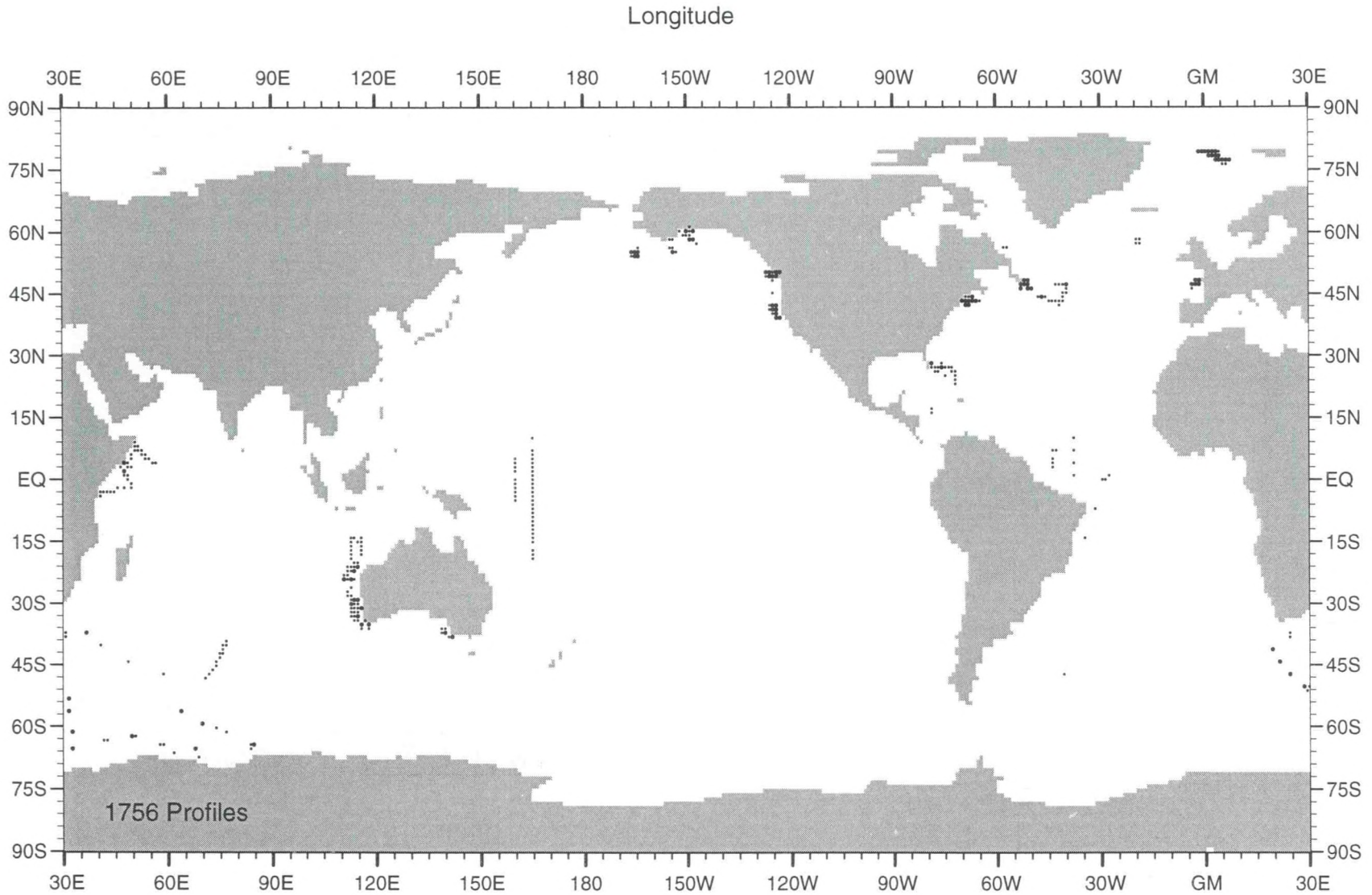

Fig. B81 WOD98 CTD station distribution for January-March for 1987

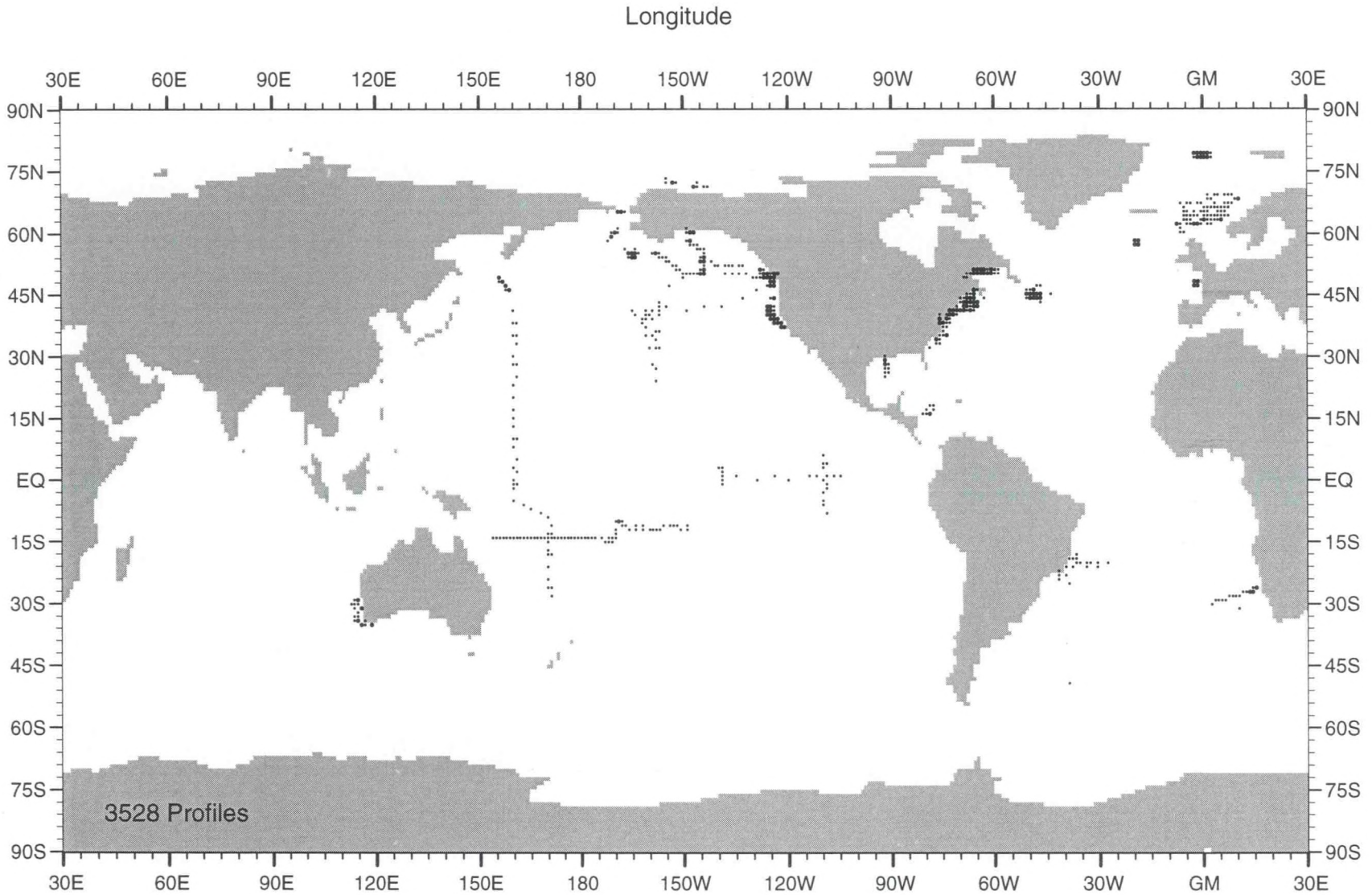

Fig. B82 WOD98 CTD station distribution for April-June for 1987

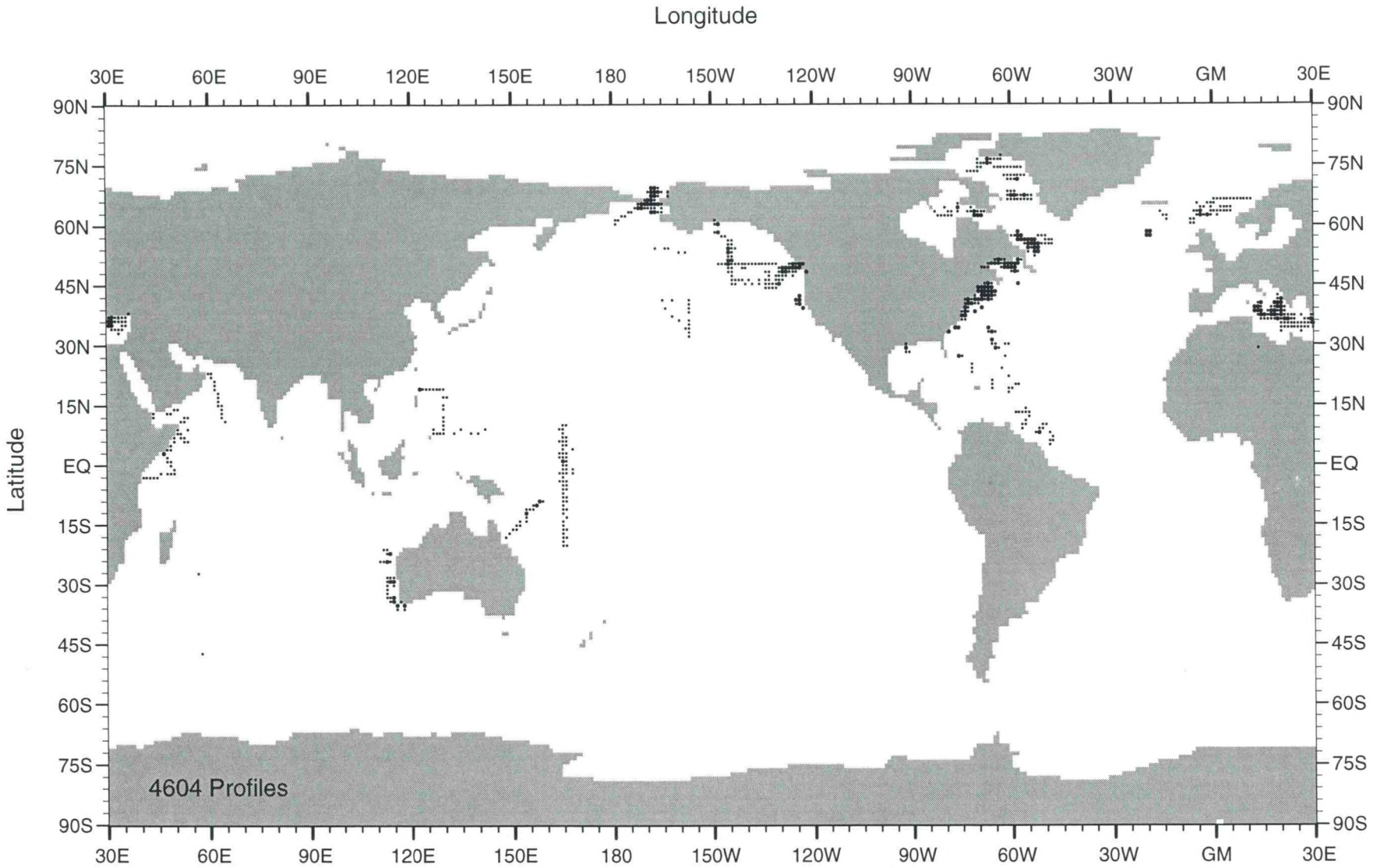

Fig. B83 WOD98 CTD station distribution for July-September for 1987

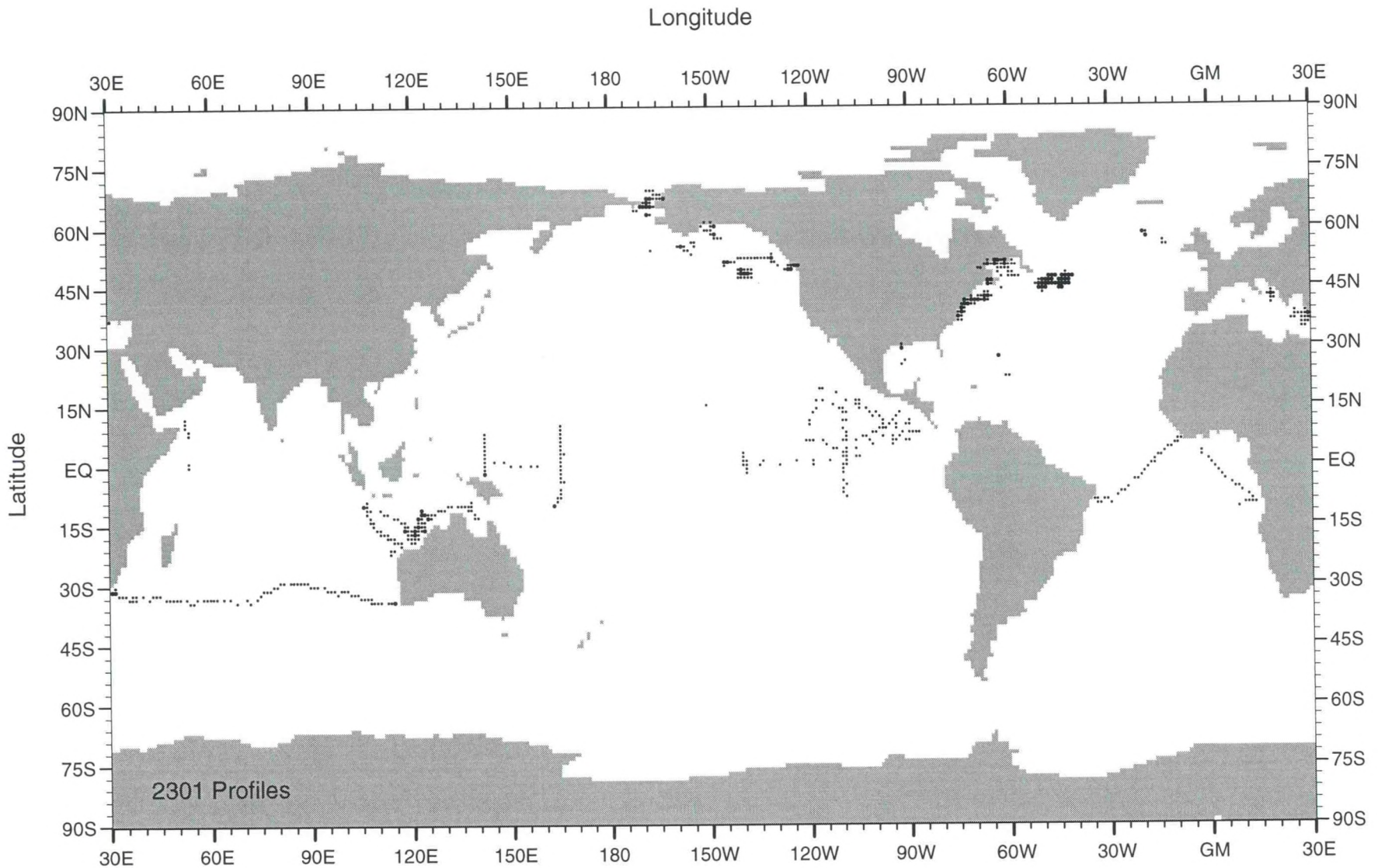

Fig. B84 WOD98 CTD station distribution for October-December for 1987

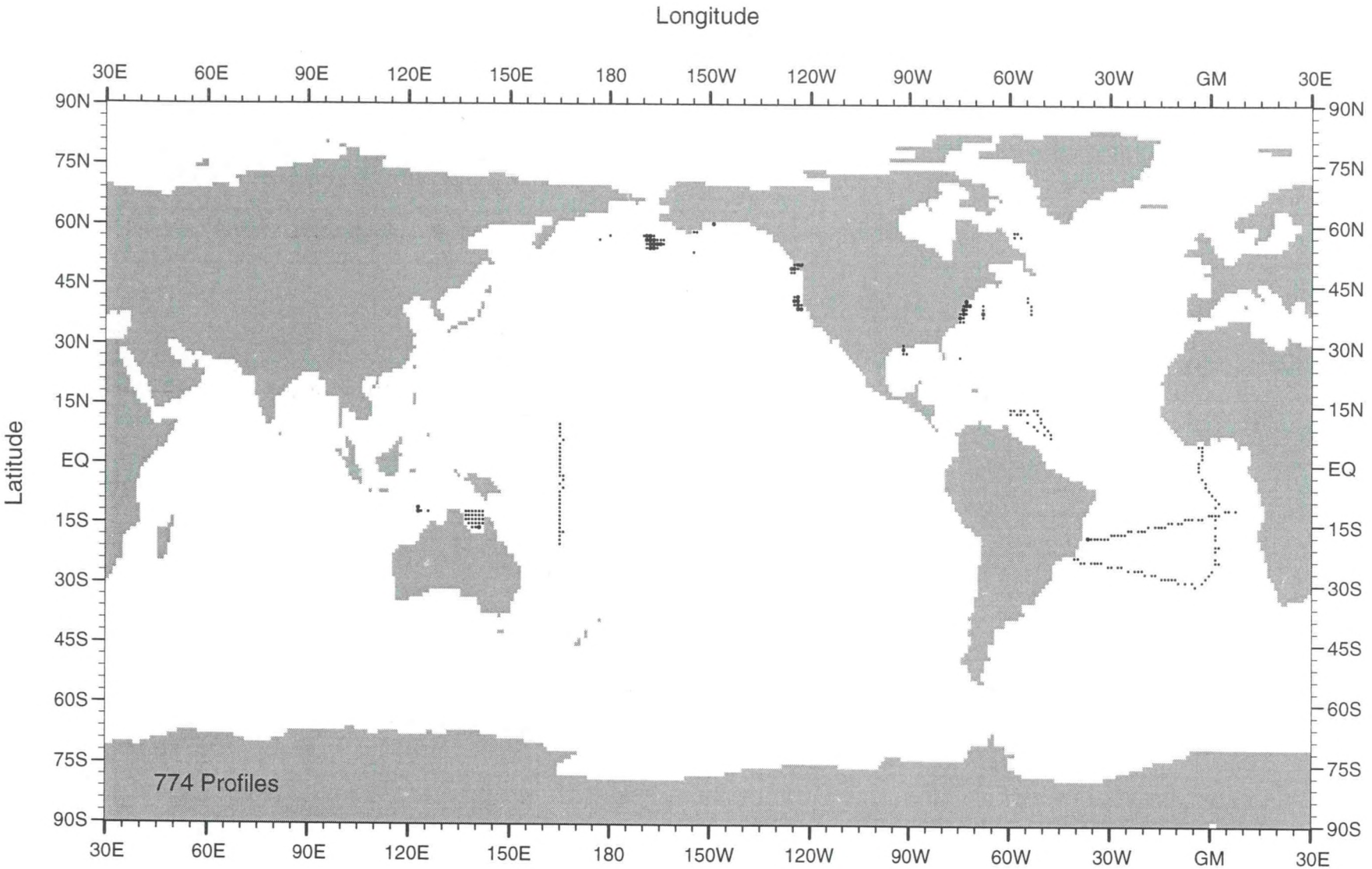

Fig. B85 WOD98 CTD station distribution for January-March for 1988

