NOAA Atlas NESDIS 53

WORLD OCEAN ATLAS 2001
VOLUME 5: Plankton

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Silver Spring, MD
May 2002

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This publication should be cited as:

O'Brien, Todd D., M.E. Conkright, T.P. Boyer, C. Stephens, John I. Antonov, R.A. Locarnini, H.E. Garcia, 2002: *World Ocean Atlas 2001, Volume 5: Plankton*. S. Levitus, Ed., NOAA Atlas NESDIS 53, U.S. Government Printing Office, Wash., D.C., 89 pp.

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Preface

The oceanographic analyses described by this atlas series expand on earlier works, *e.g.* the *World Ocean Atlas 1998* (WOA98)*, World Ocean Atlas 1994* (WOA94) and *Climatological Atlas of the World Ocean*. Previously published oceanographic objective analyses have proven to be of great utility to the oceanographic, climate research, and operational environmental forecasting communities. Such analyses are used as boundary and/or initial conditions in numerical ocean circulation models and atmosphere-ocean 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, for computation of nutrient fluxes by Ekman transport, and for planning oceanographic expeditions.

We have expanded our earlier analyses to include an all-data annual analysis of chlorophyll, monthly analyses of oxygen, and seasonal and monthly analyses of nutrients. Additional data for these variables have become available and there is a need for such analyses of these data in order to:

1) 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) help verify remotely sensed estimates of chlorophyll (SeaWIFS, ADEOS missions) which requires knowledge of *in situ* variables such as chlorophyll and plankton;

3) provide the most comprehensive set of oceanographic databases and products based on these data to the international research and forecasting communities.

We continue preparing climatological analyses on a one-degree grid. This is because higher resolution analyses are not justified for all the variables we are working with and we wish to produce a set of analyses for which all variables have been analyzed in the same manner. High-resolution analyses as typified by the work of Boyer and Levitus (1997) will be published as separate atlases.

In the acknowledgment section of this publication we have expressed our view that creation of global ocean profile and plankton databases and analyses are only possible through the cooperation of scientists, data managers, and scientific administrators throughout the international scientific 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.

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May 2002

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 on which this atlas is based are in *World Ocean Database 2001* and are distributed on-line and CD-ROM by NODC/WDC. Many data were acquired as a result of the NODC *Oceanographic Data Archaeology and Rescue* (NODAR) project, the IOC/IODE *Global Oceanographic Data Archaeology and Rescue* (GODAR) project, and the IOC/IODE *World Ocean Database* project (WOD). At NODC/WDC, "data archaeology and rescue" projects are supported with funding from the NOAA Environmental Science Data and Information Management (ESDIM) Program and the NOAA Climate and Global Change Program which has included support from NASA and DOE. Support for some of the regional IOC/GODAR meetings was provided by the MAST program of the European Union. The European Community has also provided support for the MEDAR/MEDATLAS project which has resulted in the inclusion of substantial amounts of ocean profile data from the Mediterranean and Black Seas into *World Ocean Database 2001*.

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. Their efforts have made this and similar works possible.

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VOLUME 5: PLANKTON

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ABSTRACT

This atlas contains maps of the distribution of *World Ocean Database 2001* plankton taxonomic groups and biomass on a one-degree grid. Maps for all-data annual and seasonal compositing periods are presented for bacterioplankton, phytoplankton, protist plankton, zooplankton, and plankton biomass. All-data annual maps are also presented for select taxonomic sub-groups within these major categories. Unanalyzed mean fields of annual zooplankton biomass and annual and seasonal calculated zooplankton carbon mass are provided.

1. INTRODUCTION

This atlas is based on all historical plankton biomass and abundance data available from the National Oceanographic Data Center (NODC) and World Data Center (WDC) for Oceanography, Silver Spring, Maryland, plus data gathered as a result of several data management projects including:

a) the Intergovernmental Oceanographic Commission (IOC) *Global Oceanographic Data Archaeology and Rescue* (GODAR) project;

b) the NODC *Oceanographic Data Archaeology and Rescue* (NODAR) project;

c) the IOC *World Ocean Database* project.

Plankton data were first added to the World Ocean Database shortly after the release of *World Ocean Atlas 1994* (WOA94), and first released as part of *World Ocean Database 1998* (WOD98). Since the publication of WOD98, substantial amounts of additional plankton data have become available. However, even with these additional data, we are still hampered in a number of ways by a lack of data. Because of the lack of data, we are forced to examine the annual cycle by compositing all data regardless of the year of observation. In many areas, quality control is made difficult by the limited number of data. Data may exist in an area for only one season, thus precluding any representative annual analysis. In some areas there may be a reasonable spatial distribution of data points on which to base an analysis, but there may be only a few (perhaps only one) data in each one-degree latitude-longitude square. With plankton data, additional issues of the taxonomic coverage (*e.g.,* the quality and quantity of species enumerated) and the sampling methods and biases (*e.g.,* due to sampling depth intervals or net mesh opening) can also make an existing data set not comparable with other data within the same region.

This atlas was modeled after earlier atlases in the World Ocean Atlas series [Levitus and Boyer (1994), Conkright *et al.* (1994), and Conkright *et al.* (1998a,b)], and represents the first efforts at adding a plankton component to these products. This atlas features analysis of mean zooplankton biomass. Adding data to the database is an ongoing process. As more data are added, spatial and temporal coverage will improve, and additional taxonomic groups will be added to the analysis.

2. DATA AND DATA DISTRIBUTION

Data sources and quality control procedures are briefly described below. For further information on the data sources used in *World Ocean Atlas 2001* (WOA01), refer to the *World Ocean Database 2001* (WOD01) series [O'Brien *et al.* (2002)]. General ocean station data quality control procedures, not specific to the plankton data, are also outlined by Conkright *et al.* (2002a).

2.1 Data sources

The historical plankton tows used in this product were obtained from the NODC/WDC archives, and includes all data gathered as a result of the NODAR and GODAR projects. Large amounts of these data were digitized from manuscript and cruise reports, on-site at NODC or through joint efforts with other institutes.

Appendix A shows the geographic distribution of historical bacterioplankton observations. Appendix B shows the geographic distribution of historical phytoplankton observations. Appendix C shows the geographic distribution of historical protist plankton observations. Appendix D shows the geographic distribution of historical zooplankton observations. Appendix E shows the geographic distribution of historical plankton biomass observations. Before each distribution figure, a table summarizes the major taxonomic members of that group.

In all data distribution maps that appear in the appendices, a small dot indicates a one-degree square containing one to four tows and a large dot indicates a square containing five or more tows.

2.2 Data quality control

Quality control of the data is a major task, the difficulty of which is directly related to lack of data (in some areas) upon which to base statistical checks. Consequently certain empirical criteria were applied, and as part of the last processing step, subjective judgment was used. Individual data, and in some cases entire profiles or cruises, have been flagged because these data produced features that were judged to be non-representative or in error (*e.g.,* due to equipment malfunction, sampling bias, or a significant population bloom). As part of our work, we have made available World Ocean Database 2001 (WOD01) which contain all of the plankton data with various quality control flags applied. Our knowledge of the variability of the world ocean now includes a greater appreciation and understanding of the ubiquity of eddies, rings, and patchiness in some parts of the world ocean as well as seasonal and diurnal variability. Therefore, we have simply flagged data, not eliminated them. Thus, individual investigators can make their own decision regarding the representativeness or correctness of the data.

2.2a Duplicate tow elimination

Duplicate data are typically only a minor problem for plankton data. However, some duplication may happen when data are received directly from a project, and also from a regional data center. Sometimes this results in similar data with slightly different time and/or position and/or data values, and hence are not easily identified as duplicate stations. Therefore, our databases were checked for the presence of exact and "near" exact replicates using eight different criteria. The first checks involve identifying stations with exact position/date/time and data values; the next checks involve offsets in position/date/time. Tows identified as duplicates in the checks with a large offset were individually verified to ensure they were indeed duplicate profiles. When a duplicate is found, the duplicating tow is removed from the database.

2.2b Range checks

Broad, taxonomic group-based value range checks were used to flag extremely large or small values within the database. At this time, only a single range (for the entire world ocean) was used, for the major taxonomic groups (Table 1). Future work will divide the ranges into smaller taxonomic sub-groups, and individual oceanographic basins, allowing for tighter automated range checks.

Table 1. WOD01 Broad Taxonomic Group-based Value Range Checks

Group	*Min*	*Max*	*Units*
Bacteria	0.001	5,000	#/ul
Phytoplankton	0.001	50,000	#/ml
Zooplankton	0.001	200,000	#/m^3
Total Displacement Volume	0.005	10.	ml/m^3
Total Settled Volume	0.025	50.	ml/m^3
Total Wet Mass	0.5	10,000	mg/m^3
Total Dry Mass	0.01	500	mg/m^3
Total Ash-free Dry Mass	0.01	100	mg/m^3

2.2c Statistical checks

Statistical checks were used only to highlight suspect values, and were not used to automatically flag any of these values. Observations greater than five standard deviations from the mean were investigated on a case-by-case basis. While natural variability may account for some of these, others were due to sampling gear biases (*e.g.,* a very low diatom count due to a few diatoms being caught in a larger mesh zooplankton tow).

2.2d Subjective flagging of data

The data were averaged by one-degree squares and graphically displayed for visual analysis. Sometimes the one-degree means contained suspicious data contributing to unrealistic distributions, yielding intense bull's-eyes or gradients. Examination of these features indicated that some of them were due to particular oceanographic cruises. In such cases, data from an entire cruise were eliminated from further use by setting a flag on each tow from the cruise. In other cases, individual tows or measurements were found to cause these features. These instances were then flagged and eliminated from the analysis.

2.2e Representativeness of the data

Another quality control issue is data representativeness. The general paucity of data forces the compositing of all historical data to produce "climatological" fields. In a given one-degree square, there may be data from a month or season of one particular year, while in the same or a nearby square there may be data from an entirely different year. If there is large interannual or seasonal variability in a region where scattered sampling in time has occurred, then one can expect the analysis to reflect this. Because the observations are scattered randomly with respect to time, except for a few limited areas, the results cannot, in a strict sense, be considered a true long-term climatological average.

To clarify discussions on the amount of available data, quality control techniques, and the representativeness of the data, the reader should examine in detail the maps showing the distribution of data (Appendices A, B, C, D, E) and the *World Ocean Database 2001* atlas series which shows the distribution of oceanographic stations/profiles as a function of year and instrument type [Conkright *et al.* (2002b), O'Brien *et al.* (2002)],. These maps are provided to give the reader a quick, simple way of examining the historical data distributions.

3. DATA PROCESSING AND PROCEDURES

This atlas features preliminary analysis of total zooplankton biomass. The dominant types of zooplankton biomass estimates available as part of the WOD01 are “total displacement volume” and “total wet mass”, with lesser amounts of “total settled volume”, “total dry mass” and “total ash-free dry weight” (Appendix E).

For the purposes of creating zooplankton biomass fields for the atlas, the objective was to provide as much spatial coverage as possible while remaining within reasonable parameters for net mesh size and sampling depth interval. The raw data are available within the WOD01 product (online, CD-ROMs) for investigators which wish to define different criteria for their specific needs.

3.1 Choice of spatial grid

A one-degree latitude-longitude spatial grid was selected for these data to put them on a uniform grid with that of the other variables of the WOA98 and WOA01 atlases.

3.2 Choice of Depth Interval

Figure 1 summarizes the depth coverage of all biomass tows in WOD01. The dominant biomass sampling interval, 0 - 200 meters, was selected for the biomass analysis. For single nets, depths of up to 250 meters were allowed to maximize map coverage**.** For multiple net tows, with multiple depth intervals (*e.g., 0-100, 100-200, 200-500, 500-1000)*, the sum of the values only from those nets falling inside of this interval was used to create a new single depth interval (*e.g., 0-100 + 100-200 = “0-200"*).

3.3 Choice of Mesh Size

Figure 2 shows the distribution of sampling mesh sizes deployed in the WOD01 biomass data. Four groupings of mesh sizes are present, 50-275 μm, 300-

400 μm, 450-600 μm, and >800 μm. The distributions of plankton tows using these mesh sizes are plotted in Figures 3-6.

The full range mesh sizes used for this analysis was 150 μm to 500 μm, but dominated heavily by the 300-400 μm mesh size. Supplemental data from 168-200 μm mesh range were used to add coverage to data sparse regions (*e.g.,* the Arctic and Antarctic). Also included was the 505 μm mesh data of the CalCOFI project.

3.4 Calculation of mean biomass

For each 1-degree latitude-longitude grid, the annual mean biomass value was calculated using all unflagged biomass data which satisfied the target depth and mesh intervals. These calculations were performed for each of the major types of biomass (Appendix F).

3.5 Conversion and calculation of mean zooplankton carbon mass

To further improve the spatial and temporal coverage of the WOA01 zooplankton biomass, the five types of plankton biomass were converted to a common biomass type, zooplankton carbon mass (mg-C/m^3), using the conversion factors provided by the ICES Committee on Terms and Equivalents [Cushing *et al.* (1958), Table 2].

Table 2: Conversion of zooplankton biomass to zooplankton carbon mass

Original Biomass Measure	Conversion Factor
Displacement Volume (ml) to Carbon mass (mg-C) [1]	* 96
Wet Mass (mg) to Carbon mass (mg-C) [1]	* 0.12
Dry Mass (mg) to Carbon mass (mg-C) [1]	* 0.60
Settled Volume (ml) to Wet Mass (mg) [1] then to Carbon mass (mg-C) [1]	* 195 * 0.12

[1] per Cushing *et al.* (1958)

Each of the biomass types were converted to carbon mass using the appropriate conversion factor in Table 2. Annual mean calculated zooplankton carbon mass was calculated using all unflagged zooplankton carbon mass values (which satisfied the depth and mesh interval targets). Seasonal mean carbon mass was calculated by using only those biomass data within the specified season. The WOA98 and WOA01 seasons are based on the Northern Hemisphere and defined as follows: Winter = January-March, Spring = April-June, Summer = July-September, and Fall = October-December.

4. RESULTS

4.1 Explanation of figures

The figures in this atlas are available in both a paper (black-and-white) and electronic (color) form. Unlike other atlases of the WOA01 series, the zooplankton biomass data were too sparse to contour. Instead, this atlas utilizes a six-value-category plot in which the size of a graphical circle represents the value range of the biomass at each one-degree grid location. [The online digital (color) atlas uses a 10-value-category plot in which the color of a graphical dot represents the value range.]

4.2 Contents of the World Ocean Atlas 2001 CD-ROM

This atlas presents zooplankton biomass data for the 0-200 meter depth interval. Associated with this atlas is a CD-ROM containing digital fields of zooplankton biomass (the five biomass types (Appendix F) and the calculated zooplankton carbon mass (Appendix G)). Also available is a DVD-ROM with color figures illustrating these data for the world, Pacific, Atlantic and Indian basins. The following is a list of digital fields for the world ocean:

(a) fields containing the number of biomass observations by one-degree squares;

(b) one-degree fields of unanalyzed annual mean zooplankton biomass (all types);

(c) one-degree fields of unanalyzed seasonal mean zooplankton biomass (carbon mass only).

The *World Ocean Atlas 2001* data are available online in addition to the CDROM and/or DVD-ROM format.

5. SUMMARY

In the preceding sections we have described the results of a project to combine historical zooplankton biomass data archived at NODC/WDC, including substantial amounts of data gathered as a result of the NODC and IOC data archaeology and rescue projects. We desire to build a set of climatological analyses that are identical for all variables including relatively data sparse variables such as nutrients and plankton. This provides investigators with a consistent set of analyses to work with.

We have attempted to create unanalyzed mean fields and data sets that can be used as a "black box." We emphasize that some quality control procedures used are subjective. For those users who wish to make their own choices, all the data used in our analyses are available both at standard depth levels as well as observed depth levels (*World Ocean Database 2001* CD-ROM set - Conkright *et al.*, 2002a). The results presented in this atlas show some features that are suspect and may be due to nonrepresentative or incorrect data that were not flagged by the quality control techniques used. Although we have attempted to eliminate as many of these features as possible by flagging the data which generate these features some obviously remain. Some may eventually turn out not to be artifacts but rather to represent real features, not yet capable of being described in a meaningful way due to lack of data.

6. FUTURE WORK

Our analyses will be updated when justified by additional observations. As more data are received and/or digitized at NODC/WDC, we will expand the spatial and temporal coverage of the zooplankton biomass means, ideally tightening the range of mesh sizes, improving coverage for the five biomass types, and improving the conversion equations for calculated zooplankton carbon mass. Table 3 summarizes the WOD01 content by major taxonomic groups. Future work will also include similar analysis of zooplankton and phytoplankton abundance (counts) for some of the major taxa (*e.g.,* copepods, chaetognaths, diatoms, dinoflagellates).

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TABLES and FIGURES

TABLE 3. WOD01 Plankton Content		Total Stations	*Winter (Jan.-Mar.)*	*Spring (Apr.-Jun.)*	*Summer (Jul.-Sep.)*	*Fall (Oct.-Dec.)*	Figure
BACTERIOPLANKTON:							
1000000	ALL BACTERIA SUB-GROUPS	**2,012**	***394***	***392***	***663***	***563***	**A1**
1010000	CYANOBACTERIA	**1,000**	*191*	*153*	*406*	*250*	A2
PHYTOPLANKTON:							
2000000	ALL PHYTOPLANKTON SUB-GROUPS	**24,989**	***5,038***	***7,377***	***8,286***	***4,288***	**B1**
2010000	DIATOMS	**20,363**	*4,272*	*6,067*	*6,573*	*3,451*	B2
2020000	DINOFLAGELLATES	**13,937**	*1,903*	*4,613*	*5,360*	*2,061*	B3
2030000	CHROMOPHYTES	**4,650**	*526*	*1,326*	*1,877*	*921*	-
2040000	CHLOROPHYTES	**1,381**	*202*	*598*	*463*	*118*	-
2050000	COCCOLITHOPHORES	**3,623**	*822*	*1,181*	*1,056*	*564*	B4
PROTIST PLANKTON:							
3000000	ALL PROTIST PLANKTON SUB-GROUPS	**12,871**	***2,385***	***3,416***	***4,319***	***2,751***	**C1**
3010000	MASTIGOPHORA	**290**	*29*	*117*	*135*	*9*	-
3020000	AMEBAS	**42**	*1*	*5*	*32*	*4*	-
3030000	FORAMINIFERA	**4,194**	*858*	*1,046*	*1,360*	*930*	C2
3040000	HELIOZOANS	**80**	*3*	*3*	*45*	*29*	-
3050000	RADIOLARIANS	**3,804**	*765*	*803*	*1,347*	*889*	C3
3060000	CILIOPHORA	**3,799**	*450*	*1,124*	*1,505*	*720*	C4
ZOOPLANKTON:							
4000000	ALL ZOOPLANKTON SUB-GROUPS	**41,178**	***9,321***	***12,102***	***11,206***	***8,549***	**D1**
4020000	PORIFERA	**1,944**	*486*	*503*	*538*	*417*	-
4030000	CNIDARIA	**14,521**	*3,119*	*4,039*	*4,239*	*3,124*	D2
4040000	CTENOPHORA	**3,672**	*897*	*950*	*1,082*	*743*	D3
4060000	PLATYHELMINTHES	**2,037**	*508*	*541*	*557*	*431*	-
4070000	NERMERTEA	**2,330**	*634*	*609*	*636*	*451*	-
4100000	ROTIFERA	**2,131**	*486*	*511*	*681*	*453*	-
4150000	NEMATODA	**2,042**	*520*	*539*	*548*	*435*	-
4170000	BRYOZOA (ECTOPROCTA)	**3,105**	*794*	*817*	*925*	*569*	-
4180000	PHORONIDA	**2,198**	*605*	*607*	*562*	*424*	-
4190000	BRACHIOPODA	**2,005**	*510*	*537*	*529*	*429*	-

TABLE 3. *(continued)*		Total Stations	*Winter (Jan.-Mar.)*	*Spring (Apr.-Jun.)*	*Summer (Jul.-Sep.)*	*Fall (Oct.-Dec.)*	Figure
4200000	MOLLUSCA	**15,281**	*3,418*	*3,845*	*4,629*	*3,389*	-
4202500	Gastropods	**12,834**	*2,939*	*3,366*	*3,777*	*2,752*	D4
4205000	Bilvalves	**2,307**	*412*	*526*	*1,002*	*367*	-
4207500	Cephalopods	**4,007**	*1,146*	*883*	*1,280*	*698*	D5
4220000	SIPUNCULA	**2,078**	*524*	*525*	*578*	*451*	-
4240000	ANNELIDA	**12,029**	*2,564*	*3,333*	*3,404*	*2,728*	-
4245000	Polychaetes	**10,264**	*2,306*	*2,849*	*2,871*	*2,238*	D6
4270000	ARTHROPODS (*excluding Crustaceans*)	**2,431**	*707*	*611*	*665*	*448*	-
4280000	CRUSTACEANS	**35,713**	*7,806*	*11,062*	*9,443*	*7,402*	-
4281000	Ostracods	**8,820**	*2,445*	*2,011*	*2,152*	*2,212*	D7
4282000	Copepods	**31,961**	*7,319*	*9,145*	*8,537*	*6,960*	D8
4283000	Cirripedia (barnacles)	**6,920**	*1,335*	*2,359*	*2,196*	*1,030*	-
4284000	Mysidacea	**4,353**	*1,111*	*1,166*	*1,150*	*926*	D9
4286000	Isopods	**3,868**	*1,174*	*913*	*881*	*900*	-
4287000	Amphipods	**14,900**	*3,369*	*4,089*	*3,922*	*3,520*	D10
4288000	Euphausiacea	**16,522**	*3,456*	*5,246*	*4,307*	*3,513*	D11
4289000	Decapoda	**14,343**	*2,363*	*5,513*	*4,225*	*2,242*	D12
4300000	ECHINODERMATA	**5,665**	*1,021*	*1,609*	*2,127*	*908*	-
4310000	CHAETOGNATHA	**23,740**	*5,508*	*6,333*	*6,549*	*5,350*	D13
4320000	HEMICHORDATA	**2,003**	*521*	*519*	*544*	*419*	-
4330000	TUNICATES	**17,629**	*3,756*	*4,993*	*5,089*	*3,791*	D14
5000000	LARVAL FISH	**49,468**	***13,698***	***16,045***	***11,530***	***8,195***	D15
PLANKTION BIOMASS							
-200	ALL BIOMASS TYPES	**98,612**	***24,032***	***28,623***	***27,162***	***18,795***	**E1**
-201	Total Displacement Volume	**62,466**	*17,506*	*18,700*	*14,641*	*11,619*	*F1*
-202	Total Settled Volume	**7,953**	*1,422*	*1,786*	*2,828*	*1,917*	*F2*
-203	Total Wet Mass	**28,944**	*5,105*	*8,430*	*9,972*	*5,437*	*F3*
-204	Total Dry Mass	**928**	*134*	*297*	*378*	*119*	*F4*
-205	Total Ash-free Dry Mass	**260**	-	-	-	*260*	*F5*
Values in the first column indicate the WOD01 Biological Grouping Code (BGC) for the taxonomic group described in the second column.							

Figure 1. Frequency of Coverage for WOD01 Biomass Sampling Depth Intervals.

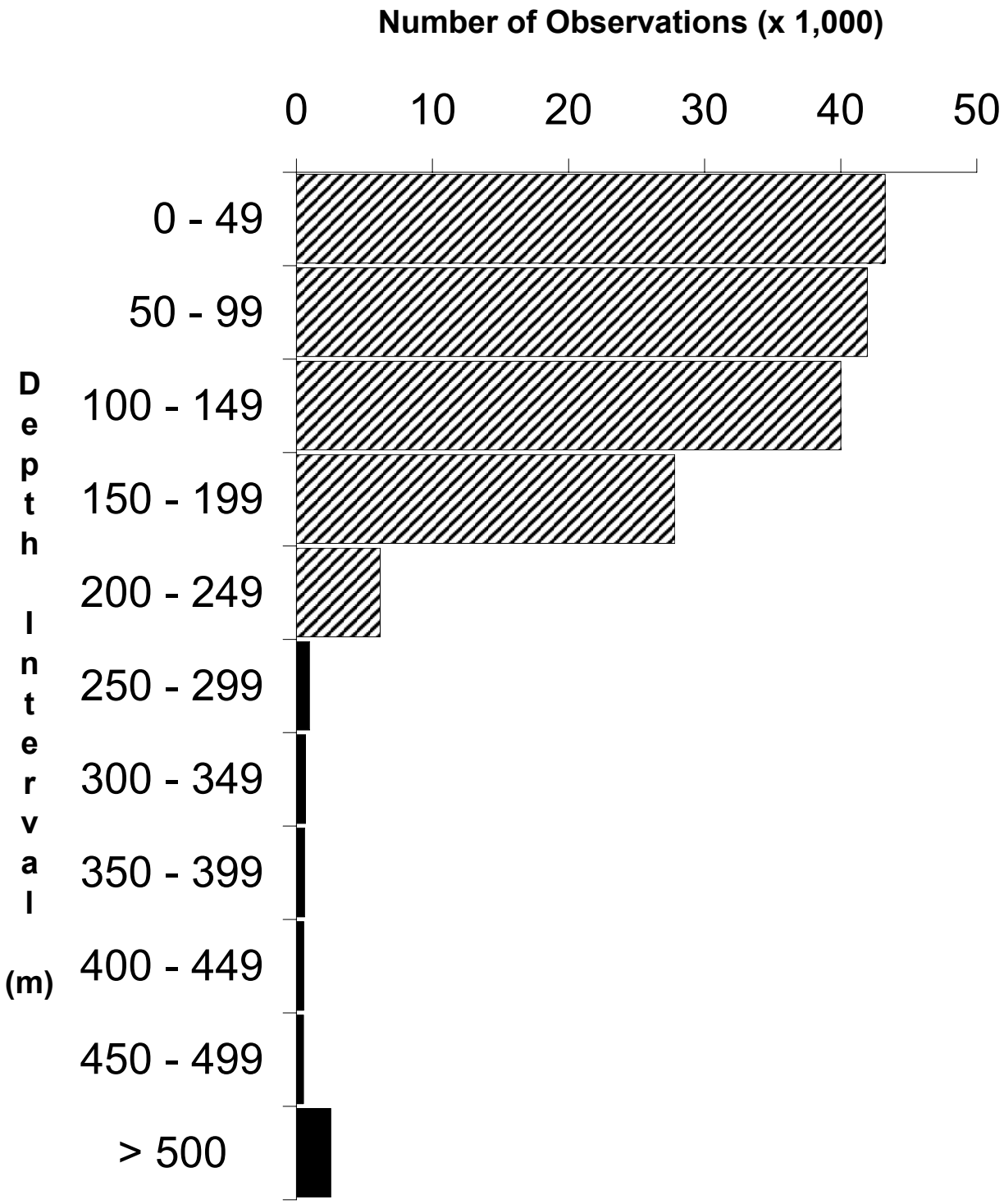
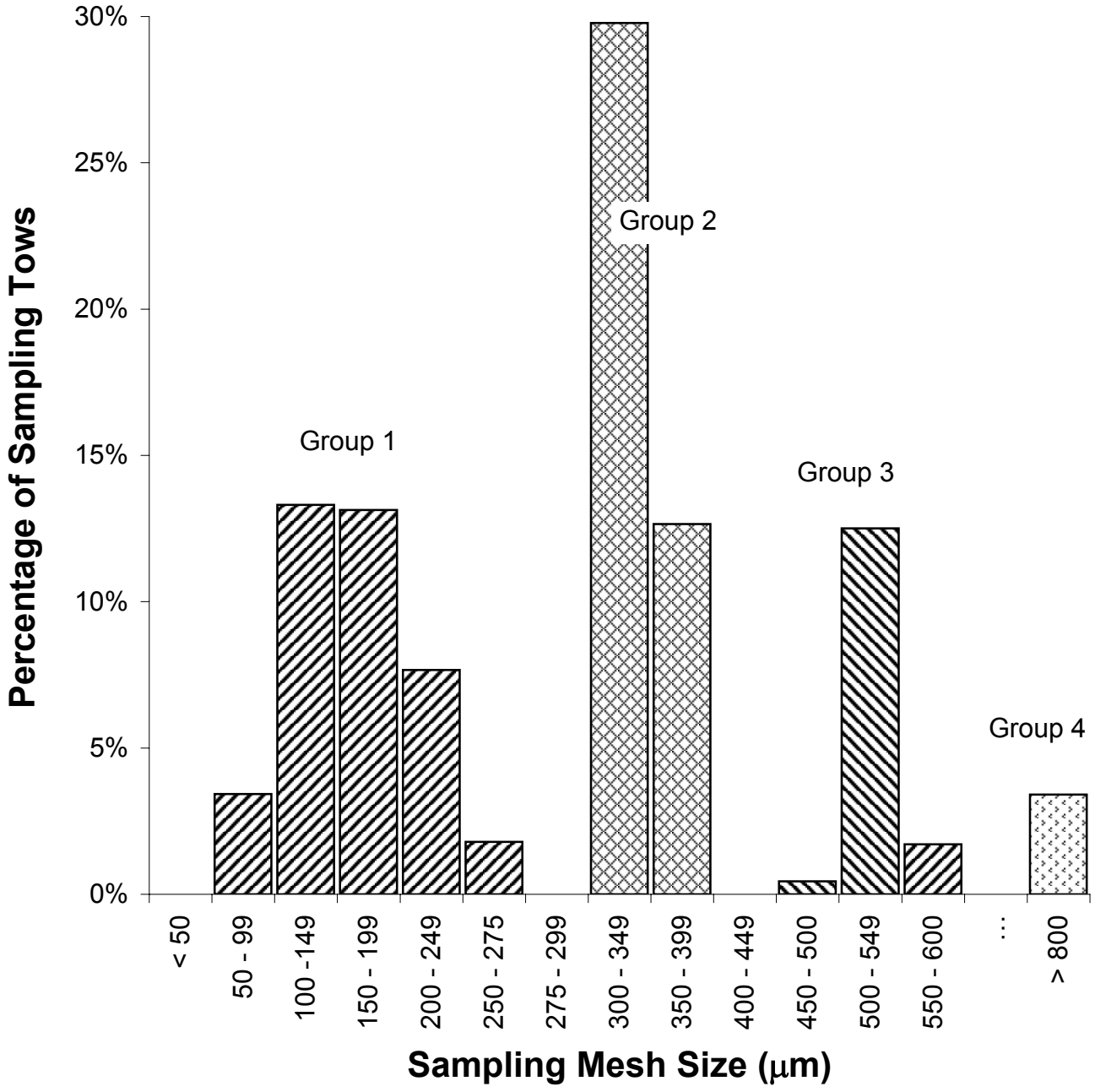


Figure 2. Frequency of WOD01 Biomass Sampling Mesh Size



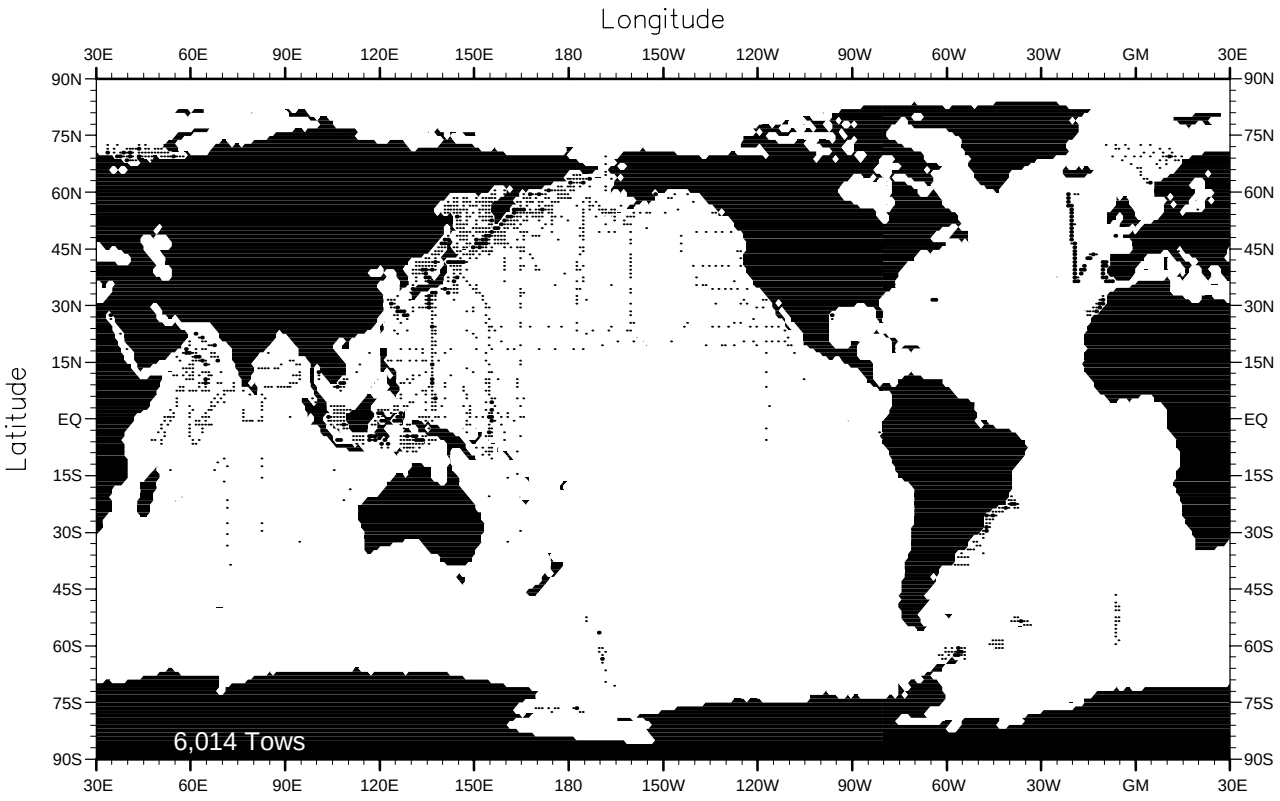


Fig. 3. Distribution of all biomass tows using mesh sizes 50 - 275 µm.

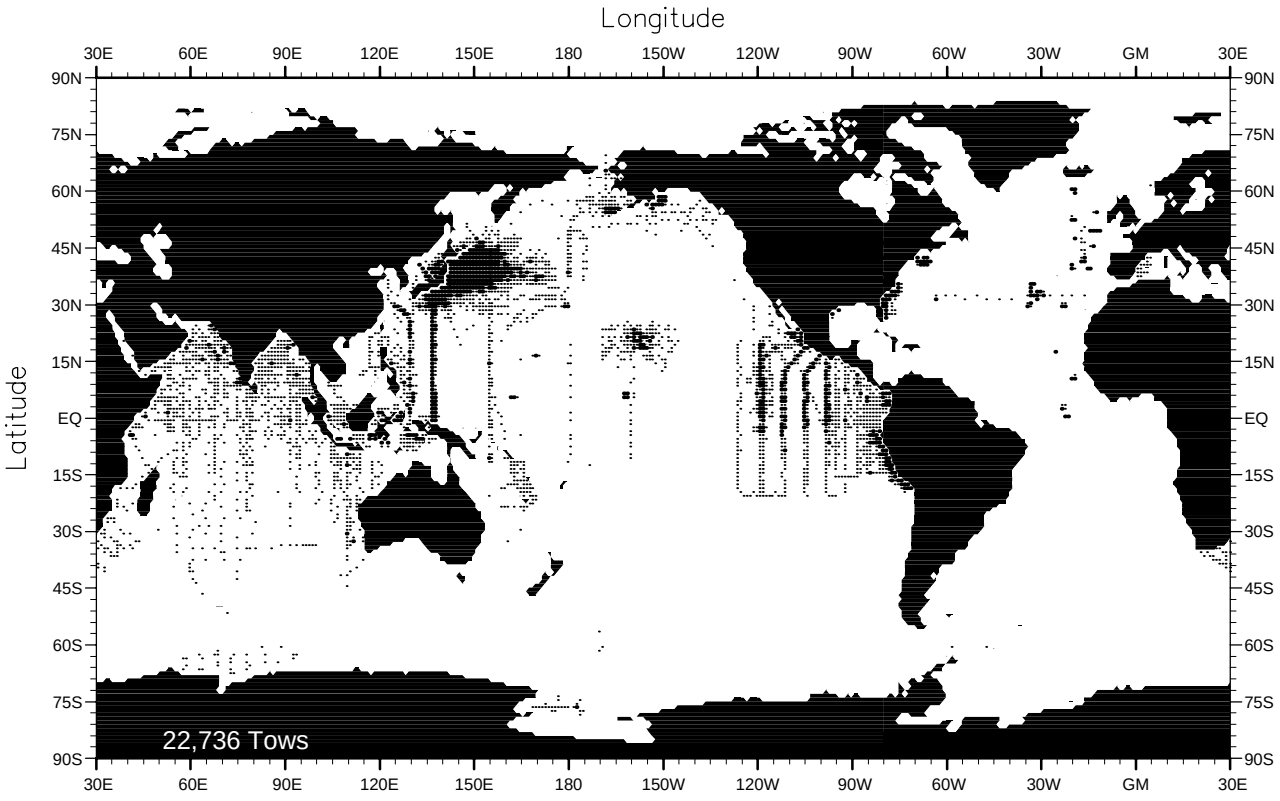


Fig. 4. Distribution of all biomass tows using mesh sizes 300 - 400 µm.

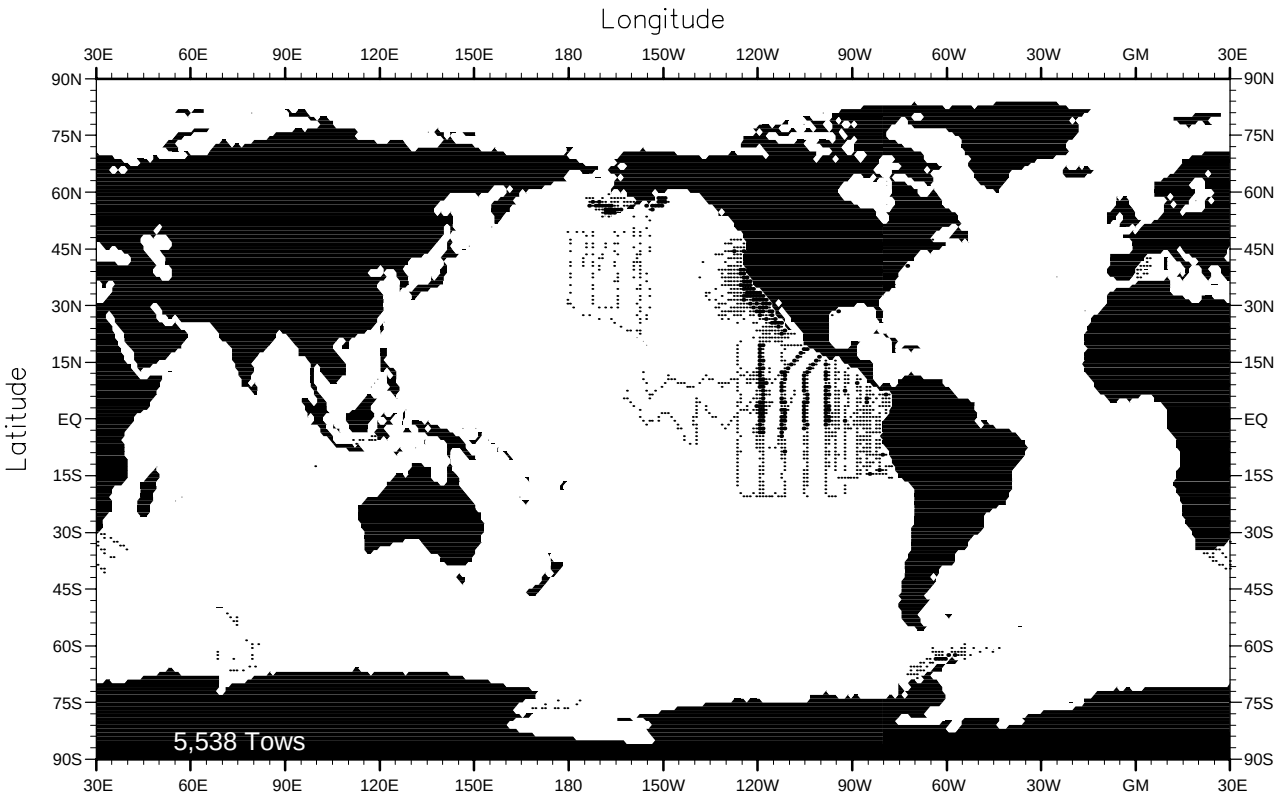


Fig. 5. Distribution of all biomass tows using mesh sizes 450 - 600 µm.

