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WORLD ATLAS OF DISTRIBUTION OF RECENT POLYCYSTINA (RADIOLARIA)

Demetrio Boltovskoy, Stanley A. Kling, Kozo Takahashi, and Kjell Bjørklund

ABSTRACT

This work is based on the compilation of currently accessible (published and unpublished) data on Radiolaria (Polycystina) distributions from plankton and sediment trap samples, and from surface sediment materials. The database assembled covers a total of 307 polycystine taxa in 6719 samples. Data sources are 91 publications and databases produced between 1958 and 2008, yielding a total of 338,127 datapoints (including absolute abundances, percentage data, and binary records). Taxa included in the various publications were critically evaluated in order to identify the same forms based on descriptions, illustrations, and synonymy lists. This information is used to produce (1) Maps showing species abundances above 150 m (plankton samples), below 150 m (plankton and sediment trap samples), and in the surface sediments (based on data pooled for 5x5 degree Marsden squares); (2) Maps of absolute radiolarian abundances in the plankton, in sediment trap materials, and in the surface sediments; (3) Summary diagrams of vertical distributions (plankton samples); (4) Patterns of species richness; and (5) Maps and graphs of geographic distribution of higher-level taxa (families and orders). In addition, some interoceanic and water-column vs. sediment comparisons emerging from this information are summarized in graphs and tables.

Demetrio Boltovskoy. Departamento de Ecología, Genética y Evolución, Facultad de Ciencias Exactas y Naturales, Universidad de Buenos Aires, 1428 Buenos Aires, Argentina; Consejo Nacional de Investigaciones Científicas y Técnicas; Museo Argentino de Ciencias Naturales “Bernardino Rivadavia”, demetrio@ege.fcen.uba.ar
Stanley A. Kling.416 Shore View Lane, Leucadia, California 92024, USA s.kling@sbcglobal.net
Kozo Takahashi. Department of Earth & Planetary Sciences, Graduate School of Sciences, Kyushu University, Hakozaki 6-10-1, Higashi-ku, Fukuoka 812-8581, Japan kozo@geo.kyushu-u.ac.jp
Kjell Bjørklund.Natural History Museum, University of Oslo, P.O. Box 1172 Blindern, Oslo, Norway k.r.bjorklund@nhm.uio.no

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INTRODUCTION

Unlike much hard-shelled micro-plankton, radiolarians are distributed to all depths of the oceans, and individual species are variously restricted to horizontal and vertical provinces. Furthermore, these provinces are not static, but become modified geographically and bathymetrically as the water masses and currents responsible for these habitats change. This makes them uncommonly useful for studying oceanographic conditions in both present-day oceans and the preserved sedimentary record. There are by now a large number of sources of data relating to the ecology and distribution of radiolarians. However, these studies are generally of regional scale within individual oceans, and we believe it is timely to summarize this information on a worldwide basis.

We have undertaken a compilation of currently accessible (published and unpublished) data on Radiolaria (Polycystina) distributions from plankton and sediment trap samples, and from surface sediment materials. The database we have assembled covers a total of 307 polycystine taxa (145 spumellarians and 162 nassellarians, plus 18 family and order-level categories), in 6719 samples from the World Ocean (3492 from the Pacific, 2186 from the Atlantic, 696 from the Indian Ocean, and 345 from the Arctic; see Table 1 and Appendix 1).

A deterrent to this scale of synthesis has been disagreement in the taxonomic concepts among authors and the consequent fragmentation of the distributional significance of radiolarian species. Thus, the initial phase of this project was to list the taxa included in the various publications and then identify forms that are the same based on descriptions, illustrations and synonymy lists, rather than on the names under which they were cited (which vary widely between publications). The process we used to achieve this conformity is elaborated in the Methods section. The first stage of results from this project is the production of an atlas of distribution patterns of Recent radiolarians, which is the subject of this report. The basic displays are world maps showing species abundances above and below 150 m and in sediment trap and surface sediment samples. In addition to the maps, we have also plotted latitudinal sections of vertical distributions. Equitability and specific diversity, radiolarian fluxes (sediment traps), assessment of seasonality as a function of latitude (sediment traps), and biogeographic zonations, are also presented.

TABLE 1. Numbers of samples for each source and ocean basin.