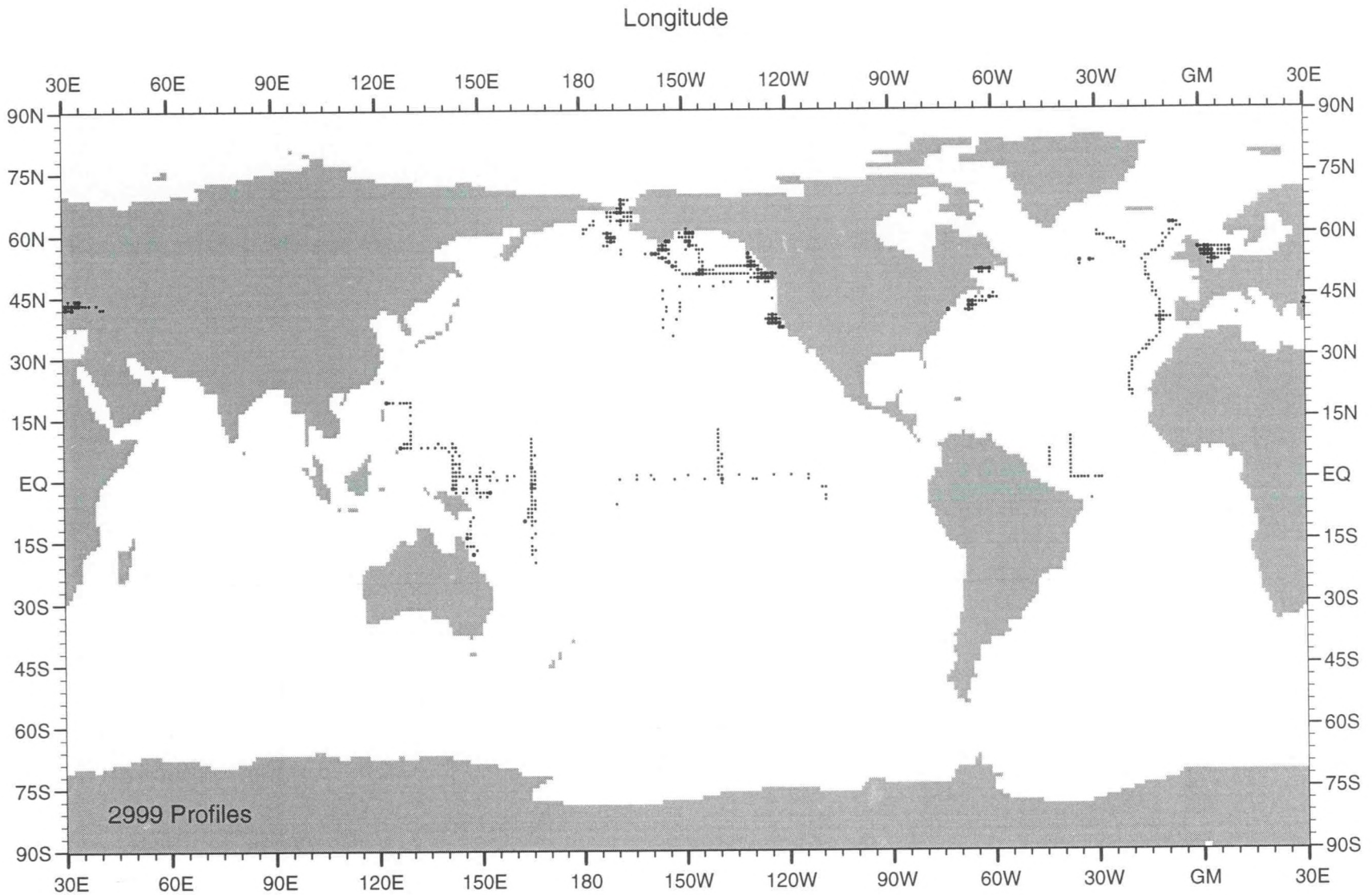

Fig. B86 WOD98 CTD station distribution for April-June for 1988

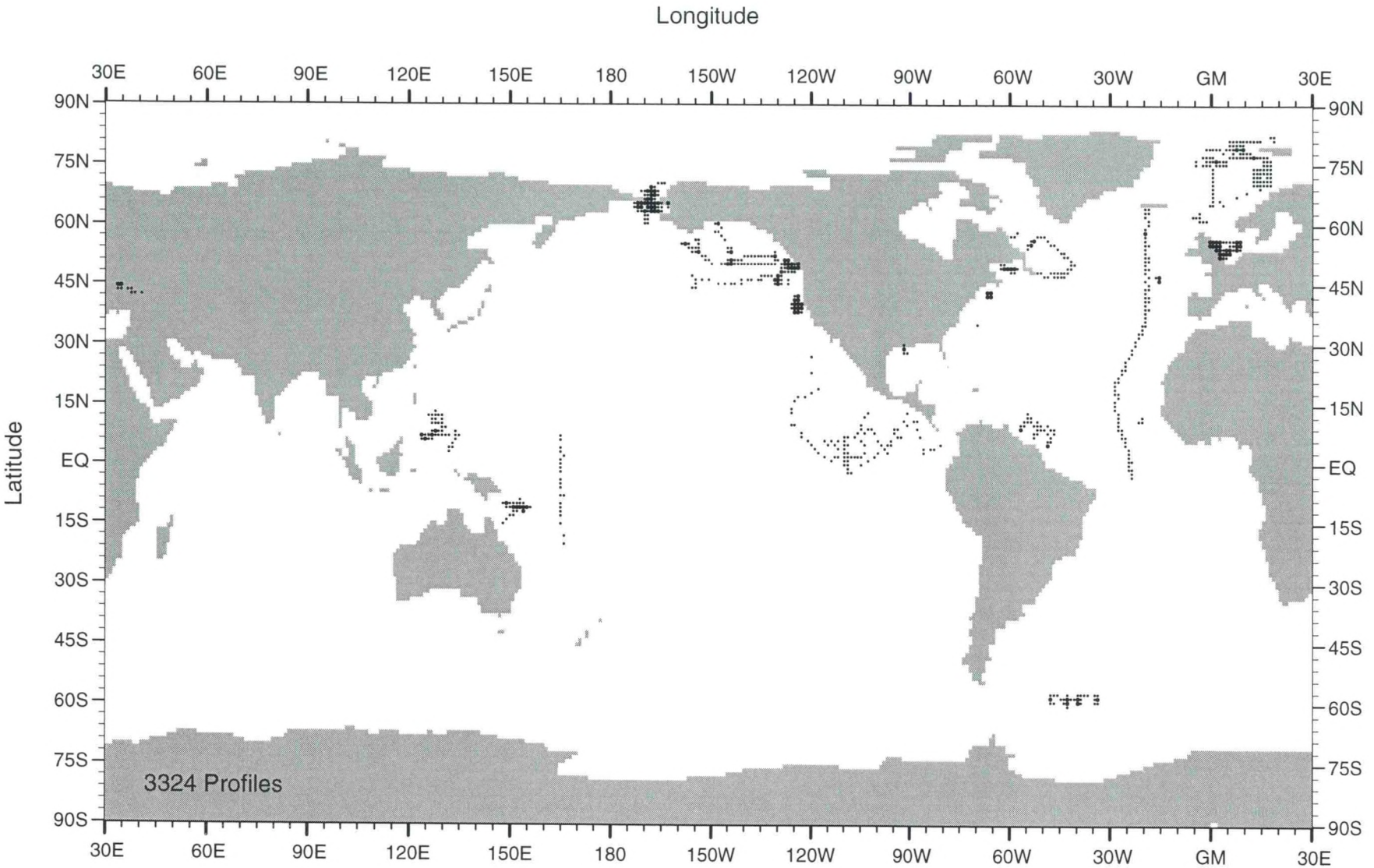

Fig. B87 WOD98 CTD station distribution for July-September for 1988

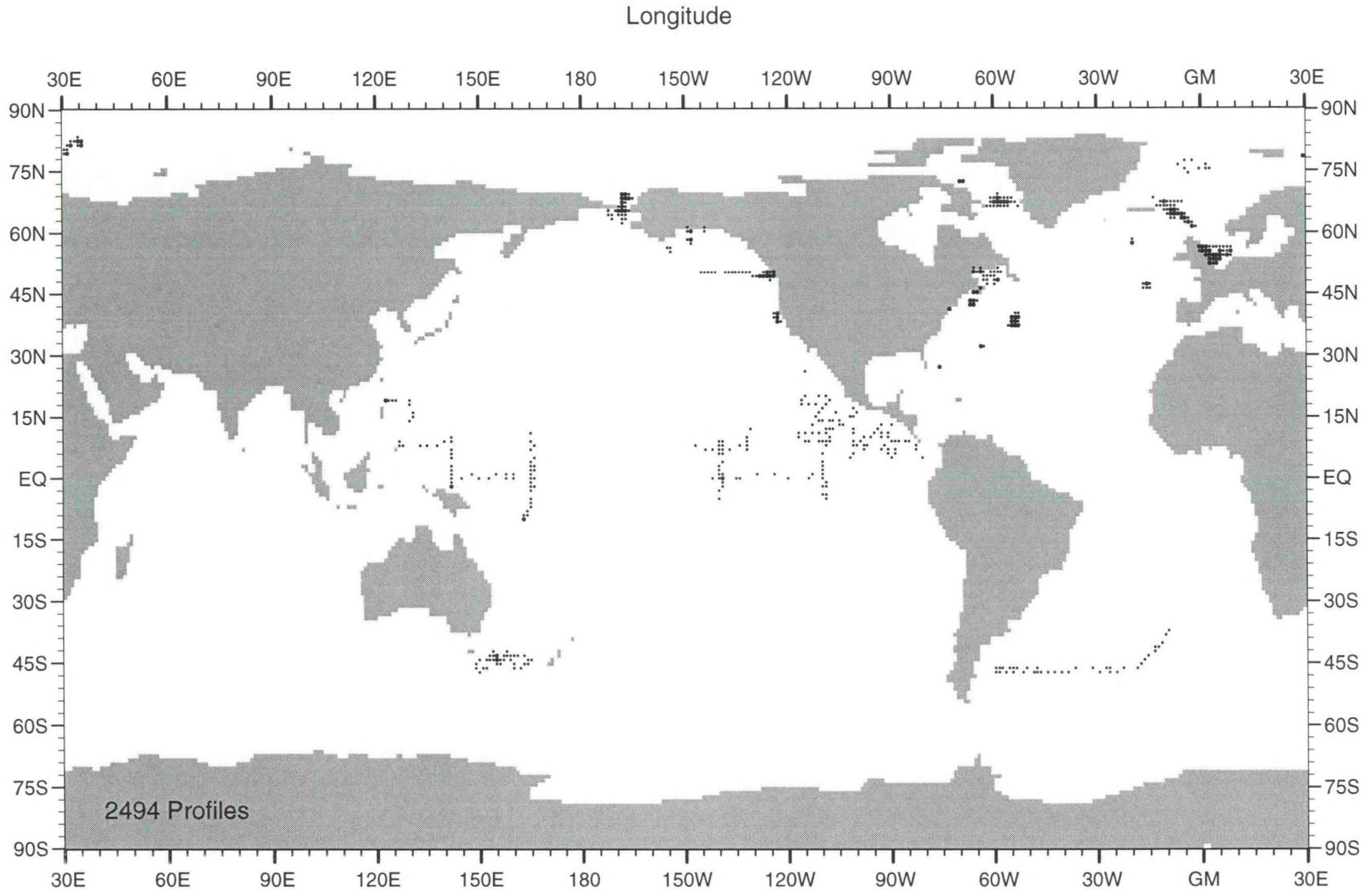

Fig. B88 WOD98 CTD station distribution for October-December for 1988

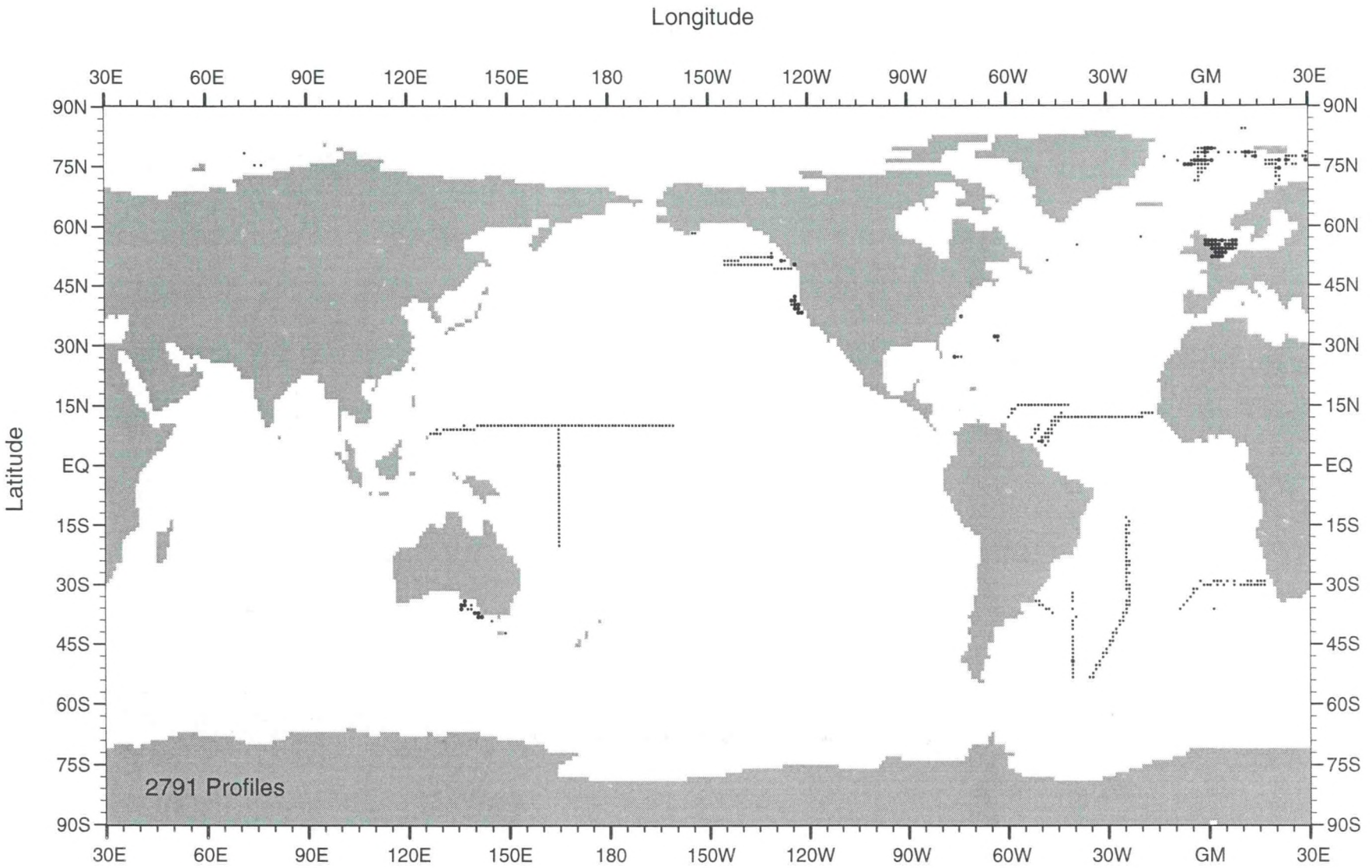

Fig. B89 WOD98 CTD station distribution for January-March for 1989

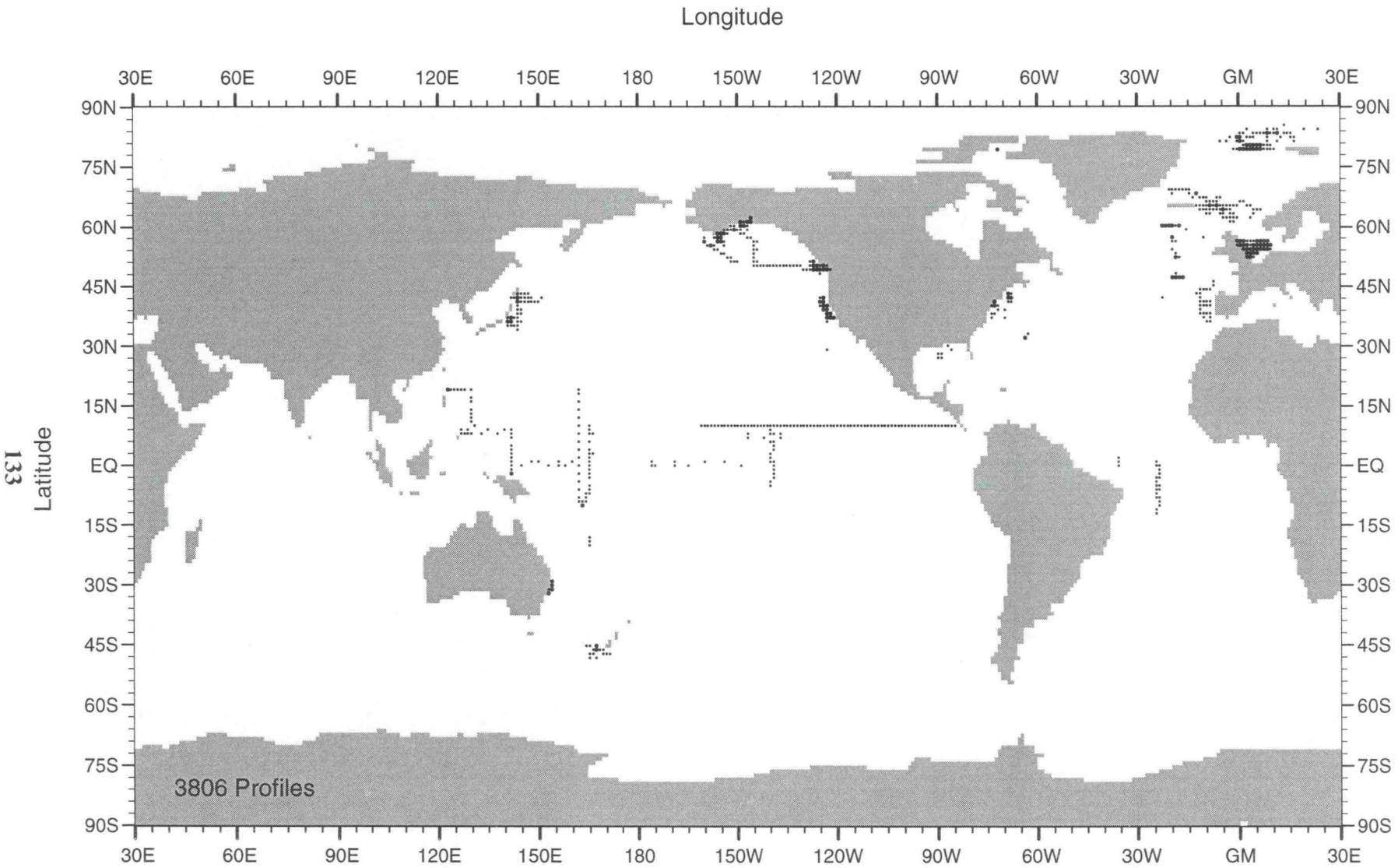

Fig. B90 WOD98 CTD station distribution for April-June for 1989

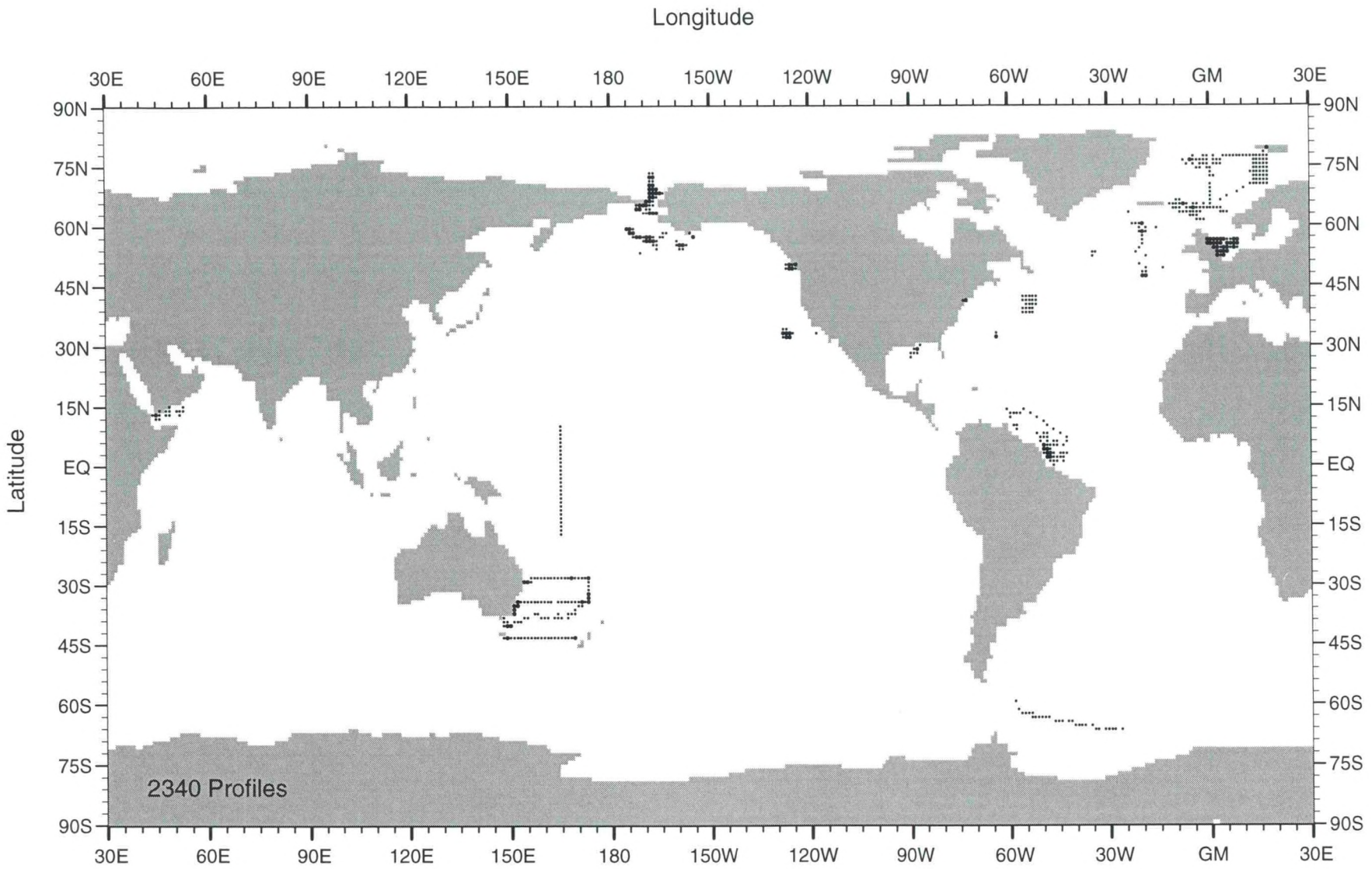