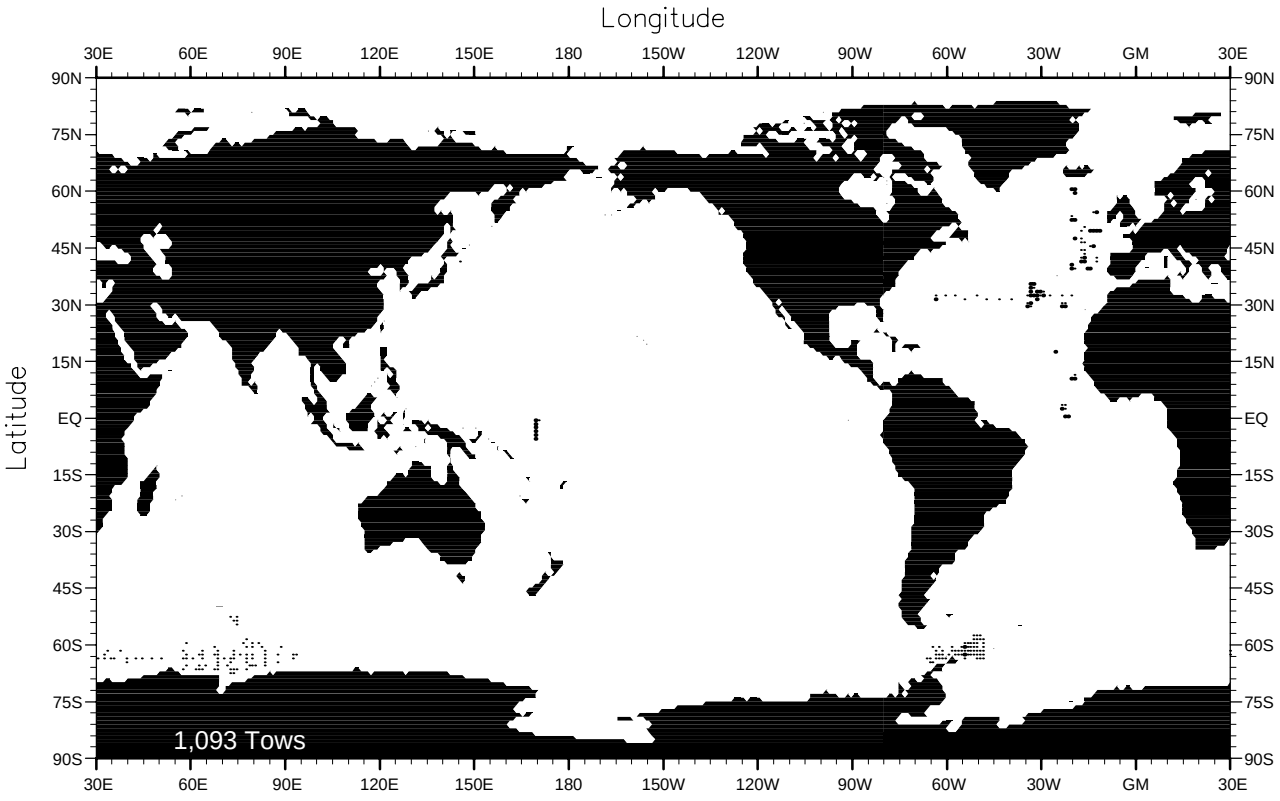


Fig. 6. Distribution of all biomass tows using mesh sizes > 800 µm.

APPENDICES A - E

In each data distribution figure of Appendices A - E, a small dot indicates a one-degree latitude-longitude square containing data from 1 - 4 plankton tows, and a large dot indicates a one-degree latitude-longitude square containing five or more plankton tows.

Table A1: Taxonomic composition of all Bacterioplankton

Number of Tows: **2,012**
Number of Observations: 25,776
Number of Taxonomic Descriptions: **26**

Top 30 Taxonomic Descriptions

Rank	#_OBS	ITIS-TSN	DESCRIPTION
1	14,162	202420	*Monera* ("bacteria")
2	5,018	773	*Synechococcus*
3	3,688	610076	*Prochlorococcus*
4	2,358	601	*Cyanophycota*
5	202	938	*Oscillatoria thiebautii*
6	170	917	*Oscillatoria*
7	119	934	*Oscillatoria erythraea*
8	10	1247	*Calothrix crustacea*
9	10	942	*Oscillatoria contorta*
10	7	862	*Oscillatoriaceae*
11	6	678	*Coccochloris*
12	6	613	*Anacystis montana*
13	5	1192	*Aphanizomenon flosaquae*
14	2	1034	*Schizothrix calcicola*
15	2	607	*Agmenellum thermale*
16	1	1146	*Nostoc*
17	1	1100	*Anabaena*
18	1	1055	*Spirulina subsalsa*
19	1	747	*Microcystis*
20	1	727	*Merismopedia*
21	1	620	*Anacystis incerta*
22	1	-7026	*Moraxella*
23	1	410	*Chromobacterium*
24	1	222	*Alcaligenes*
25	1	174	*Flavobacterium*
26	1	74	*Pseudomonas*

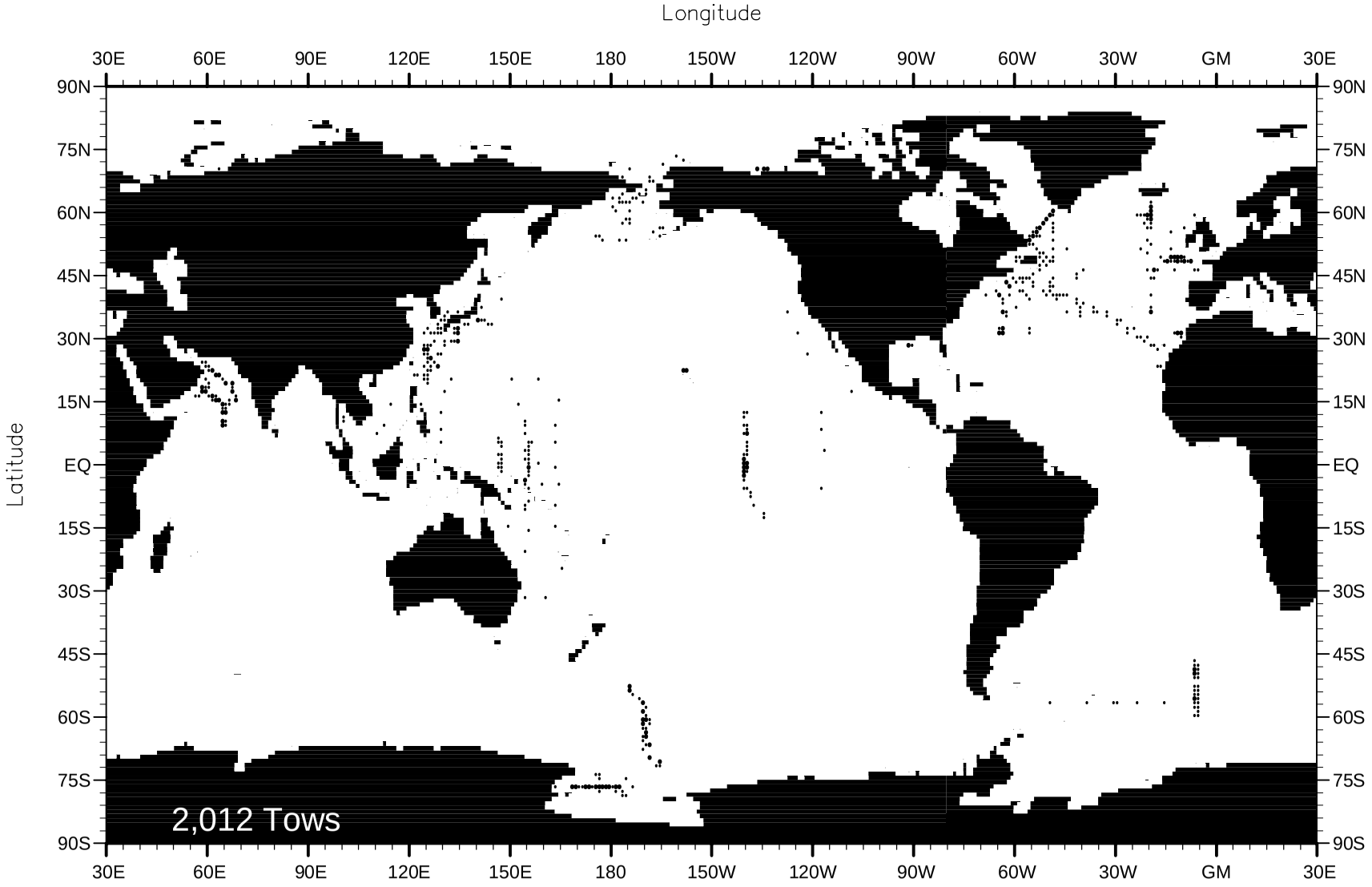


Fig. A1. Annual distribution of all bacterioplankton observations.

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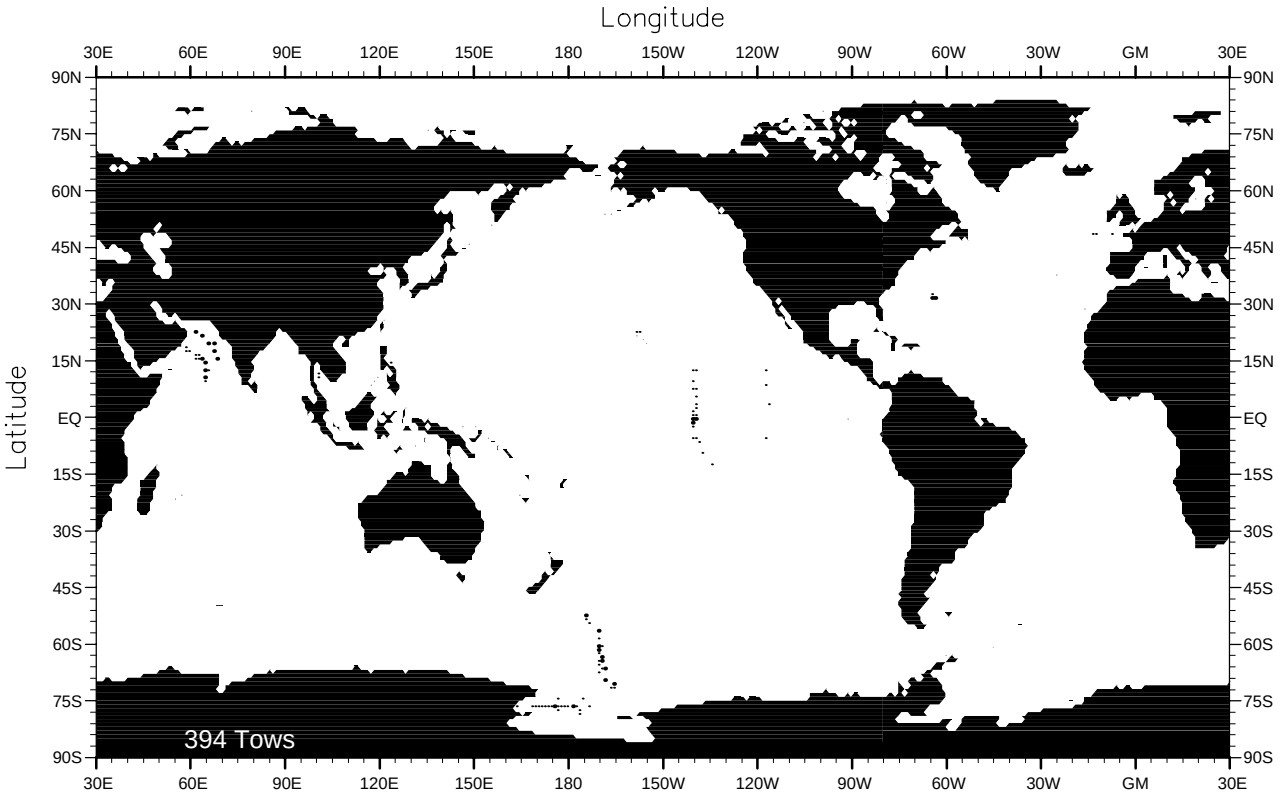

Fig. A1.1 Winter (Jan.-Mar.) distribution of all bacterioplankton observations.

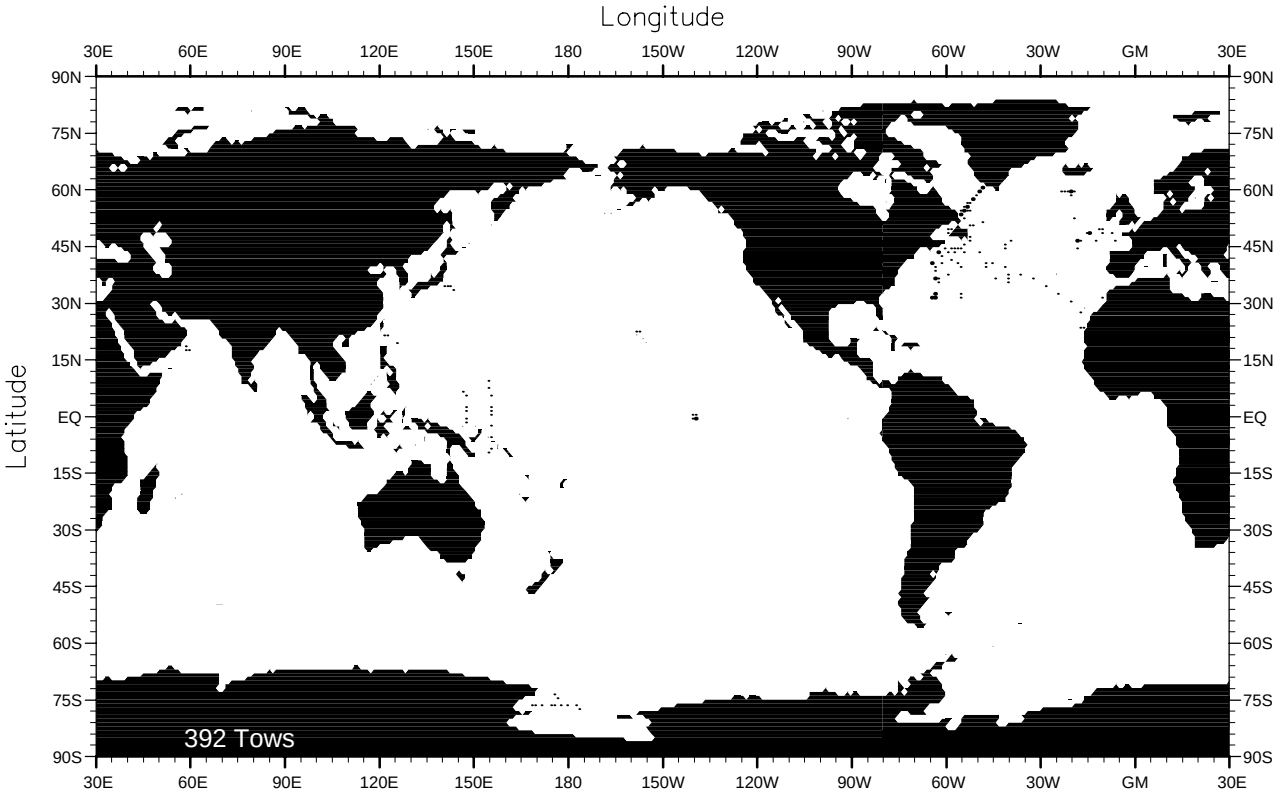

Fig. A1.2 Spring (Apr.-Jun.) distribution of all bacterioplankton observations.

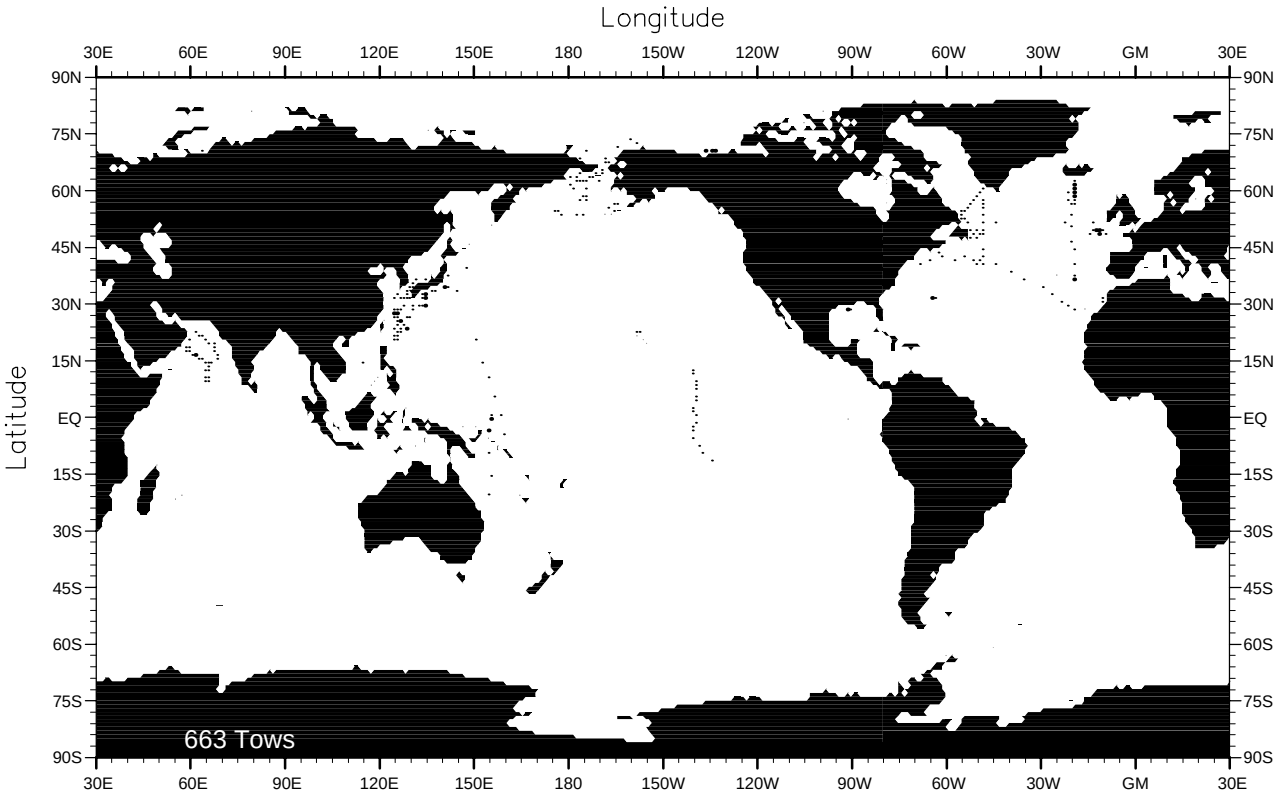

Fig. A1.3 Summer (Jul.-Sep.) distribution of all bacterioplankton observations.

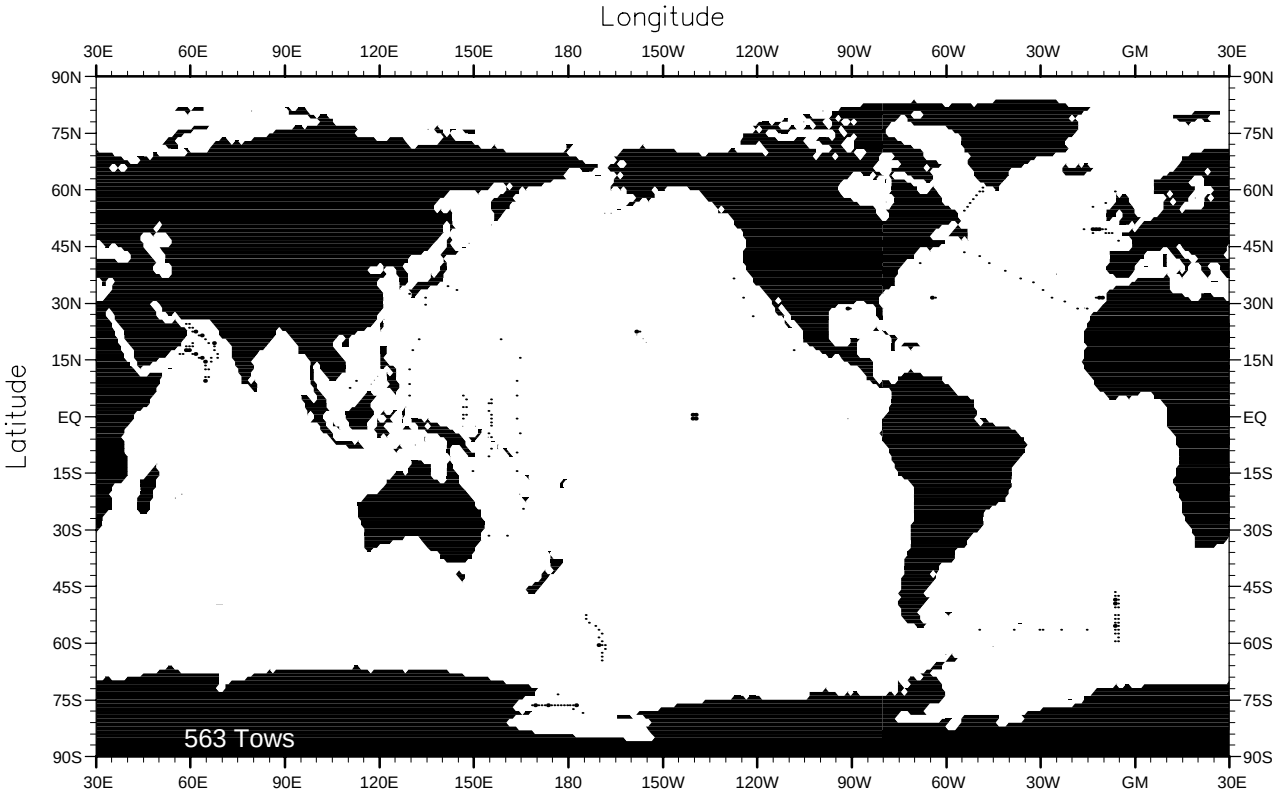

Fig. A1.4 Fall (Oct.-Dec.) distribution of all bacterioplankton observations.

Table A2: Taxonomic composition of all Cyanobacteria

Number of Tows: **1,000**
Number of Observations: 11,609
Number of Taxonomic Descriptions: **22**

Top 30 Taxonomic Descriptions

Rank	#_OBS	ITIS-TSN	DESCRIPTION
1	5,018	773	*Synechococcus*
2	3,688	610076	*Prochlorococcus*
3	2,358	601	*Cyanophycota ("cyanobacteria")*
4	202	938	*Oscillatoria thiebautii*
5	170	917	*Oscillatoria*
6	119	934	*Oscillatoria erythraea*
7	10	1247	*Calothrix crustacea*
8	10	942	*Oscillatoria contorta*
9	7	862	*Oscillatoriaceae*
11	6	678	*Coccochloris*
12	6	613	*Anacystis montana*
13	5	1192	*Aphanizomenon flosaquae*
14	2	1034	*Schizothrix calcicola*
15	2	607	*Agmenellum thermale*
17	1	1146	*Nostoc*
18	1	1100	*Anabaena*
19	1	1055	*Spirulina subsalsa*
20	1	747	*Microcystis*
21	1	727	*Merismopedia*
22	1	620	*Anacystis incerta*

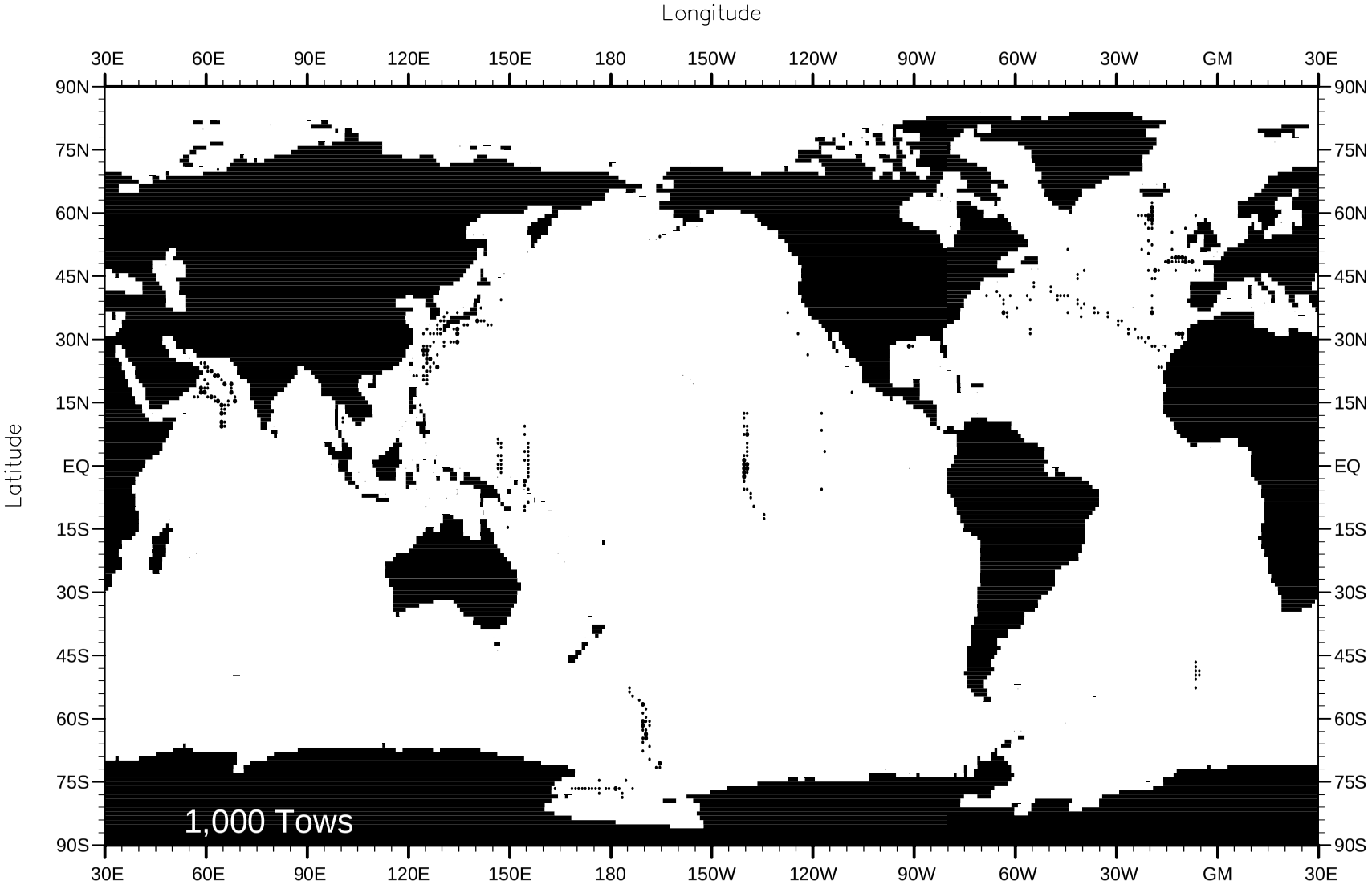

Fig. A2. Annual distribution of all cyanobacteria observations.

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Table B1: Taxonomic composition of all Phytoplankton

Number of Tows: **24,989**
Number of Observations: 415,235
Number of Taxonomic Descriptions: **1,650**

Top 30 Taxonomic Descriptions

Rank	#_OBS	ITIS-TSN	DESCRIPTION
1	11,086	2758	*Chaetoceros*
2	8,976	2402	*Skeletonema costatum*
3	7,893	2484	*Thalassiosira*
4	7,748	3139	*Thalassionema nitzschioides*
5	5,463	5070	*Nitzschia*
6	5,348	2546	*Coscinodiscus*
7	5,272	10400	*Ceratium fusus*
8	5,209	2930	*Pennales*
9	5,182	5093	*Nitzschia seriata*
10	5,176	2395	*Leptocylindrus danicus*
11	5,170	-5001	*“Nanoplankton (2.0 - 20. um)”*
12	4,981	2286	*Bacillariophyceae*
13	4,560	5080	*Nitzschia longissima*
14	4,463	5077	*Nitzschia delicatissima*
15	4,452	2903	*Rhizosolenia stolterfothii*
16	4,426	9874	*Dinophyceae*
17	4,396	2791	*Chaetoceros decipiens*
18	4,365	2881	*Rhizosolenia alata*
19	4,301	5149	*Nitzschia closterium*
20	4,275	2780	*Chaetoceros compressus*
21	4,019	2787	*Chaetoceros curvisetus*
22	3,902	2759	*Chaetoceros affinis*
23	3,866	10031	*Gymnodinium*
24	3,849	-5006	*"Phytoplankton"*
25	3,623	2811	*Chaetoceros lorenzianus*
26	3,610	2904	*Rhizosolenia styliformis*
27	3,449	10399	*Ceratium furca*
28	3,438	2387	*Corethron criophilum*
29	3,380	2902	*Rhizosolenia setigera*
30	3,177	2733	*Eucampia zoodiacus*
...			

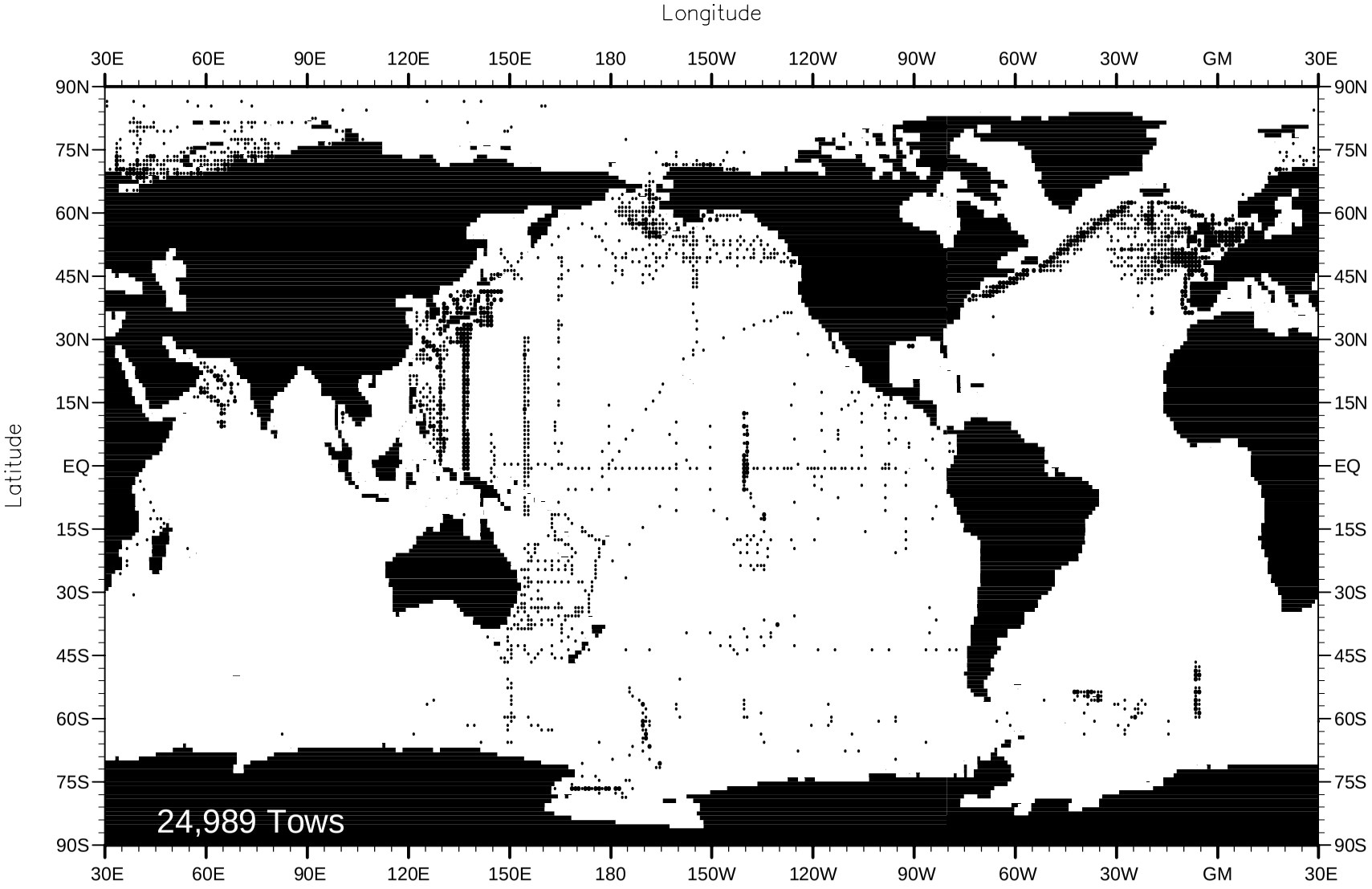

Fig. B1. Annual distribution of all phytoplankton observations.

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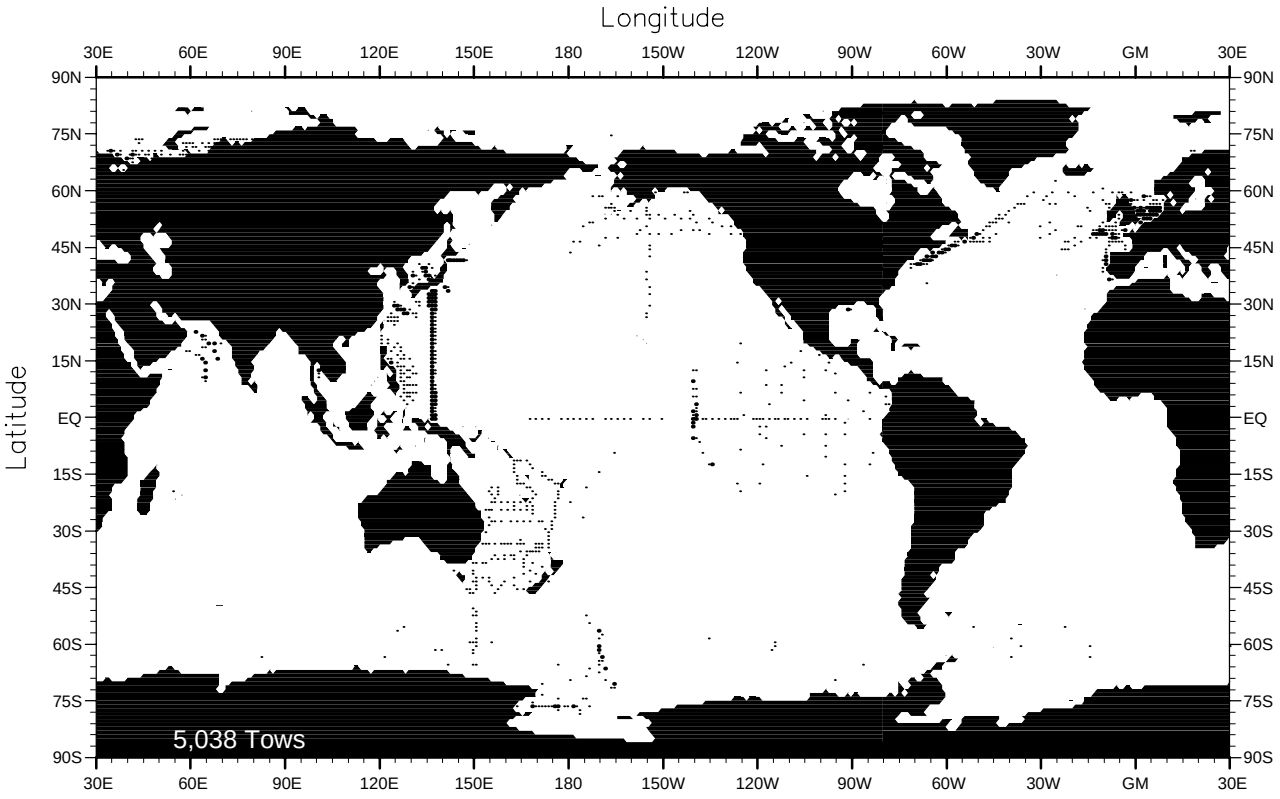

Fig. B1.1 Winter (Jan.-Mar.) distribution of all phytoplankton observations.

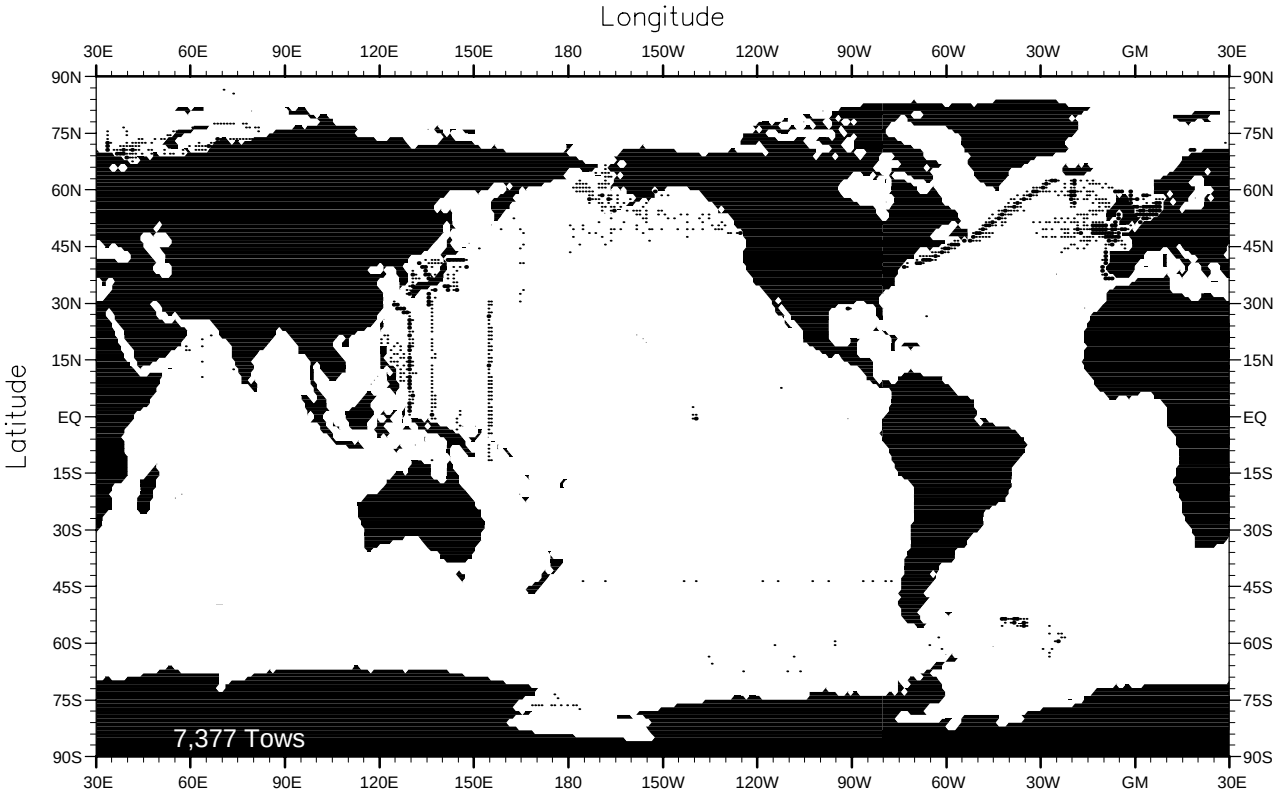

Fig. B1.2 Spring (Apr.-Jun.) distribution of all phytoplankton observations.

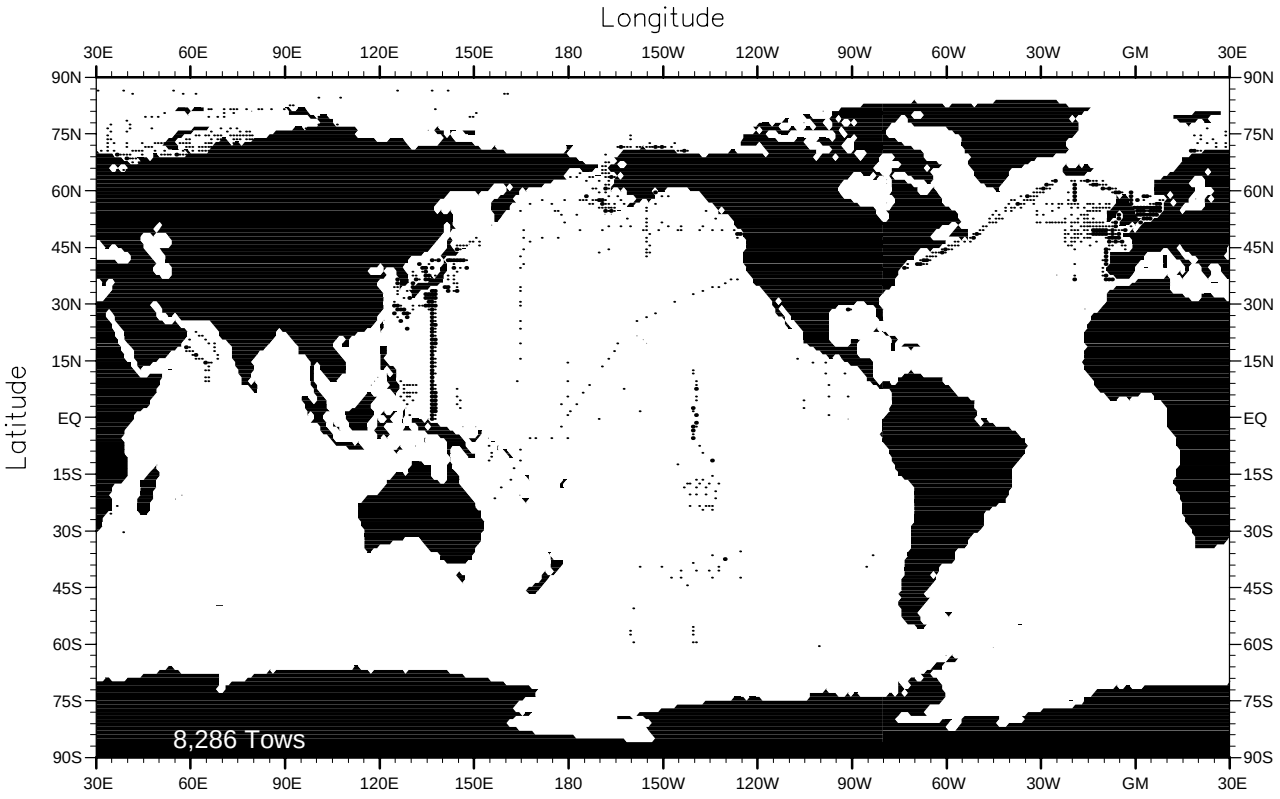

Fig. B1.3 Summer (Jul.-Sep.) distribution of all phytoplankton observations.