	Plankton	Sediment traps	Surface sediments	Total
N Pacific	732	1080	794	2606
S Pacific	234	318	334	886
N Atlantic	335	116	676	1127
S Atlantic	382	43	634	1059
Indian	141	50	505	696
Arctic	30	101	214	345
Total	1854	1708	3157	6719

These displays will allow the reader to view the results of numerous regional studies simultaneously, to reveal the relationships between the radiolarian distributions and worldwide water mass and circulation patterns. Furthermore, comparison of distributions in the water column with those on the sea floor provide insights into the dynamics of settling shells. This information will help users to interpret future changes in distributions as they are affected by climatic and oceanographic changes. And paleontologists will be better able to interpret past climatic and oceanographic conditions. Finally, the maps may point up reports of species far from otherwise restricted local distributions, thus suggesting re-examinations of taxonomic relationships.

It should be stressed that this work is not aimed at solving taxonomic or nomenclature problems, but at illustrating our current knowledge of the geographic distribution of polycystine taxa. Neither does it include all the Recent polycystine species described because the forms covered are restricted to those cited in the 88 sources used. However, the size of this database and its geographic coverage allow assuming that all but the extremely rare Recent forms have been accounted for. Because one of our goals was assessing objectively the overall number of polycystine species, even taxa with only one single record were incorporated in the database (see Appendix 2).

This atlas is a presentation of data, and therefore we have generally refrained from making interpretations of the illustrations, or drawing conclusions from them.

SOURCES AND METHODS

Sources of information

This atlas is based on practically all the information available on the distribution of Recent polycystine radiolarians in the World Ocean. Information has been compiled from 91 different sources, including publications, Master and Doc-