Fig. B91 WOD98 CTD station distribution for July-September for 1989

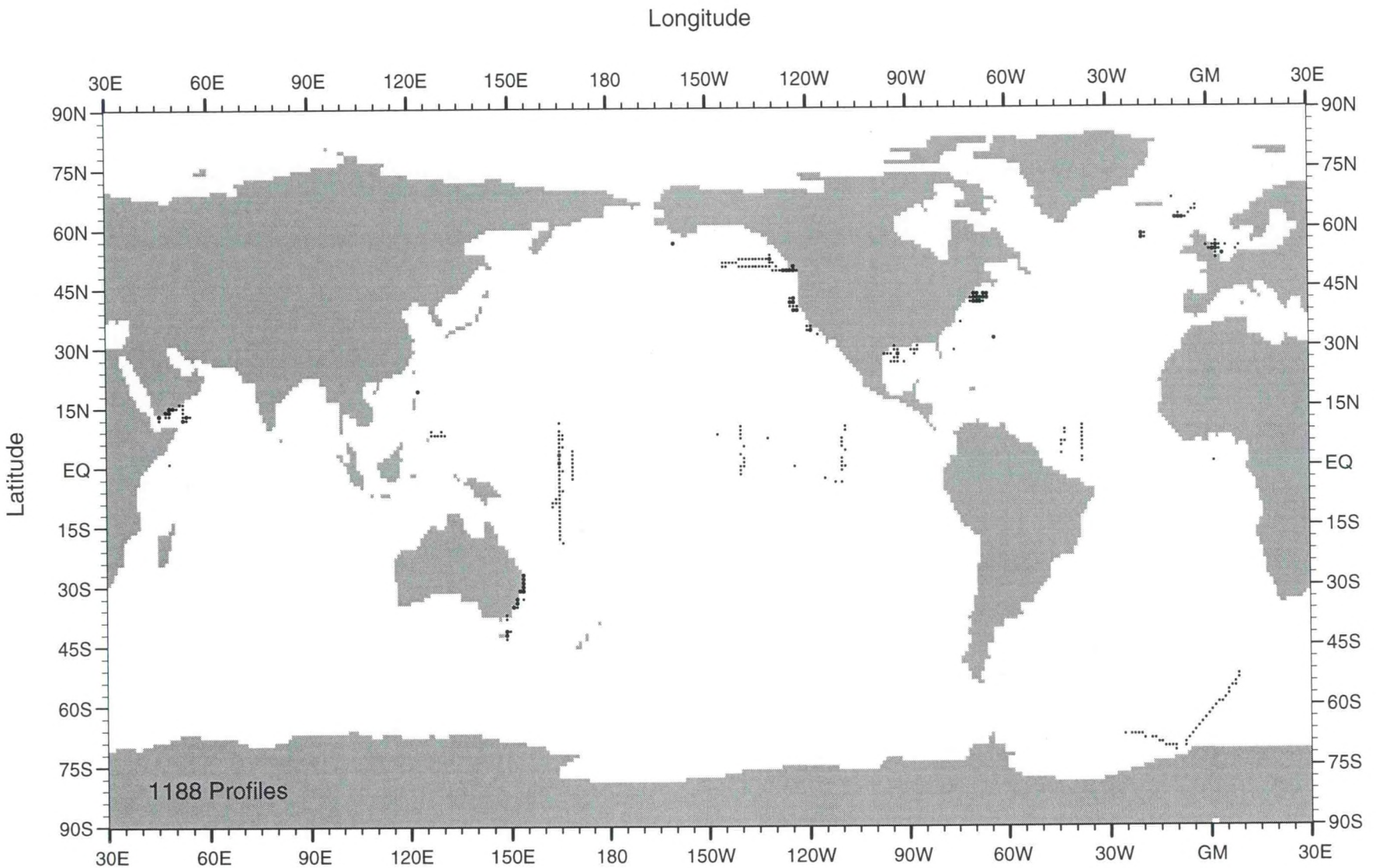

Fig. B92 WOD98 CTD station distribution for October-December for 1989

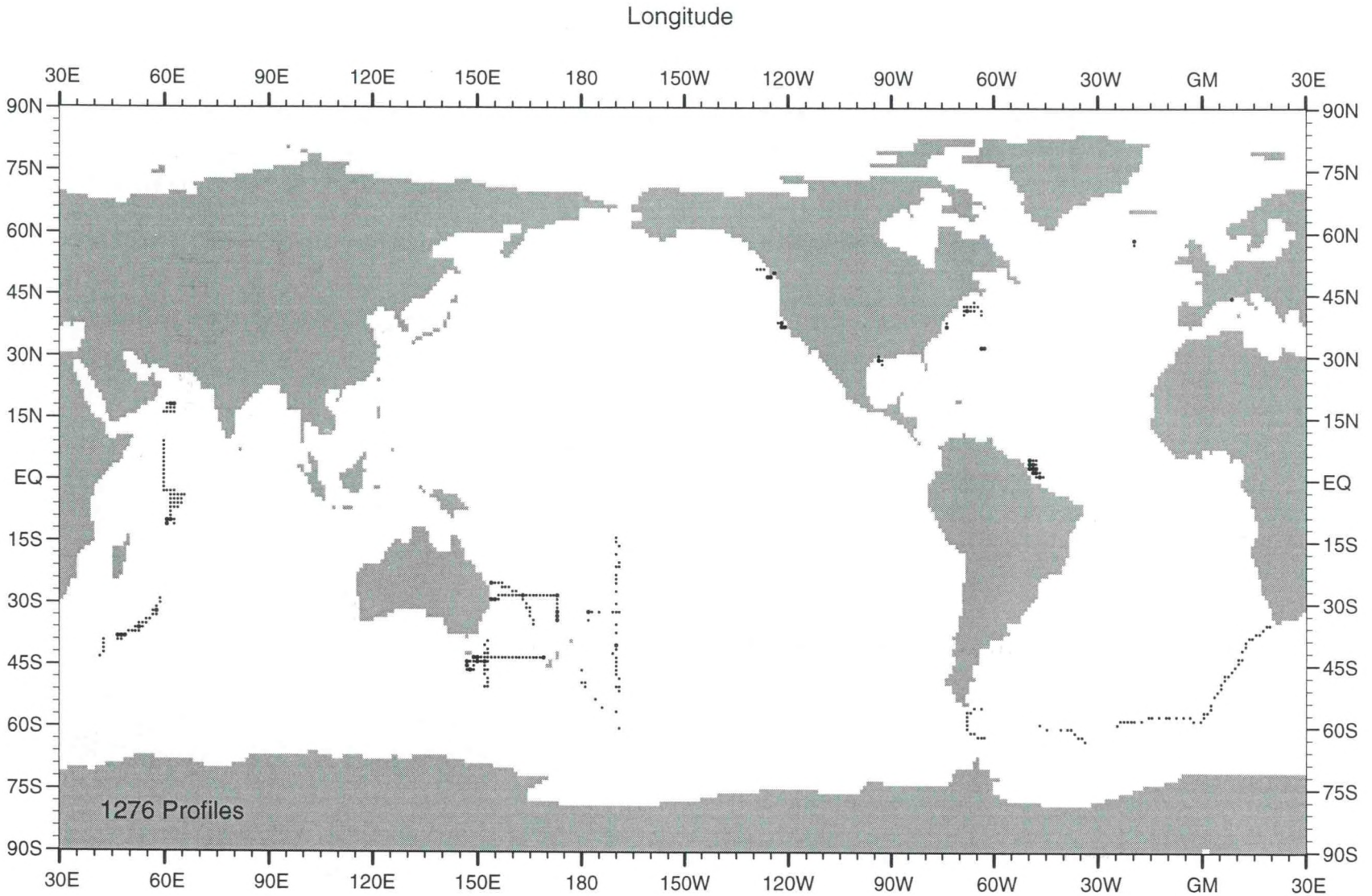

Fig. B93 WOD98 CTD station distribution for January-March for 1990

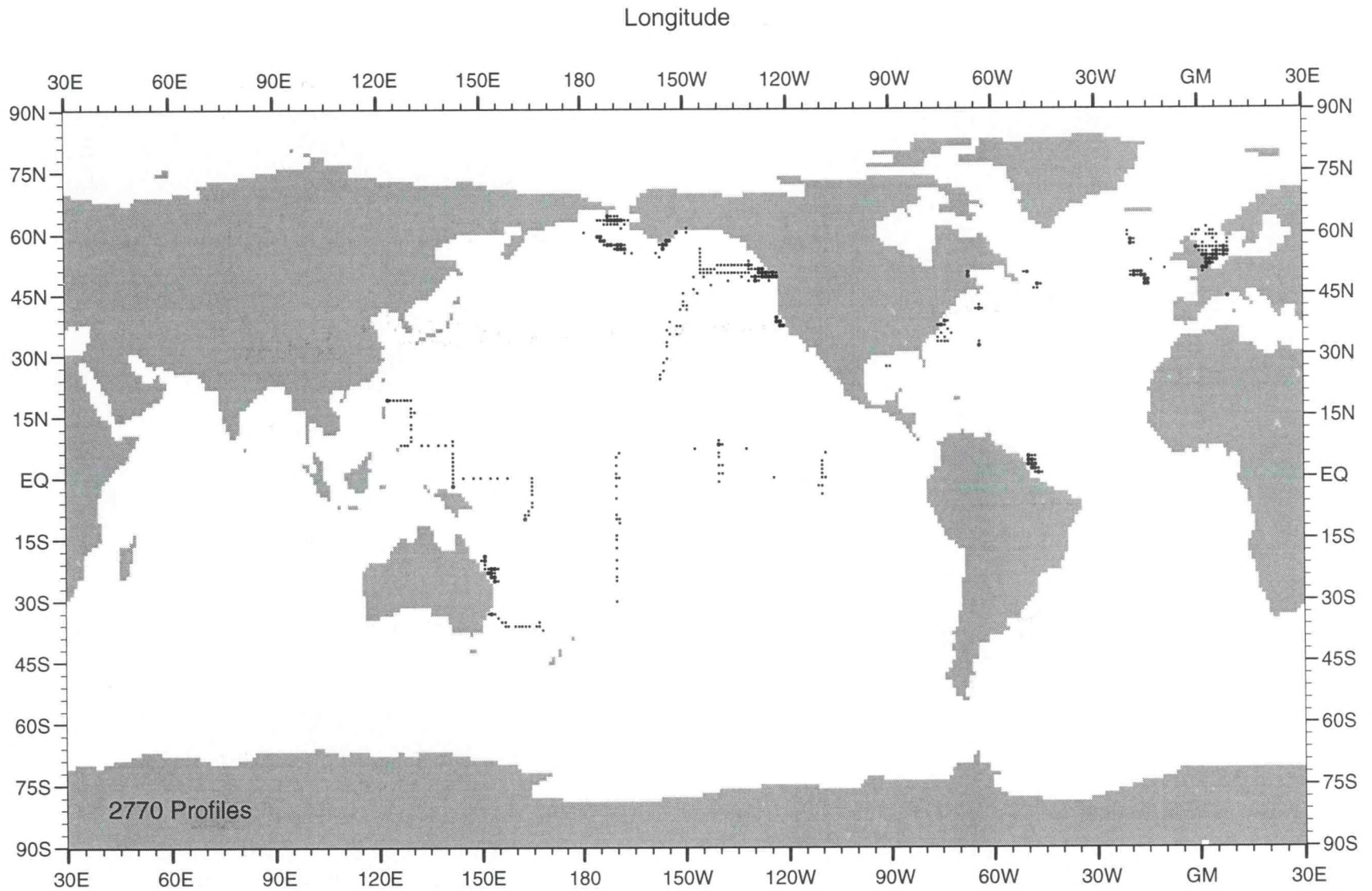

Fig. B94 WOD98 CTD station distribution for April-June for 1990

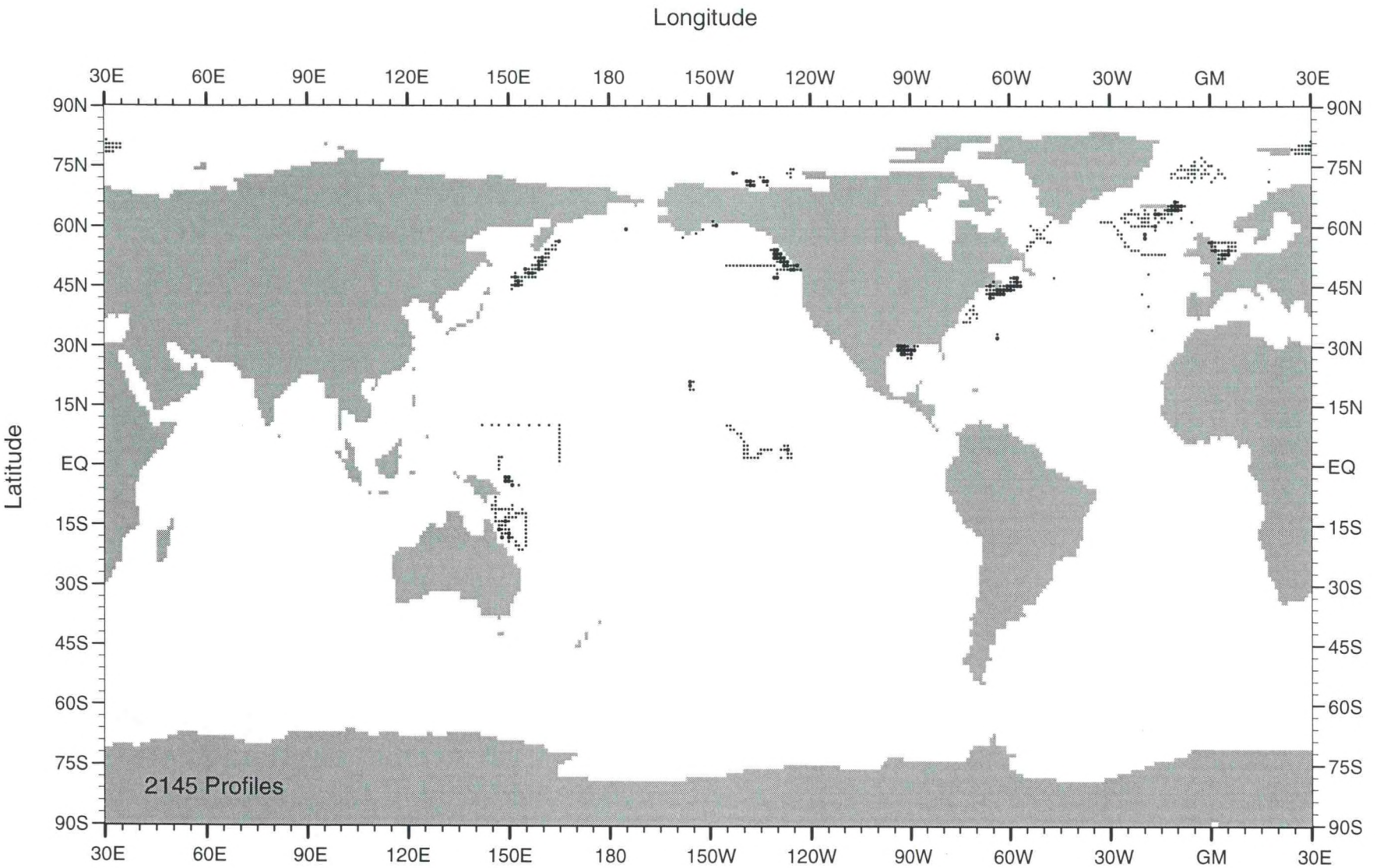

Fig. B95 WOD98 CTD station distribution for July-September for 1990

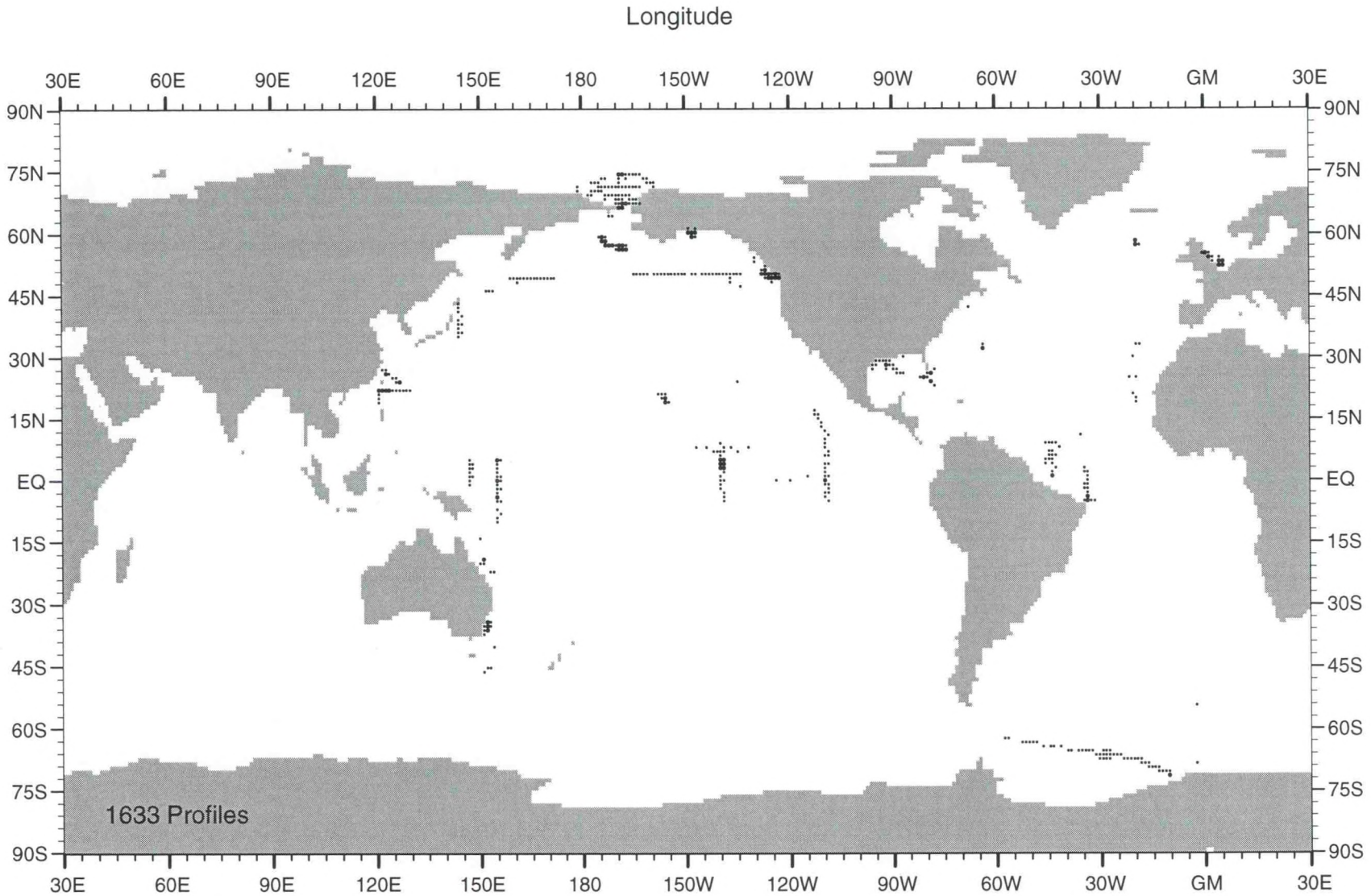