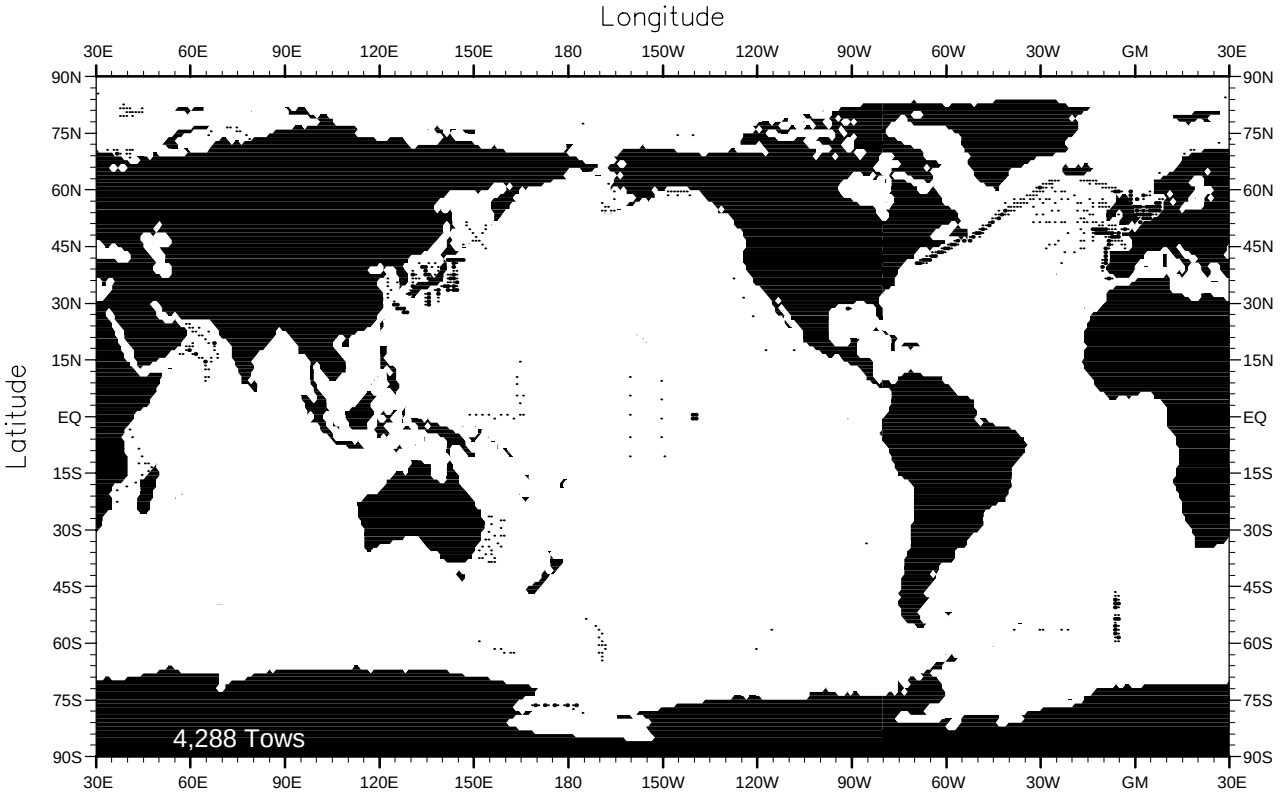

Fig. B1.4 Fall (Oct.-Dec.) distribution of all phytoplankton observations.

Table B2: Taxonomic composition of all Diatoms

Number of Tows: **20,363**
Number of Observations: 303,897
Number of Taxonomic Descriptions: **763**

Top 30 Taxonomic Descriptions

Rank	#_OBS	ITIS-TSN	DESCRIPTION
1	11,086	2758	*Chaetoceros*
2	8,976	2402	*Skeletonema costatum*
3	7,893	2484	*Thalassiosira*
4	7,748	3139	*Thalassionema nitzschioides*
5	5,463	5070	*Nitzschia*
6	5,348	2546	*Coscinodiscus*
7	5,209	2930	*Pennales*
8	5,182	5093	*Nitzschia seriata*
9	5,176	2395	*Leptocylindrus danicus*
10	4,981	2287	*Bacillariophyceae*
11	4,560	5080	*Nitzschia longissima*
12	4,463	5077	*Nitzschia delicatissima*
13	4,452	2903	*Rhizosolenia stolterfothii*
14	4,396	2791	*Chaetoceros decipiens*
15	4,365	2881	*Rhizosolenia alata*
16	4,301	5149	*Nitzschia closterium*
17	4,275	2780	*Chaetoceros compressus*
18	4,019	2787	*Chaetoceros curvisetus*
19	3,902	2759	*Chaetoceros affinis*
20	3,623	2811	*Chaetoceros lorenzianus*
21	3,610	2904	*Rhizosolenia styliformis*
22	3,438	2387	*Corethron criophilum*
23	3,380	2902	*Rhizosolenia setigera*
24	3,177	2733	*Eucampia zoodiacus*
25	3,118	2931	*Diatomaceae*
26	3,114	2888	*Rhizosolenia calcar-avis*
27	3,057	3134	*Thalassiothrix longissima*
28	3,037	2749	*Hemiaulus hauckii*
29	2,838	3117	*Asterionella japonica*
30	2,732	3133	*Thalassiothrix frauenfeldii*
...			

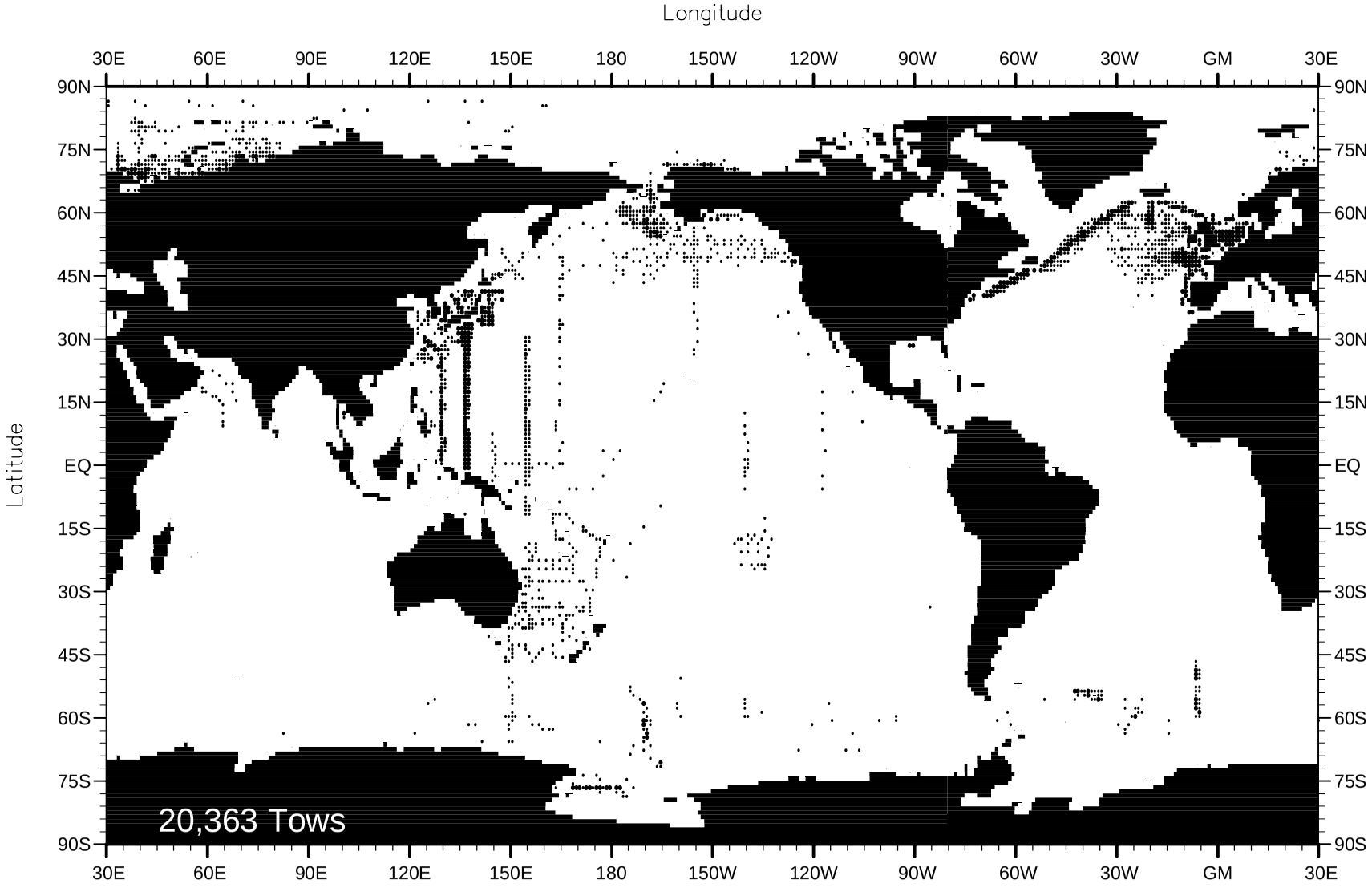

Fig. B2. Annual distribution of all diatom observations.

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Table B3: Taxonomic composition of all Dinoflagellates

Number of Tows: **13,937**
Number of Observations: 71,528
Number of Taxonomic Descriptions: **684**

Top 30 Taxonomic Descriptions

Rank	#_OBS	ITIS-TSN	DESCRIPTION
1	5,272	10400	*Ceratium fusus*
2	4,426	9874	*Dinophyceae*
3	3,866	10031	*Gymnodinium*
4	3,449	10399	*Ceratium furca*
5	3,163	10212	*Peridinium*
6	1,848	10408	*Ceratium tripos*
7	1,775	10149	*Noctiluca miliaris*
8	1,744	10077	*Gyrodinium*
9	1,563	10148	*Noctiluca*
10	1,459	9877	*Prorocentrum*
11	1,146	10397	*Ceratium*
12	1,120	10234	*Peridinium pellucidum*
13	1,021	9873	*Pyrrophycophyta*
14	1,016	10340	*Protoperidinium*
15	927	10401	*Ceratium lineatum*
16	866	9879	*Prorocentrum micans*
17	832	10403	*Ceratium macroceros*
18	771	9928	*Dinophysis*
19	736	10223	*Peridinium depressum*
20	690	10205	*Peridiniaceae*
21	677	10402	*Ceratium longipes*
22	583	573414	*Gymnodinium wulffii*
23	581	10371	*Gonyaulax polygramma*
24	574	9996	*Gymnodiniaceae*
25	566	9997	*Amphidinium*
26	556	10463	*Oxytoxum*
27	525	9880	*Prorocentrum minimum*
28	519	10359	*Gonyaulax*
29	483	10398	*Ceratium arcticum*
30	466	10041	*Gymnodinium lohmanni*
...			

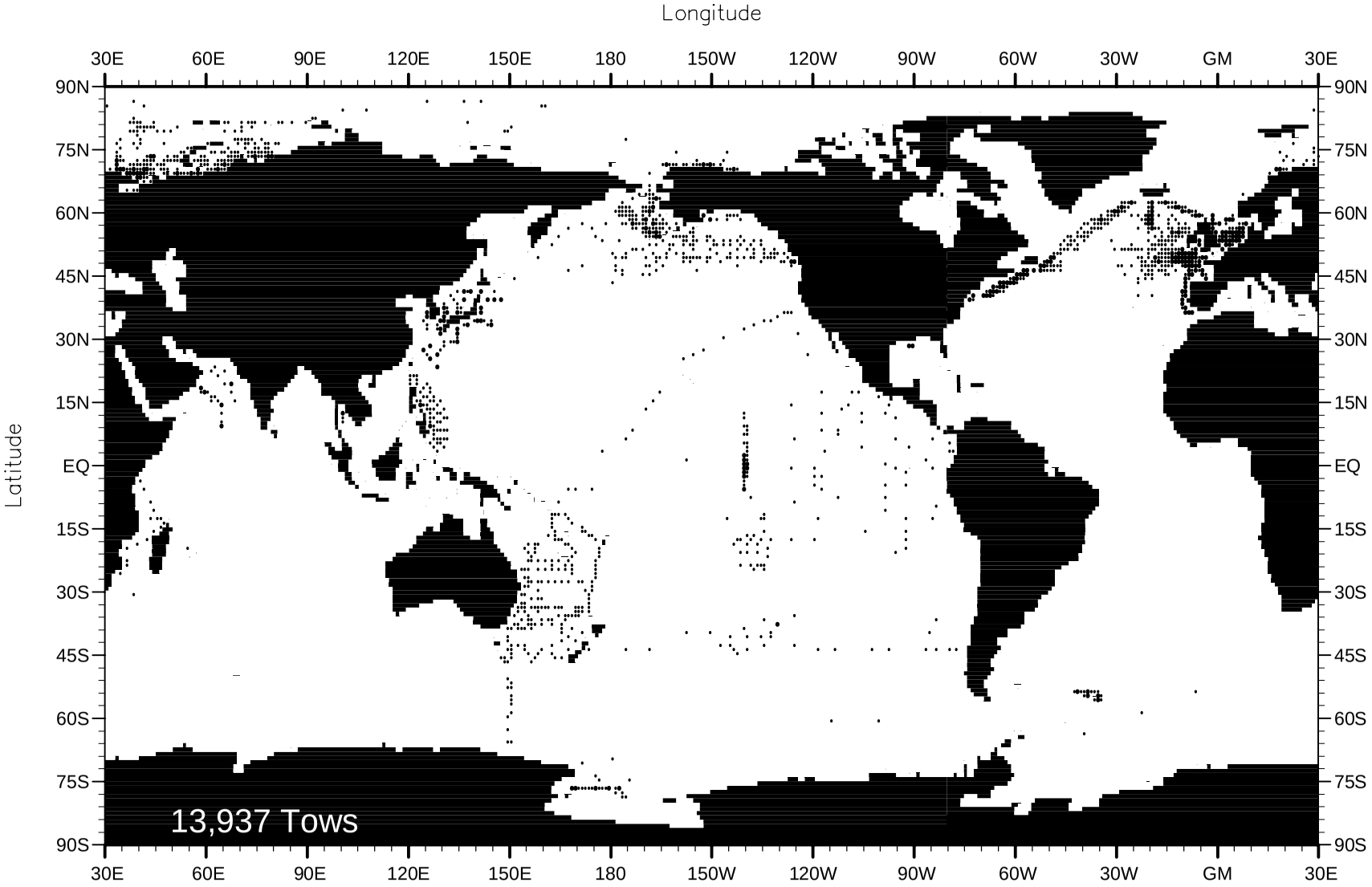

Fig. B3. Annual distribution of all dinoflagellate observations.

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Table B4: Taxonomic composition of all Coccolithophores

Number of Tows: **3,623**
Number of Observations: 8,456
Number of Taxonomic Descriptions: **57**

Top 30 Taxonomic Descriptions

Rank	#_OBS	ITIS-TSN	DESCRIPTION
1	1,996	43790	*Coccolithophorida*
2	1,897	2271	*Umbilicosphaera*
3	598	2272	*Umbilicosphaera mirabilis*
4	510	2250	*Coccolithus huxleyi*
5	501	2248	*Coccolithus*
6	421	2247	*Coccolithaceae*
7	418	2173	*Phaeocystis pouchetii*
8	368	-8017	*Phaeocystis antarctica*
9	186	2249	*Coccolithus pelagicus*
10	154	2262	*Rhabdosphaera*
11	141	2255	*Discosphaera*
12	127	2187	*Acanthoica*
13	116	2172	*Phaeocystis*
14	113	2227	*Pontosphaera huxleyi*
15	101	2235	*Syracosphaera pulchra*
16	89	-6007	*Chrysochromulina + imantonia*
17	81	2252	*Cyclococcolithus*
18	63	-7011	*Coronosphaera mediterranea*
19	60	2257	*Gephyrocapsa*
20	55	2223	*Ophiaster hydroideus*
21	50	2261	*Helicosphaera carteri*
22	44	2270	*Umbellosphaera hulburtiana*
23	38	2148	*Imantonia rotunda*
24	36	2160	*Chrysochromulina*
25	30	2199	*Calyptrosphaera*
26	27	-7005	*Caneosphaera molischii*
27	22	2135	*Prymnesiophyceae*
28	19	-7955	*Coccolithus fragilis*
29	19	2234	*Syracosphaera*
30	17	2256	*Discosphaera tubifer*
...			

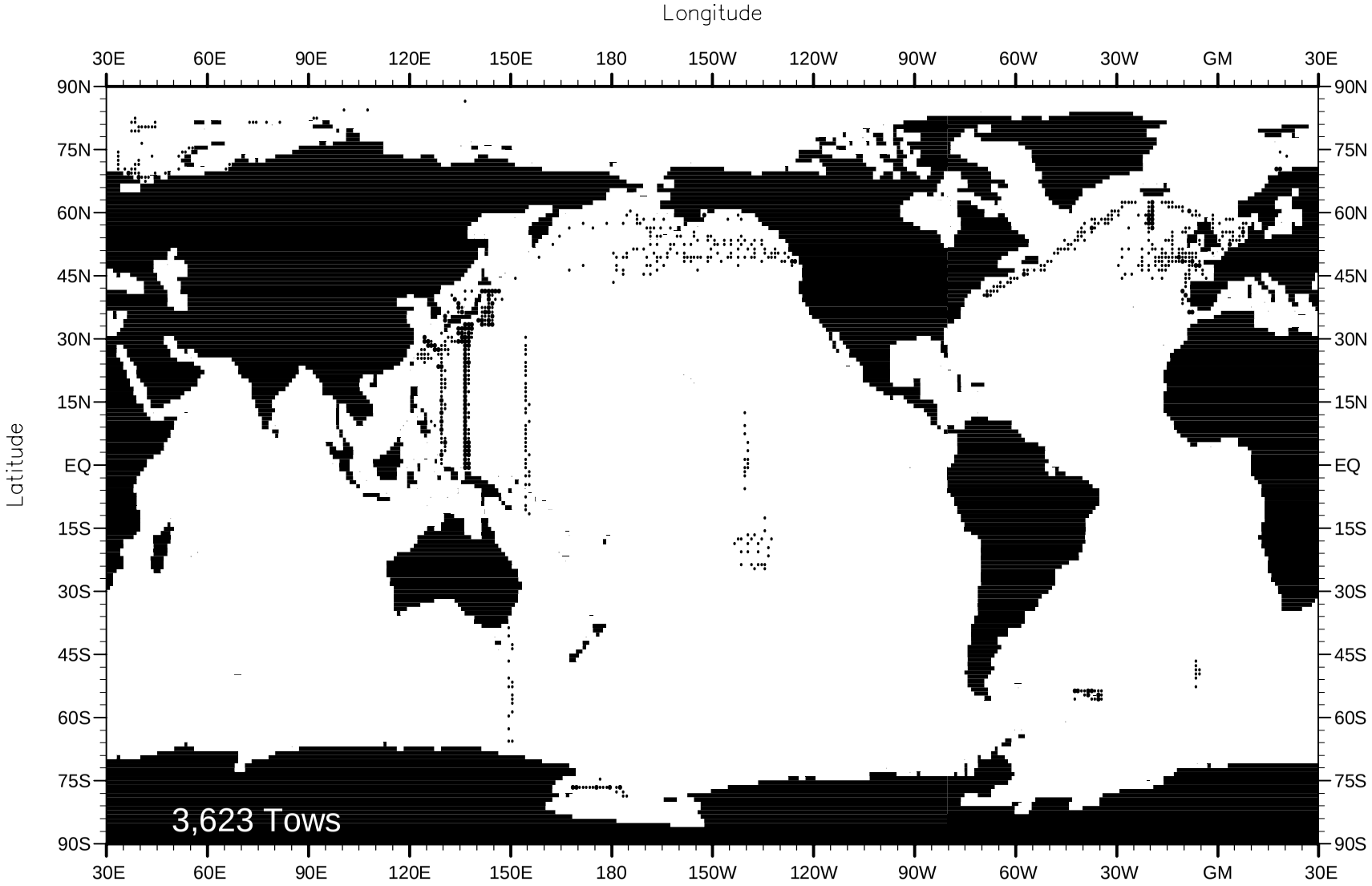

Fig. B4. Annual distribution of all coccolithophore observations.

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Table C1: Taxonomic composition of all Protist Plankton

Number of Tows: **12,871**
Number of Observations: 35,005
Number of Taxonomic Descriptions: **289**

Top 30 Taxonomic Descriptions

Rank	#_OBS	ITIS-TSN	DESCRIPTION
1	5,784	44030	*Foraminiferida*
2	4,845	46088	*Radiolaria*
3	4,204	43780	*Protozoa*
4	1,895	-6001	*Foraminifera + Radiolaria*
5	1,880	-7348	*Ellobiopsidae*
6	1,751	-5016	*Ciliates*
7	1,586	46620	*Tintinnina*
8	1,166	46743	*Tintinnidae*
9	950	-7255	*Parafavella denticulata*
10	848	46289	*Mesodinium rubrum*
11	760	46627	*Tintinnopsis*
12	657	43848	*Sarcodina*
13	472	46713	*Ptychocylis obtusa*
14	420	43782	*Mastigophora*
15	396	46729	*Parafavella gigantea*
16	396	46107	*Acantharia*
17	287	46690	*Dictyocysta*
18	271	43815	*Bodonina*
19	253	-7583	*Parafavella cylindrica*
20	211	-7850	*Favella denticulata var cylindrica*
21	196	-7584	*Parafavella robusta*
22	196	46211	*Ciliophora*
23	169	331709	*Codonellopsis*
24	168	46111	*Acanthometron*
25	158	-7855	*Favella denticulata var rotundata*
26	158	-7585	*Parafavella subrotundata*
27	151	-7586	*Parafavella tenuis*
28	135	-7852	*Favella denticulata var gigantea*
29	135	-7581	*Leprotintinnus pellucidus*
30	127	46707	*Favella*
...			

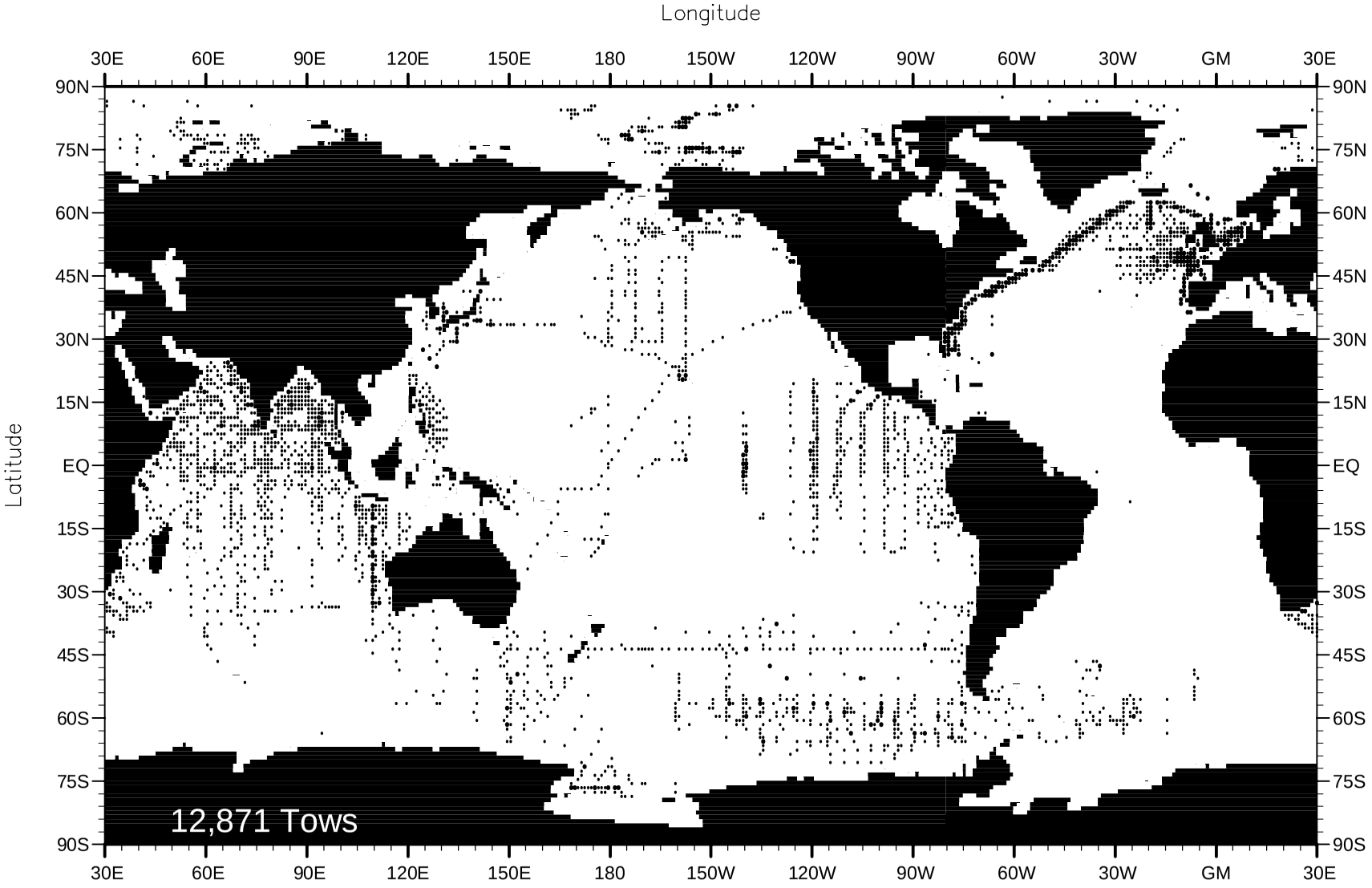

Fig. C1. Annual distribution of all protist plankton observations.

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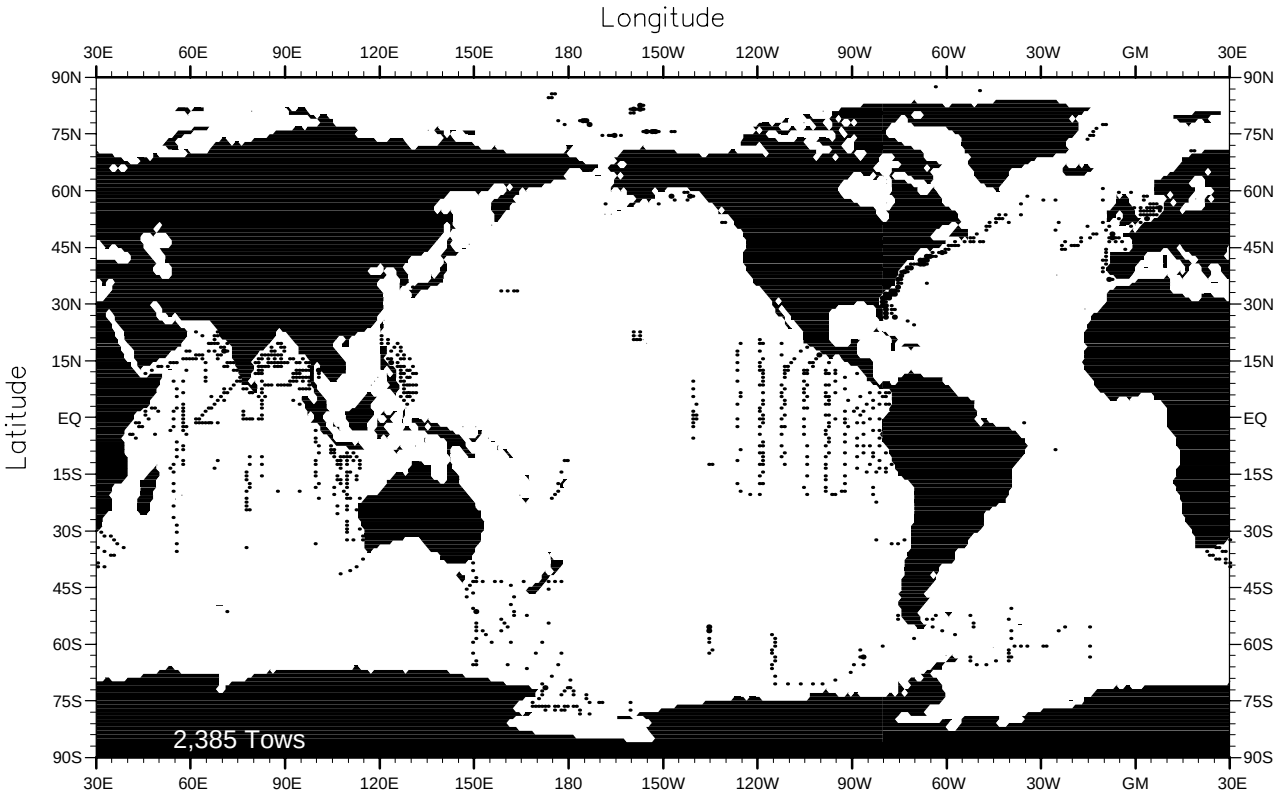

Fig. C1.1 Winter (Jan.-Mar.) distribution of all protist plankton observations.

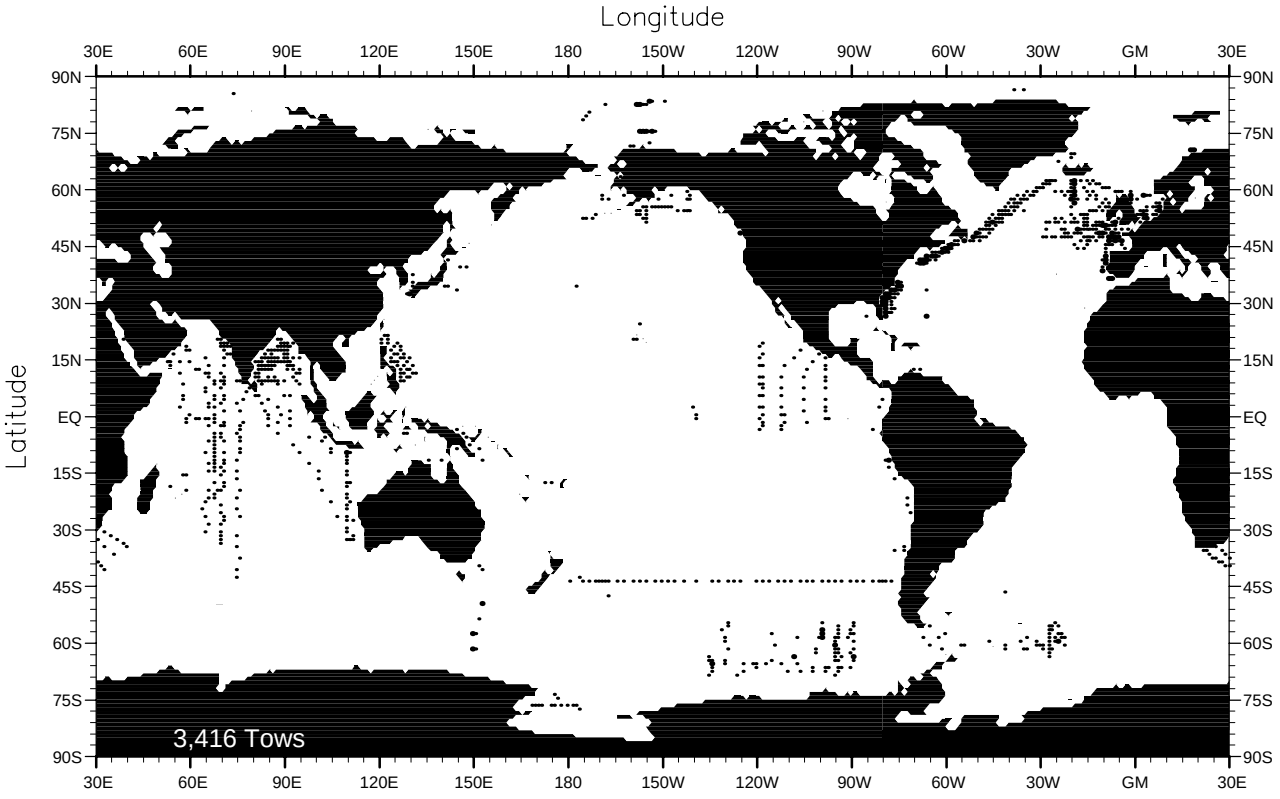

Fig. C1.2 Spring (Apr.-Jun.) distribution of all protist plankton observations.

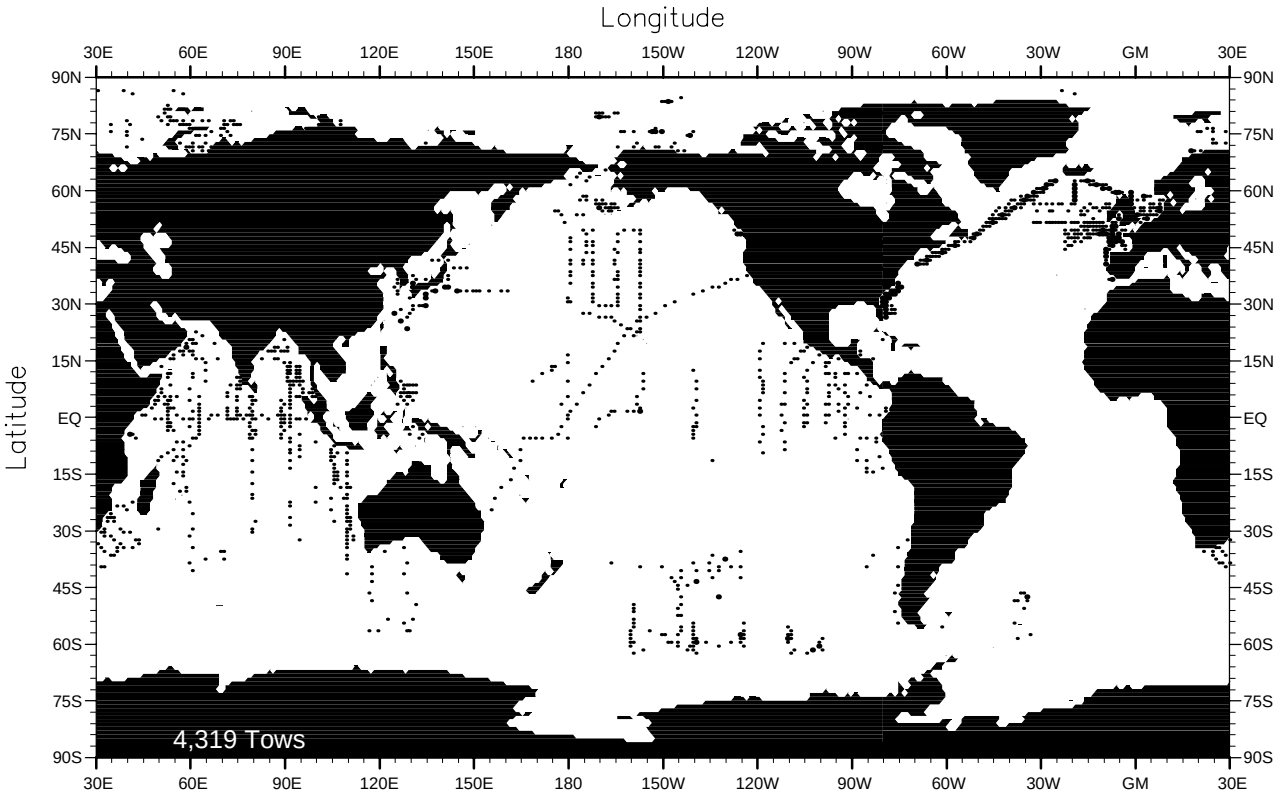

Fig. C1.3 Summer (Jul.-Sep.) distribution of all protist plankton observations.

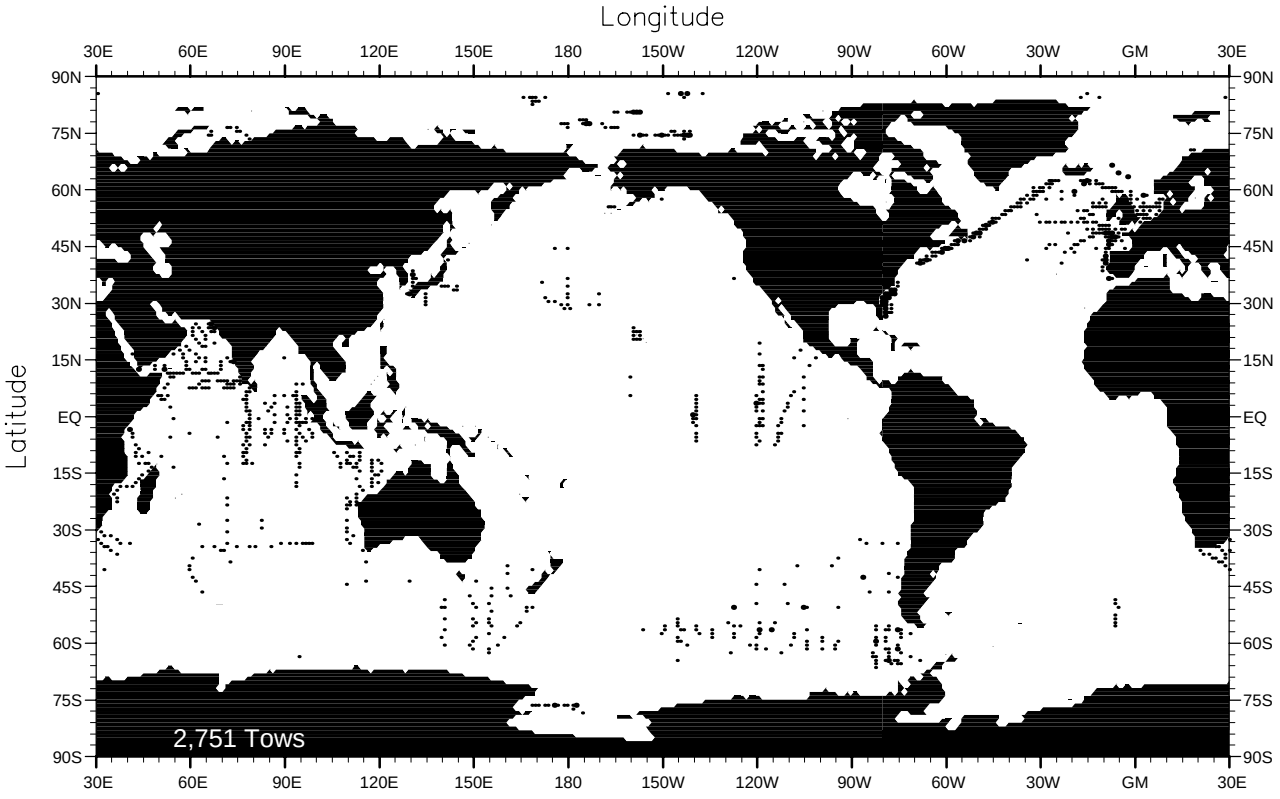

Fig. C1.4 Fall (Oct.-Dec.) distribution of all protist plankton observations.