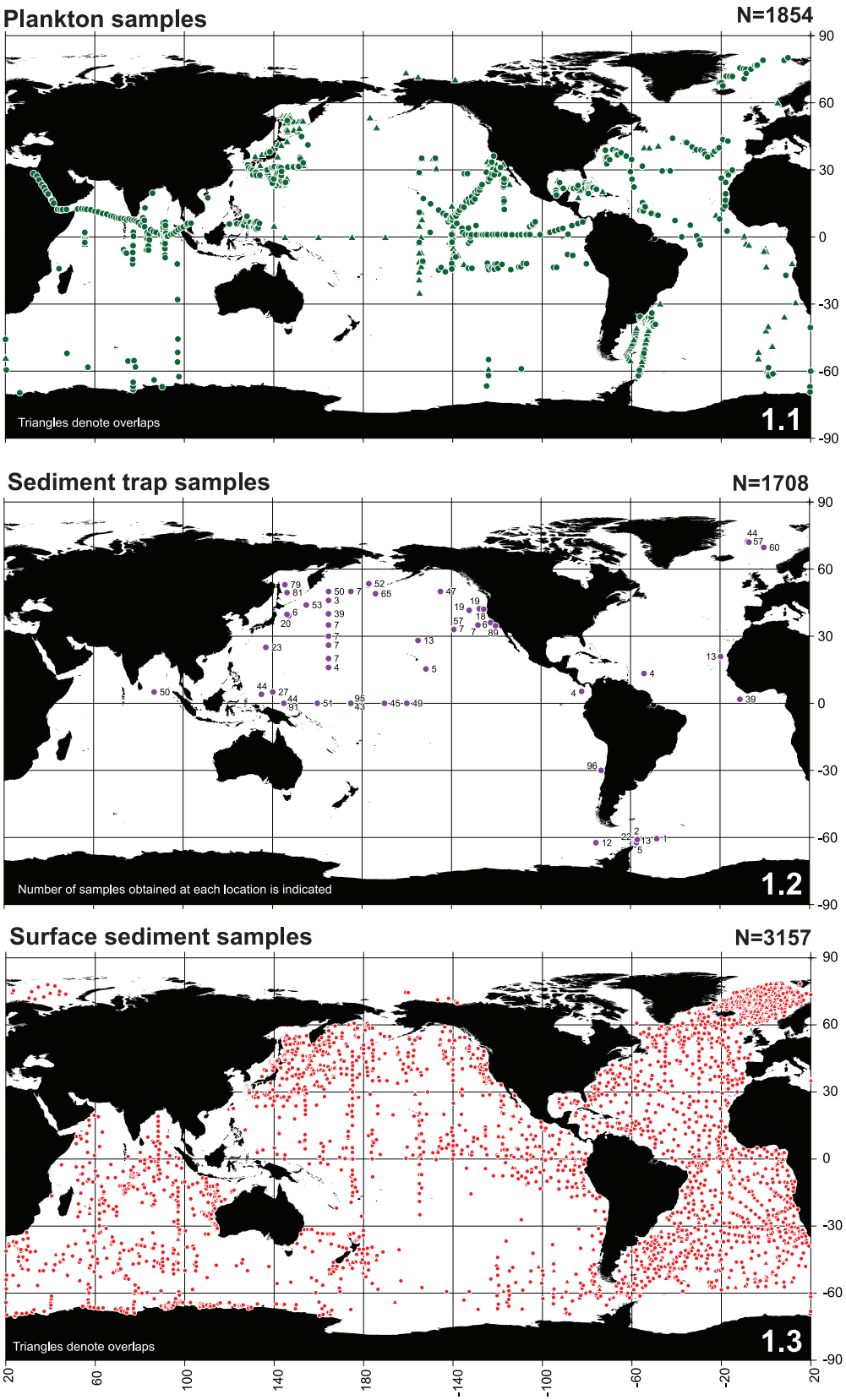

Figure 1. Geographic distribution of the plankton, sediment trap, and surface sediment samples used in this compilation. Overlapping positions are denoted with triangles.

toral dissertations, publicly available internet databases (PANGAEA, JGOFS), and unpublished records (Figure 1, Appendix 1). Our main target was reports that (1) covered at least a large majority of the radiolarian species in the samples (as opposed to papers dealing with one or a few selected species only), (2) included at least relative (%) abundance data, and (3) supplied basic station data unequivocally (mainly position and water depth). Nevertheless, we also covered several papers that provide binary (presence-absence) radiolarian data, works that dealt with only one or a few radiolarian species, as well as a few publications restricted to the assessment of radiolarian absolute abundances (i.e., cells per liter of water filtered - plankton samples, cells per square meter per day - sediment trap samples, and skeletons per g dry sediment - surface sediment samples). Appendix 1 provides an overview of the sources used and the type of information extracted from each.

The database thus compiled covered the following information:

- Source publication
- Type of radiolarian data (presence-absence, species percentages, absolute density estimates, etc.)
- Sample type (plankton, sediment trap, surface sediments) and identification
- Sampler type
- Type and depth of tow, volume of water filtered, net mesh size, date (for plankton samples)
- Depth of trap, type of trap, dates of trap deployment (for sediment trap samples)
- Sample preparation and analysis: sieve mesh size, number of radiolarians counted per sample
- Latitude and longitude, bottom depth
- Number of radiolarians per cubic meter of water fitered (plankton), per g of dry sediment (sediments), or per square meter per day (sediment traps) (when available).

In some cases, the total numbers of samples included in our database (Appendix 1) may differ from the numbers reported by the corresponding author because we eliminated samples barren of polycystines (occasionally included in the original sample lists). On the other hand, samples with no polycystines in surveys aimed at absolute radiolarian abundances only were retained in our data.

Table 1 illustrates the geographic distribution of the samples (Figures 1, 2) and their type. Sedimentary materials yielded the highest numbers of samples. In addition, these samples are much more evenly spread across the oceans, thus yielding a better coverage than plankton and sediment trap materials. Many of the plankton samples, and especially sediment trap samples, are from intensive studies covering small areas, often represented by tens or even hundreds of samples taken at the same geographic locations (e.g., vertical net or bottle castings, serial sediment traps collections).

The North Pacific Ocean is by far better covered than any other area, both in absolute terms of number of samples and in terms of samples per unit surface. It is followed by the North Atlantic, with other oceanic areas lagging behind (Figure 2).

When information was extracted from two or more partially overlapping sources the records in question were cross-checked in order to avoid duplicates. However, in a few cases, when the provenance of the data was not fully detailed in the source(s) duplicate information may have been retained in our database. We estimate that these duplicates represent <1% of the datapoints compiled.

Standarization of the data

Raw data extracted from each source were critically evaluated to identify synonyms and other suspicious identifications, as well as apply a uniform nomenclature throughout.