Fig. B96 WOD98 CTD station distribution for October-December for 1990

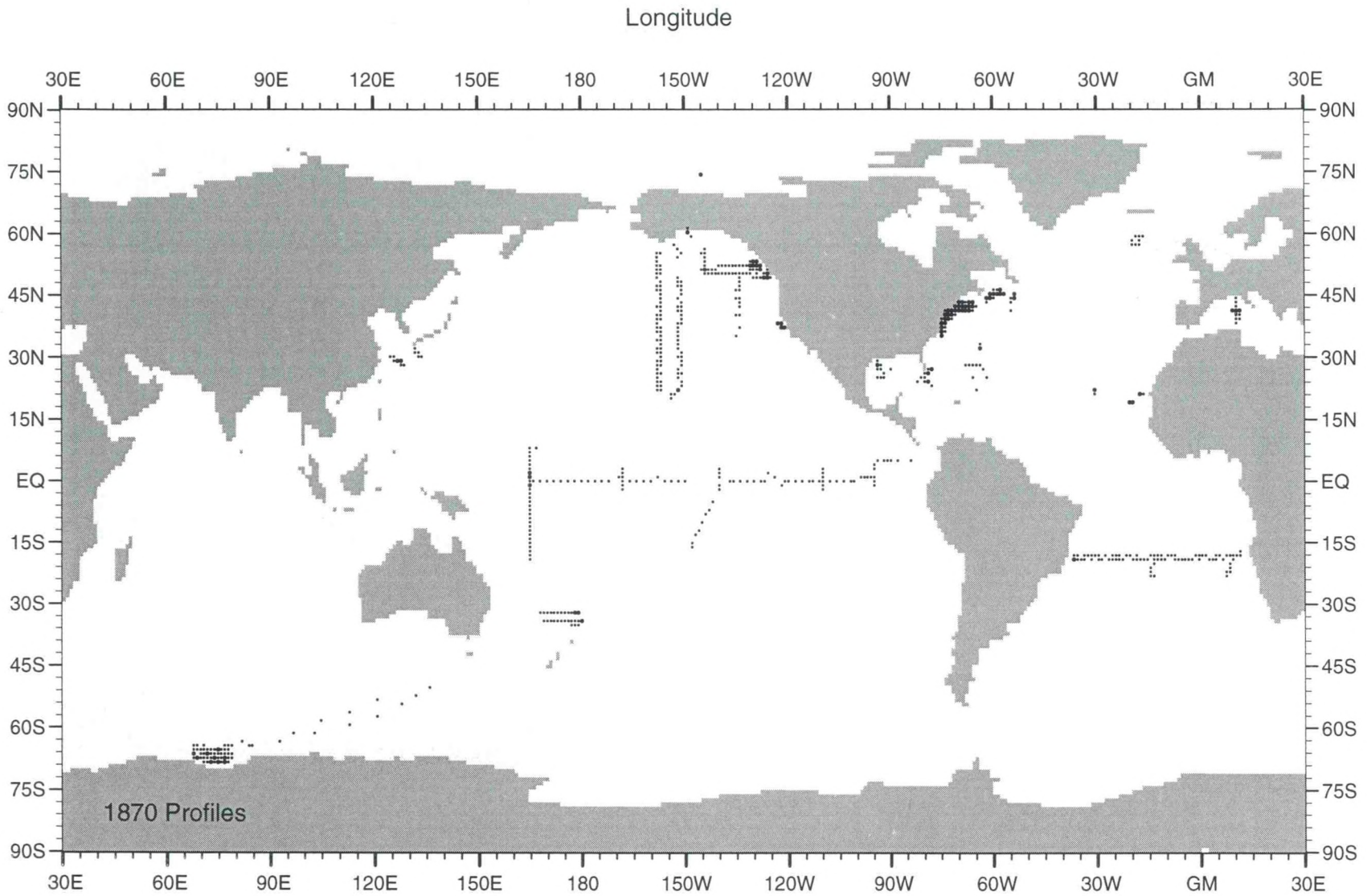

Fig. B97 WOD98 CTD station distribution for January-March for 1991

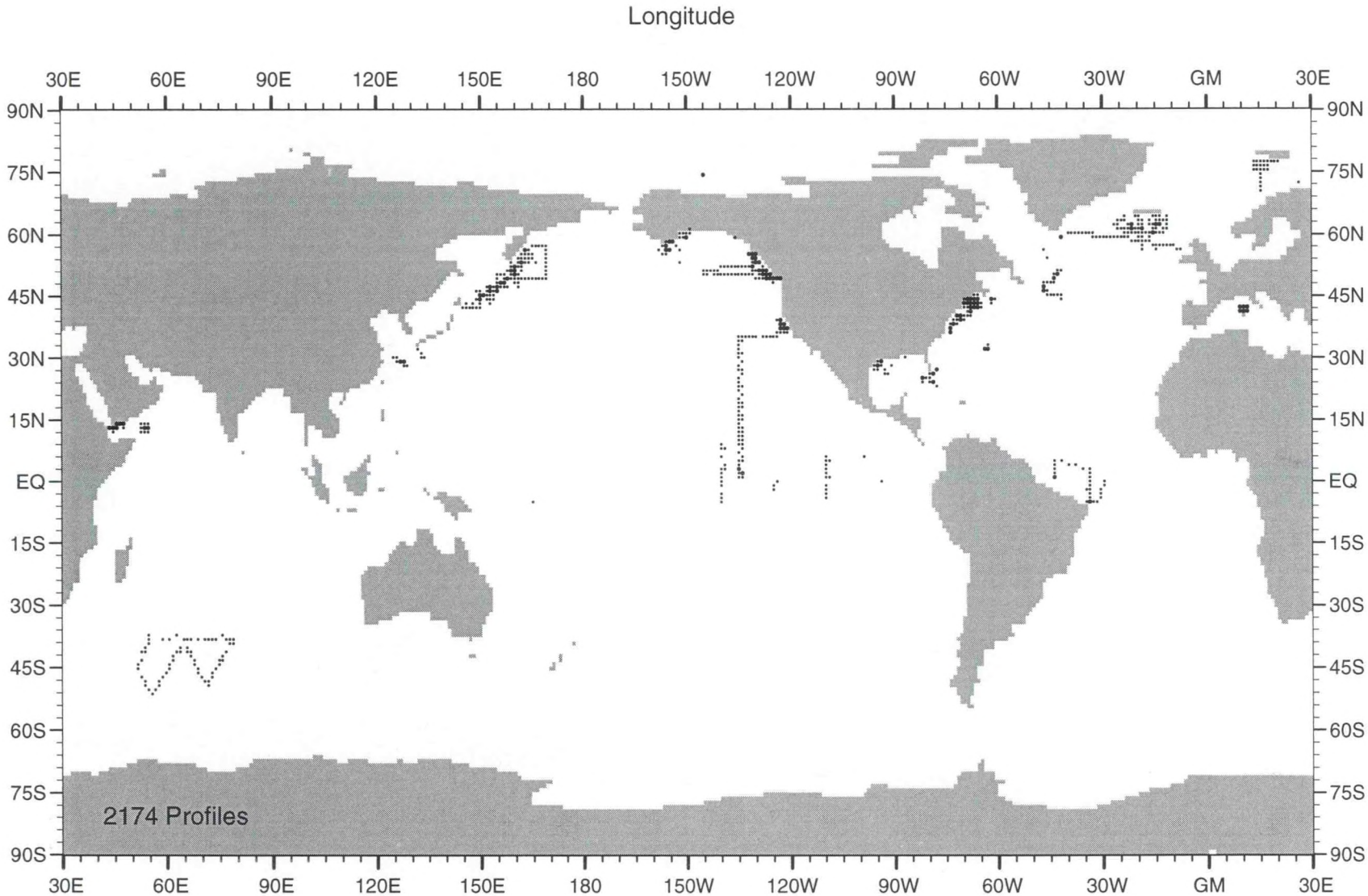

Fig. B98 WOD98 CTD station distribution for April-June for 1991

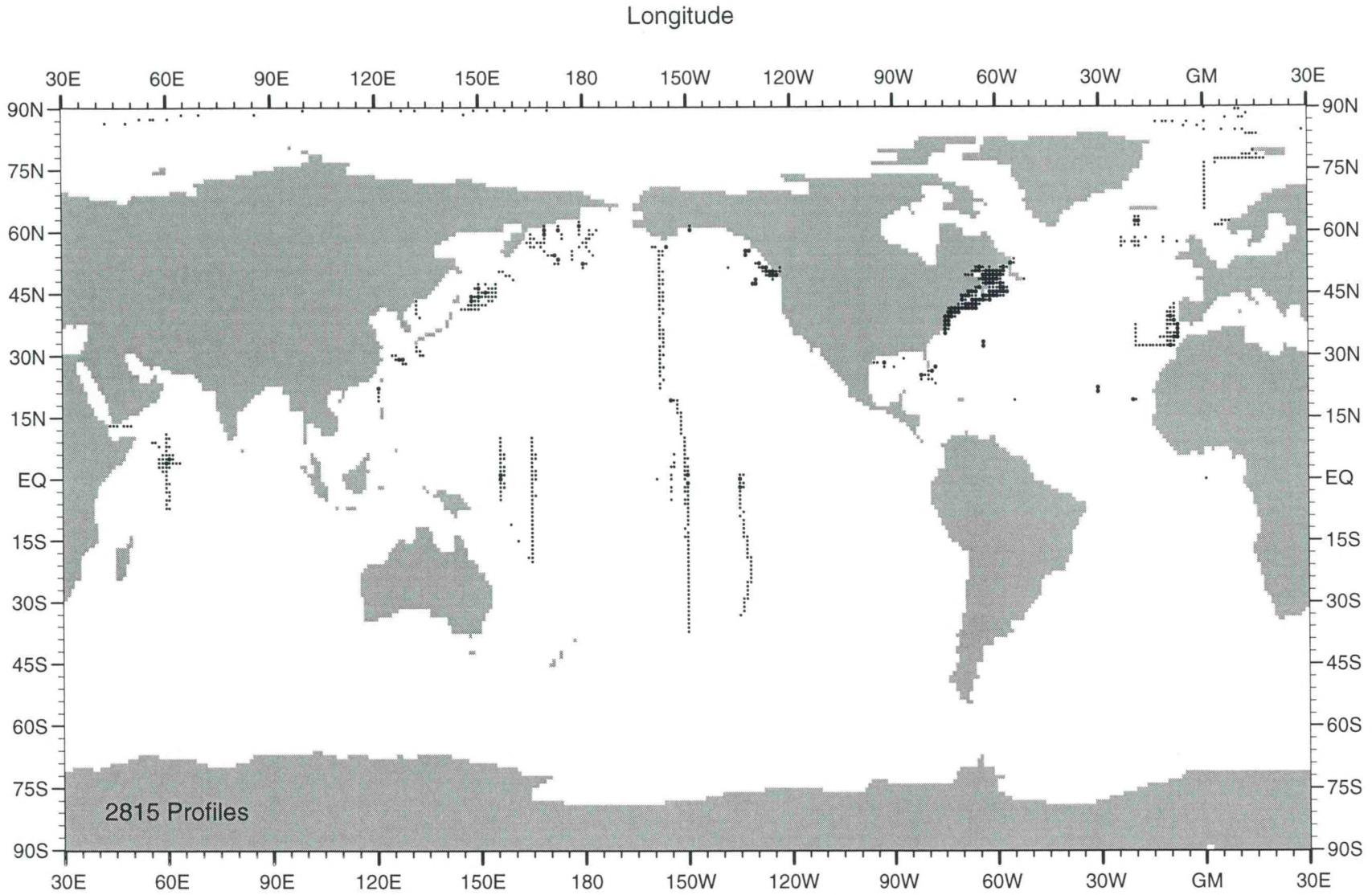

Fig. B99 WOD98 CTD station distribution for July-September for 1991

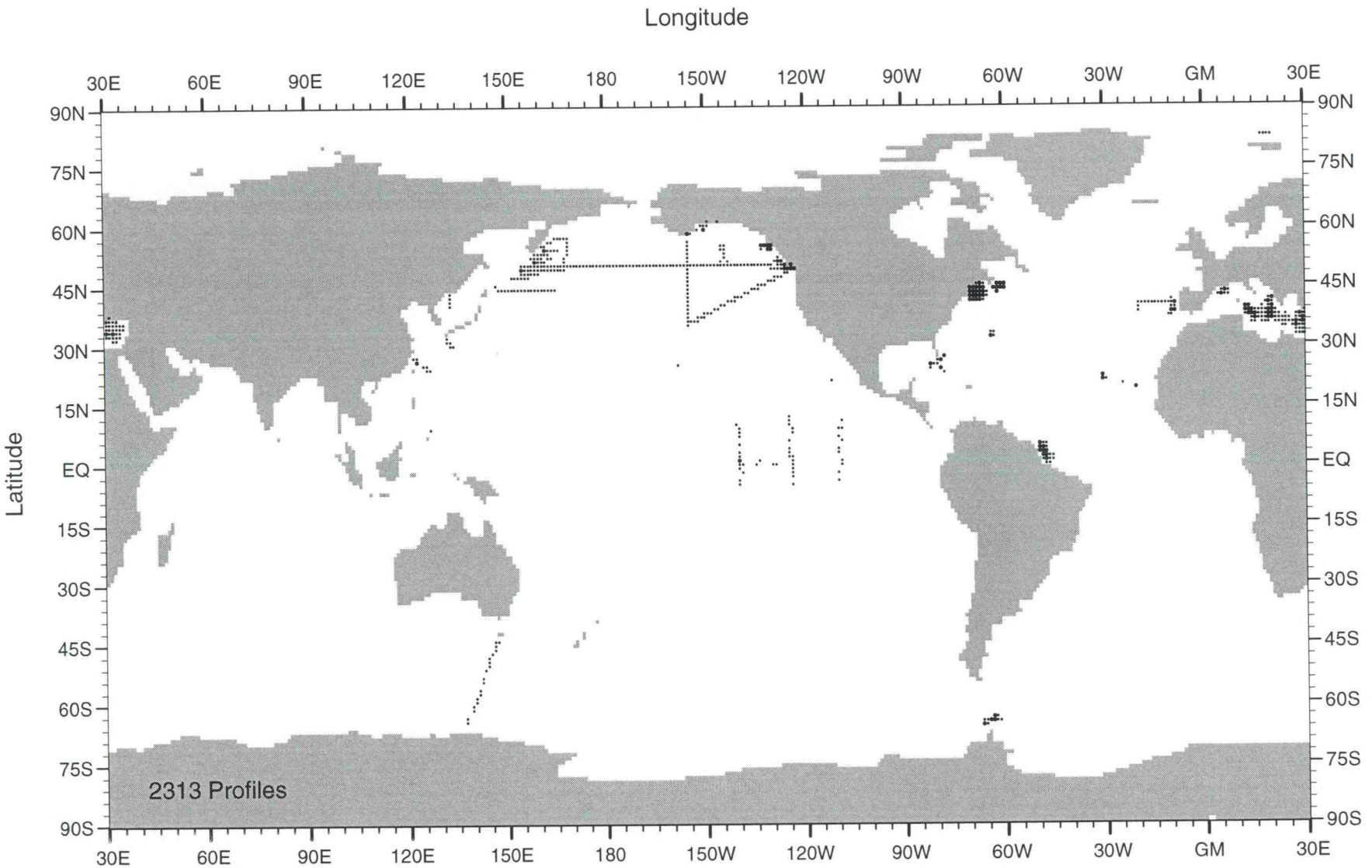

Fig. B100 WOD98 CTD station distribution for October-December for 1991

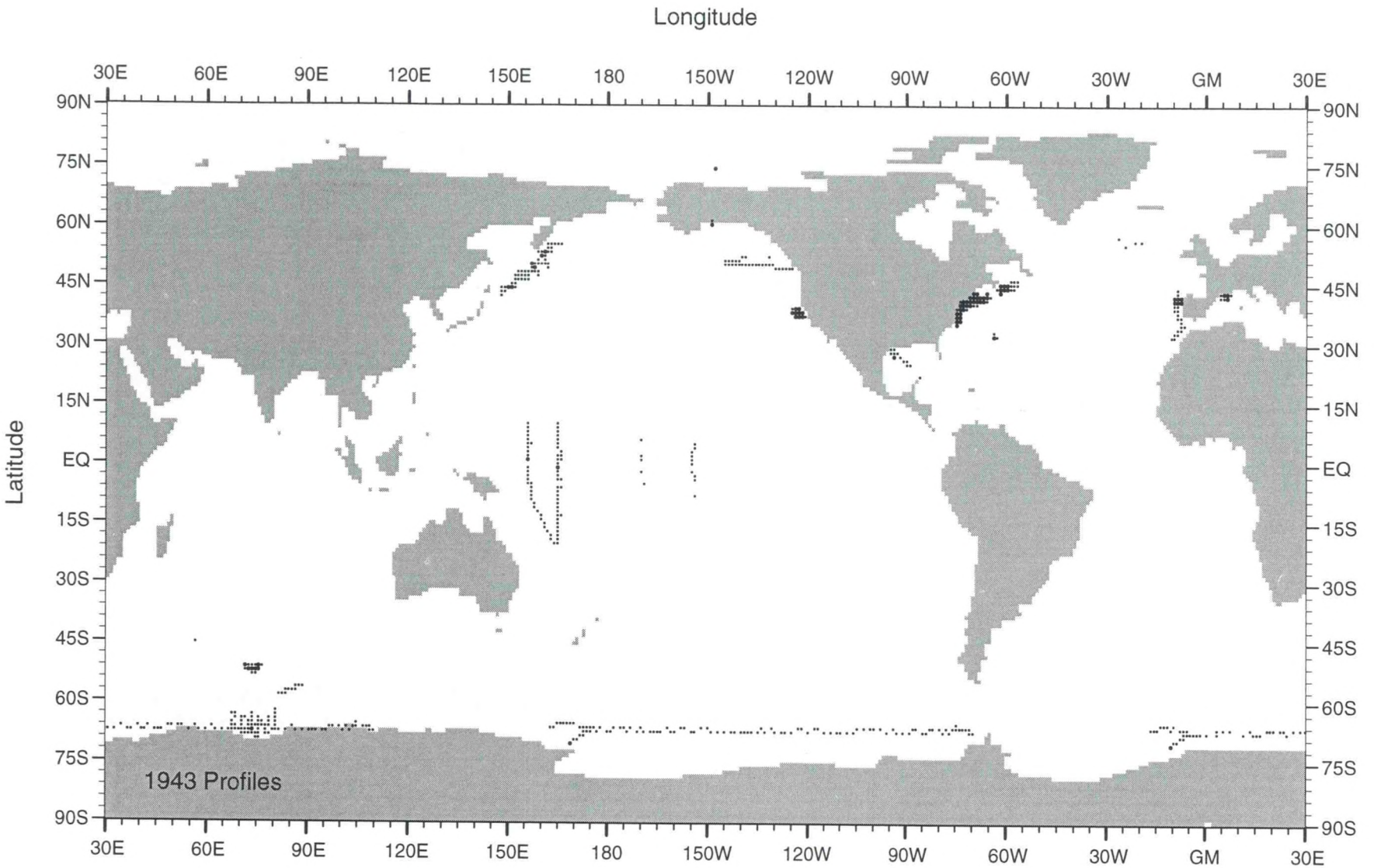