Table C2: Taxonomic composition of all Foraminifera

Number of Tows: **4,194**
Number of Observations: 5,991
Number of Taxonomic Descriptions: **7**

Top 30 Taxonomic Descriptions

Rank	#_OBS	ITIS-TSN	DESCRIPTION
1	5,784	44030	*Foraminiferida*
2	93	45796	*Globigerina*
3	75	45794	*Globigerinidae*
4	24	45797	*Globigerina bulloides*
5	13	45779	*Globorotaliidae*
6	1	45820	*Globigerinita*
7	1	45782	*Globorotalia*

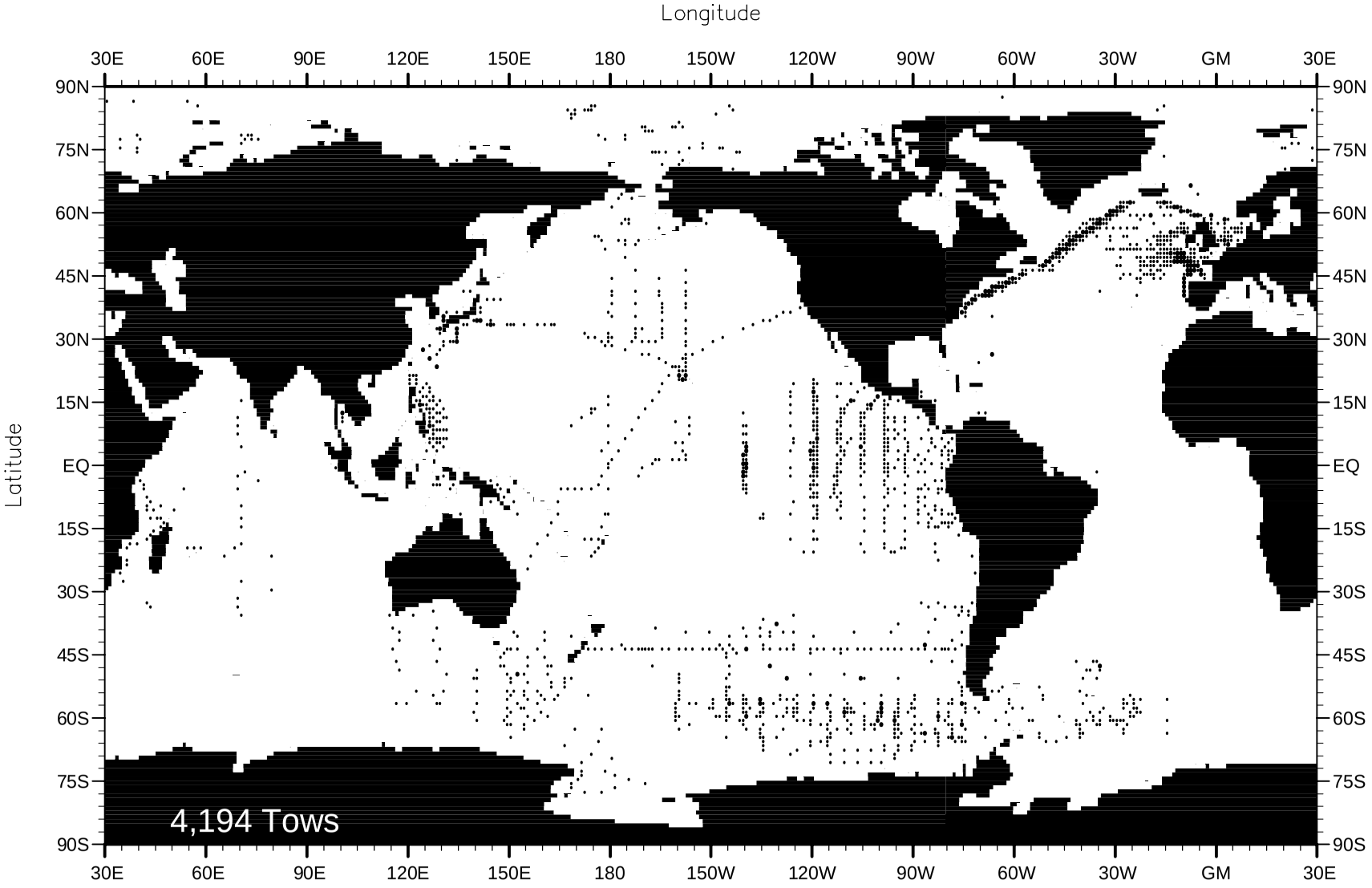

Fig. C2. Annual distribution of all foraminifera observations.

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Table C3: Taxonomic composition of all Radiolaria

Number of Tows: **3,804**
Number of Observations: 5,790
Number of Taxonomic Descriptions: **40**

Top 30 Taxonomic Descriptions

Rank	#_OBS	ITIS-TSN	DESCRIPTION
1	4,845	46088	*Radiolaria*
2	396	46107	*Acantharia*
3	168	46111	*Acanthometron*
4	104	-7830	*Botryopyle setosa*
5	88	550459	*Acanthometron pellucida*
6	36	-7882	*Plectacantha oikiskos*
7	26	-7229	*Stauracantha quadrifurca*
8	22	46106	*Aulacantha scolymantha*
9	21	-7225	*Amphilithium*
10	15	-7824	*Amphimelissa setosa*
11	12	-7840	*Dictyophimus gracilipes*
12	9	-7768	*Nephrospirus*
13	6	-7883	*Protocystis*
14	5	-7869	*Haliomma beroes*
15	5	-7844	*Echinomma leptodermum*
16	2	46080	*Actinopodea*
17	2	-7825	*Amphimelissa stenostoma*
18	2	-7241	*Aulosphaera trigonopa*
19	2	-7240	*Corocalyptra elisabethae*
20	2	-7237	*Eucecryphalus*
21	2	-7233	*Sphaerozoum geminatum*
22	2	-7228	*Amphilithium clavarium*
23	1	-7843	*Dorataspis heteopora*
24	1	-7362	*Coleaspis vaginata*
25	1	-7361	*Diploconus amalla*
26	1	-7351	*Amphilonche belonoides*
27	1	-7230	*Pleuraspis costata*
28	1	46100	*Dictyophimus*
29	1	-7894	*Trochodiscus helioides*
30	1	-7893	*Trochodiscus echiniscus*
...			

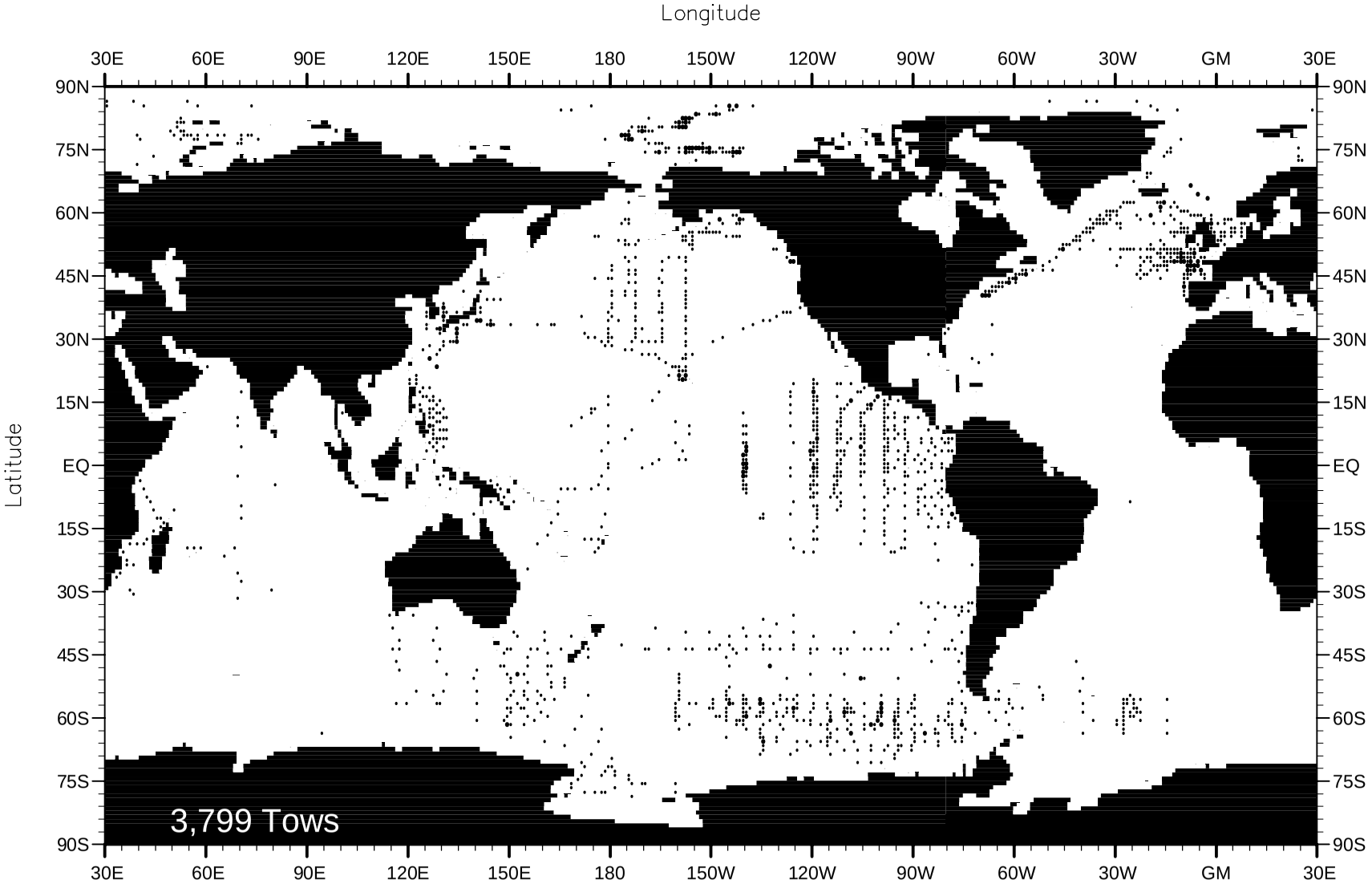

Fig. C3. Annual distribution of all radiolarian observations.

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Table C4: Taxonomic composition of all Ciliophora

Number of Tows: **3,799**
Number of Observations: 13,725
Number of Taxonomic Descriptions: **229**

Top 30 Taxonomic Descriptions

Rank	#_OBS	ITIS-TSN	DESCRIPTION
1	1,751	-5016	*"Ciliates"*
2	1,586	46620	*Tintinnina*
3	1,166	46743	*Tintinnidae*
4	950	-7255	*Parafavella denticulata*
5	848	46289	*Mesodinium rubrum*
6	760	46627	*Tintinnopsis*
7	472	46713	*Ptychocylis obtusa*
8	396	46729	*Parafavella gigantea*
9	287	46690	*Dictyocysta*
10	253	-7583	*Parafavella cylindrica*
11	211	-7850	*Favella denticulata var cylindrica*
12	196	-7584	*Parafavella robusta*
13	196	46211	*Ciliophora*
14	169	331709	*Codonellopsis*
15	158	-7855	*Favella denticulata var rotundata*
16	158	-7585	*Parafavella subrotundata*
17	151	-7586	*Parafavella tenuis*
18	135	-7852	*Favella denticulata var gigantea*
19	135	-7581	*Leprotintinnus pellucidus*
20	127	46707	*Favella*
21	126	-7854	*Favella denticulata var robusta*
22	121	-7680	*Salpingella secata*
23	101	-7262	*Amphorella quadrilineata*
24	84	46656	*Tintinnopsis radix*
25	84	-7849	*Favella denticulata var acuta*
26	83	46773	*Acanthostomella norvegica*
27	82	46730	*Parafavella parumdentata*
28	76	-7856	*Favella denticulata var subrotundata*
29	76	46460	*Sessilina*
30	76	46287	*Mesodinium*
...			

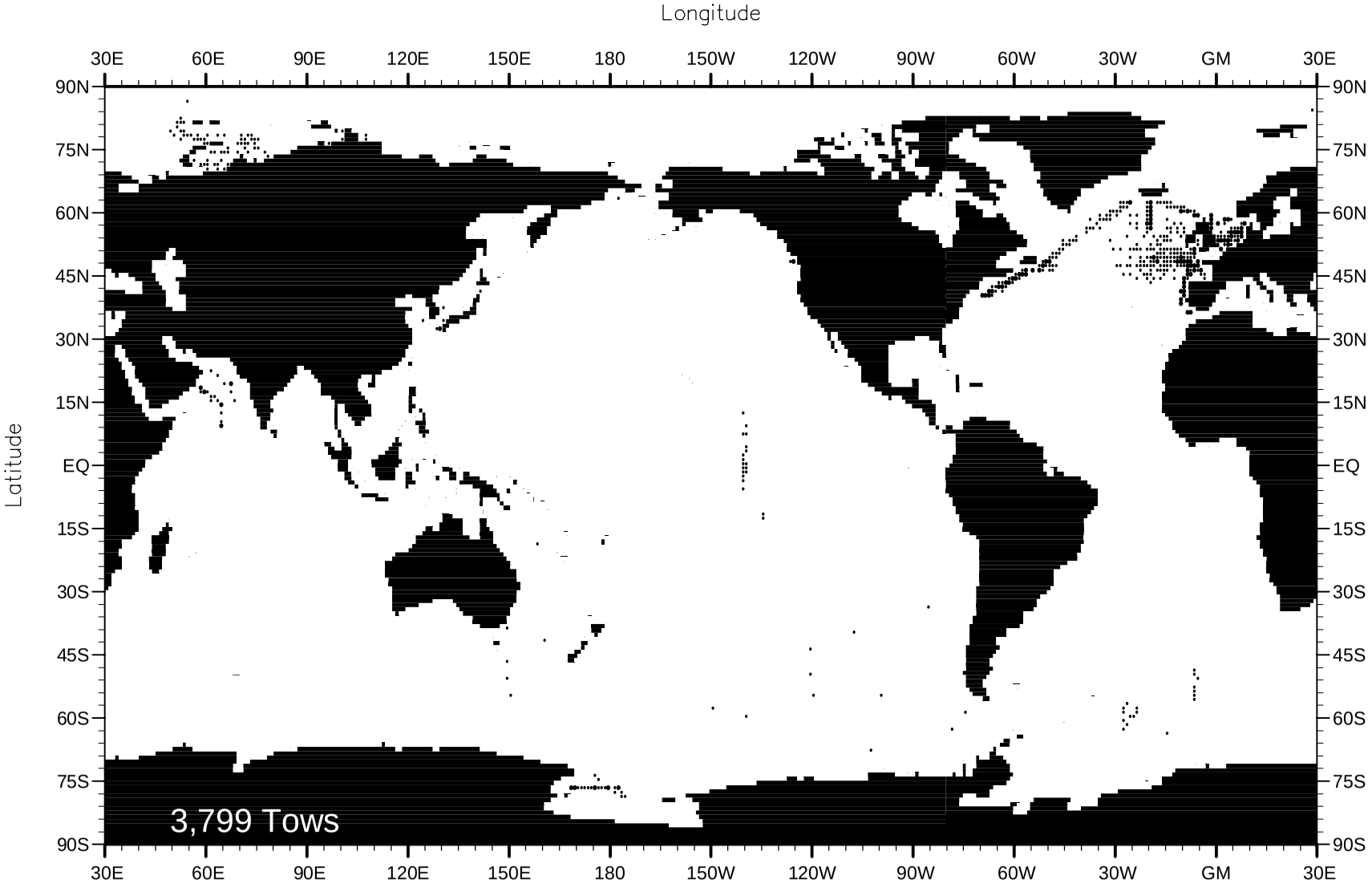

Fig. C4. Annual distribution of all ciliopora observations.

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Table D1: Taxonomic composition of all Zooplankton

Number of Tows: **41,178**
Number of Observations: 860,566
Number of Taxonomic Descriptions: **1,726**

Top 30 Taxonomic Descriptions

Rank	#_OBS	ITIS-TSN	DESCRIPTION
1	58,691	85272	*Calanus finmarchicus*
2	37,055	85257	*Copepoda*
3	22,108	158650	*Chaetognatha*
4	21,684	85369	*Pseudocalanus*
5	20,942	88805	*Oithona similis*
6	17,915	85371	*Pseudocalanus minutus*
7	16,710	95496	*Euphausiacea*
8	16,670	85746	*Metridia longa*
9	15,514	86087	*Acartia longiremis*
10	14,828	88802	*Oithona*
11	14,220	64358	*Polychaeta*
12	14,059	95599	*Decapoda*
13	13,818	85545	*Pareuchaeta norvegica*
14	13,538	93294	*Amphipoda*
15	12,008	85877	*Temora longicornis*
16	11,352	69459	*Gastropoda*
17	11,265	85741	*Metridia lucens*
18	10,817	-5002	*"Zooplankton"*
19	10,158	84195	*Ostracoda*
20	10,011	159664	*Appendicularia (aka "larvacea")*
21	9,805	85766	*Centropages hamatus*
22	9,653	85263	*Calanus*
23	8,650	85370	*Pseudocalanus elongatus*
24	8,617	76333	*Thecosomata*
25	8,262	156857	*Echinodermata*
26	7,951	51268	*Siphonophora*
27	7,708	85267	*Calanus glacialis*
28	7,532	89433	*Cirripedia*
29	7,163	88541	*Oncaea borealis*
30	6,644	48739	*Hydrozoa*
...			

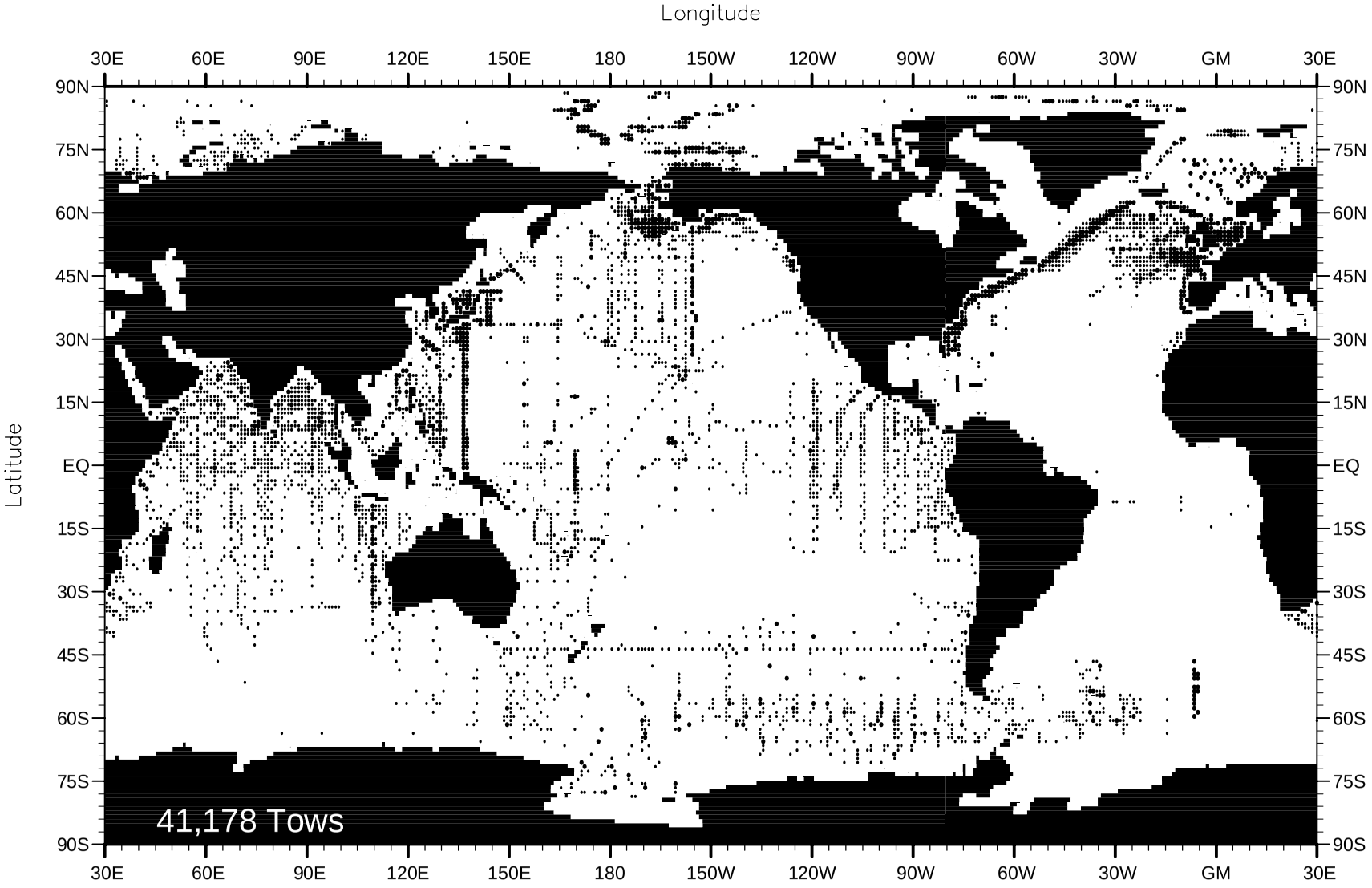

Fig. D1. Annual distribution of all zooplankton observations.

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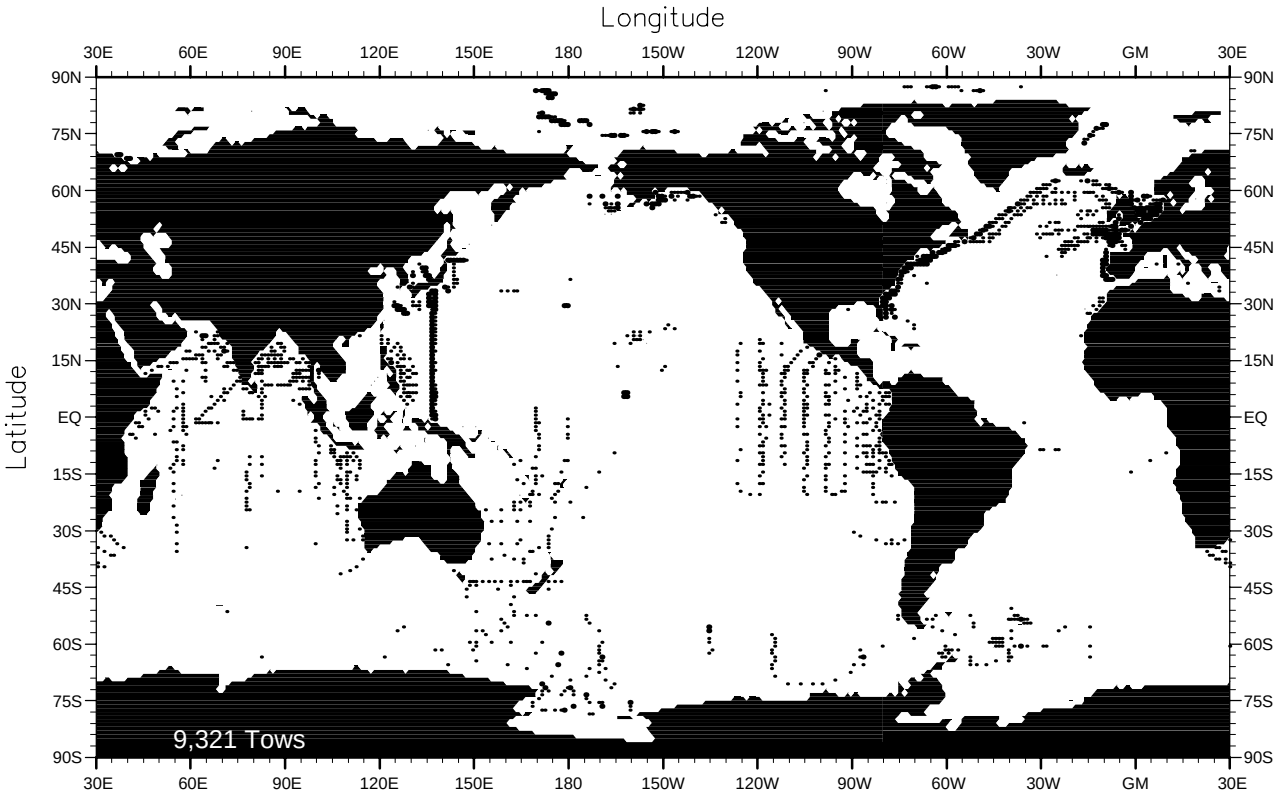

Fig. D1.1 Winter (Jan.-Mar.) distribution of all zooplankton observations.

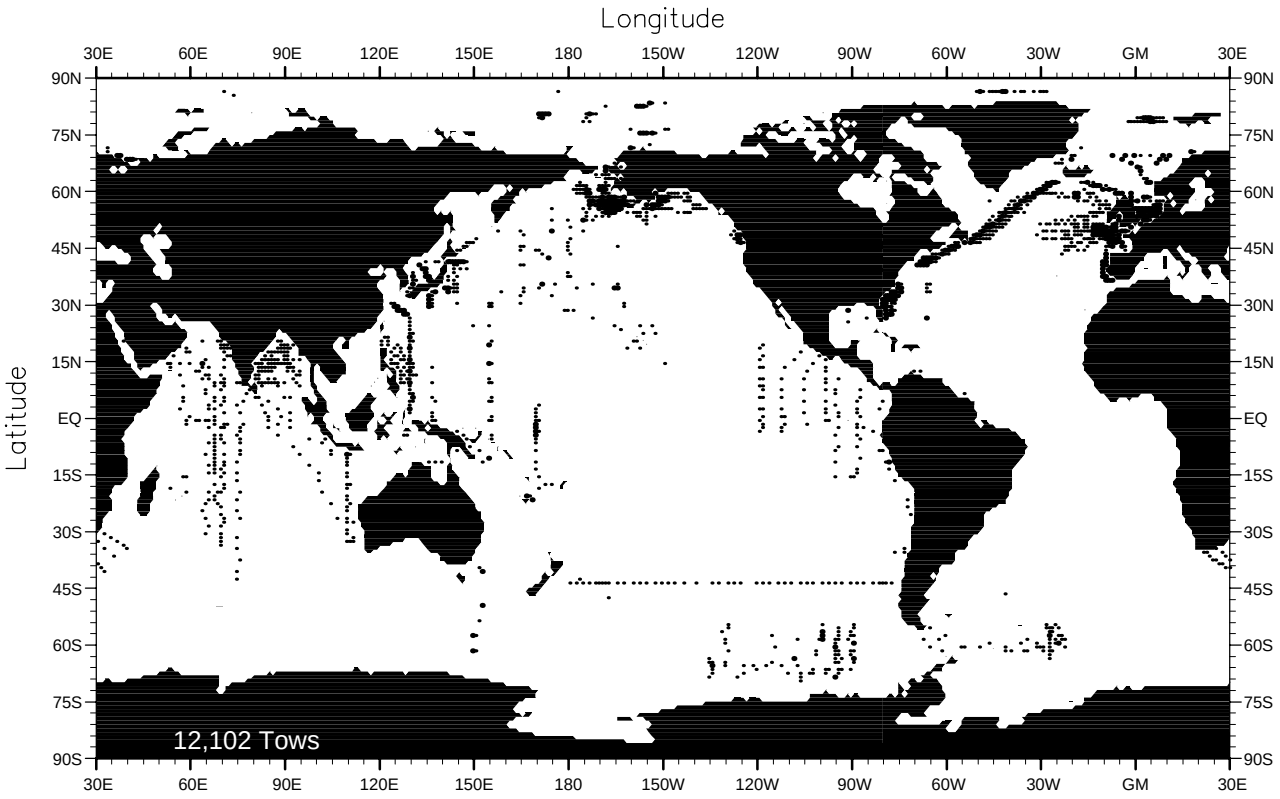

Fig. D1.2 Spring (Apr.-Jun.) distribution of all zooplankton observations.

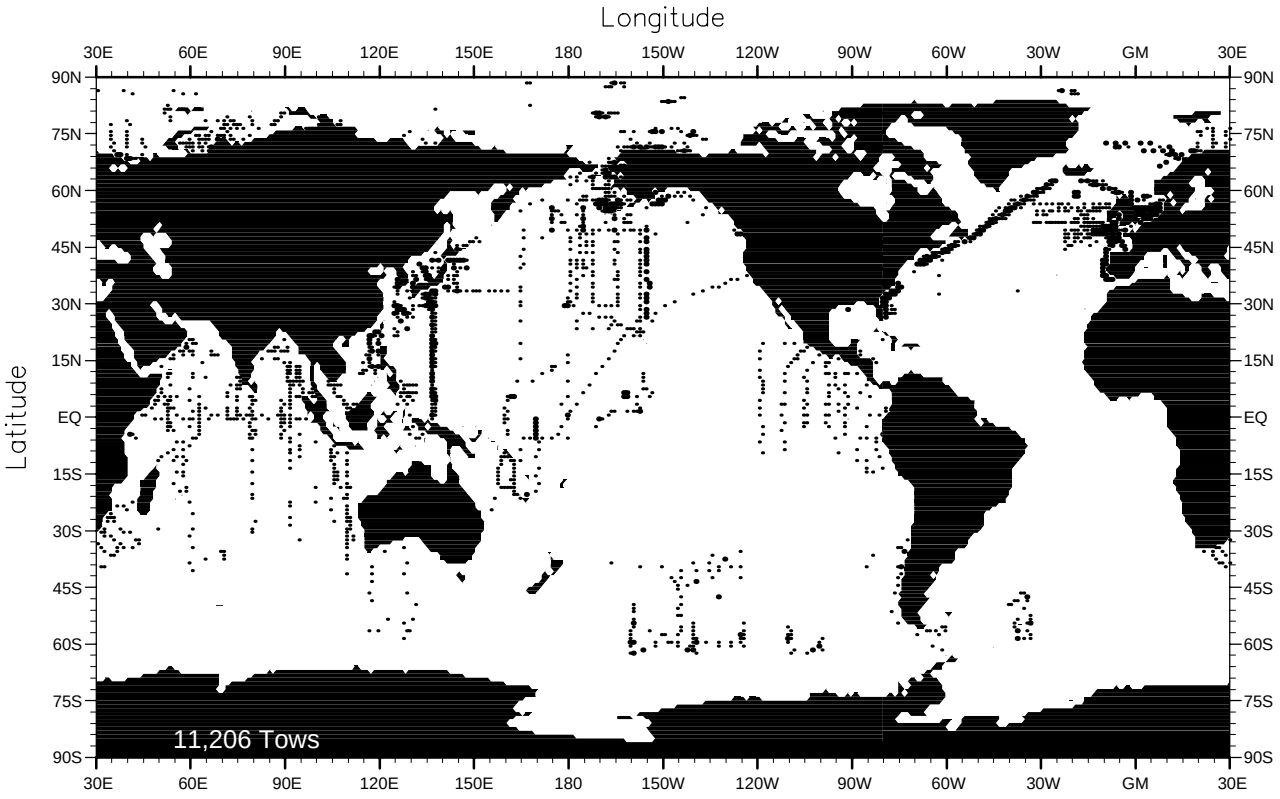

Fig. D1.3 Summer (Jul.-Sep.) distribution of all zooplankton observations.

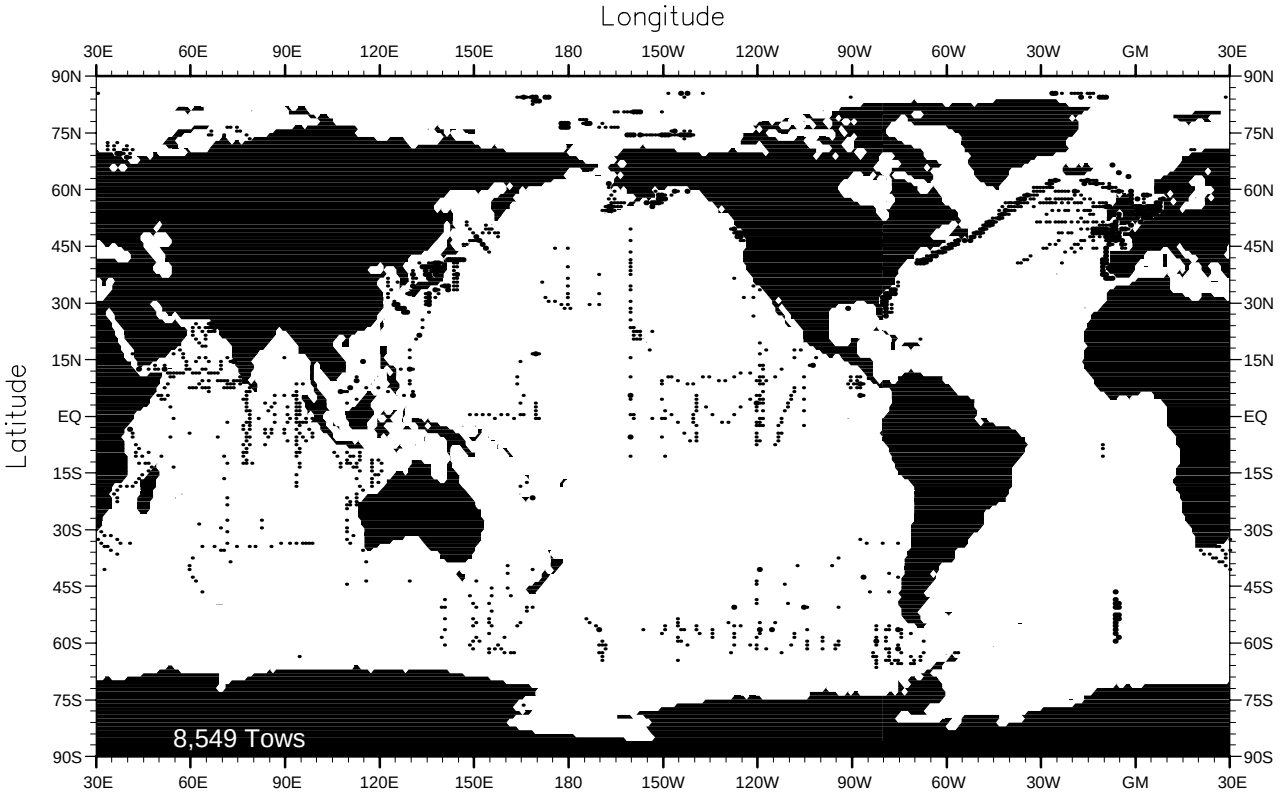

Fig. D1.4 Fall (Oct.-Dec.) distribution of all zooplankton observations.

Table D2: Taxonomic composition of all Cnidaria

Number of Tows: **14,521**
Number of Observations: 41,284
Number of Taxonomic Descriptions: **155**

Top 30 Taxonomic Descriptions

Rank	#_OBS	ITIS-TSN	DESCRIPTION
1	7,951	51268	*Siphonophora*
2	6,644	48739	*Hydrozoa*
3	4,669	48738	*Cnidaria*
4	3,599	51094	*Aglantha digitalis*
5	2,883	51938	*Anthozoa*
6	2,786	-5009	*"Jellyfish"*
7	2,234	51483	*Scyphozoa*
8	1,897	51265	*Velella*
9	1,895	51260	*Porpita*
10	1,892	51435	*Physalia*
11	460	51159	*Aeginopsis laurentii*
12	298	51302	*Dimophyes arctica*
13	274	48740	*Hydroida*
14	206	49523	*Obelia flabellata*
15	196	49387	*Rathkea octopunctata*
16	190	-7568	*Arachnactis bournei*
17	175	49451	*Corymorpha flammea*
18	162	49536	*Phialidium*
19	153	51631	*Tetraplatia*
20	137	51093	*Aglantha*
21	128	-7611	*Nectophores bracts*
22	124	-5020	*Hydromedusae*
23	122	49173	*Catablema vesicarium*
24	122	48934	*Plotocnide borealis*
25	121	50814	*Proboscidactyla*
26	107	48933	*Plotocnide*
27	104	51671	*Cyanea capillata*
28	96	49515	*Obelia longissima*
29	93	48978	*Euphysa flammea*
30	83	48767	*Bougainvillia superciliaris*
...			

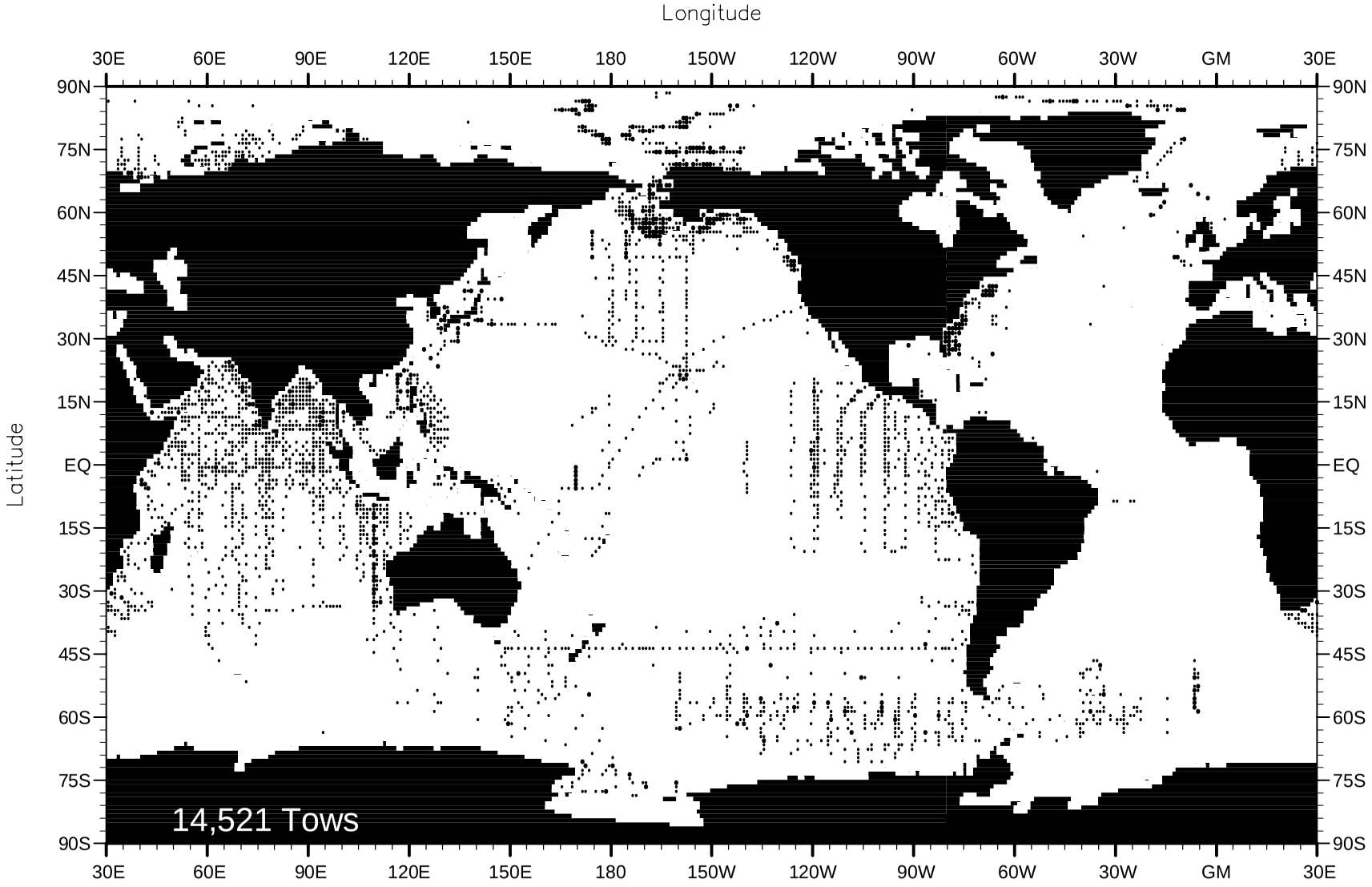

Fig. D2. Annual distribution of all cnidarian observations.

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Table D3: Taxonomic composition of all Ctenophora

Number of Tows: **3.672**
Number of Observations: 4,957
Number of Taxonomic Descriptions: **12**

Top 30 Taxonomic Descriptions

Rank	#_OBS	ITIS-TSN	DESCRIPTION
1	3,237	53856	*Ctenophora*
2	1,059	53954	*Beroe*
3	286	53868	*Hormiphora cucumis*
4	261	53861	*Pleurobrachia*
5	42	53903	*Bolinopsis*
6	42	53862	*Pleurobrachia pileus*
7	13	53881	*Mertensia ovum*
8	10	53858	*Tentaculata*
9	3	53904	*Bolinopsis infundibulum*
10	2	-7271	*Hormiphoro palmata*
11	1	53956	*Beroe ovata*
12	1	53879	*Mertensia*

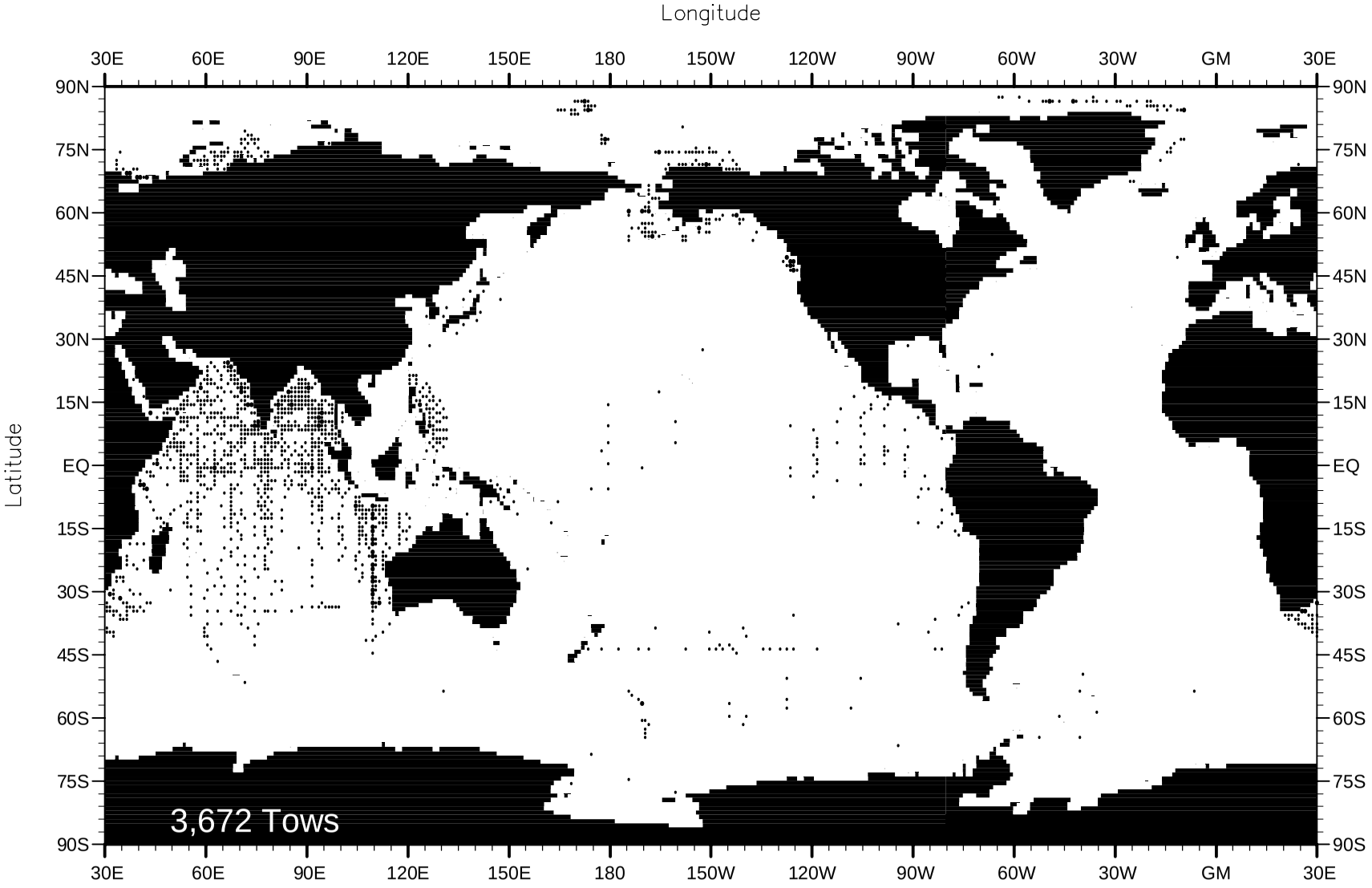

Fig. D3. Annual distribution of all ctenophore observations.