Fig. B101 WOD98 CTD station distribution for January-March for 1992

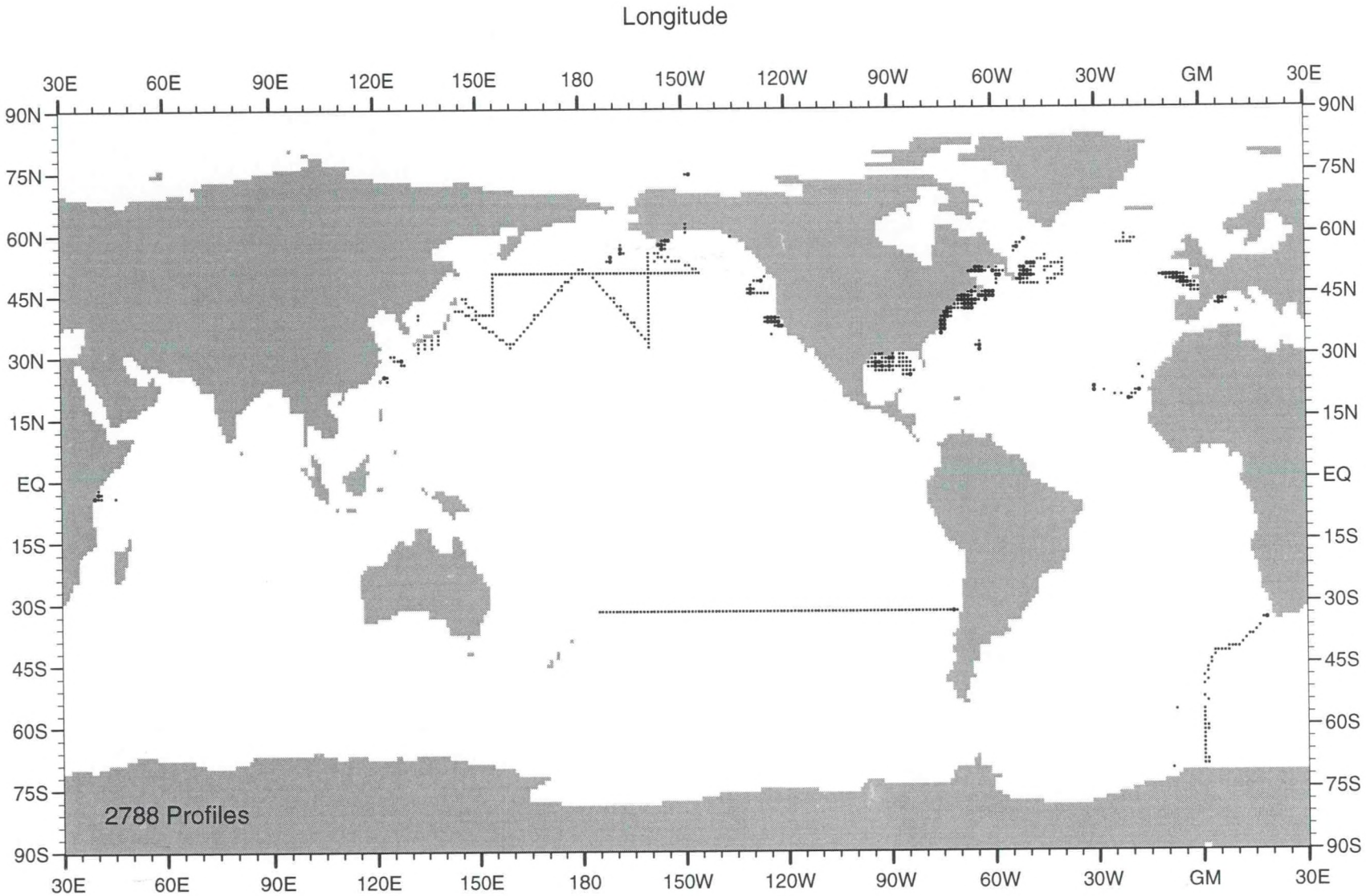

Fig. B102 WOD98 CTD station distribution for April-June for 1992

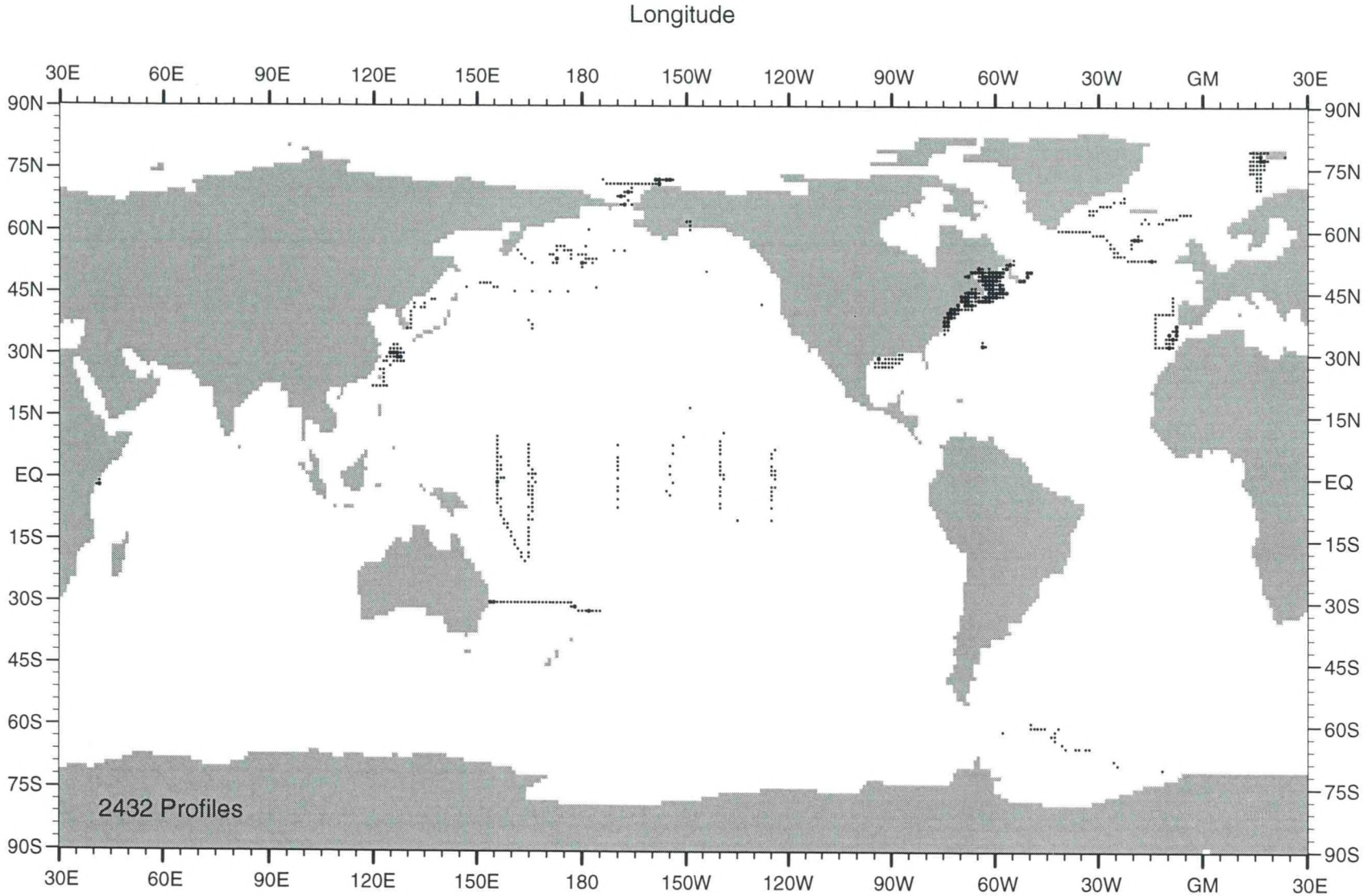

Fig. B103 WOD98 CTD station distribution for July-September for 1992

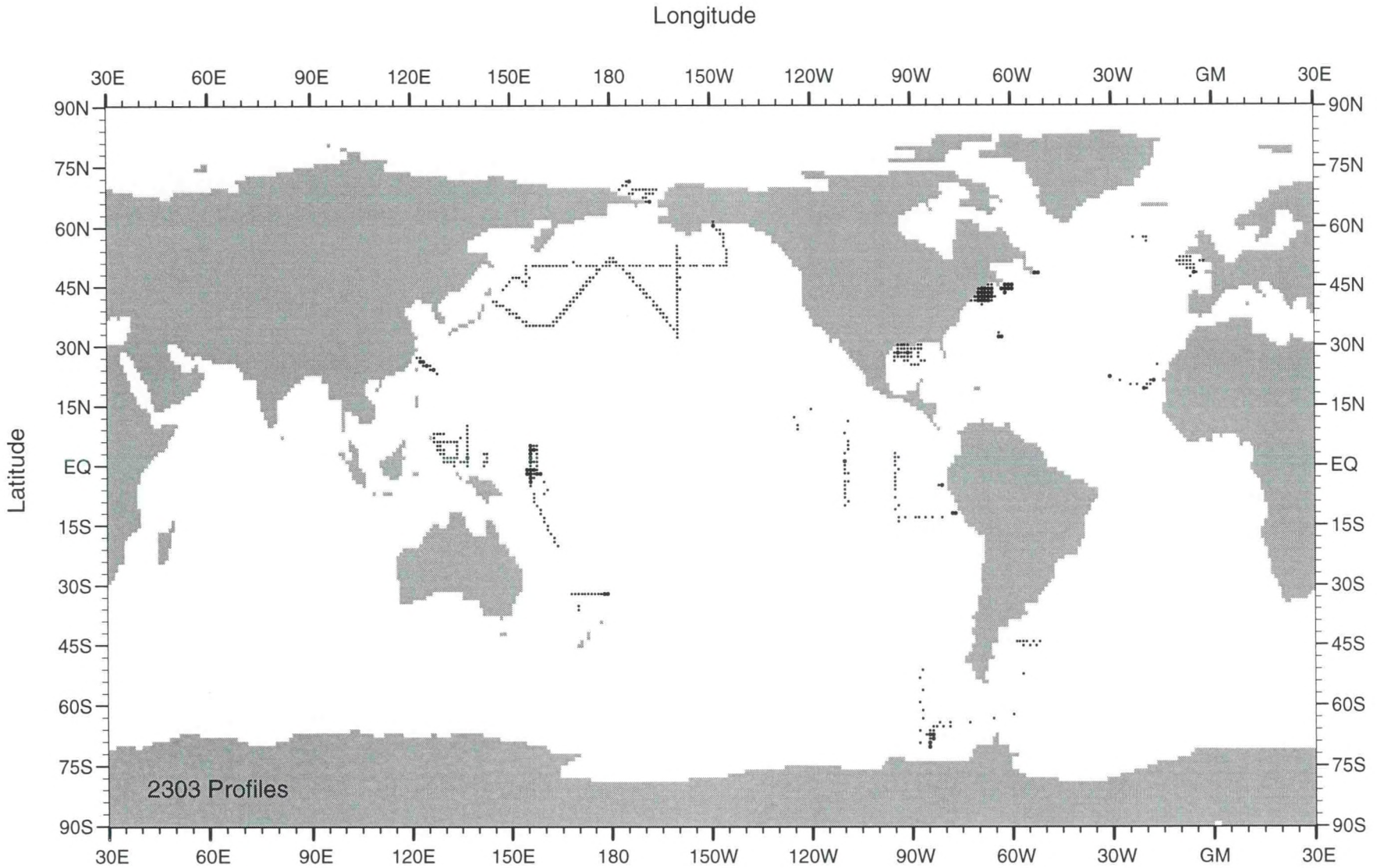

Fig. B104 WOD98 CTD station distribution for October-December for 1992

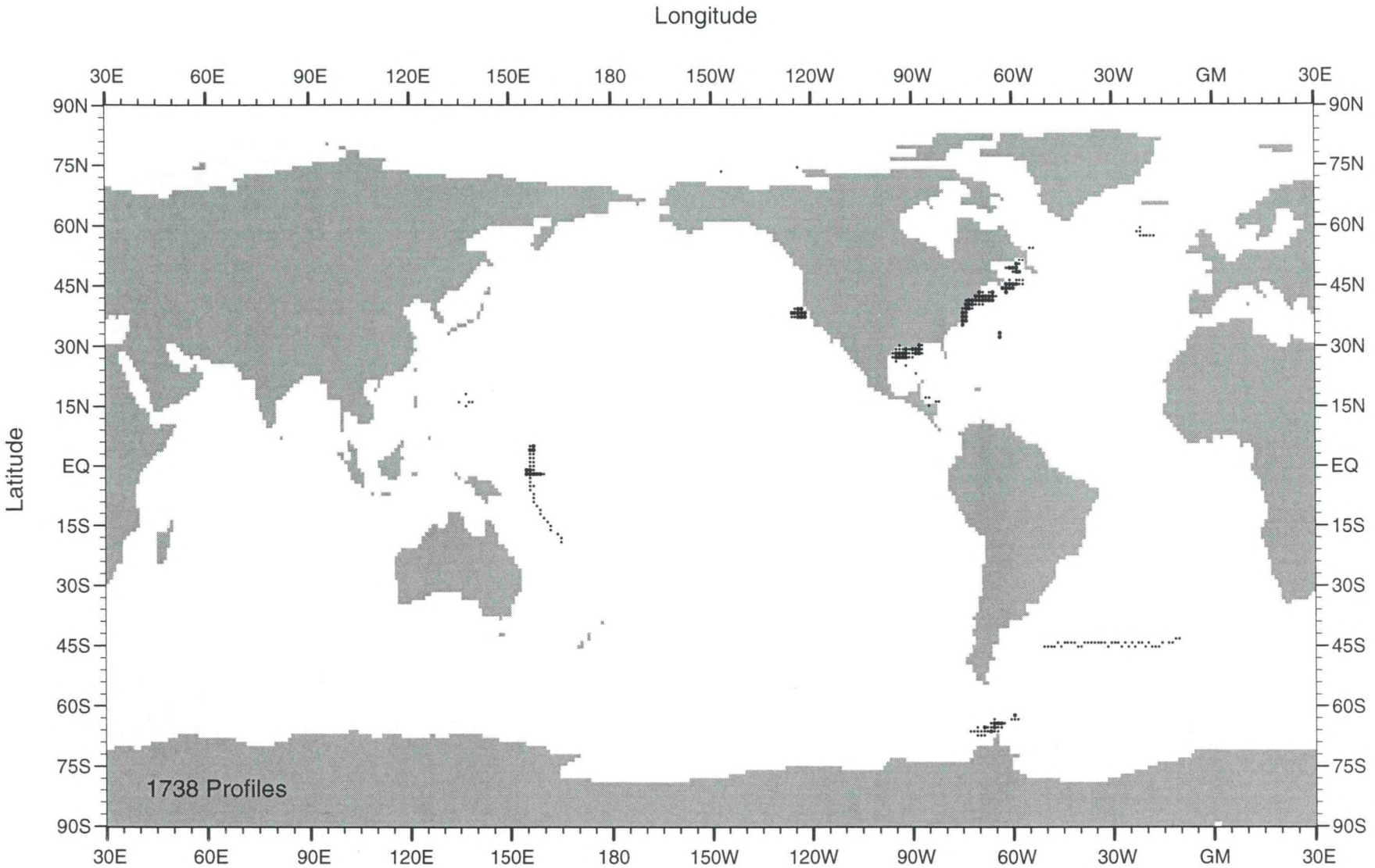

Fig. B105 WOD98 CTD station distribution for January-March for 1993

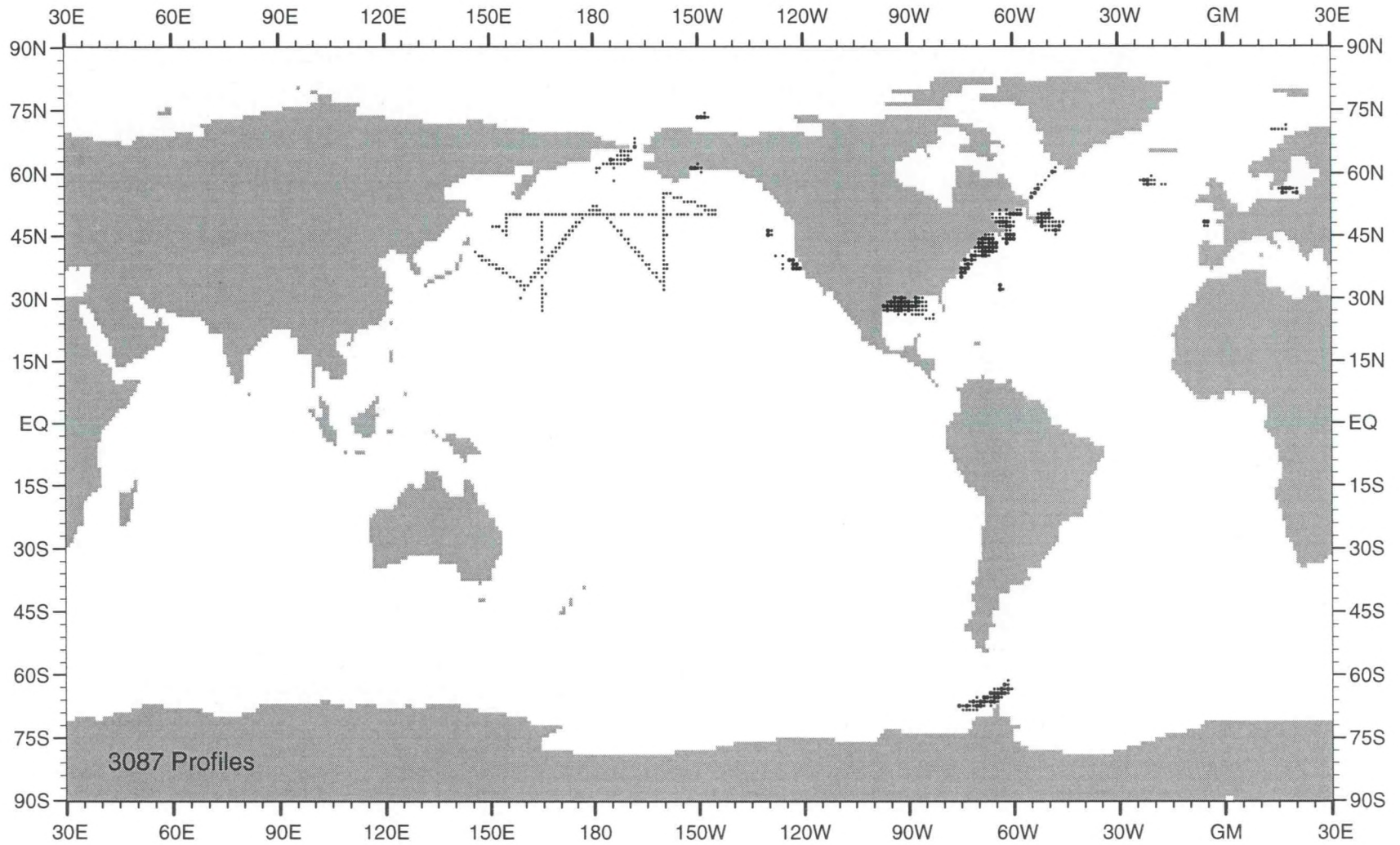