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Table D4: Taxonomic composition of all Gastropods

Number of Tows: **12,834**
Number of Observations: 37,848
Number of Taxonomic Descriptions: **79**

Top 30 Taxonomic Descriptions

Rank	#_OBS	ITIS-TSN	DESCRIPTION
1	11,352	69459	*Gastropoda*
2	8,617	76333	*Thecosomata*
3	4,343	331672	*Heteropoda*
4	1,994	78062	*Gymnosomata*
5	1,987	78156	*Nudibranchia*
6	1,905	72387	*Janthina*
7	1,651	76340	*Limacina helicina*
8	1,535	-8020	*Gastropod larvae & Pteropods*
9	1,529	76351	*Limacina retroversa*
10	844	78089	*Clione limacina*
11	602	76336	*Limacina*
12	564	72386	*Janthinidae*
13	114	76387	*Creseis*
14	111	72839	*Atlanta*
15	106	78088	*Clione*
16	44	76420	*Cymbuliidae*
17	39	76407	*Peraclis*
18	38	204837	*Pilidium*
19	37	76388	*Creseis acicula*
20	36	-7073	*Charcotia bifrons*
21	32	74103	*Nassarius*
22	29	-8023	*Pteropods thecosomes*
23	29	-8022	*Pteropods gymnosomes*
24	25	72838	*Atlantidae*
25	22	78071	*Pneumodermopsis*
26	22	72878	*Naticidae*
27	21	78780	*Prosobranchia*
28	21	76356	*Cavolinia*
29	21	72840	*Atlanta gaudichaudi*
30	14	76389	*Creseis virgula*
...			

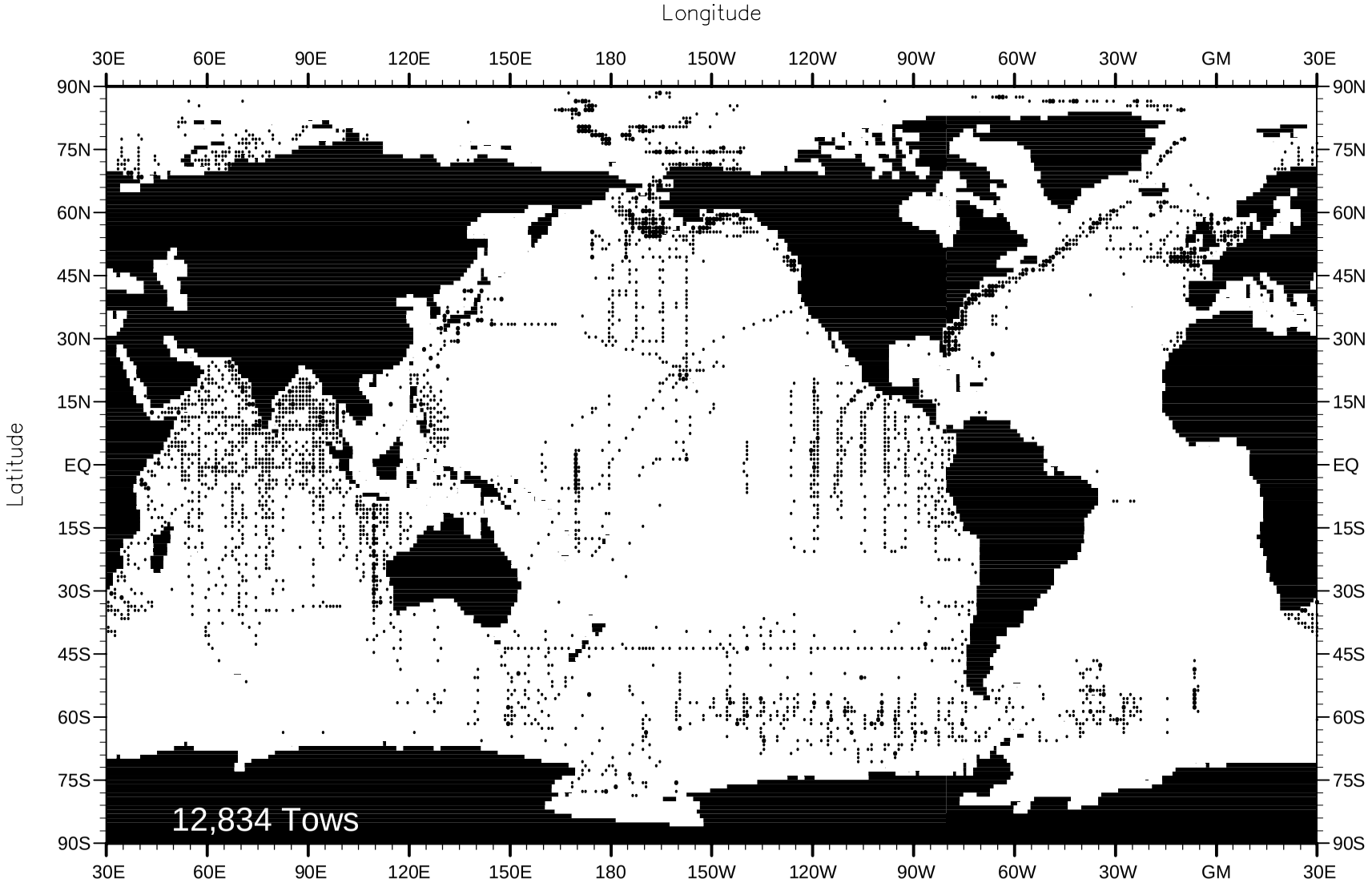

Fig. D4. Annual distribution of all gastropod observations.

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Table D5: Taxonomic composition of all Cephalopods

Number of Tows: **4,007**
Number of Observations: 5,190
Number of Taxonomic Descriptions: **55**

Top 30 Taxonomic Descriptions

Rank	#_OBS	ITIS-TSN	DESCRIPTION
1	4,911	82326	*Cephalopoda*
2	68	-7278	*Decembrachiata*
3	13	-5015	*"Squid"*
4	12	82405	*Pterygioteuthis giardi*
5	10	82655	*Japetella diaphana*
6	10	82397	*Enoploteuthidae*
7	10	-7641	*Rhynchoteuthion*
8	9	82414	*Gonatidae*
9	9	82368	*Myopsida*
10	8	556517	*Liocranchia reinhardti*
11	8	205733	*Helicocranchia pfefferi*
12	8	82419	*Gonatus fabrici*
13	7	82577	*Cranchia armata*
14	7	82415	*Gonatopsis*
15	6	556284	*Sthenoteuthis oualaniensis*
16	6	82418	*Gonatus*
17	5	82443	*Onychia*
18	5	82436	*Onychoteuthidae*
19	5	556083	*Liocranchia valdiviae*
20	4	82587	*Vampyroteuthis infernalis*
21	4	82406	*Abralia*
22	4	556140	*Abraliopsis lineata*
23	4	82590	*Octopodidae*
24	4	82421	*Gonatus magister*
25	4	82330	*Coleoidea*
26	3	82367	*Theuthoidea*
27	2	82595	*"Octopus"*
28	2	556011	*Watasenia scintillans*
29	2	82584	*Bathothauma lyromma*
30	2	82578	*Cranchia scabra*
...			

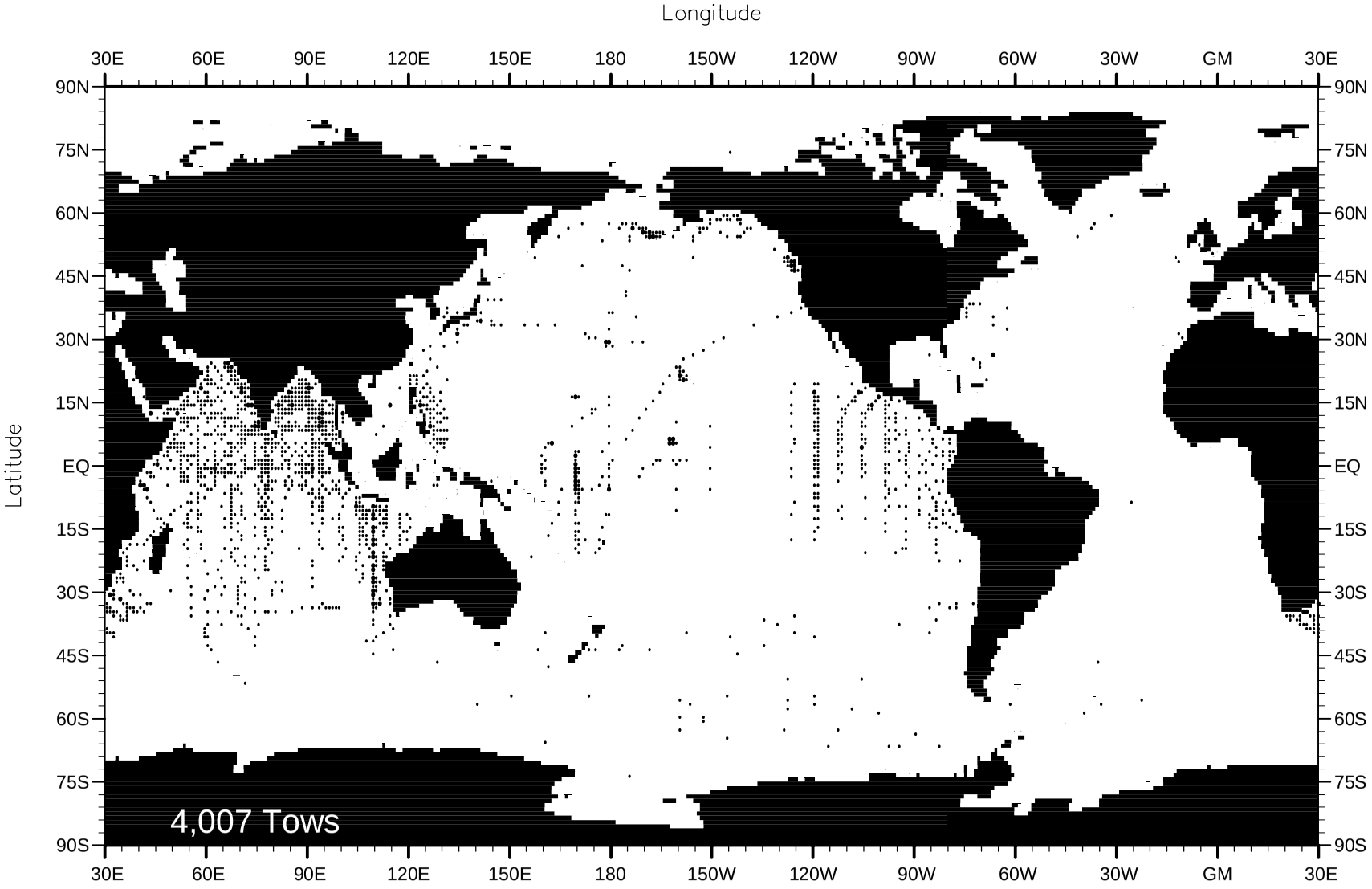

Fig. D5. Annual distribution of all cephalopod observations.

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Table D6: Taxonomic composition of all Polychaetes

Number of Tows: **10,264**
Number of Observations: 18,962
Number of Taxonomic Descriptions: **72**

Top 30 Taxonomic Descriptions

Rank	#_OBS	ITIS-TSN	DESCRIPTION
1	14,220	64358	*Polychaeta*
2	2,514	65459	*Tomopteridae*
3	1,169	66781	*Spionidae*
4	277	65460	*Tomopteris*
5	159	65462	*Tomopteris septentrionalis*
6	72	65452	*Typholoscolex meulleri*
7	59	67042	*Magelonidae*
8	56	64397	*Polynoidae*
9	26	65464	*Tomopteris elegans*
10	26	65450	*Sagitella kowalewskii*
11	25	67644	*Oweniidae*
12	24	65465	*Tomopteris helgolandica*
13	24	65228	*Phyllodocidae*
14	22	65449	*Sagitella*
15	18	64359	*Aphroditidae*
16	16	67706	*Pectinaria*
17	14	65423	*Pelagobia longicirrata*
18	11	65463	*Tomopteris pacifica*
19	9	67096	*Chaetopterus*
20	9	65803	*Syllides*
21	7	66011	*Nephtys*
22	7	65588	*Autolytus*
23	7	-7282	*Typhloscolex mulleri*
24	6	65412	*Krohnia*
25	6	65407	*Vanadis*
26	5	67899	*Terebellidae*
27	5	67310	*Poeobius meseres*
28	5	65420	*Lopadorrhynchidae*
29	5	65399	*Alciopidae*
30	4	65424	*Lepadorhynchus*
...			

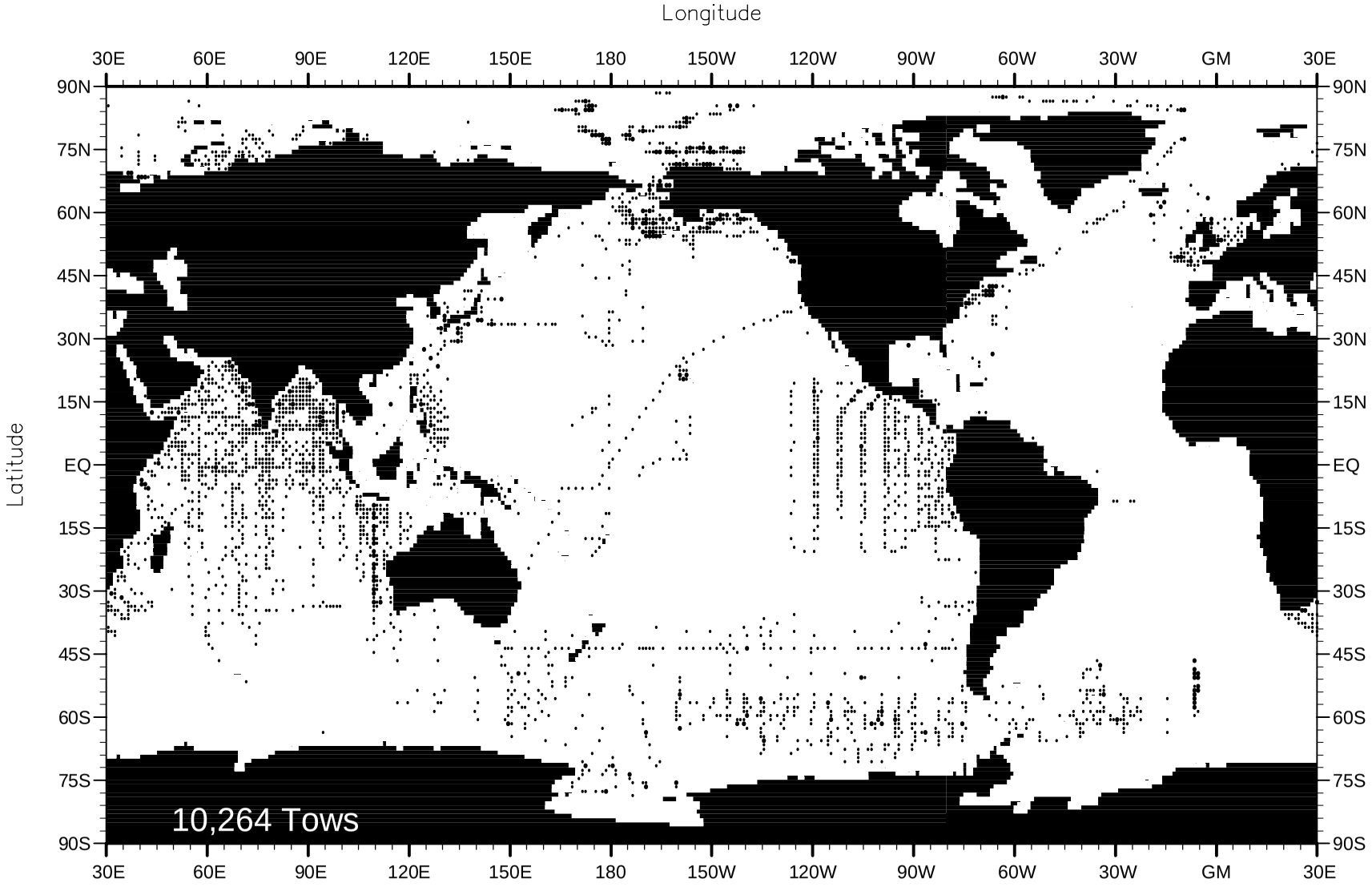

Fig. D6. Annual distribution of all polychaete observations.

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Table D7: Taxonomic composition of all Ostracods

Number of Tows: **8,820**
Number of Observations: 11,204
Number of Taxonomic Descriptions: **24**

Top 30 Taxonomic Descriptions

Rank	#_OBS	ITIS-TSN	DESCRIPTION
1	10,158	84195	*Ostracoda*
2	451	84325	*Conchoecia*
3	256	84196	*Myodocopina*
4	102	-7914	*Ostracoda-halocypridina*
5	89	84331	*Conchoecia borealis*
6	23	84329	*Conchoecia elegans*
7	21	84338	*Halocypris globosa*
8	19	84323	*Halocyprididae*
9	18	-7359	*Conchoecia serrulata*
10	16	84332	*Conchoecia borealis maxima*
11	12	-7833	*Conchoecia maxima*
12	10	84326	*Conchoecia alata*
13	5	84327	*Conchoecia alata minor*
14	5	-7906	*Conchoecinae*
15	5	-7283	*Conchoecia imbricata*
16	3	84371	*Philomedes brenda*
17	2	-7908	*Heterorhabdus tenuis*
18	2	-7902	*Archiconchoecia cucullata*
19	2	-7284	*Conchoecia ametra*
20	1	84662	*Cytheridae*
21	1	84198	*Cypridinidae*
22	1	-7905	*Conchoecia macroprocera*
23	1	-7904	*Conchoecia arcuata*
24	1	-7903	*Bathyconchoecia*

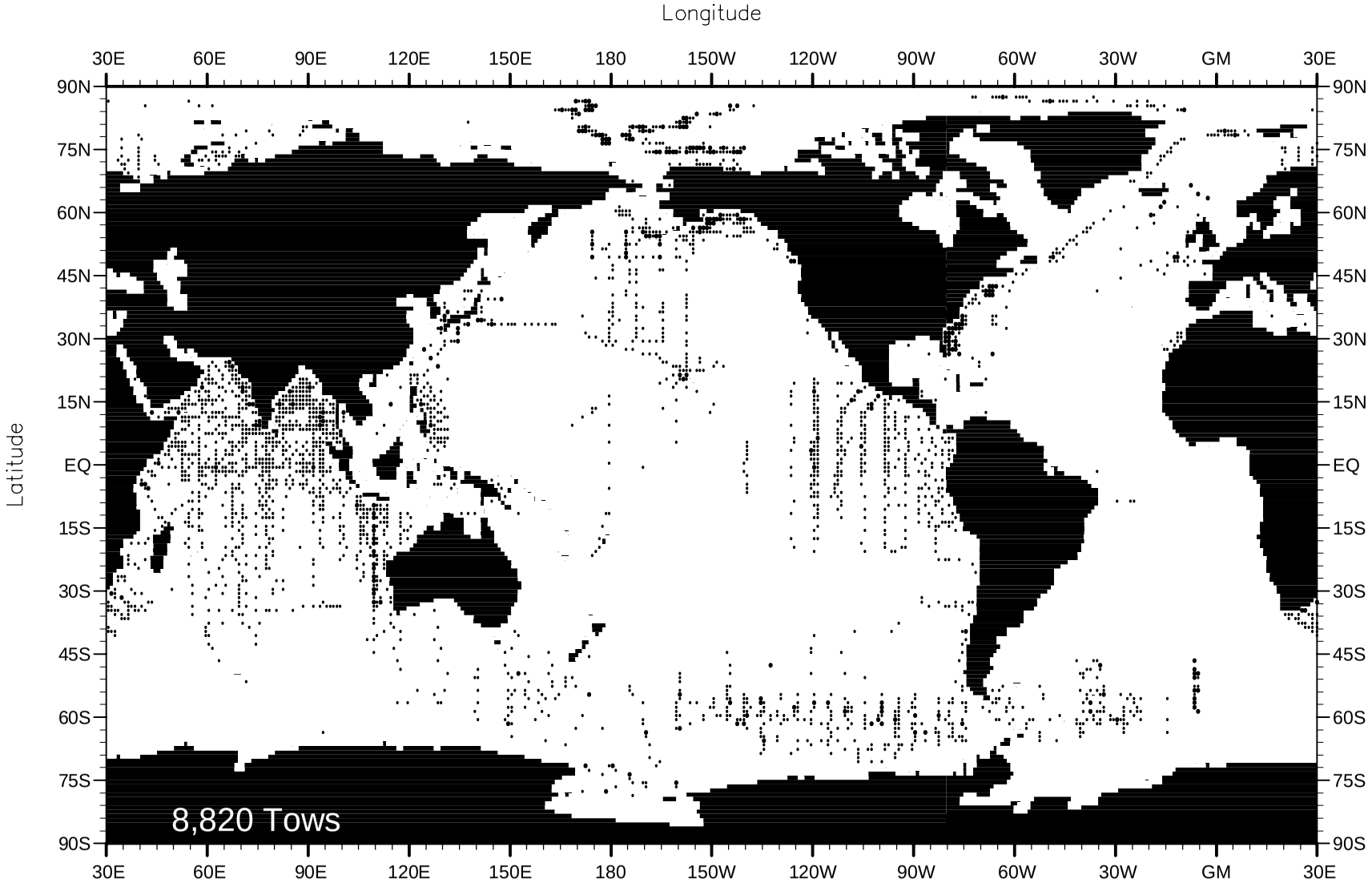

Fig. D7. Annual distribution of all ostracod observations.

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Table D8: Taxonomic composition of all Copepods

Number of Tows: **31,961**
Number of Observations: 411,951
Number of Taxonomic Descriptions: 600

Top 30 Taxonomic Descriptions

Rank	#_OBS	ITIS-TSN	DESCRIPTION
1	58,691	85272	*Calanus finmarchicus*
2	37,055	85257	*Copepoda*
3	21,684	85369	*Pseudocalanus*
4	20,942	88805	*Oithona similis*
5	17,915	85371	*Pseudocalanus minutus*
6	16,670	85746	*Metridia longa*
7	15,514	86087	*Acartia longiremis*
8	14,828	88802	*Oithona*
9	13,818	85545	*Pareuchaeta norvegica*
10	12,008	85877	*Temora longicornis*
11	11,265	85741	*Metridia lucens*
12	9,805	85766	*Centropages hamatus*
13	9,653	85263	*Calanus*
14	8,650	85370	*Pseudocalanus elongatus*
15	7,708	85267	*Calanus glacialis*
16	7,163	88541	*Oncaea borealis*
17	5,765	85756	*Pleuromamma robusta*
18	5,612	86084	*Acartia*
19	5,260	85767	*Centropages typicus*
20	4,819	86209	*Microsetella norvegica*
21	3,802	88540	*Oncaea*
22	3,580	85734	*Metridia*
23	3,479	85367	*Microcalanus pusillus*
24	3,364	-6012	*Paracalanus + Pseudocalanus*
25	3,304	88824	*Oithona atlantica*
26	3,096	-7938	*Ctenocalanus citer*
27	2,970	85322	*Paracalanus*
28	2,670	85276	*Calanus helgolandicus*
29	2,296	88806	*Oithona spinirostris*
30	2,232	-7940	*Oncaea curvata*
...			

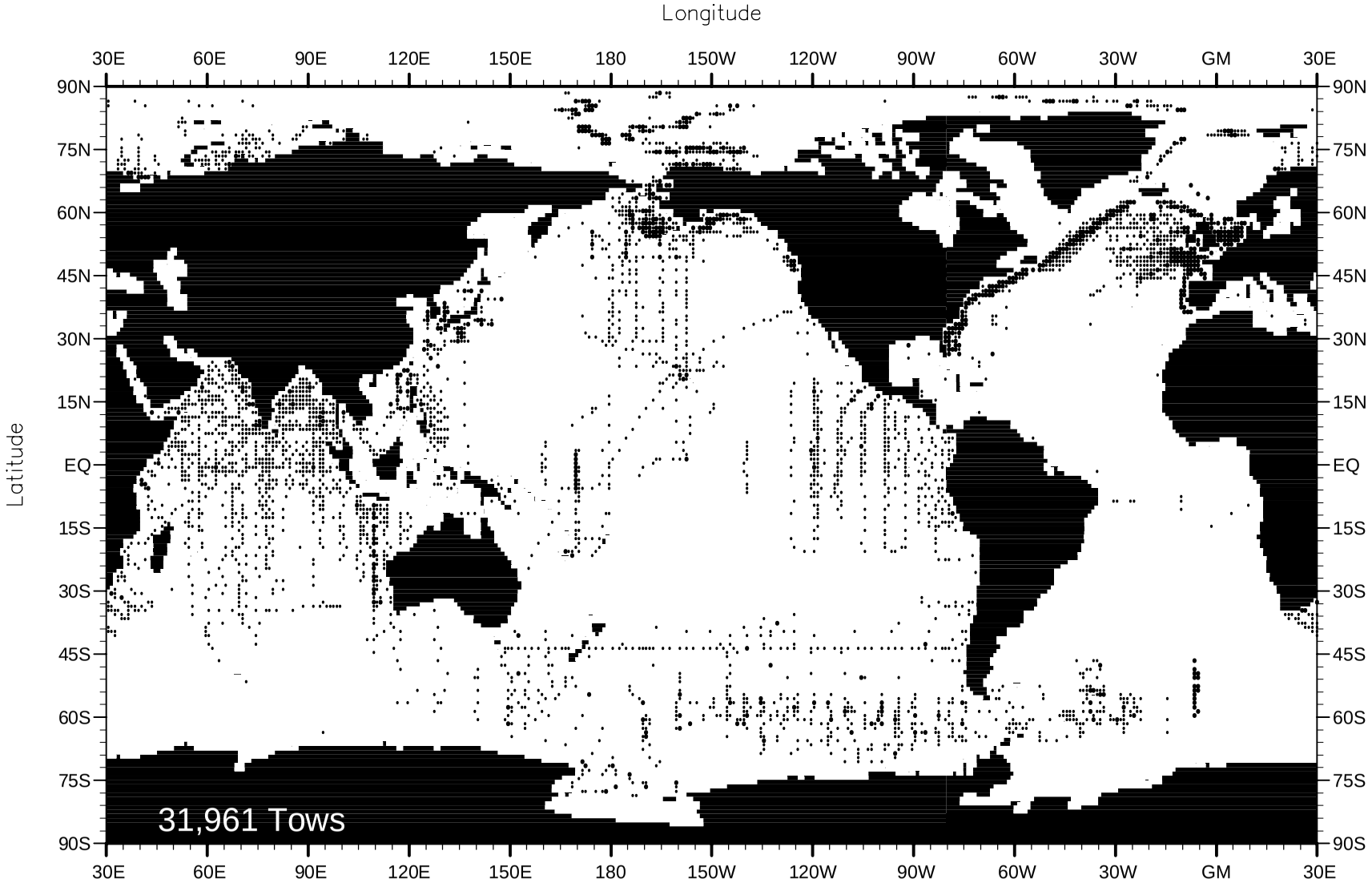

Fig. D8. Annual distribution of all copepod observations.

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Table D9: Taxonomic composition of all Mysid

Number of Tows: **4,353**
Number of Observations: 5,163
Number of Taxonomic Descriptions: **39**

Top 30 Taxonomic Descriptions

Rank	#_OBS	ITIS-TSN	DESCRIPTION
1	3,491	89807	*Mysidacea*
2	582	89856	*Mysidae*
3	518	89855	*Mysida*
4	172	90139	*Mysidopsis bigelowi*
5	56	90041	*Mysis*
6	50	90061	*Neomysis rayii*
7	38	90099	*Pseudomma truncatum*
8	29	90044	*Mysis oculata*
9	29	90043	*Mysis littoralis*
10	22	89871	*Acanthomysis stelleri*
11	21	89867	*Acanthomysis pseudomacropsis*
12	21	89861	*Acanthomysis dybowskii*
13	17	89849	*Eucopia*
14	16	90185	*Erythrops erythrophthalma*
15	14	331309	*Erythropsis*
16	10	90054	*Neomysis*
17	9	90138	*Mysidopsis*
18	9	90045	*Mysis relicta*
19	7	90029	*Meterythrops robusta*
20	6	89922	*Boreomysis*
21	6	89811	*Gnathophausia gigas*
22	5	89925	*Boreomysis kincaidi*
23	4	90184	*Erythrops*
24	4	90079	*Parerythrops obesa*
25	4	89865	*Acanthomysis nephrophthalma*
26	4	89857	*Acanthomysis*
27	3	89808	*Lophogastrida*
28	2	90202	*Promysis atlantica*
29	2	90056	*Neomysis czerniawskii*
30	2	90017	*Holmesiella anomala*
...			

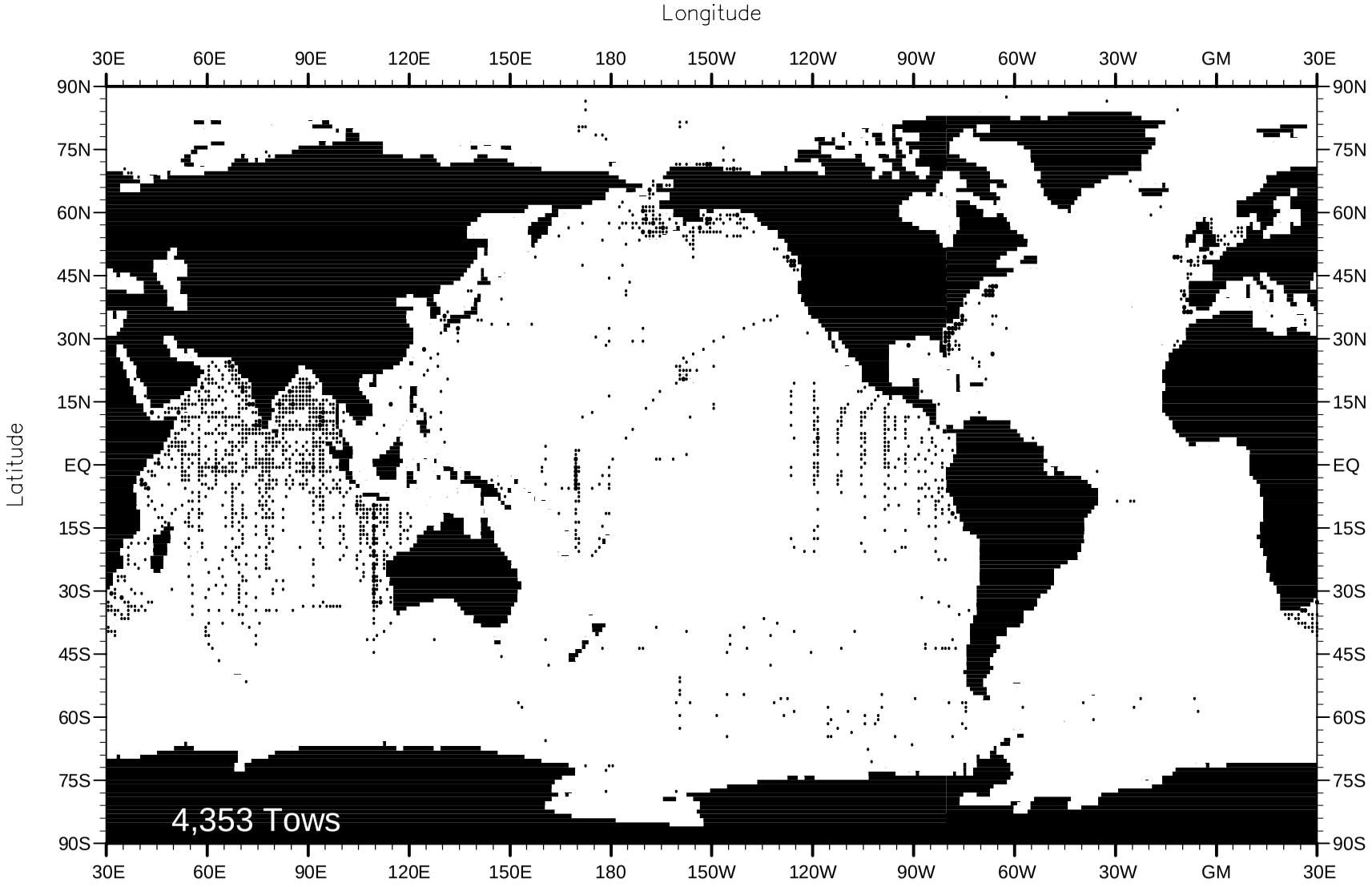

Fig. D9. Annual distribution of all mysid observations.

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Table D10: Taxonomic composition of all Amphipods

Number of Tows: **14,900**
Number of Observations: 21,607
Number of Taxonomic Descriptions: **220**

Top 30 Taxonomic Descriptions

Rank	#_OBS	ITIS-TSN	DESCRIPTION
1	13,538	93294	*Amphipoda*
2	2,200	95107	*Hyperiidea*
3	988	95152	*Parathemisto pacifica*
4	618	93295	*Gammaridea*
5	531	95172	*Phronimidae*
6	447	95148	*Parathemisto*
7	444	95151	*Parathemisto libellula*
8	228	95109	*Hyperia*
9	207	94281	*Cyphocaris challengeri*
10	139	95188	*Primno macropa*
11	116	206587	*Themisto abyssorum*
12	108	94573	*Westwoodilla caecula*
13	103	95153	*Parathemisto japonica*
14	86	95187	*Primno*
15	80	95154	*Parathemisto abyssorum*
16	78	95167	*Themisto*
17	77	-7580	*Hypereidae*
18	72	94280	*Cyphocaris*
19	67	95112	*Hyperia medusarum*
20	67	95110	*Hyperia galba*
21	66	94903	*Stenothoidae*
22	61	95108	*Hyperiidae*
23	54	94694	*Paraphoxus alderi*
24	40	95135	*Hyperoche medusarum*
25	40	93538	*Apherusa glacialis*
26	34	95355	*Vibilia*
27	33	95262	*Platyscelidae*
28	32	95302	*Scinidae*
29	27	95303	*Scina*
30	27	94489	*Oedicerotidae*
...			

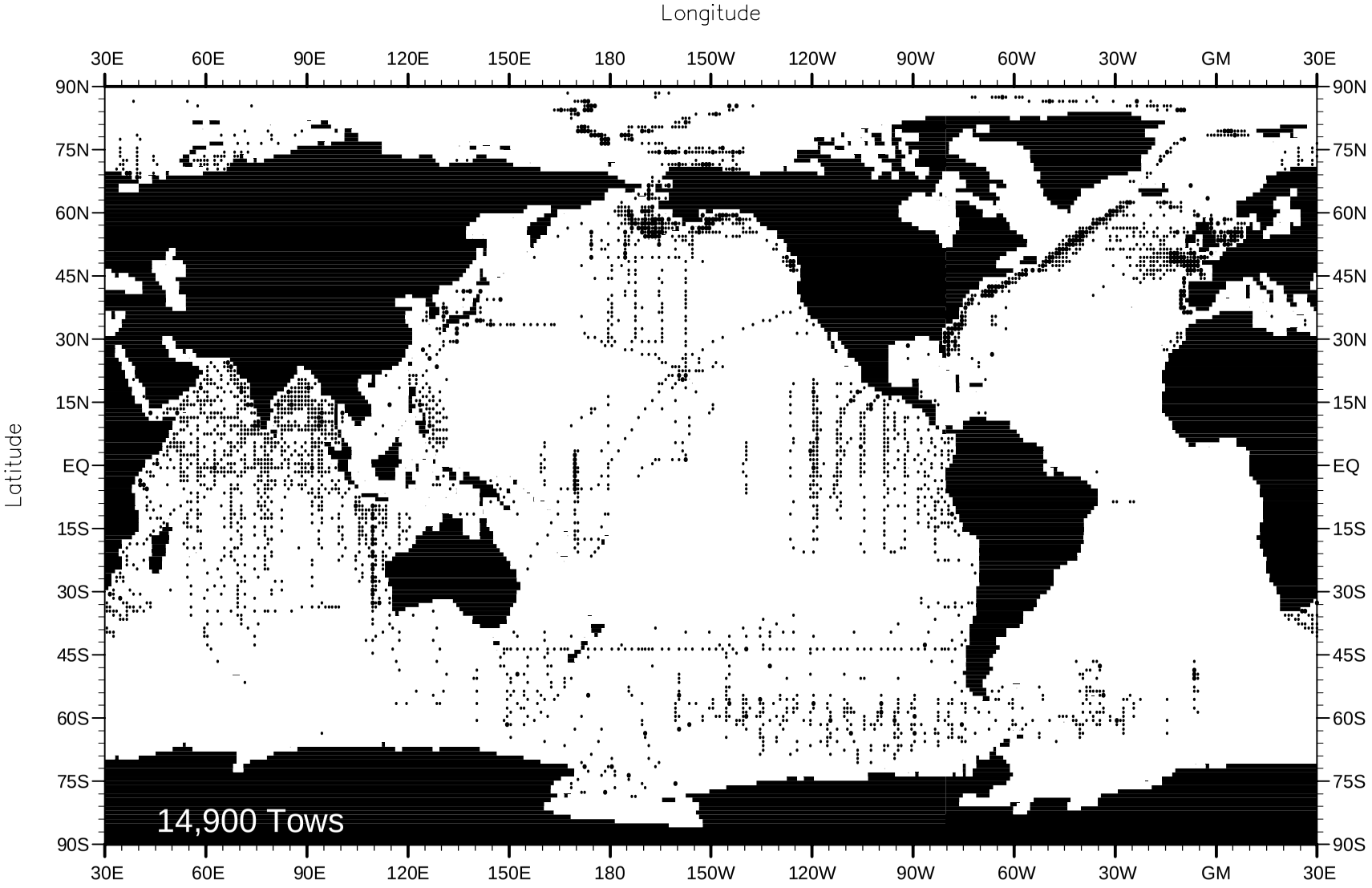

Fig. D10. Annual distribution of all amphipod observations.

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Table D11: Taxonomic composition of all Euphausiids

Number of Tows: **16,522**
Number of Observations: 29,451
Number of Taxonomic Descriptions: **33**

Top 30 Taxonomic Descriptions

Rank	#_OBS	ITIS-TSN	DESCRIPTION
1	16,710	95496	*Euphausiacea*
2	2,850	95571	*Thysanoessa*
3	2,804	95500	*Euphausiidae*
4	1,709	95573	*Thysanoessa inermis*
5	1,000	95577	*Thysanoessa raschi*
6	808	95578	*Thysanoessa spinifera*
7	789	95502	*Euphausia pacifica*
8	789	95501	*Euphausia*
9	676	95576	*Thysanoessa longipes*
10	274	95570	*Tessarabrachion oculatum*
11	241	95575	*Thysanoessa longicaudata*
12	139	95540	*Nematoscelis difficilis*
13	139	95536	*Nematobrachion flexipes*
14	135	95574	*Thysanoessa inspinata*
15	104	95558	*Stylocheiron maximum*
16	59	95520	*Euphausia crystallorophias*
17	47	95539	*Nematoscelis*
18	43	95556	*Stylocheiron*
19	43	95534	*Meganyctiphanes norvegica*
20	21	95533	*Meganyctiphanes*
21	9	95561	*Stylocheiron abbreviatum*
22	8	95507	*Euphausia tenera*
23	7	95505	*Euphausia hemigibba*
24	5	95521	*Euphausia similis*
25	5	95513	*Euphausia recurva*
26	5	95506	*Euphausia krohni*
27	4	95582	*Thysanopoda*
28	4	95579	*Thysanoessa parva*
29	2	95512	*Euphausia diomedeae*
30	2	95509	*Euphausia mutica*
...			