Fig. B106 WOD98 CTD station distribution for April-June for 1993

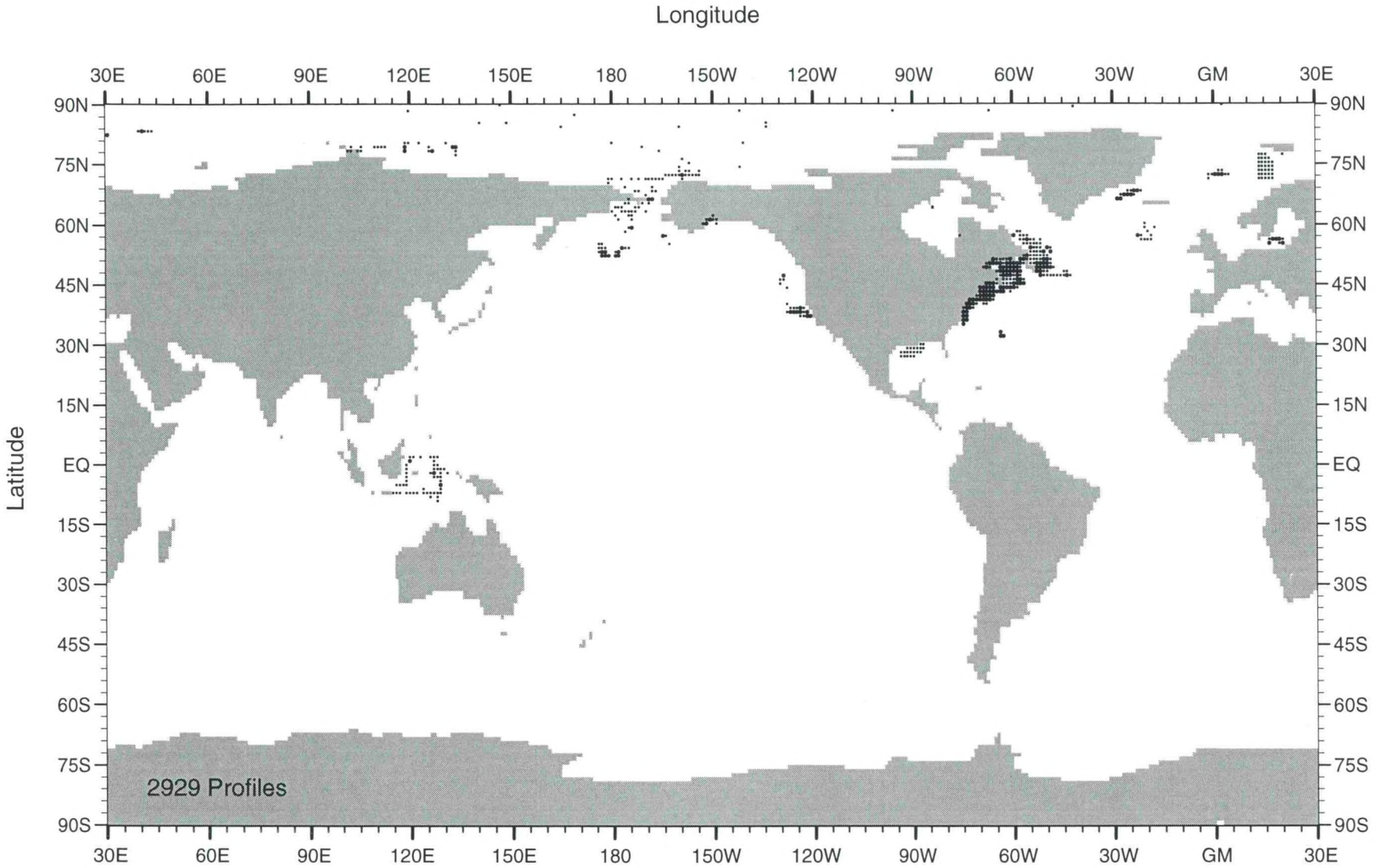

Fig. B107 WOD98 CTD station distribution for July-September for 1993

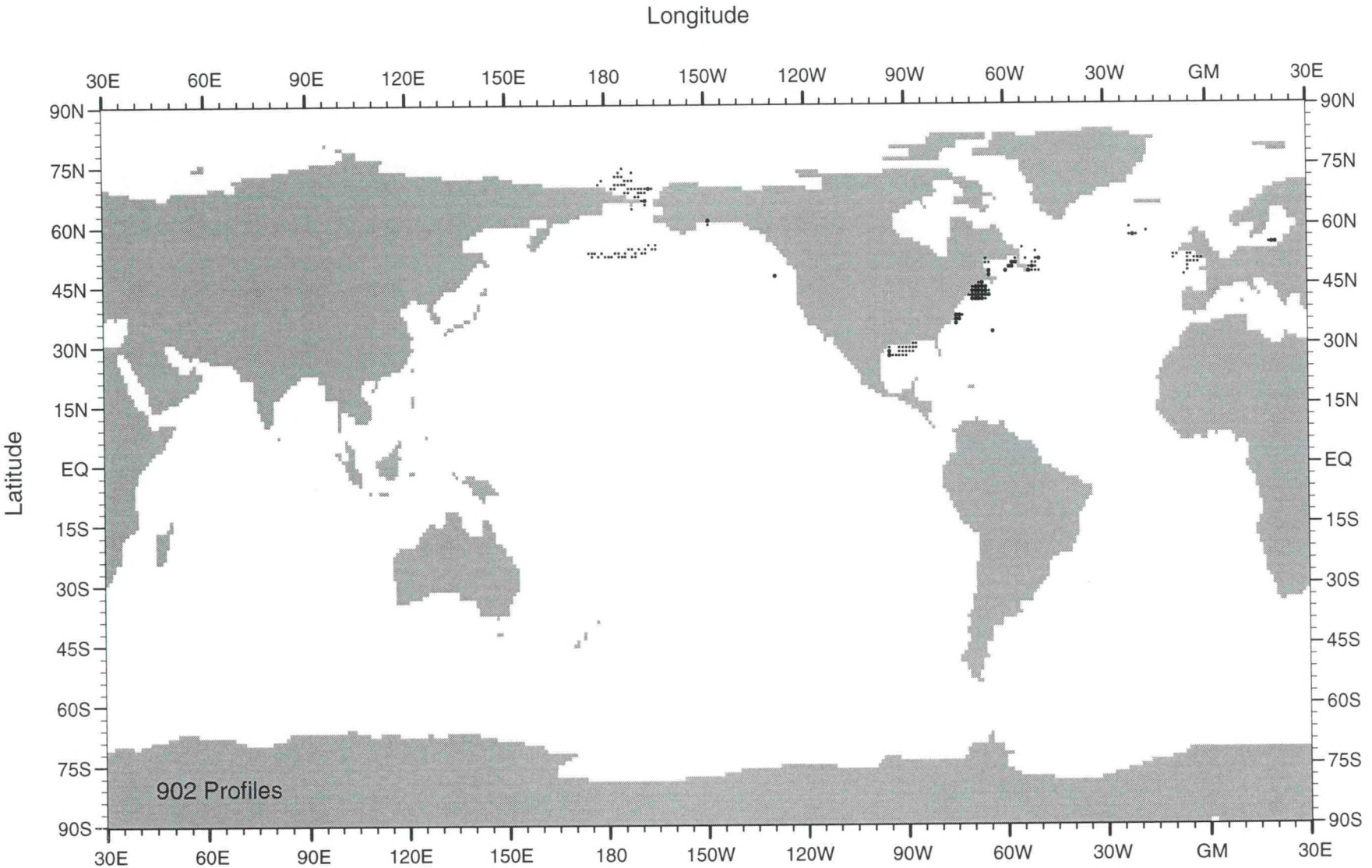

Fig. B108 WOD98 CTD station distribution for October-December for 1993

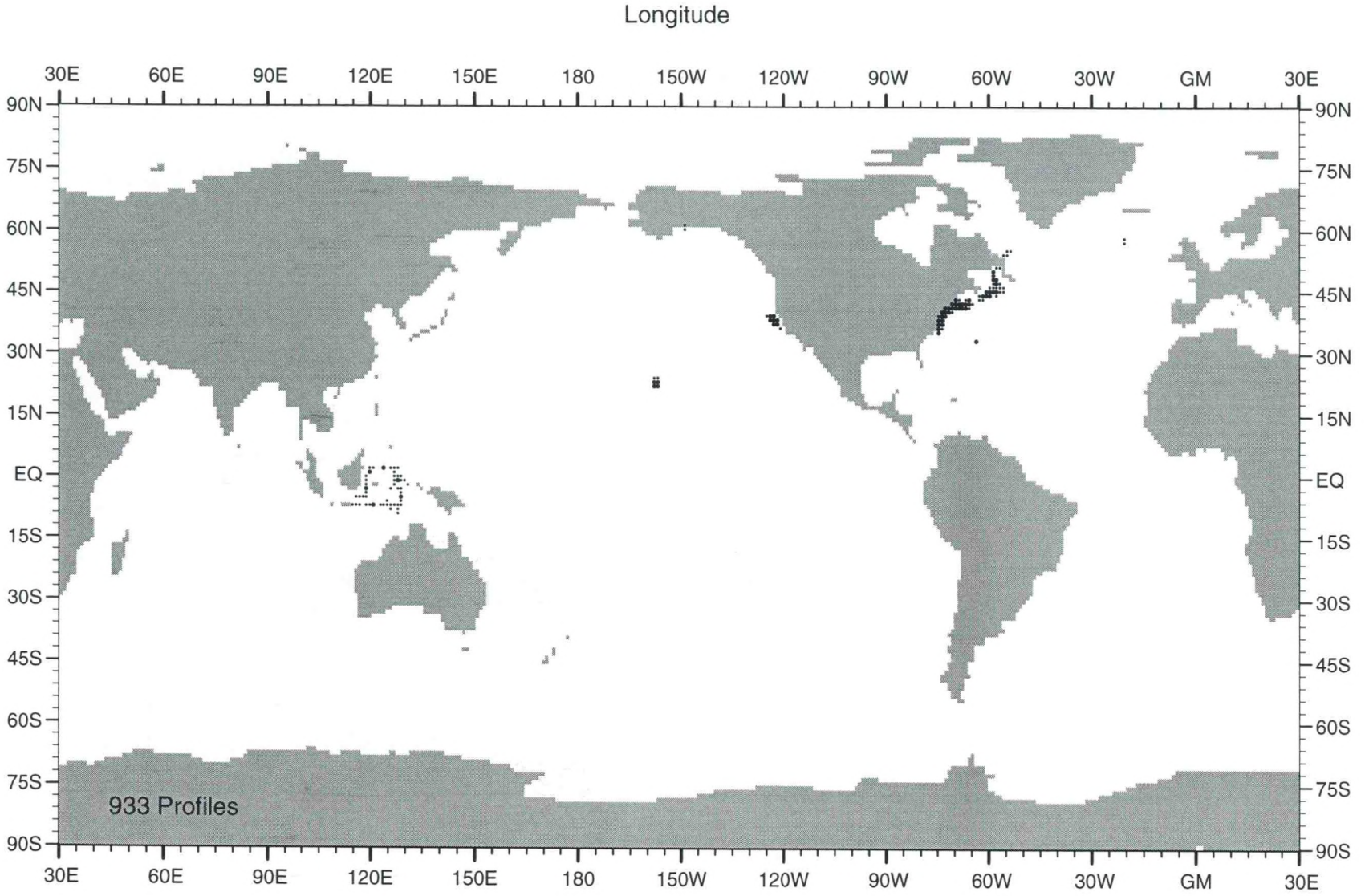

Fig. B109 WOD98 CTD station distribution for January-March for 1994

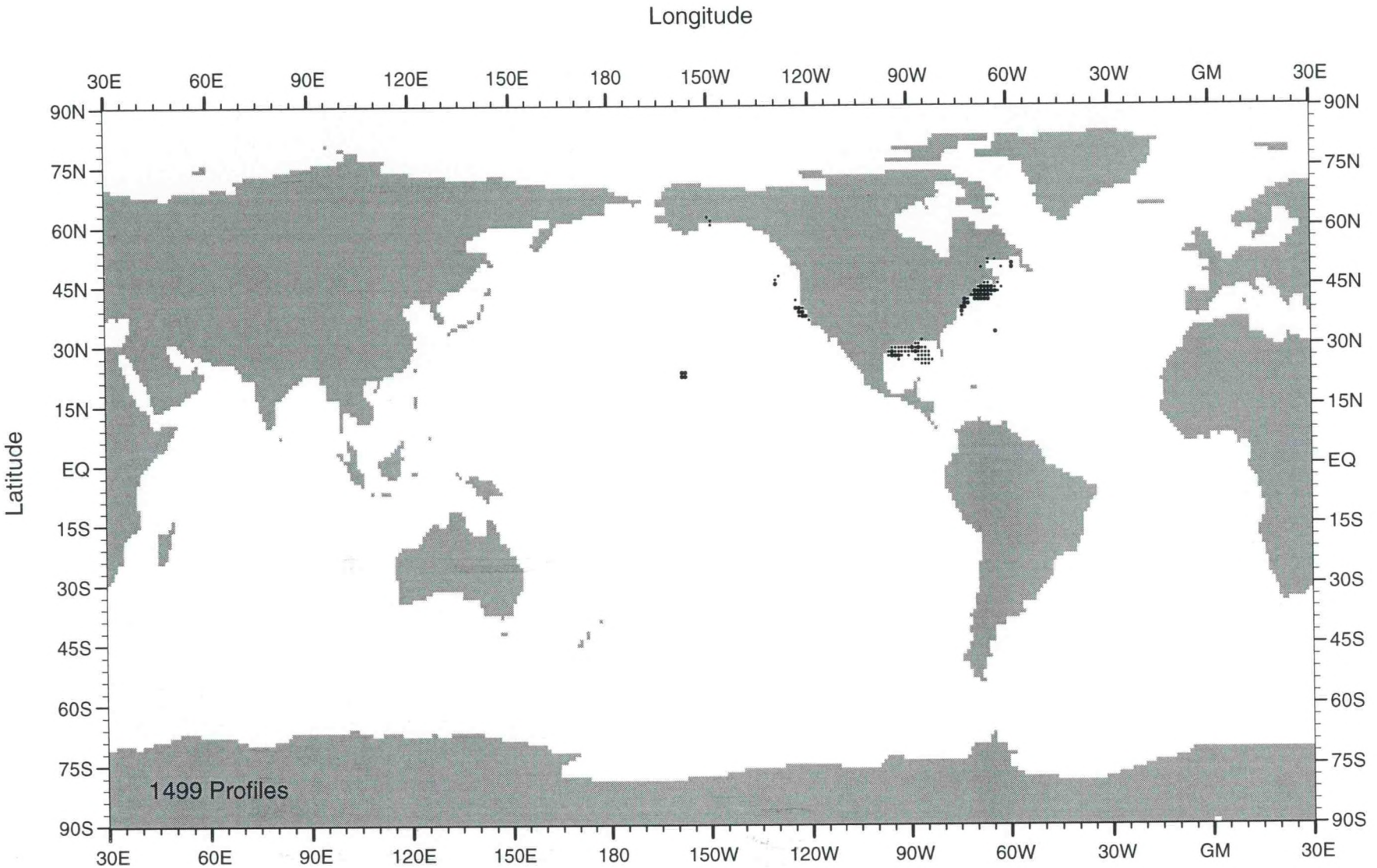

Fig. B110 WOD98 CTD station distribution for April-June for 1994

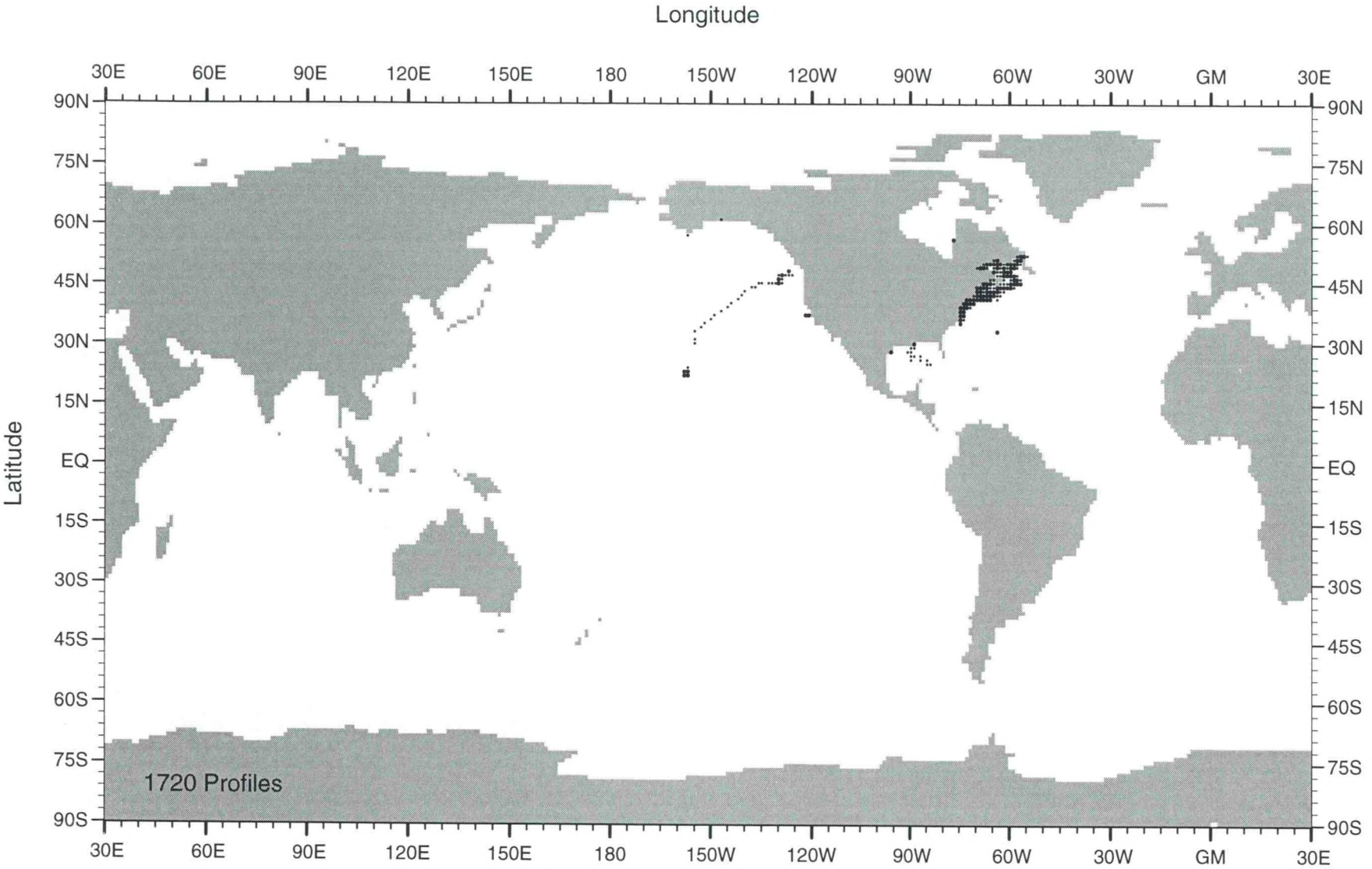

Fig. B111 WOD98 CTD station distribution for July-September for 1994

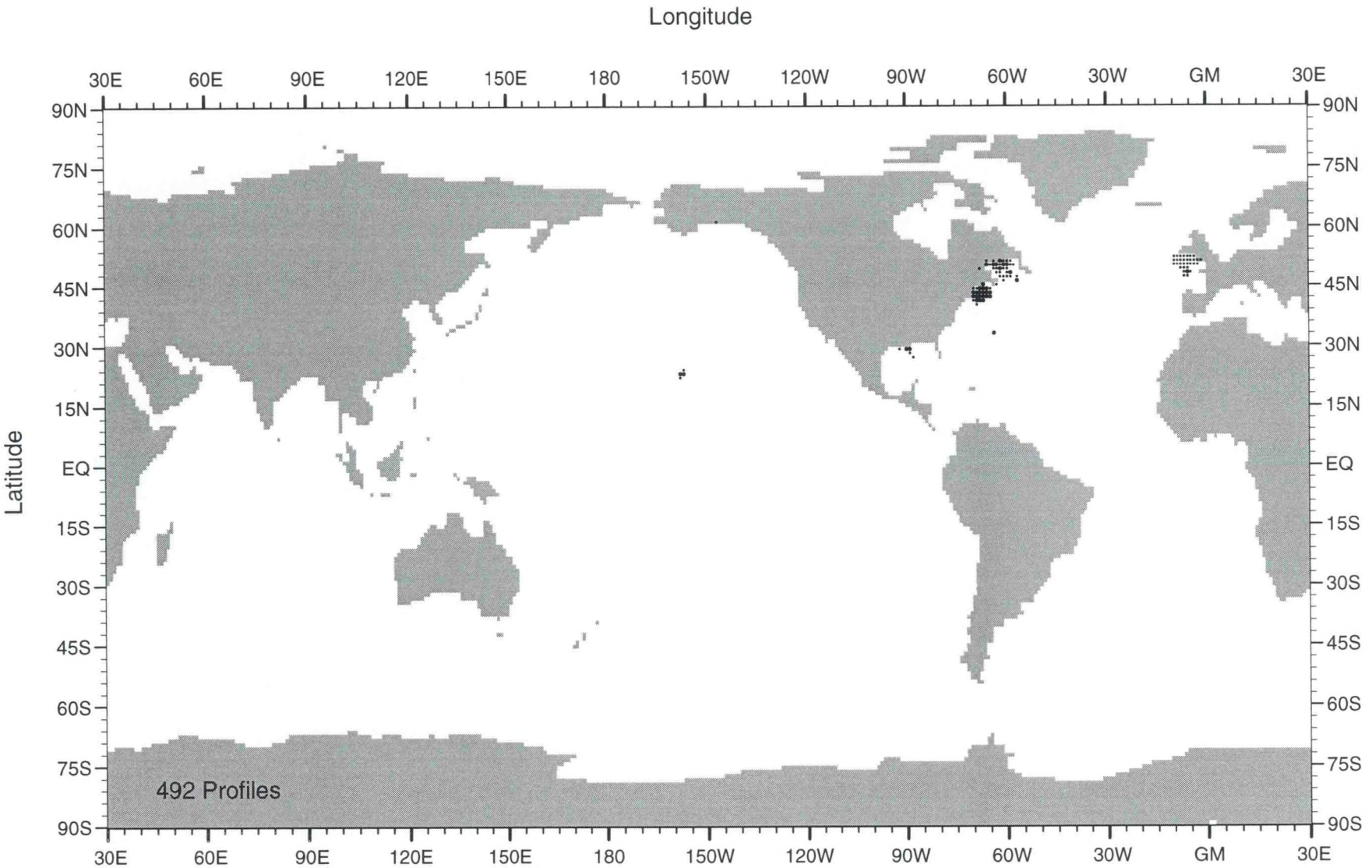

Fig. B112 WOD98 CTD station distribution for October-December for 1994

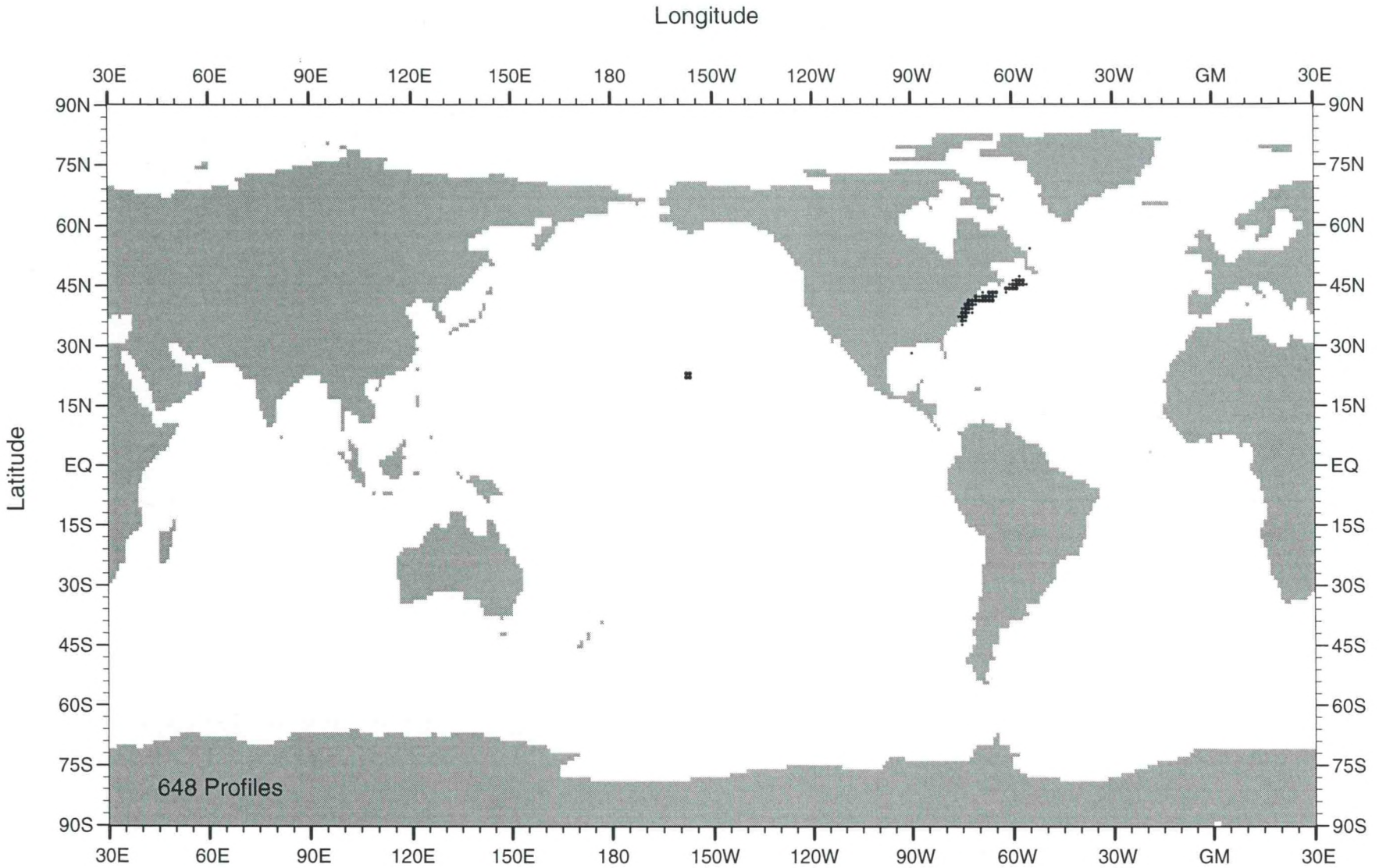

Fig. B113 WOD98 CTD station distribution for January-March for 1995

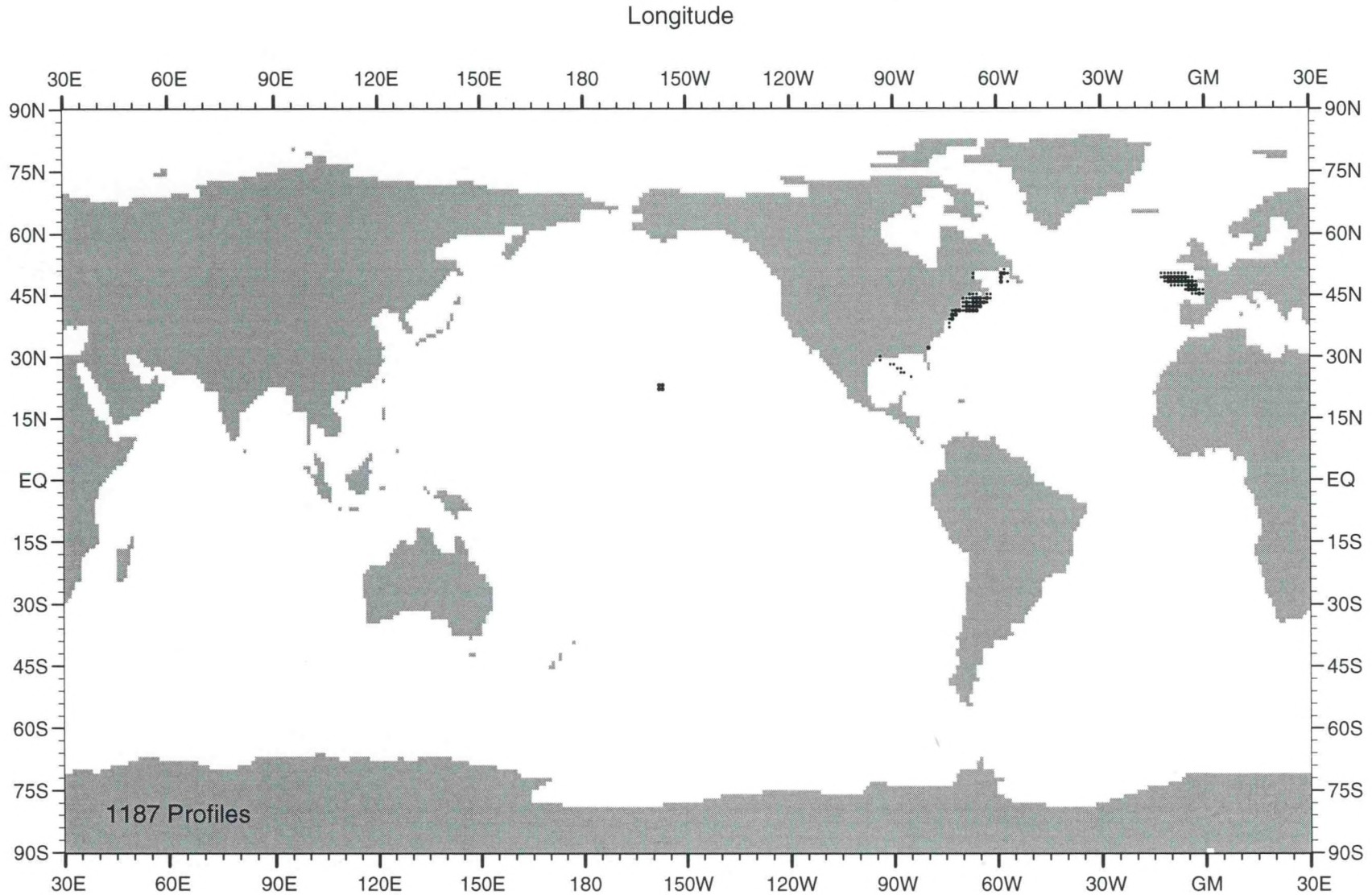

Fig. B114 WOD98 CTD station distribution for April-June for 1995

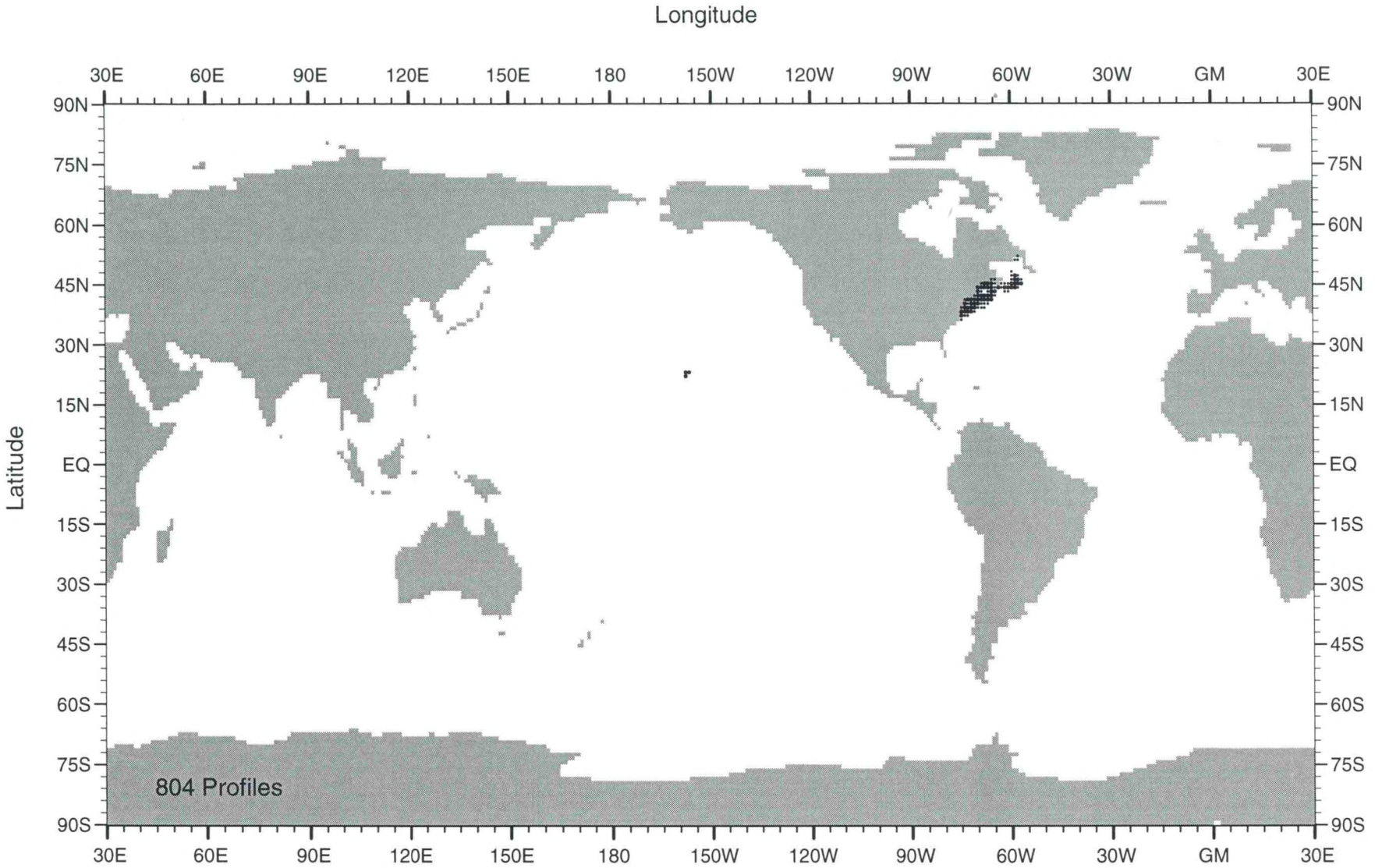

Fig. B115 WOD98 CTD station distribution for July-September for 1995

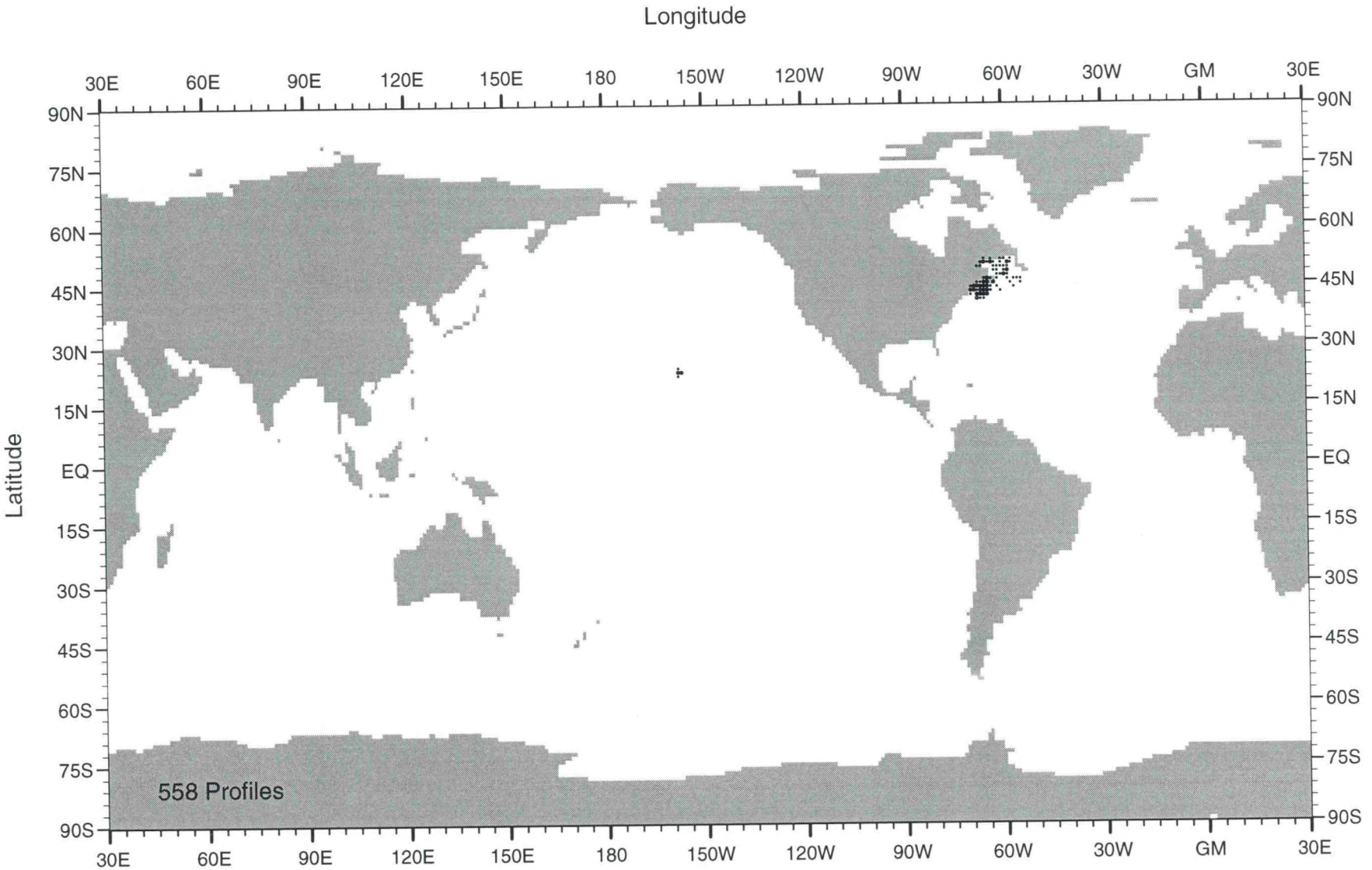