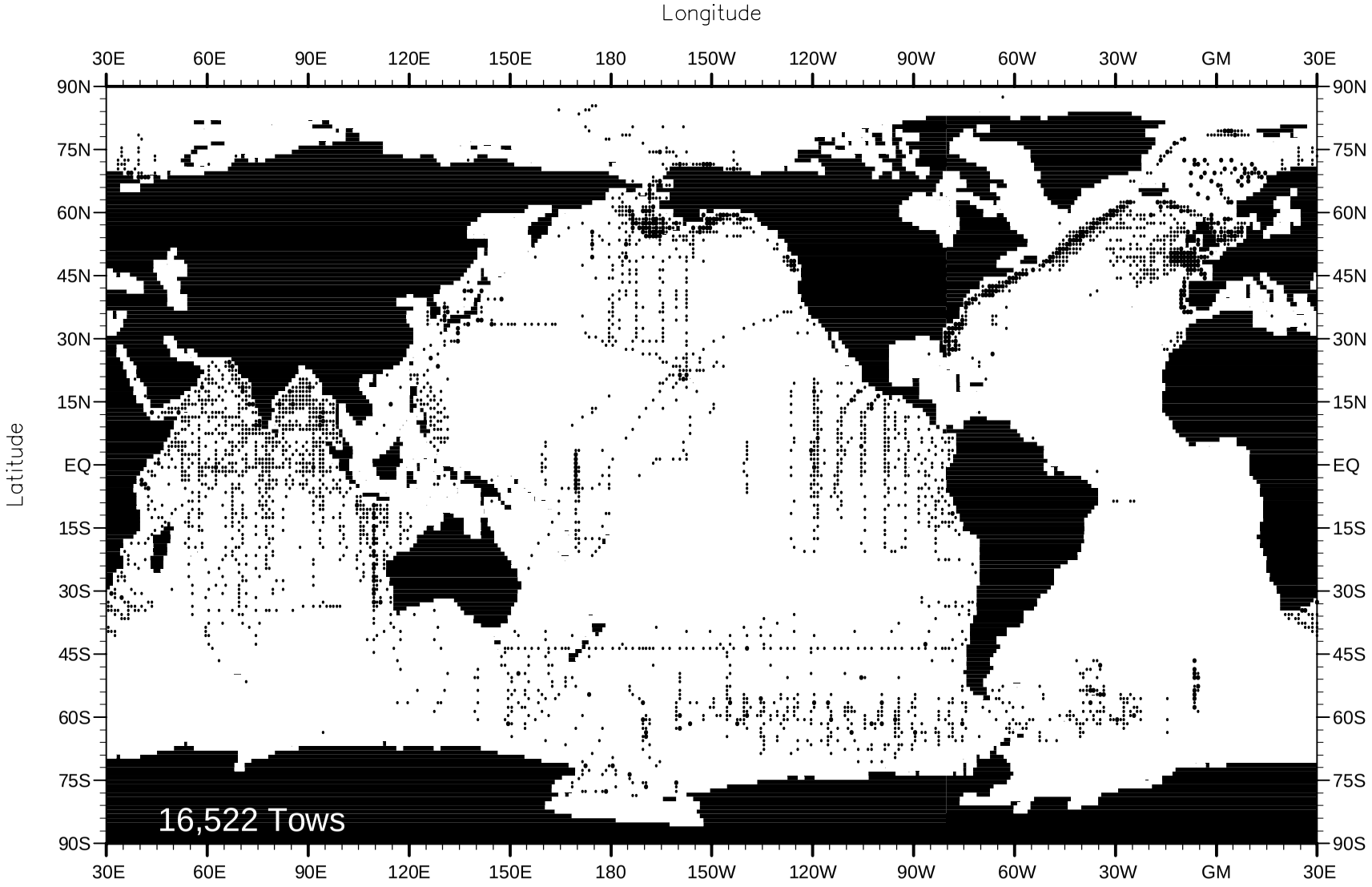

Fig. D11. Annual distribution of all euphausiid observations.

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Table D12: Taxonomic composition of all Decapods

Number of Tows: **14,343**
Number of Observations: 47,595
Number of Taxonomic Descriptions: **153**

Top 30 Taxonomic Descriptions

Rank	#_OBS	ITIS-TSN	DESCRIPTION
1	14,059	95599	*Decapoda*
2	3,390	98276	*Brachyura (true crabs)*
3	2,847	95887	*Sergestidae*
4	2,744	97646	*Palinuridae*
5	2,626	97698	*Anomura (hermit crabs)*
6	2,152	97774	*Paguridae*
7	2,136	96746	*Hippolytidae*
8	1,601	-5007	*"Shrimp"*
9	1,321	-5008	*"Crabs"*
10	1,068	96106	*Caridea*
11	1,064	98417	*Majidae*
12	893	96967	*Pandalus borealis*
13	869	98671	*Cancer*
14	775	98429	*Chionoecetes bairdi*
15	754	97106	*Crangonidae*
16	600	98428	*Chionoecetes opilio*
17	550	98427	*Chionoecetes*
18	533	331542	*Luciferidae*
19	423	97775	*Pagurus*
20	409	95601	*Penaeoidea*
21	386	98421	*Hyas*
22	359	95915	*Lucifer*
23	357	97935	*Paralithodes camtschaticus*
24	329	96976	*Pandalus montagui tridens*
25	316	95602	*Penaeidae*
26	293	95916	*Lucifer faxoni*
27	263	96968	*Pandalus goniurus*
28	256	98964	*Pinnotheridae*
29	226	96984	*Pandalus stenolepis*
30	224	98670	*Cancridae*
...			

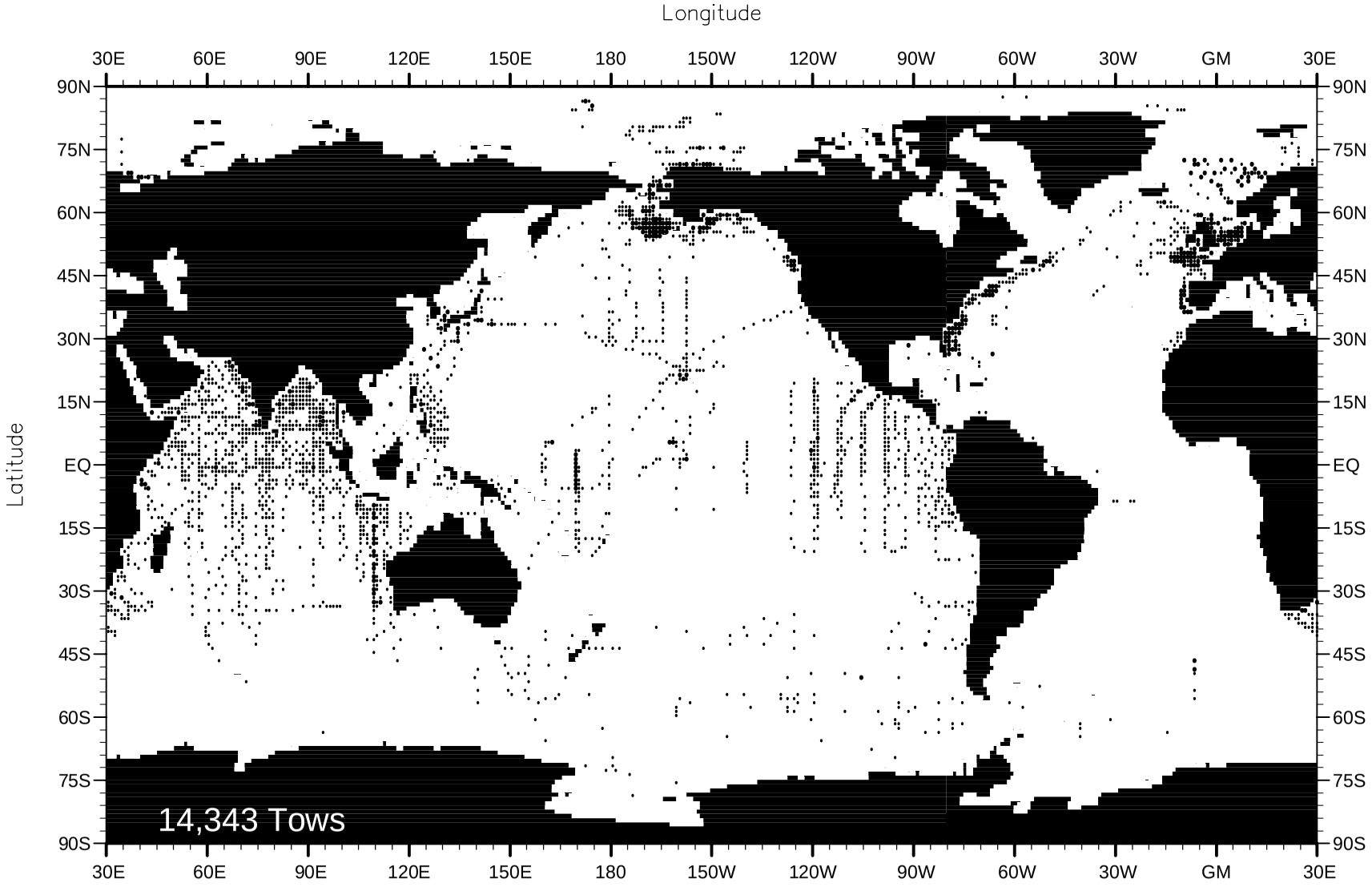

Fig. D12. Annual distribution of all decapod observations.

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Table D13: Taxonomic composition of all Chaetognaths

Number of Tows: **23,740**
Number of Observations: 74,014
Number of taxonomic Descriptions: **42**

Top 30 Taxonomic Descriptions

Rank	#_OBS	ITIS-TSN	DESCRIPTION
1	22,108	158650	*Chaetognatha*
2	5,150	158784	*Parasagitta elegans*
3	4,635	158727	*Sagitta*
4	2,613	158776	*Mesosagattia minima*
5	2,608	158773	*Flaccisagitta enflata*
6	2,486	158835	*Zonosagitta nagae*
7	2,357	158749	*Aidanosagitta regularis*
8	2,311	158813	*Serratosagitta pacifica*
9	2,180	158815	*Serratosagitta pseudoserratodentata*
10	2,056	158841	*Pterosagitta draco*
11	1,878	158733	*Aidanosagitta neglecta*
12	1,874	158770	*Flaccisagitta hexaptera*
13	1,855	158850	*Krohnitta pacifica*
14	1,855	158761	*Ferosagitta ferox*
15	1,805	158800	*Pseudosagitta lyra*
16	1,805	158758	*Ferosagitta robusta*
17	1,745	158849	*Krohnitta subtilis*
18	1,668	158691	*Eukrohnia hamata*
19	1,652	158828	*Zonosagitta bedoti*
20	1,508	158728	*Sagitta bipunctata*
21	1,416	158779	*Mesosagattia decipiens*
22	1,099	158838	*Sagitta pulchra (syn)*
23	1,052	158655	*Sagittoidea*
24	1,002	331693	*Aidanosagitta crassa naikaiensis*
25	855	158781	*Mesosagattia neodecipiens*
26	638	158738	*Aidanosagitta crassa*
27	572	158806	*Pseudosagitta scrippsae*
28	528	158823	*Solidosagatta zetesios*
29	214	158690	*Eukrohnia*
30	196	-7598	*Sagitta elegans arctica*
...			

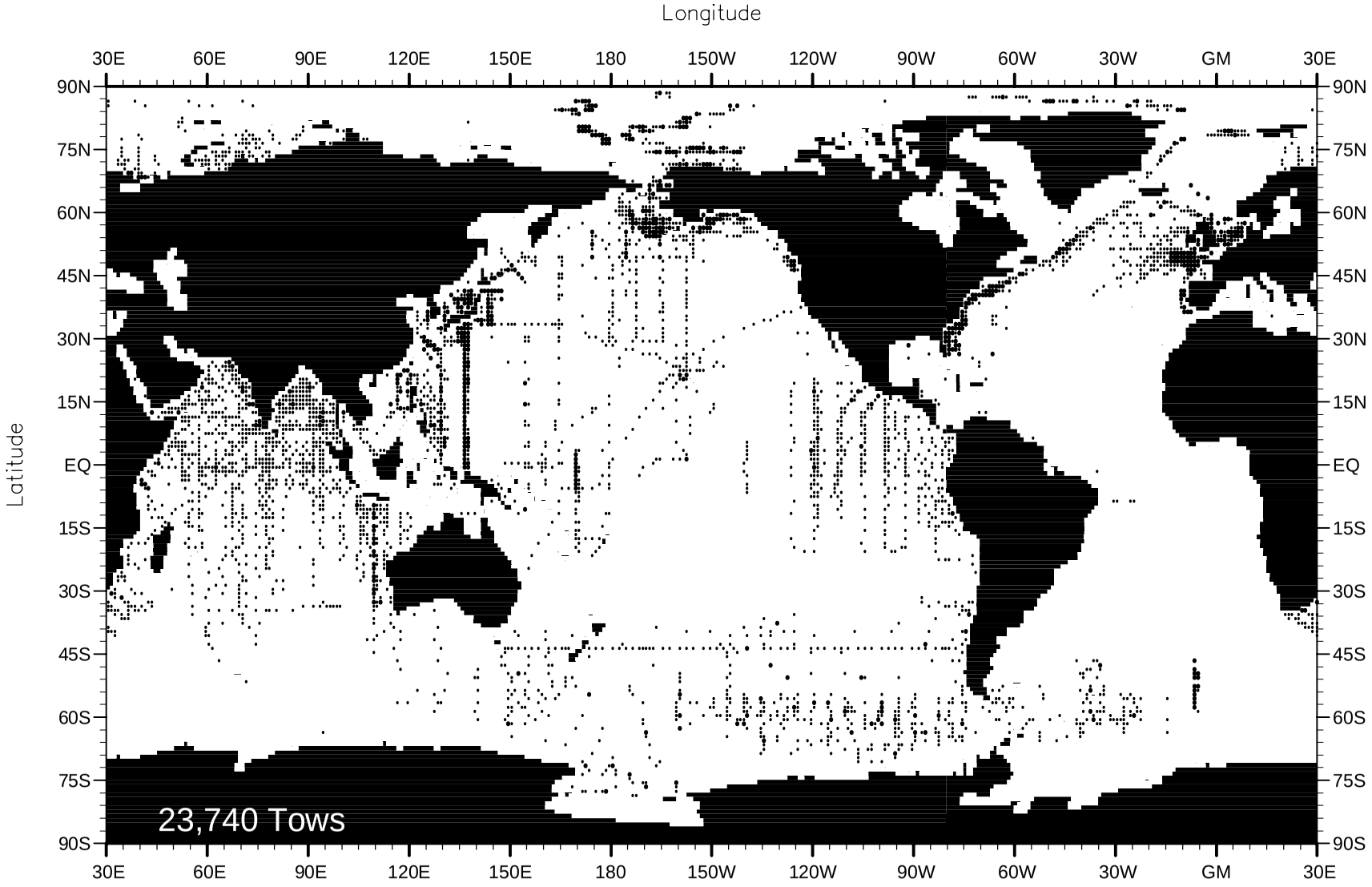

Fig. D13. Annual distribution of all chaetognath observations.

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Table D14: Taxonomic composition of all Tunicates

Number of Tows: **17.629**
Number of Observations: 43,082
Number of Taxonomic Descriptions: **48**

Top 30 Taxonomic Descriptions

Rank	#_OBS	ITIS-TSN	DESCRIPTION
1	10,011	159664	*Appendicularia (aka "larvacea")*
2	5,118	203347	*Tunicata*
3	3,144	159675	*Fritillaria borealis*
4	2,785	159668	*Oikopleura*
5	2,405	-6000	*Salps + Doliolids*
6	2,389	159634	*Pyrosomidae*
7	2,376	159174	*Ascidia*
8	2,343	159681	*Branchiostoma*
9	2,185	159632	*Thaliacea*
10	1,941	159666	*Copelata*
11	1,622	159674	*Fritillaria*
12	1,339	159638	*Doliolidae*
13	1,329	159671	*Oikopleura vanhoeffeni*
14	1,222	159645	*Salpidae*
15	512	159670	*Oikopleura labradoriensis*
16	496	159679	*Cephalochordata (aka "leptocardia")*
17	469	159635	*Pyrosoma*
18	369	159669	*Oikopleura dioica*
19	224	159643	*Salpida*
20	210	159639	*Doliolum*
21	86	158854	*Ascidiacea*
22	83	159673	*Fritillaridae*
23	75	159637	*Doliolida*
24	59	-7337	*Thalia democratica v.orientalis*
25	51	159633	*Pyrosomida*
26	45	159652	*Salpa*
27	34	159653	*Salpa fusiformis*
28	33	159659	*Thalia democratica*
29	31	159667	*Oikopleuridae*
30	19	159642	*Doliolum denticulatum*
...			

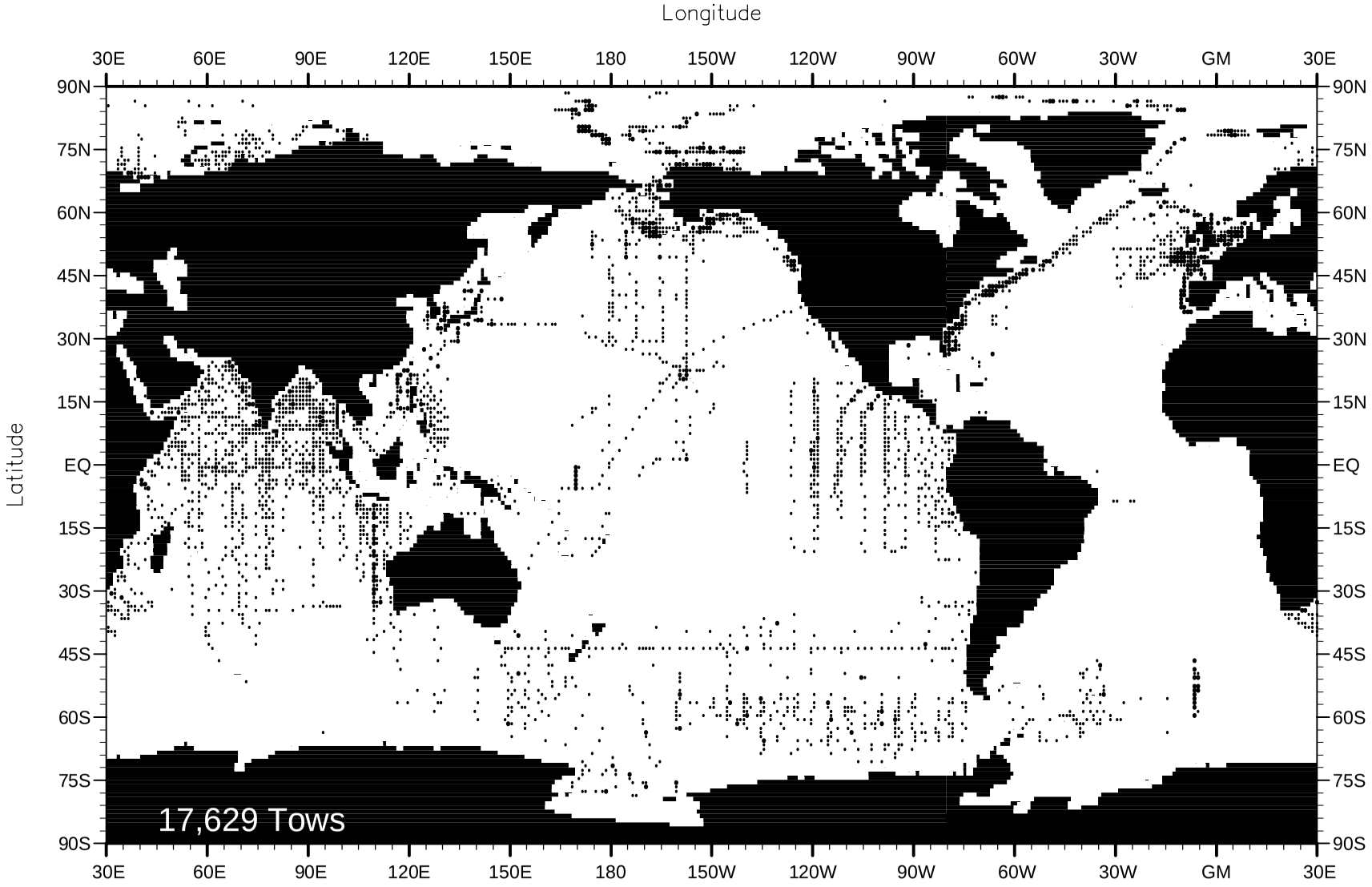

Fig. D14. Annual distribution of all tunicate observations.

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Table D15: Taxonomic composition of all Larval Fish

Number of Tows: **49,468**
Number of Observations: 126,523
Number of Taxonomic Descriptions: **539**

Top 30 Taxonomic Descriptions

Rank	#_OBS	ITIS-TSN	DESCRIPTION
1	87,742	-5004	*"Fish"*
2	1,962	161105	*Teleostei*
3	1,069	172859	*Pleuronectidae*
4	1,009	167196	*Cottidae*
5	981	164722	*Theragra chalcogramma*
6	857	171672	*Ammodytes hexapterus*
7	842	162028	*Osmeridae*
8	727	167109	*Hexagrammos*
9	676	172875	*Hippoglossoides elassodon*
10	670	162035	*Mallotus villosus*
11	661	167276	*Hemilepidotus*
12	611	171746	*Gobiidae*
13	606	161731	*Brevoortia*
14	564	170945	*Bathymasteridae*
15	562	167483	*Cyclopteridae*
16	533	161826	*Engraulidae*
17	481	161700	*Clupeidae*
18	462	159783	*Gnathostomata*
19	442	172916	*Pleuronectes bilineata*
20	442	161839	*Anchoa mitchelli*
21	436	172928	*Psettichthys melanostictus*
22	417	172714	*Bothidae*
23	410	173061	*Symphurus*
24	399	164701	*Gadidae*
25	359	167311	*Myoxocephalus*
26	357	162664	*Stenobrachius leucopsarus*
27	353	167113	*Hexagrammos stelleri*
28	345	166705	*Sebastes*
29	340	169241	*Cynoscion regalis*
30	337	169237	*Sciaenidae*
...			

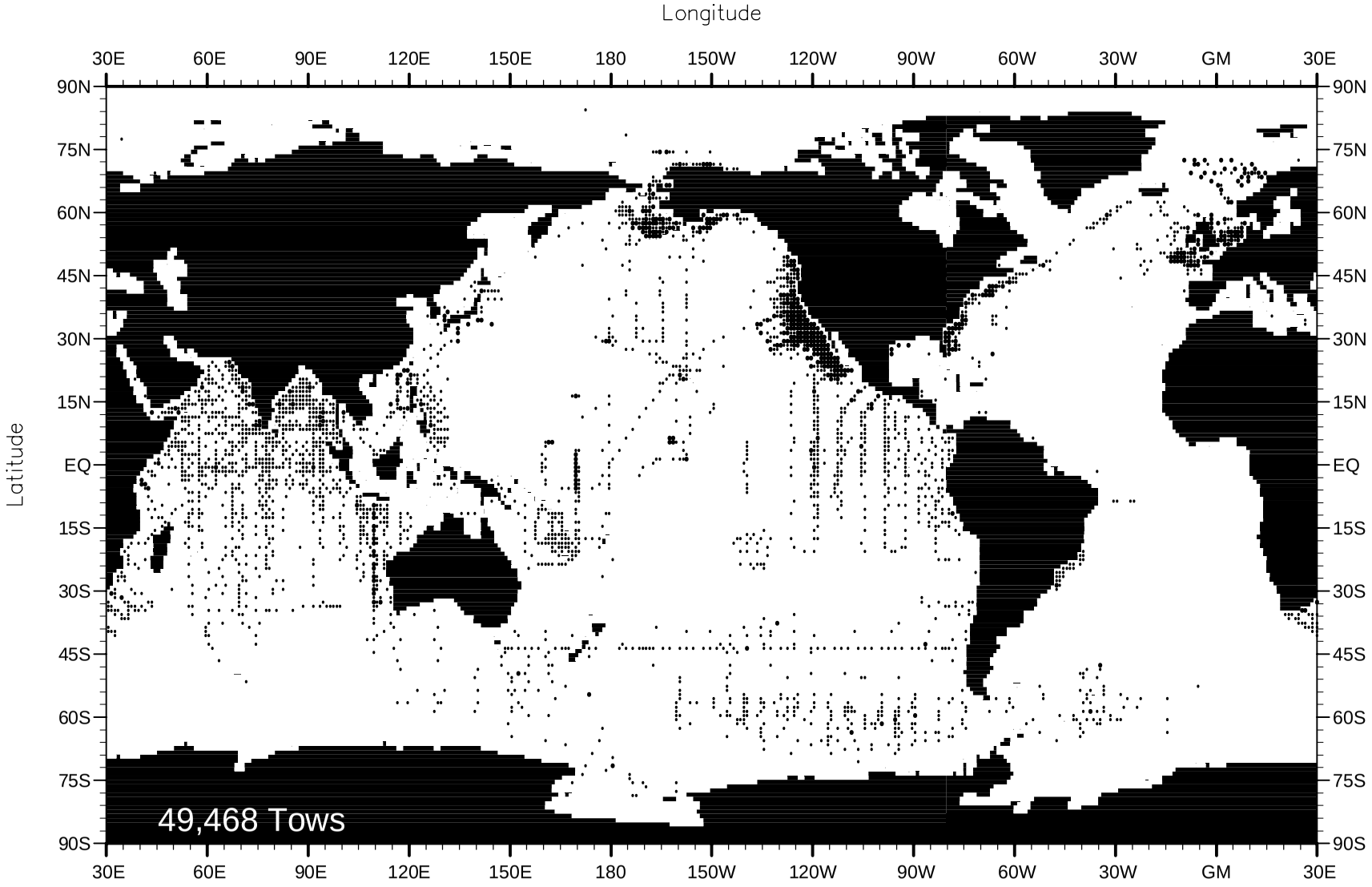

Fig. D15. Annual distribution of all larval fish observations.

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Table E1: Composition of all plankton biomass

Number of Tows: **98,612**
Number of Observations: 123,070

Rank	#_OBS	ITIS-TSN	DESCRIPTION
1	71,713	-201	*Total Displacement Volume (ml)*
2	10,700	-202	*Total Settled Volume (ml)*
3	38,863	-203	*Total Wet Mass (mg)*
4	1,534	-204	*Total Dry Mass (mg)*
5	260	-205	*Total Ash-free Dry Mass (mg)*

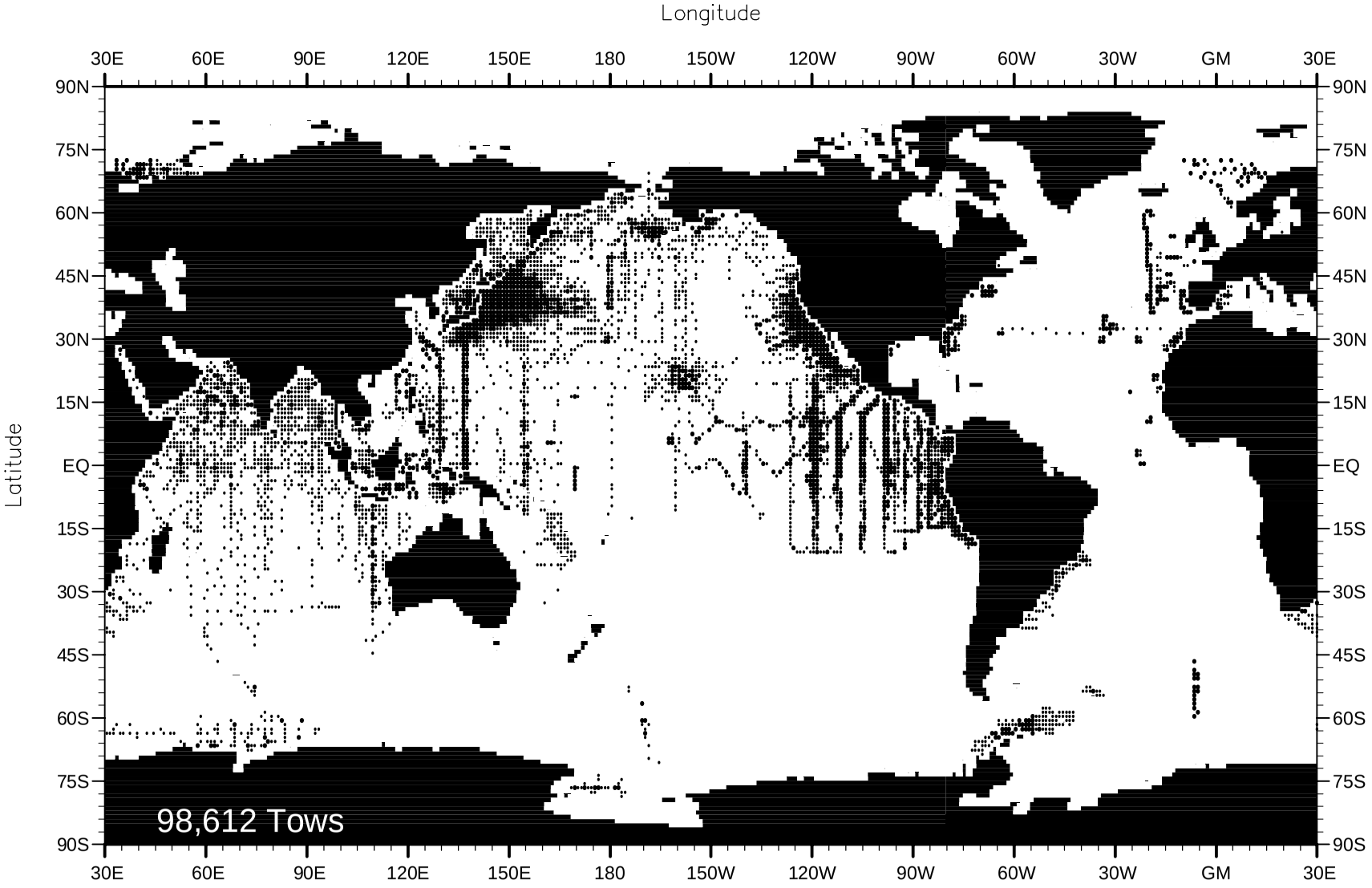

Fig. E1. Annual distribution of all plankton biomass observations.

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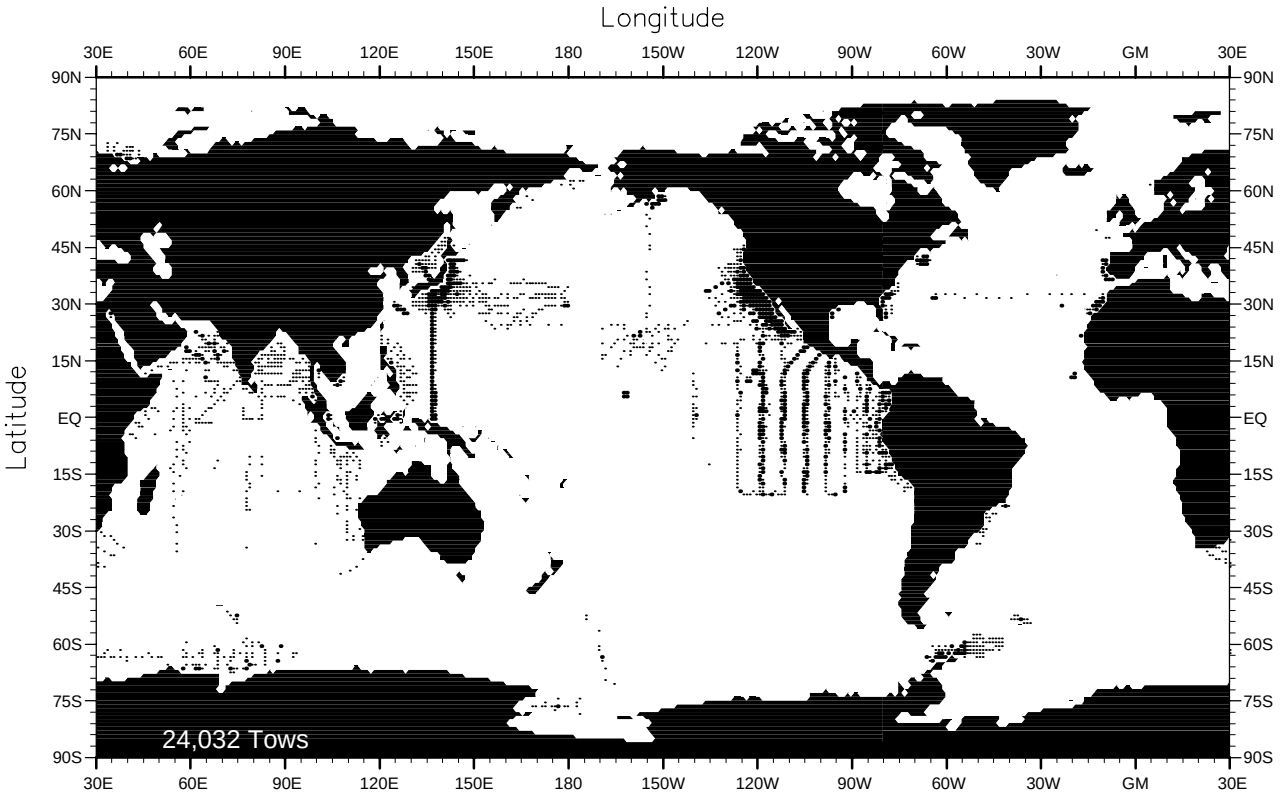

Fig. E1.1 Winter (Jan.-Mar.) distribution of all plankton biomass observations.

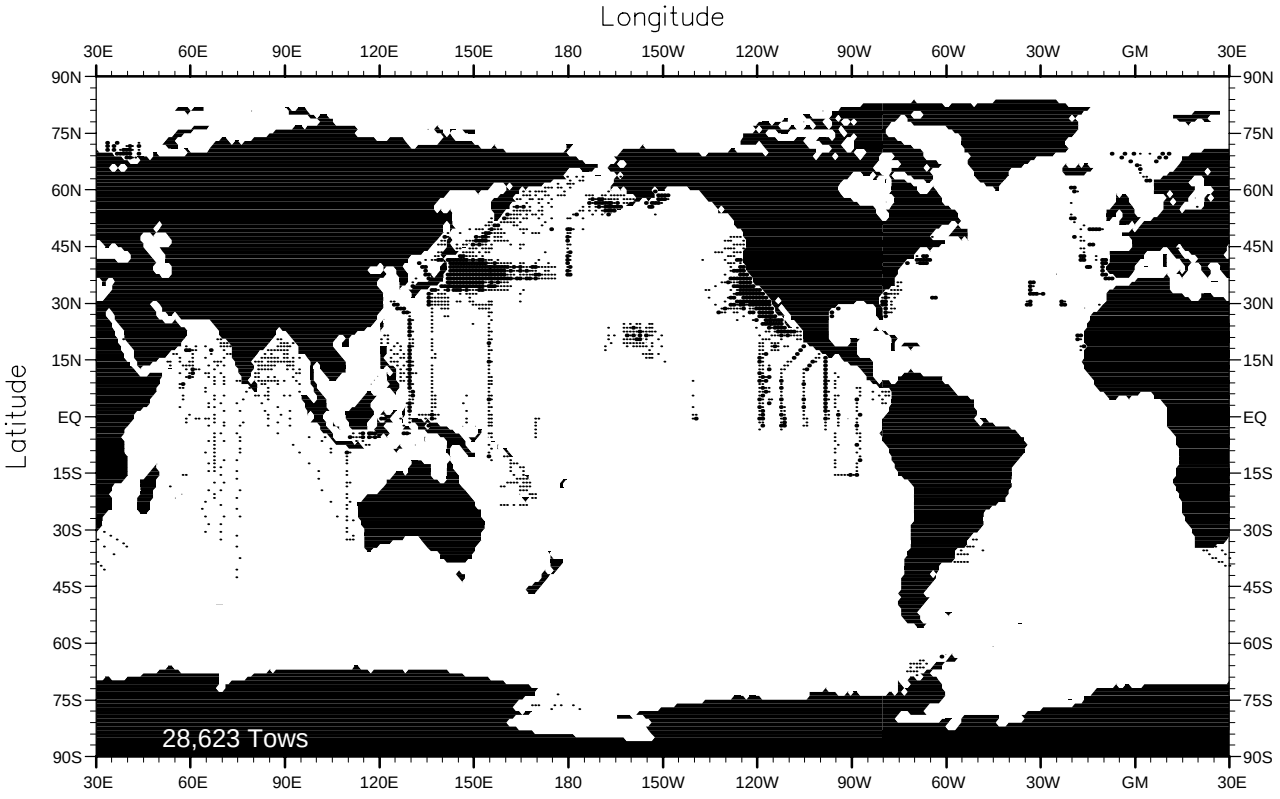

Fig. E1.2 Spring (Apr.-Jun.) distribution of all plankton biomass observations.

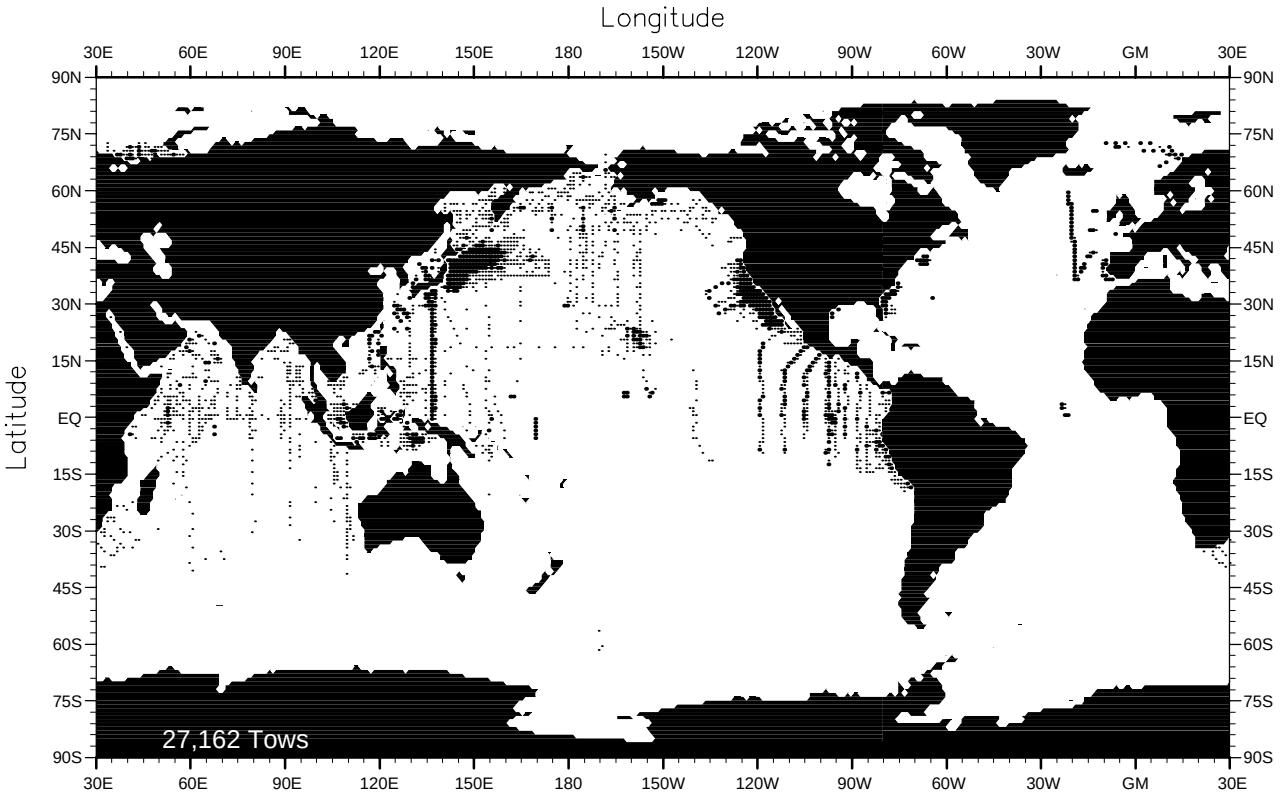

Fig. E1.3 Summer (Jul.-Sep.) distribution of all plankton biomass observations.

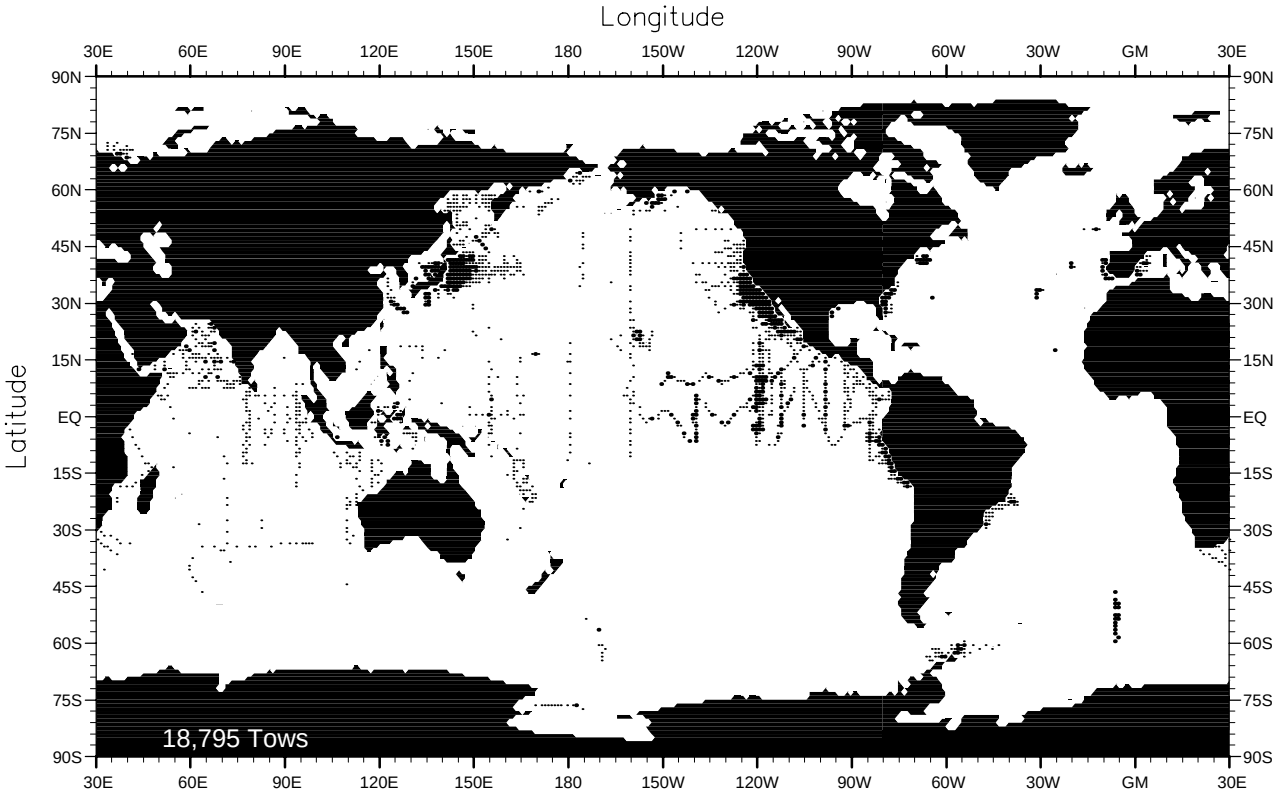

Fig. E1.4 Fall (Oct.-Dec.) distribution of all plankton biomass observations.

APPENDIX F

In each unanalyzed mean field figure in Appendix F, the size of the graphical circle represents the annual mean value for that one-degree latitude-longitude square.

APPENDIX F

In each unanalyzed mean field figure in Appendix F, the size of the graphical circle represents the annual mean value for that one-degree latitude-longitude square.

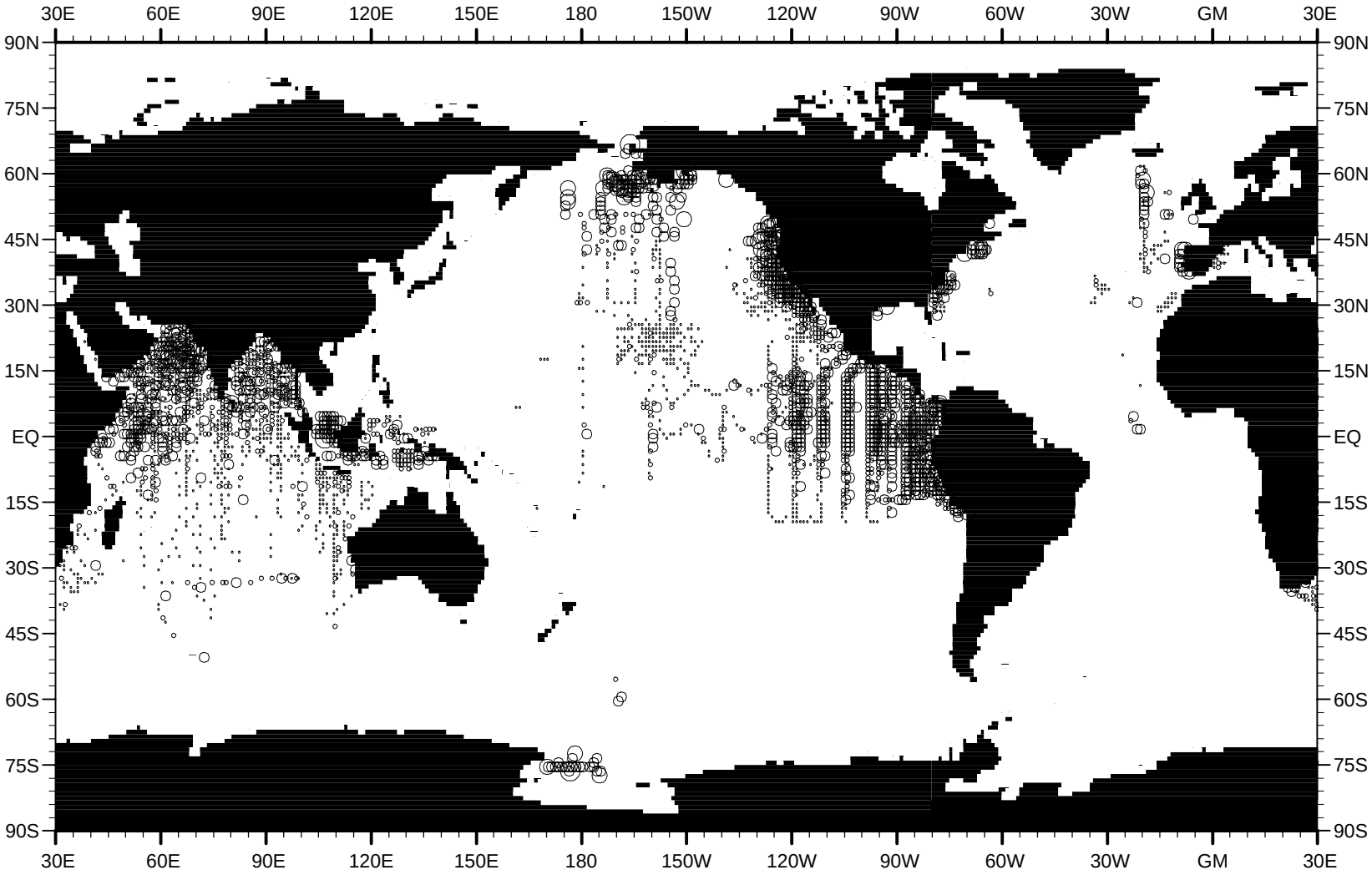

Fig. F1. Annual mean zooplankton displacement volume (ml/m3)

[Sampling depth interval: 0 - 200 meters; Sampling Mesh: 150 - 500 µm]

<= 0.05= ◦ 0.05 - 0.10= ○ 0.10 - 0.50= ◯ 0.50 - 1.00= ◯ 1.00 - 2.50= ◯ > 2.50= ◯

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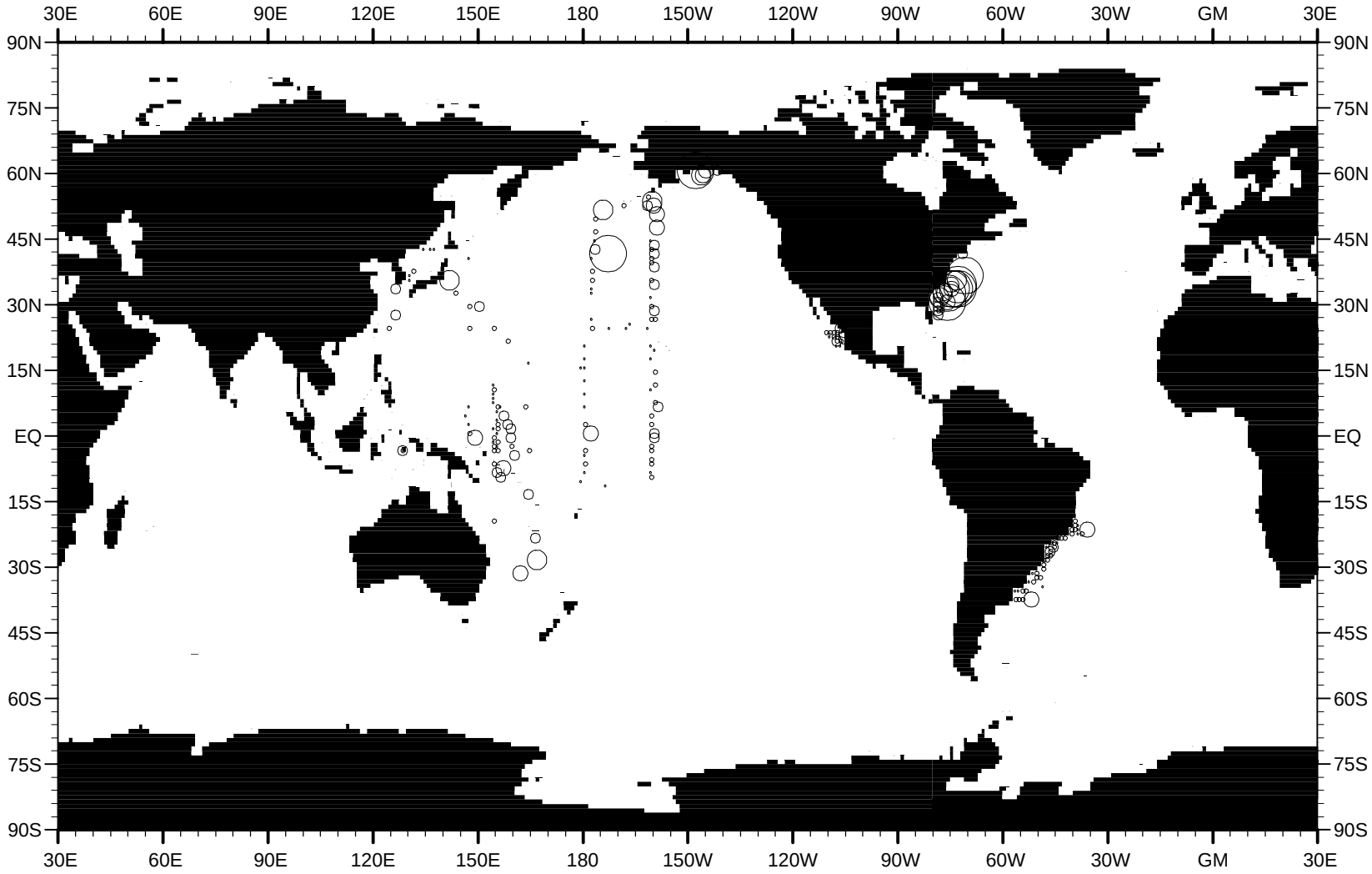

Fig. F2. Annual mean zooplankton settled volume (ml/m3)

[Sampling depth interval: 0 - 200 meters; Sampling Mesh: 150 - 500 µm]

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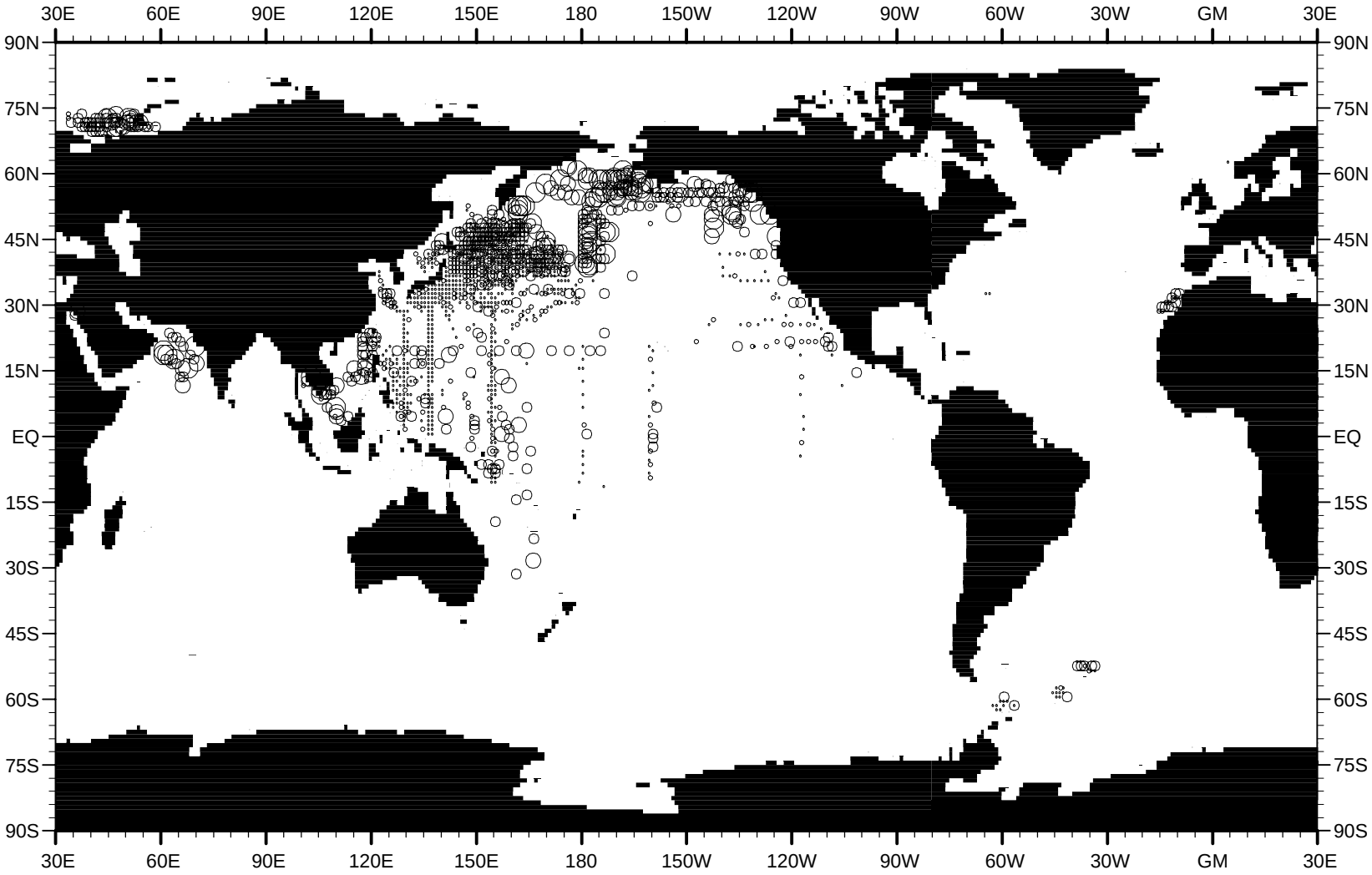

Fig. F3. Annual mean zooplankton wet mass (g/m3)

[Sampling depth interval: 0 - 200 meters; Sampling Mesh: 150 - 500 µm]

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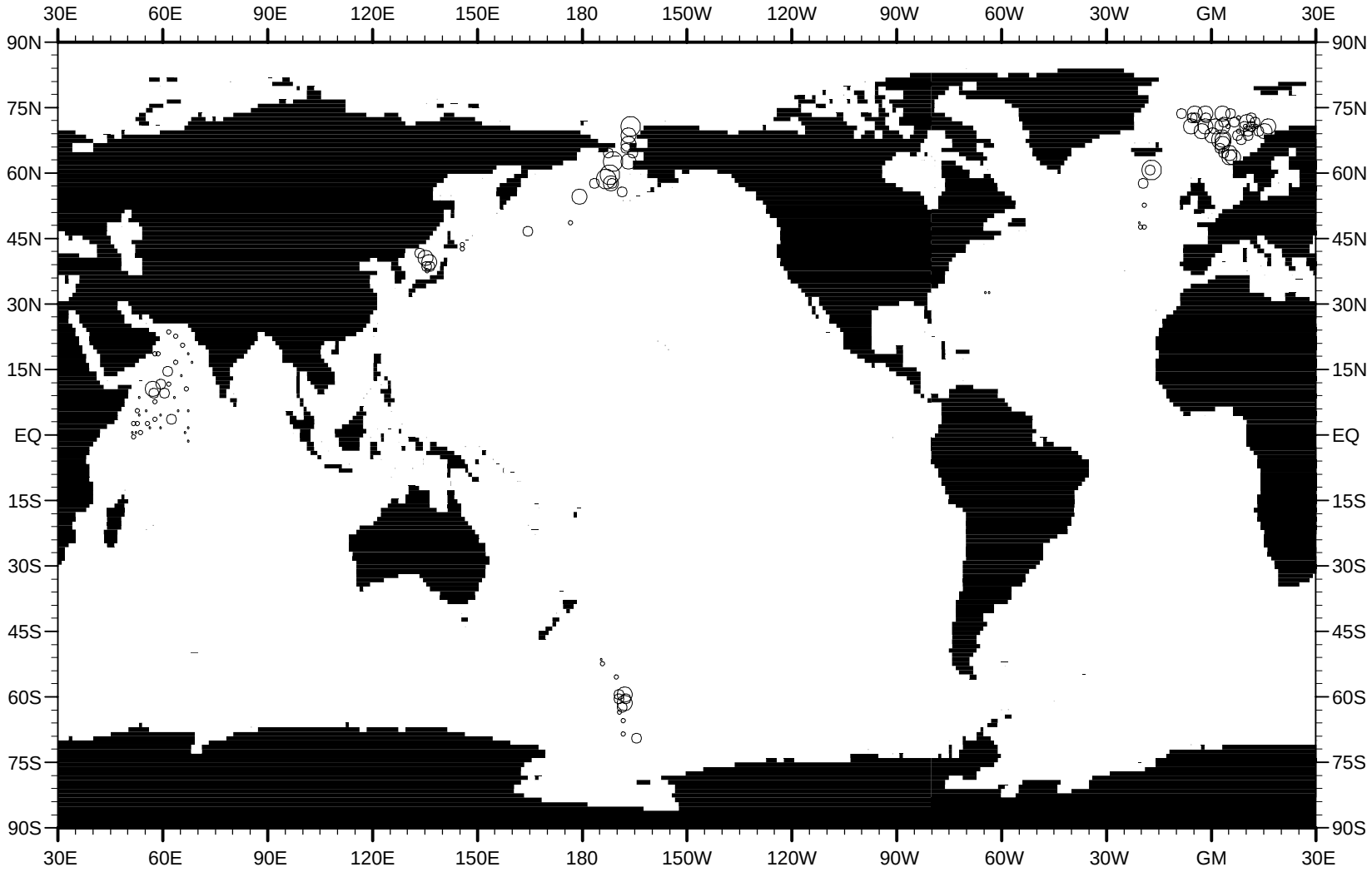

Fig. F4. Annual mean zooplankton dry mass (mg/m3)

[Sampling depth interval: 0 - 200 meters; Sampling Mesh: 150 - 500 µm]

<= 10.00= ◦ 10.00 - 25.00= ○ 25.00 - 50.00= ○ 50.00 - 100.00= ○ 100.00 - 250.00= ○ > 250.00= ○

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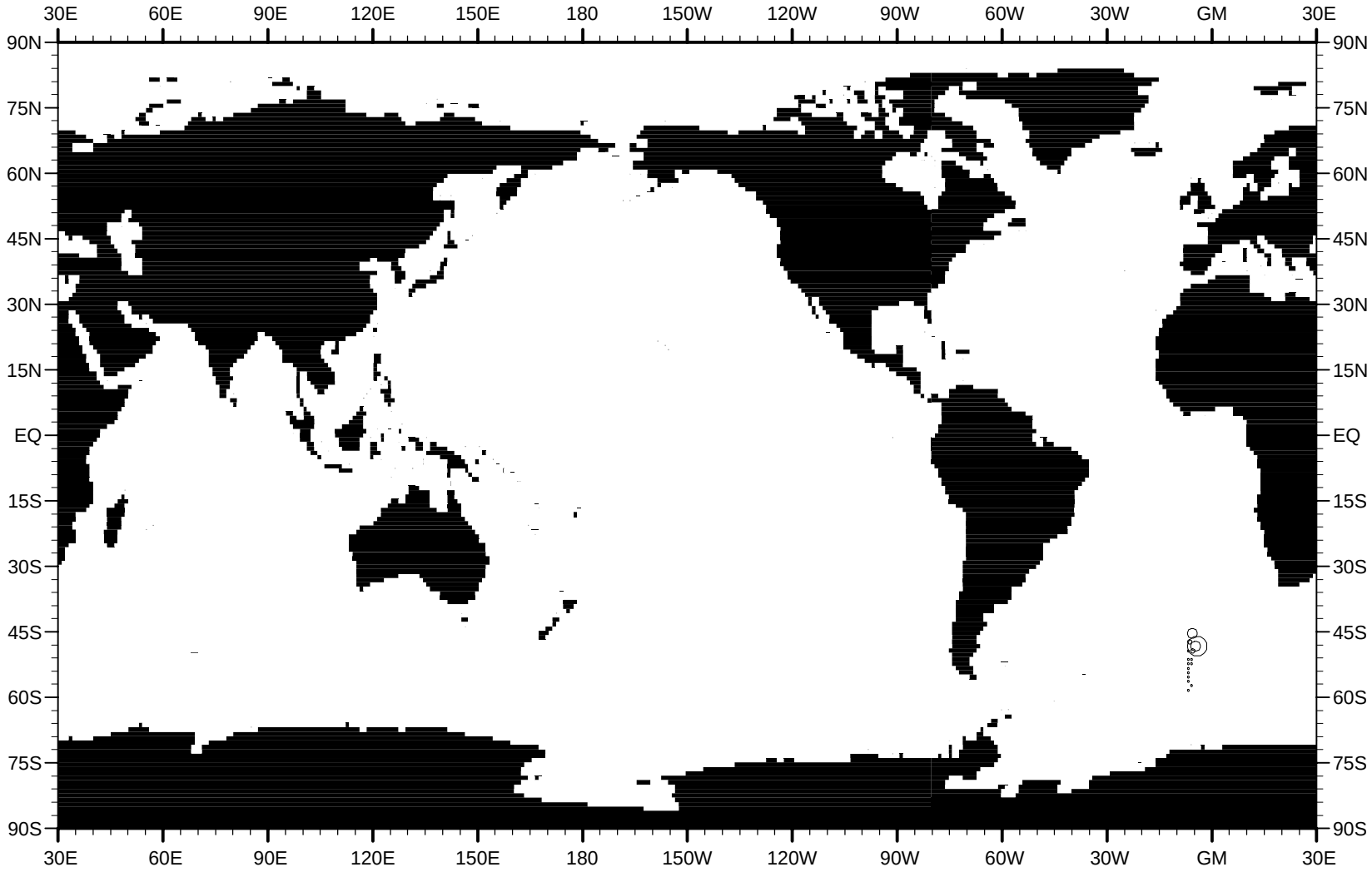

Fig. F5. Annual mean zooplankton ash-free dry mass (g/m3)

[Sampling depth interval: 0 - 200 meters; Sampling Mesh: 150 - 500 µm]

<= 10.00= ◦ 10.00 - 20.00= ○ 20.00 - 30.00= ◯ 30.00 - 40.00= ◯ 40.00 - 50.00= ◯ > 50.00= ◯

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APPENDIX G

In each unanalyzed mean field figure in Appendix G, the size of the graphical circle represents the annual or seasonal mean value for that one-degree latitude-longitude square.

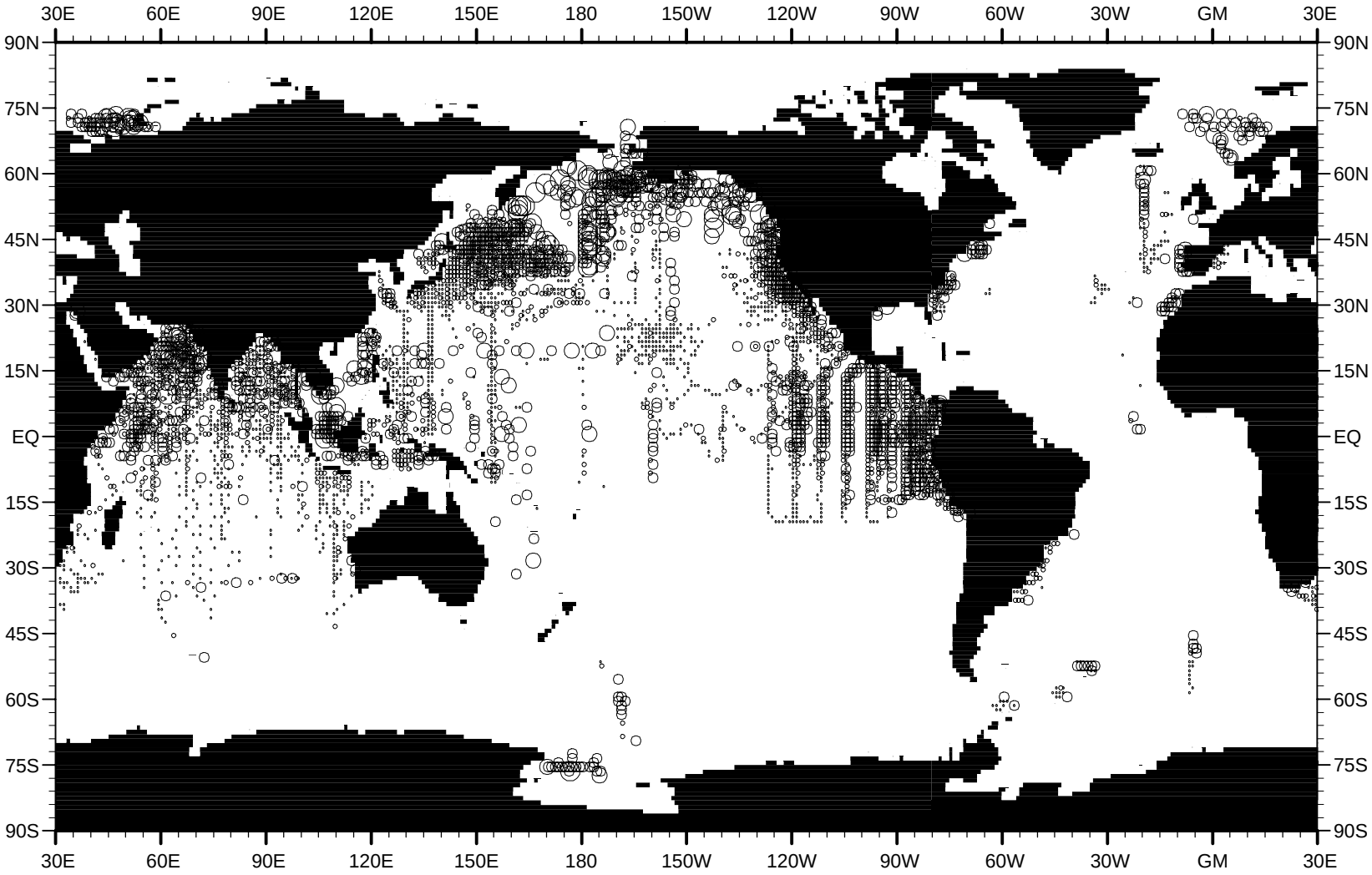

Fig. G1. Annual mean zooplankton carbon mass (mg-C/m3)

[Sampling depth interval: 0 - 200 meters; Sampling Mesh: 150 - 500 µm]

<= 5.00= ◦ 5.00 - 10.00= ○ 10.00 - 50.00= ◯ 50.00 - 100.00= ◯ 100.00 - 500.00= ◯ > 500.00= ◯

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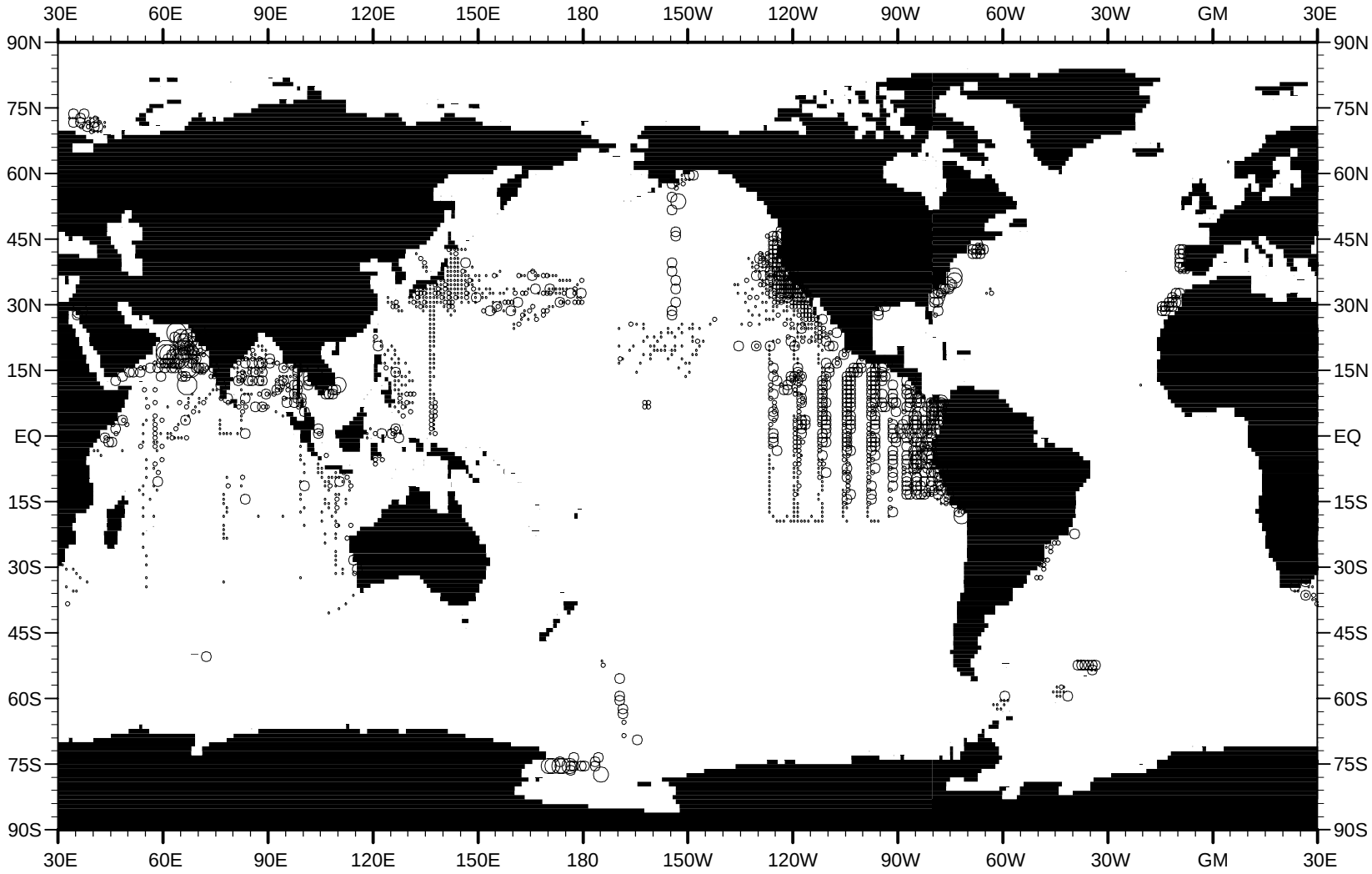

Fig. G1.1: Winter (Jan.-Mar.) mean zooplankton carbon mass (mg-C/m3)

[Sampling depth interval: 0 - 200 meters; Sampling Mesh: 150 - 500 µm]

<= 5.00= 5.00 - 10.00= 10.00 - 50.00= 50.00 - 100.00= 100.00 - 500.00= > 500.00=

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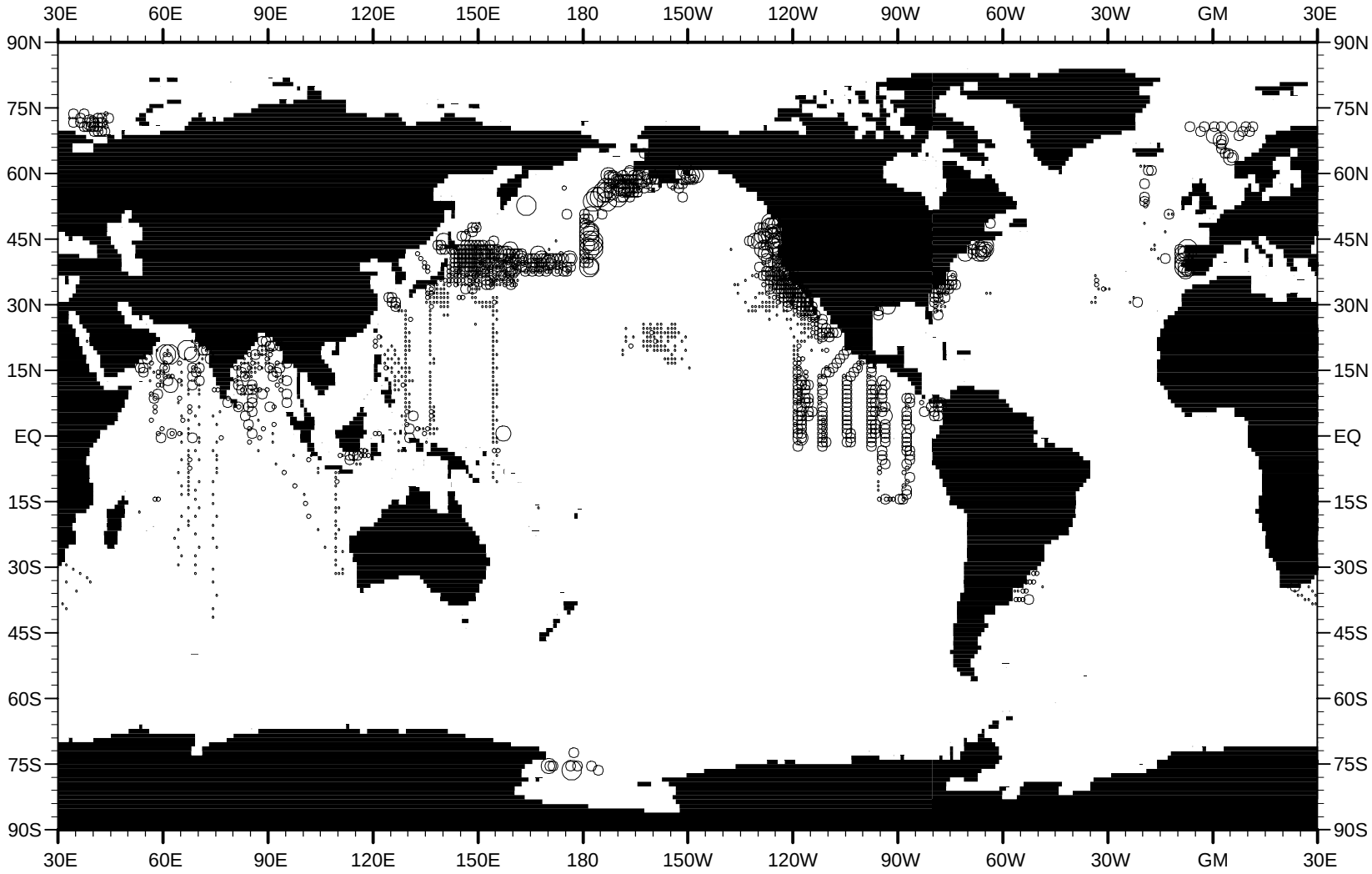

Fig. G1.2: Spring (Apr.-Jun.) mean zooplankton carbon mass (mg-C/m3)

[Sampling depth interval: 0 - 200 meters; Sampling Mesh: 150 - 500 µm]

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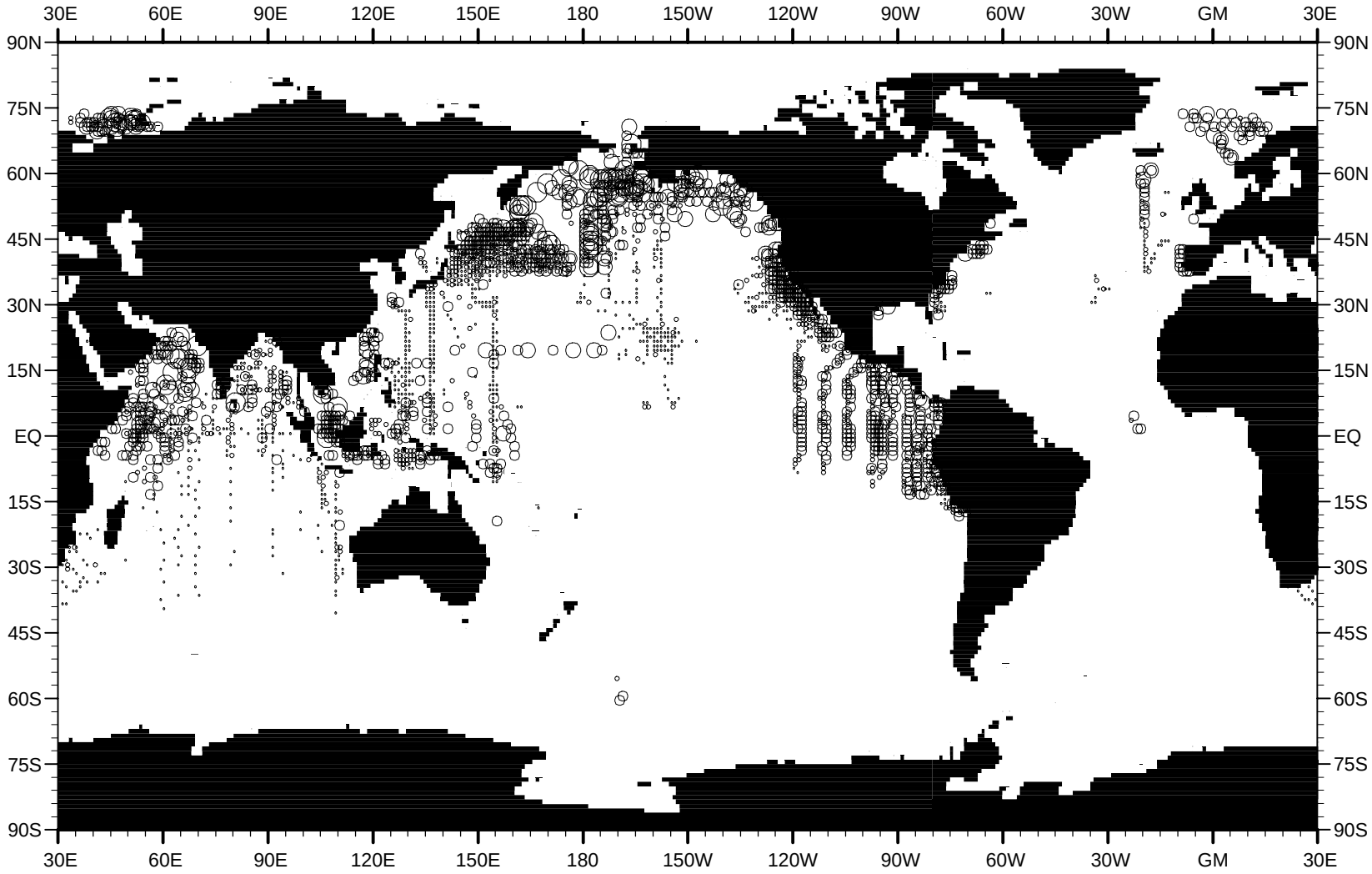

Fig. G1.3 Summer (Jul.-Sep.) mean zooplankton carbon mass (mg-C/m3)

[Sampling depth interval: 0 - 200 meters; Sampling Mesh: 150 - 500 µm]

<= 5.00= ◦ 5.00 - 10.00= ○ 10.00 - 50.00= ◯ 50.00 - 100.00= ◯ 100.00 - 500.00= ◯ > 500.00= ◯

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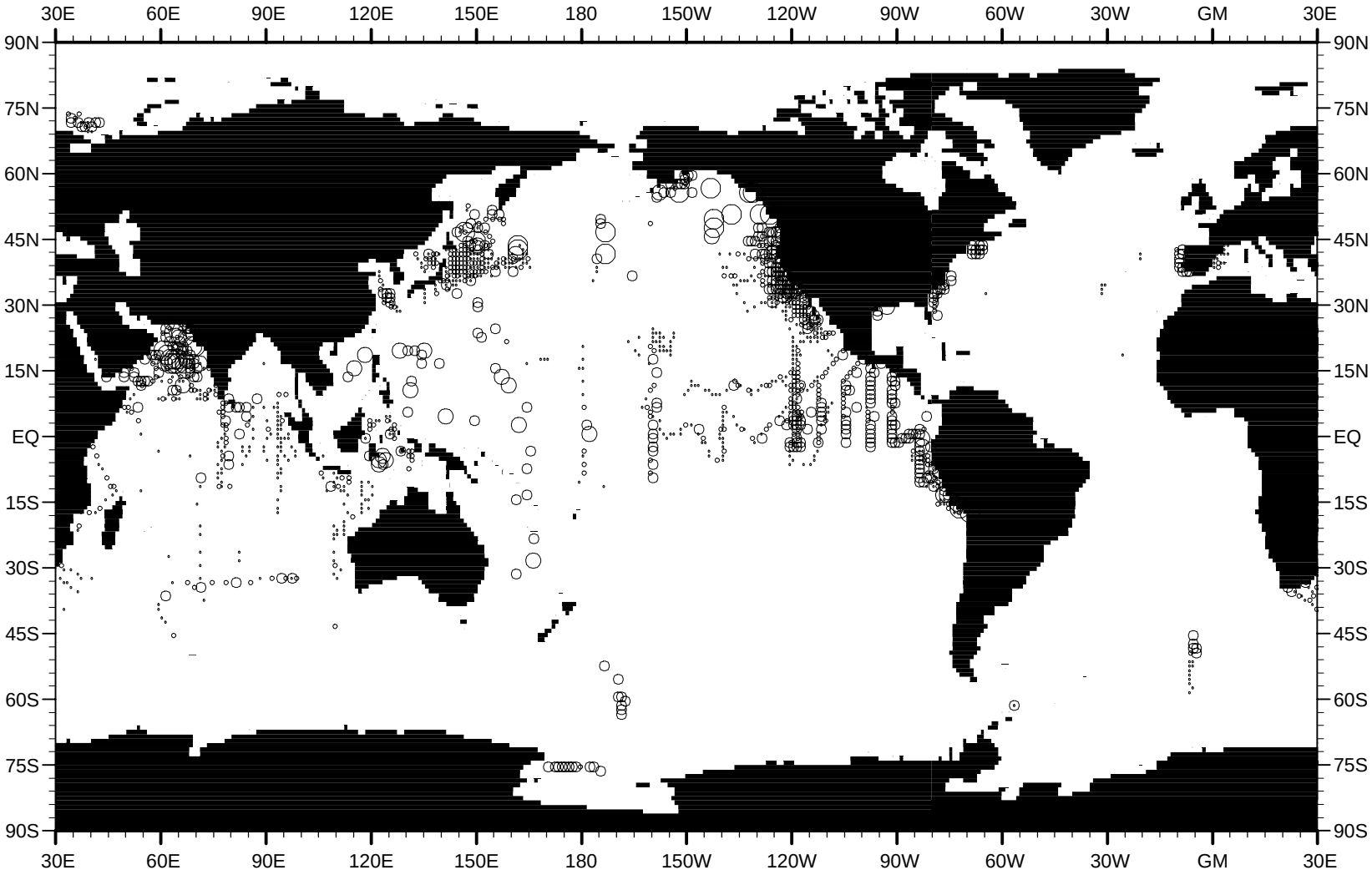

Fig. G1.4 Fall (Oct.-Dec.) mean zooplankton carbon mass (mg-C/m3)

[Sampling depth interval: 0 - 200 meters; Sampling Mesh: 150 - 500 µm]

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APPENDIX F

This is the color version of the *World Ocean Atlas 2001* Volume 5: Plankton.