Fig. B116 WOD98 CTD station distribution for October-December for 1995

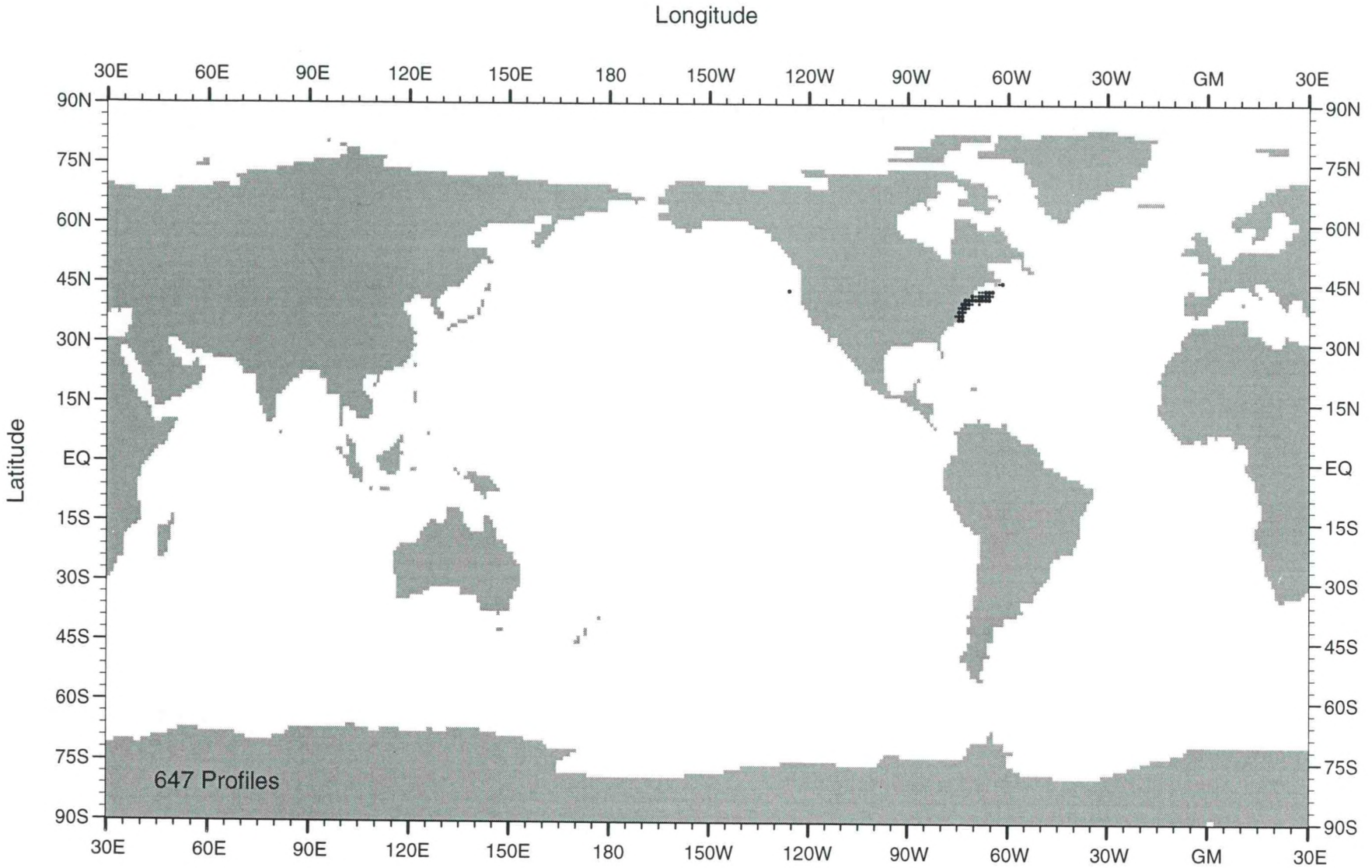

Fig. B117 WOD98 CTD station distribution for January-March for 1996

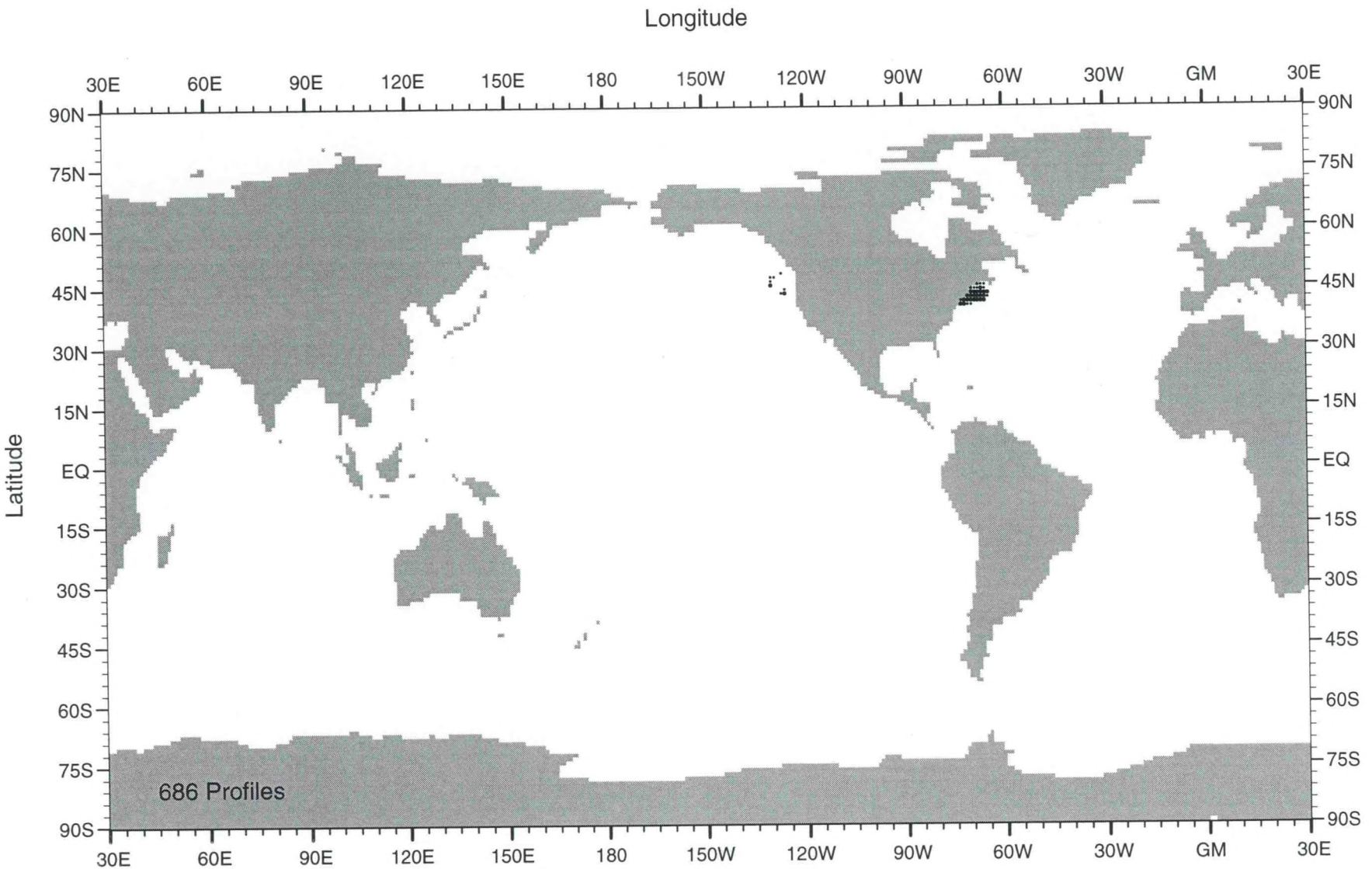

Fig. B118 WOD98 CTD station distribution for April-June for 1996

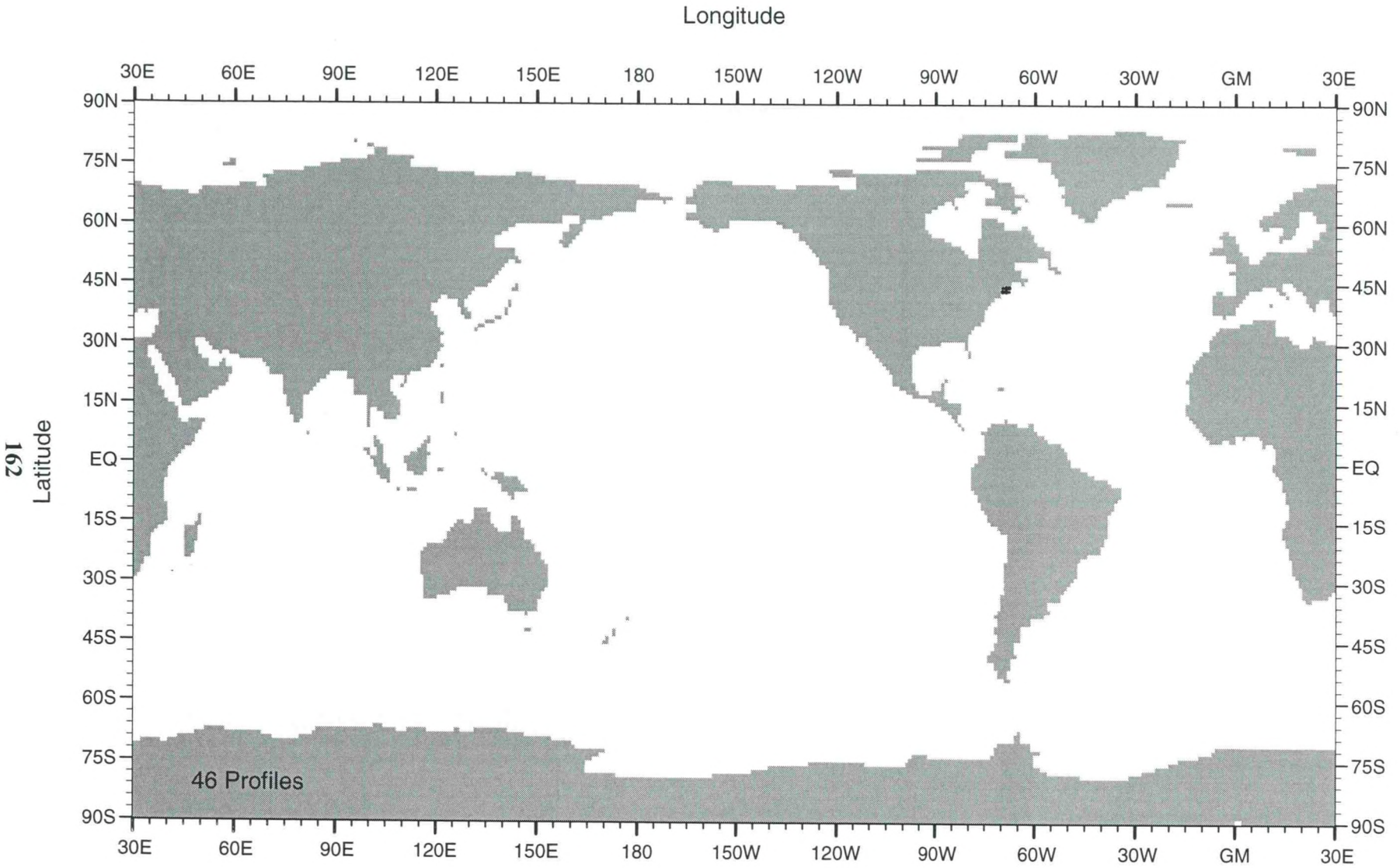

Fig. B119 WOD98 CTD station distribution for July-September for 1996

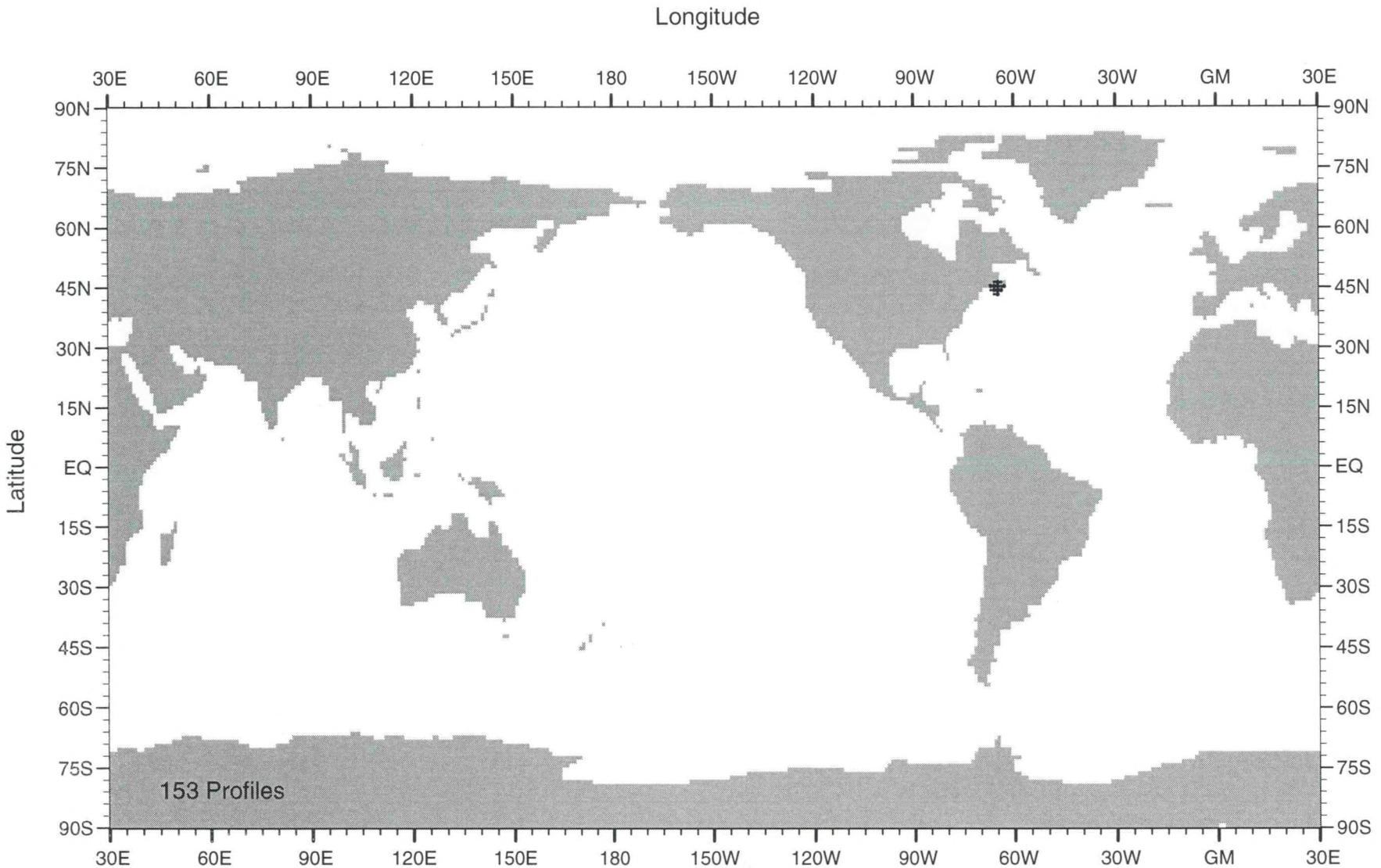

Fig. B120 WOD98 CTD station distribution for October-December for 1996

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