In each unanalyzed mean field figure in Appendix F, the color of the graphical dot represents the annual mean value for that one-degree latitude-longitude square.

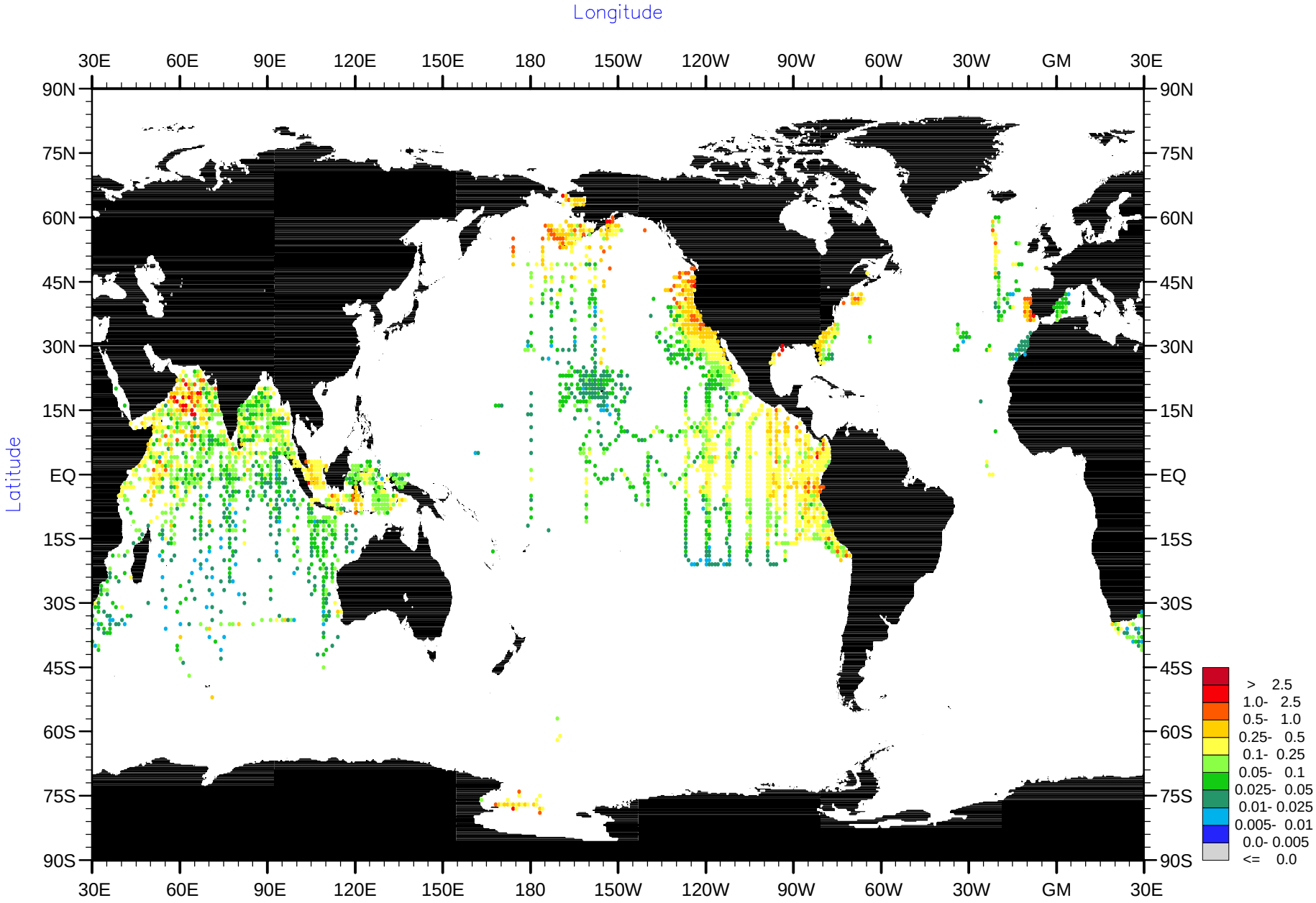

Fig. F1. Annual mean zooplankton displacement volume (ml/m3)

[Sampling depth interval: 0 - 200 meters; Sampling Mesh: 150-500 µm]

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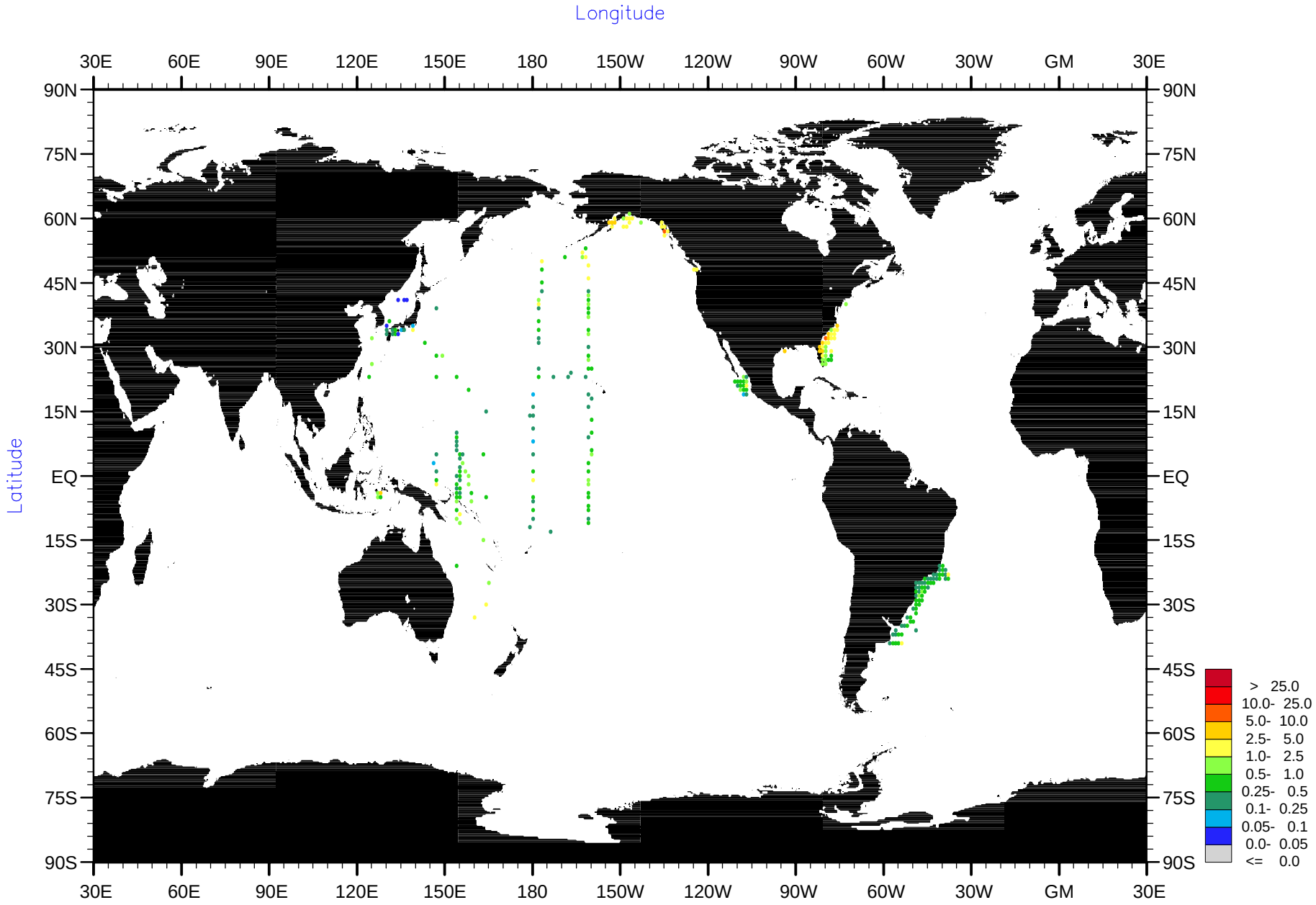

Fig. F2. Annual mean zooplankton settled volume (ml/m3)

[Sampling depth interval: 0 - 200 meters; Sampling Mesh: 150-500 µm]

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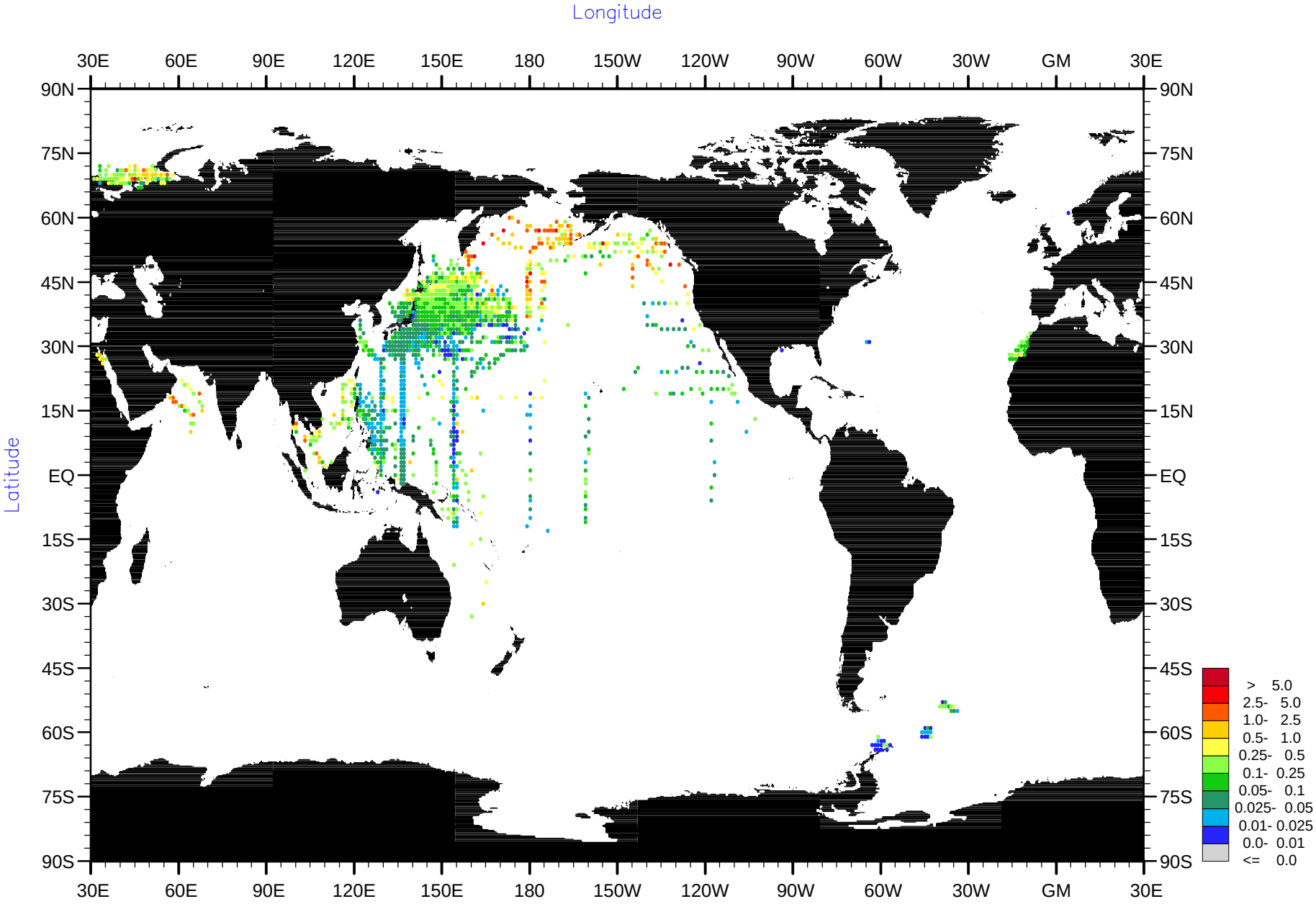

Fig. F3. Annual mean zooplankton wet mass (g/m3)

[Sampling depth interval: 0 - 200 meters; Sampling Mesh: 150-500 µm]

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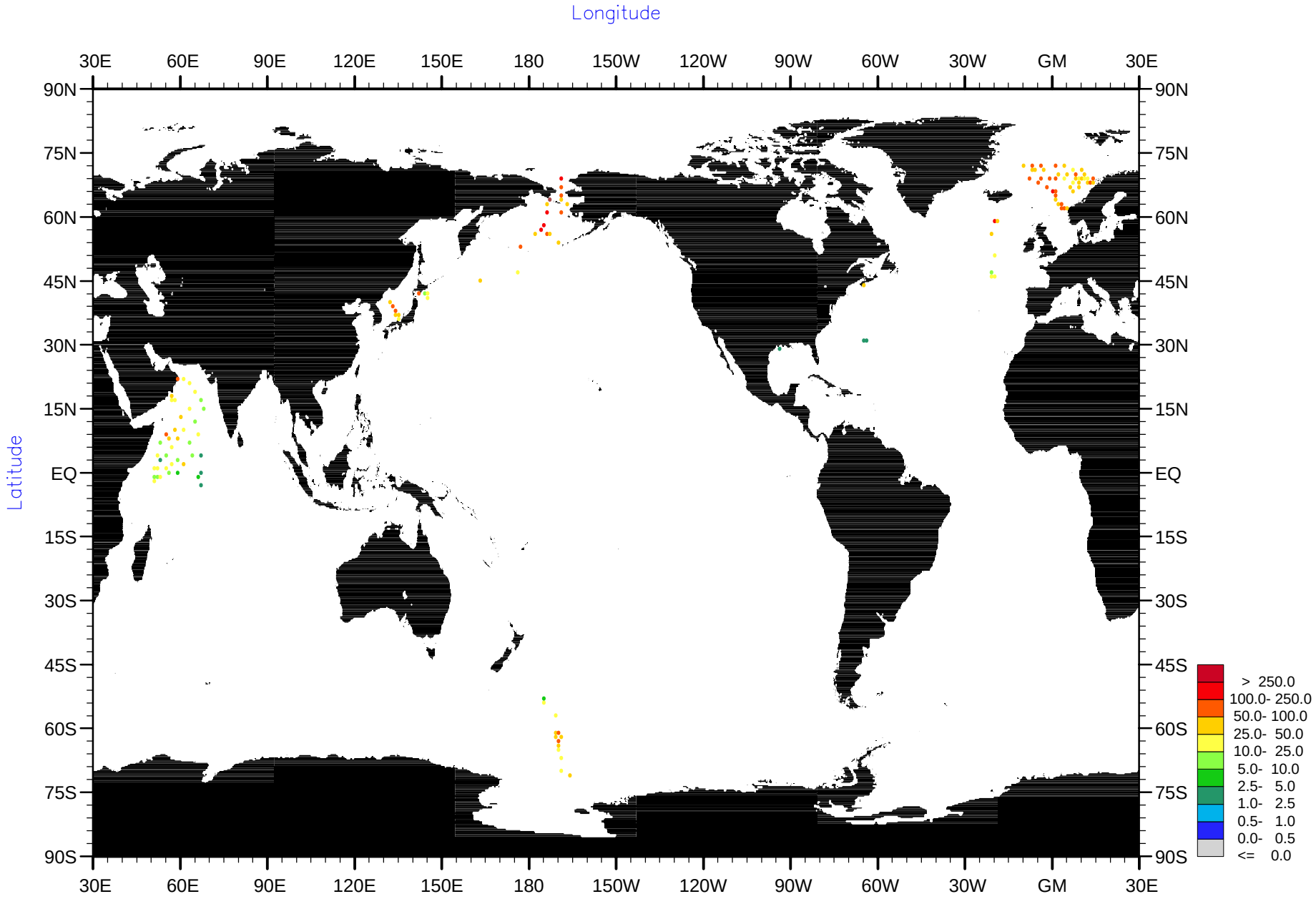

Fig. F4. Annual mean zooplankton dry mass (mg/m3)

[Sampling depth interval: 0 - 200 meters; Sampling Mesh: 150-500 µm]

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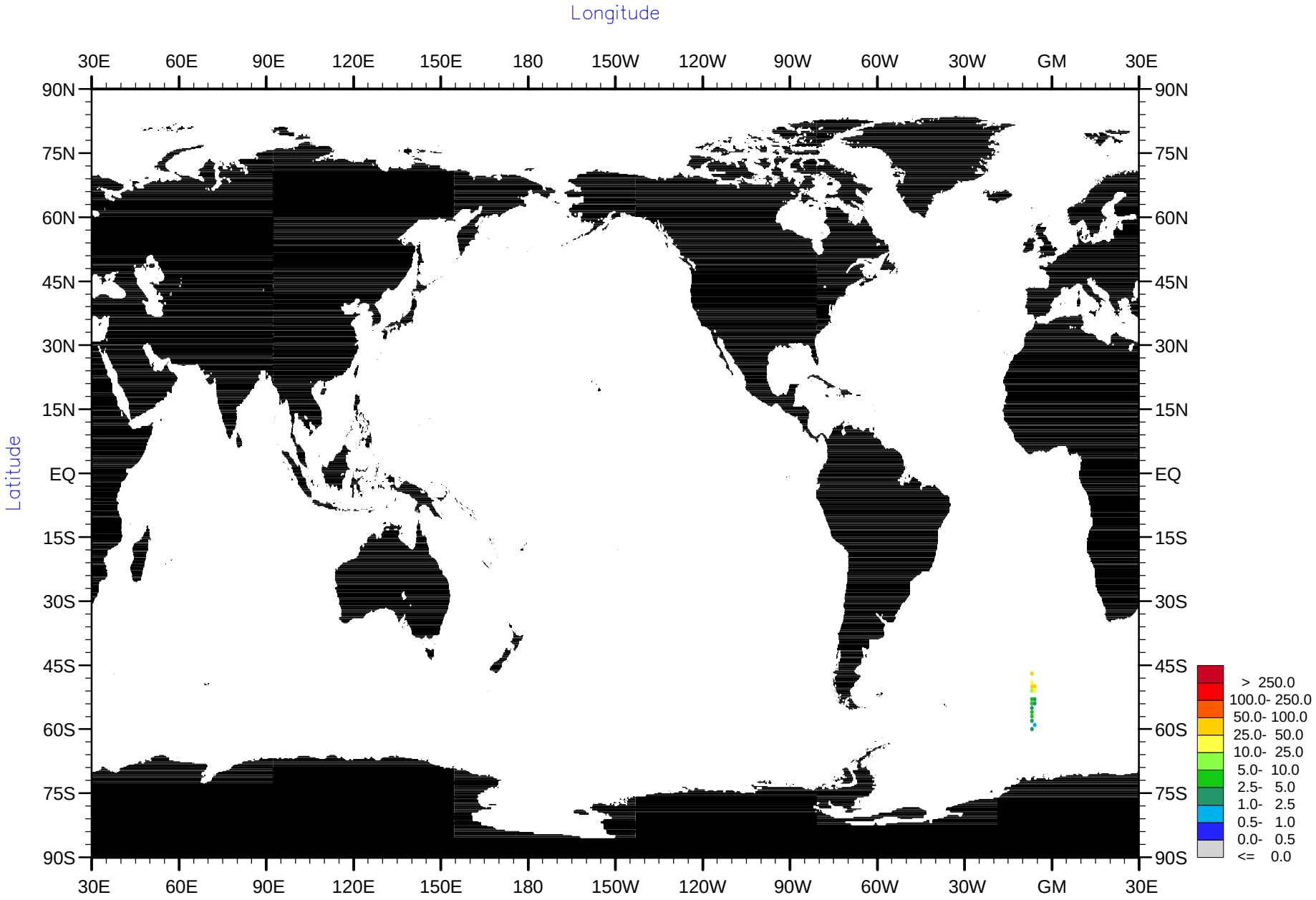

Fig. F5. Annual mean zooplankton ash-free dry mass (mg/m3)

[Sampling depth interval: 0 - 200 meters; Sampling Mesh: 150-500 µm]

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APPENDIX G

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In each unanalyzed mean field figure in Appendix G, the color of the graphical dot represents the annual or seasonal mean value for that one-degree latitude-longitude square.

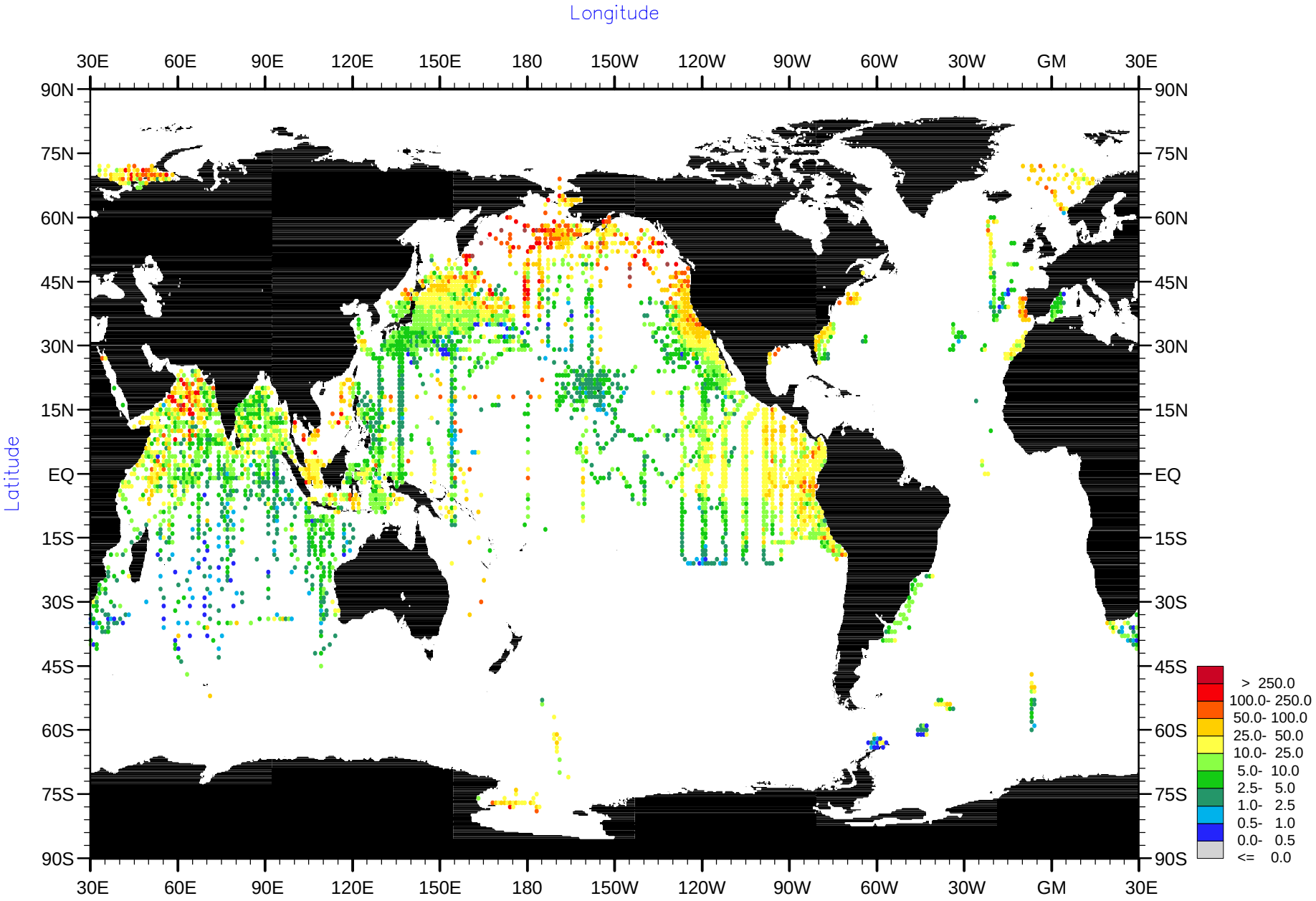

Fig. G1. Annual mean zooplankton carbon mass (mg-C/m3)

[Sampling depth interval: 0 - 200 meters; Sampling Mesh: 150-500 µm]

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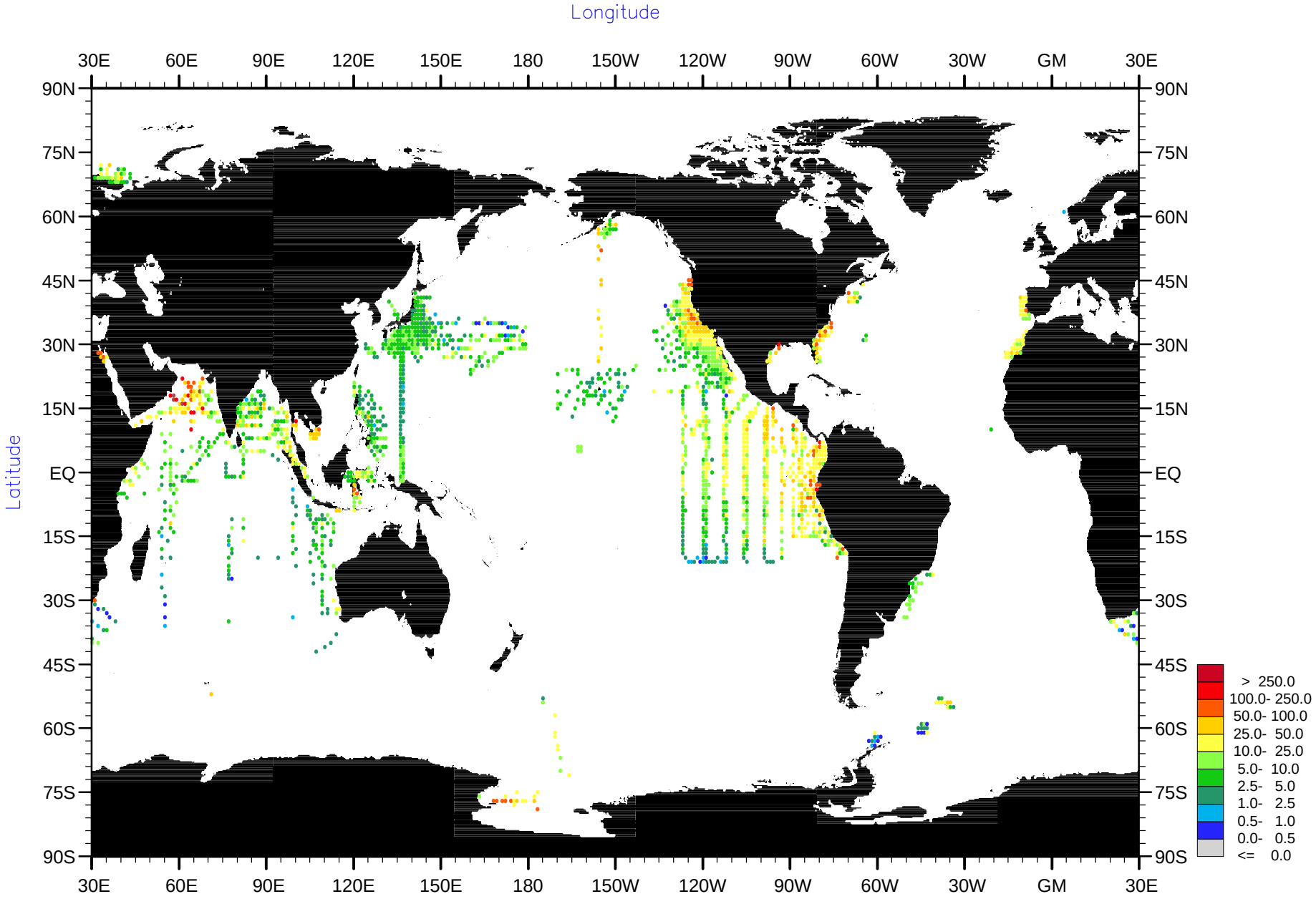

Fig. G1.1 Winter (Jan.-Mar.) mean zooplankton carbon mass (mg-C/m3)

[Sampling depth interval: 0 - 200 meters; Sampling Mesh: 150-500 µm]

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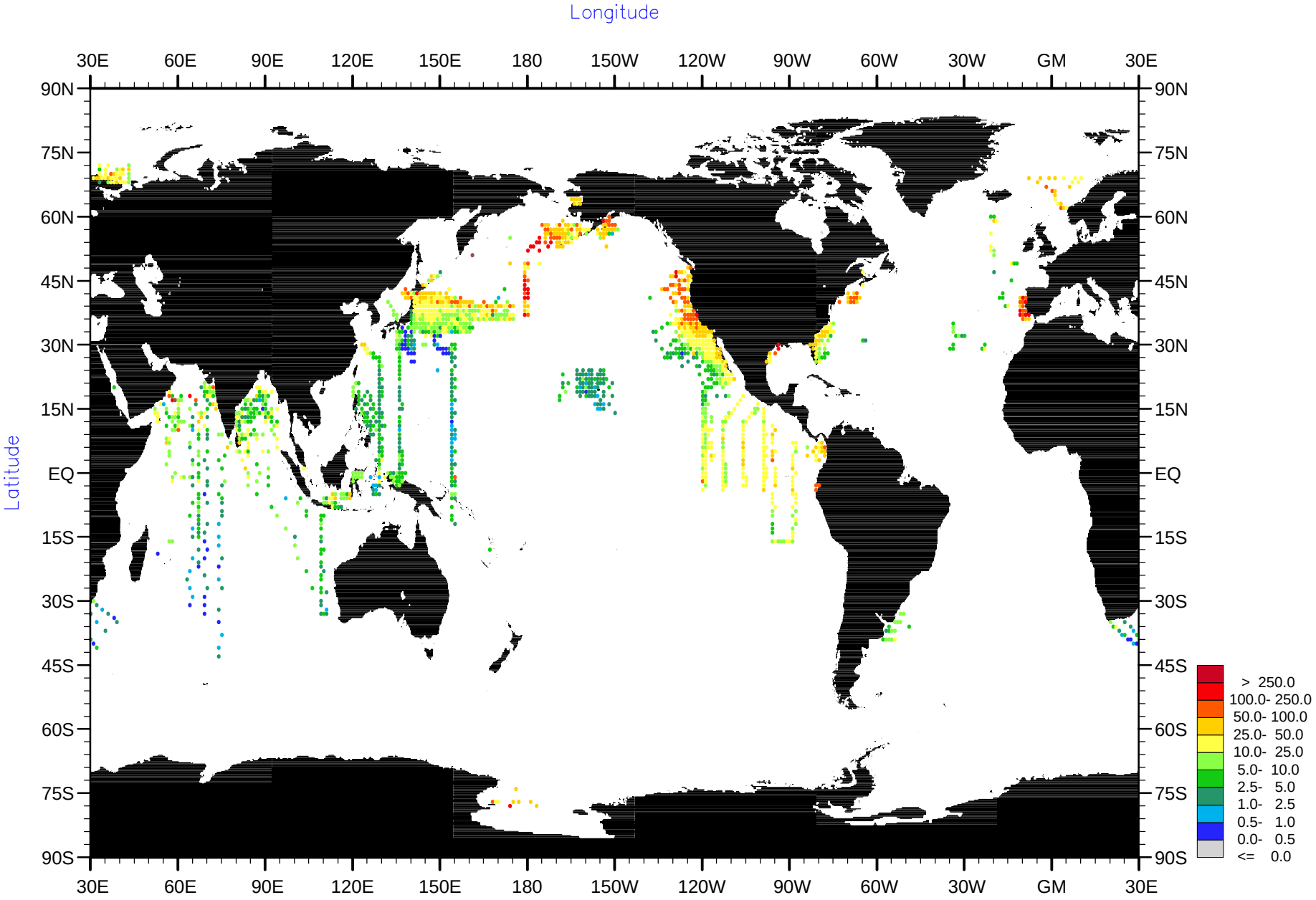

Fig. G1.2 Spring (Apr.-Jun.) mean zooplankton carbon mass (mg-C/m3)

[Sampling depth interval: 0 - 200 meters; Sampling Mesh: 150-500 µm]

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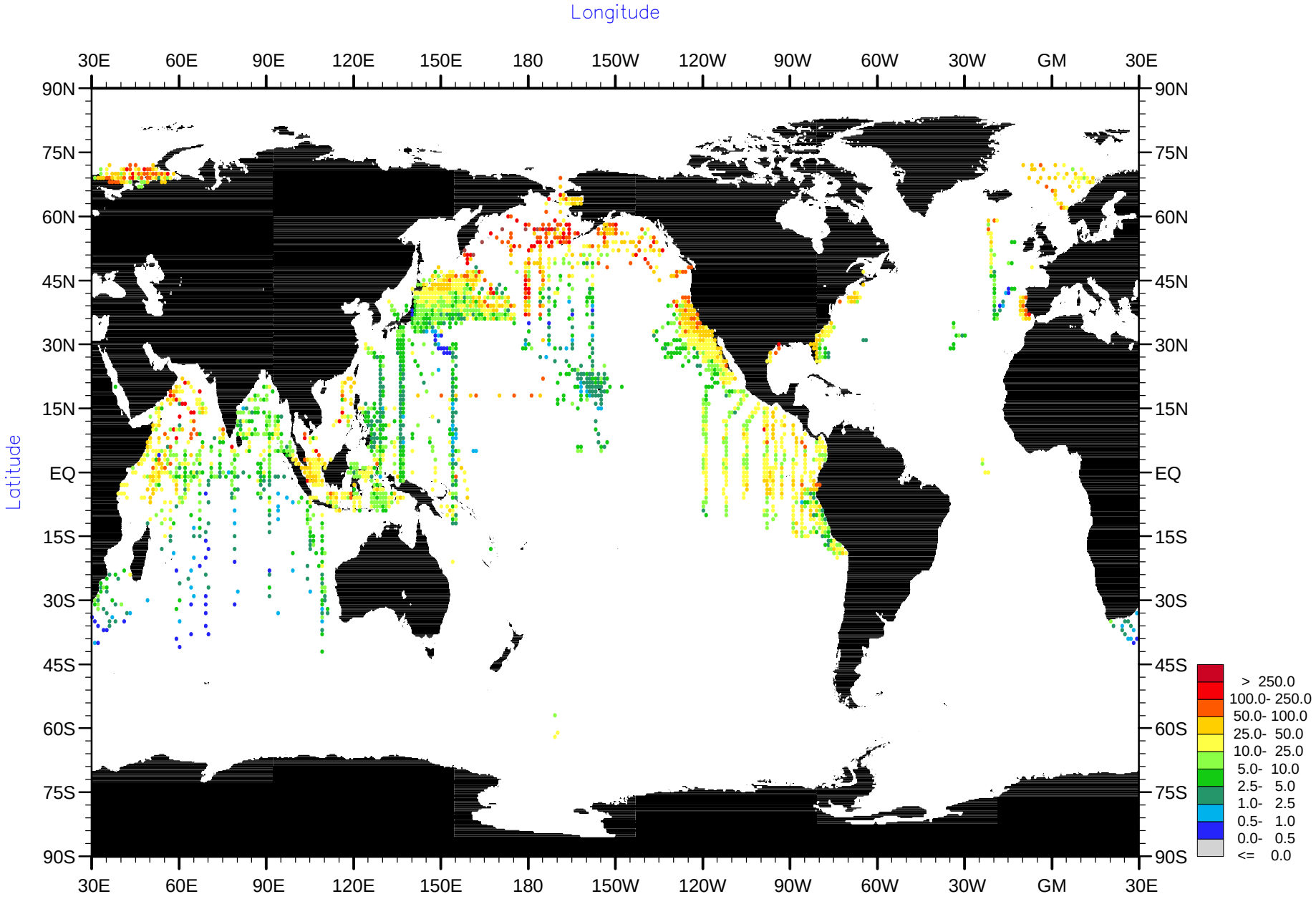

Fig. G1.3 Summer (Jul.-Sep.) mean zooplankton carbon mass (mg-C/m3)

[Sampling depth interval: 0 - 200 meters; Sampling Mesh: 150-500 µm]

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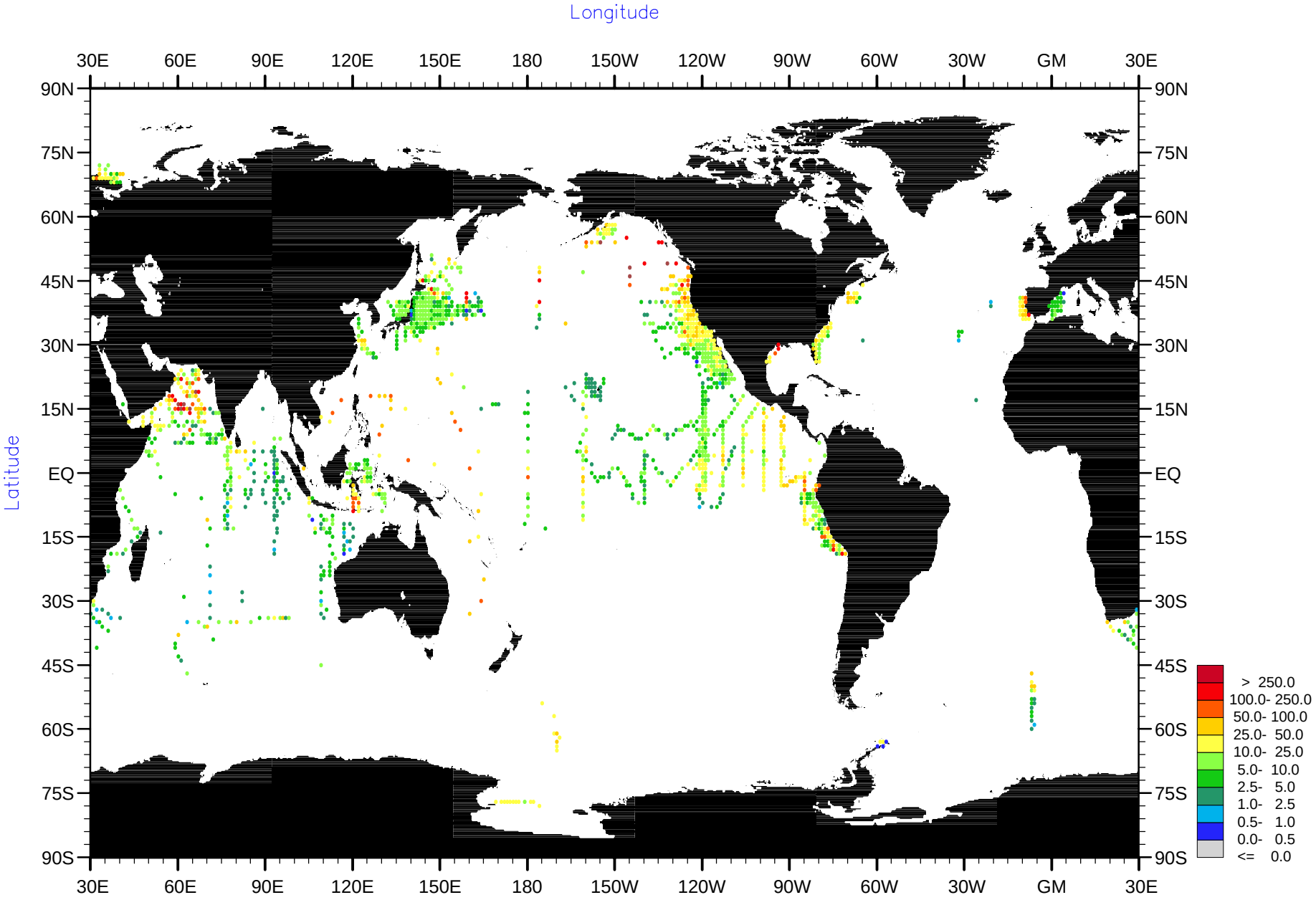

Fig. G1.4 Fall (Oct.-Dec.) mean zooplankton carbon mass (mg-C/m3)

[Sampling depth interval: 0 - 200 meters; Sampling Mesh: 150-500 µm]

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