Recent polycystines include a number of more or less well-established species whose characteristics are generally agreed upon and whose nomenclature is fairly stable among authors, and forms whose nomenclature is less uniform but whose restricted variability and rather well-defined morphology allows establishing synonyms easily and securely. Another category comprises problematic forms whose nomenclature varies widely among authors. In some cases these discrepancies can be traced to turn of the century monographs where several of Ehrenberg´s and Haeckel´s species were redescribed under new names. In most cases, however, morphological species concepts are more uniform and stable than species names, which allow grouping them under a single name with reasonable confidence. Species of these two categories were included in the database under the name currently most widely used. Synonyms were assigned on the basis of descriptions, illustrations, and/or synonyms provided by

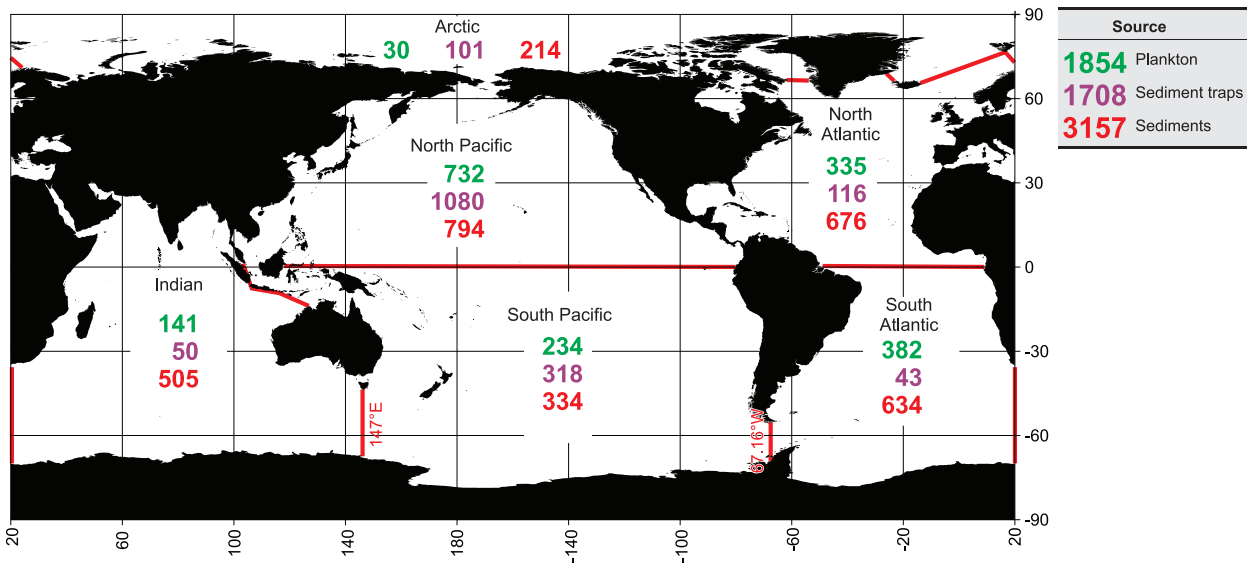

Figure 2. Numbers of samples per ocean basin.

the author. In addition, when combining names, we considered the distributions of the taxa, so that if two similar forms had clearly different distribution ranges they were left separated.

At the other end are the highly problematic forms, with very complicated and variable morphology, still requiring research to establish the species limits. In these cases we resorted to using less precise taxonomic categories such as "species groups". In extreme cases these forms were lumped under the corresponding family epithets.

Summarizing, the names used by the original authors were maintained unless:

1. From the illustrations, descriptions, and/or synonymies provided it was clear that the same species had been reported under a different name by other authors.
2. The species is a member of a problematic group and is normally identified conditionally or in nomenclatura aperta (ex gr., aff., sp. or spp., s.l., etc.). In these cases we placed it either in an unresolved species group or under the corresponding family name.
3. The taxon consists of two or more very closely related morphotypes that were considered separately by one or a few authors, but were counted jointly by most others. In most of these cases the two forms were lumped in our review (e.g., *Lamprocyclas maritalis maritalis*, *Lamprocyclas maritalis polypora* and *Lamprocyclas maritalis ventricosa*; *Didymocyrtis tetrathalamus tetrathalamus* and *Didymocyrtis tetrathalamus coronatus*; etc.). In a few cases, especially when there was evidence that the siblings have dissimilar distributional ranges, we retained the three alternatives: records of sibling A, records of sibling B, and records of both siblings undifferentiated.
4. Some species that are newly erected, but inadequately described and illustrated. These were placed under the corresponding family level group.

As a rule of thumb, species named differently in the original sources were merged only when there was clear evidence that we were dealing with synonyms. Whenever there were doubts about the status of a species, or evidence for merging it was considered inconclusive, the taxon was either left separated under the original name, or lumped in the corresponding "species group" or family (Appendix 2). Overall, our resulting database retained a very large proportion of the species treated in the original reports used for the compilation: on average, over 95% of the taxa with firm (i.e., non-conditional) identifications were incorporated into our database.

Eleven of the species listed (Appendix 2) have no records in the database. This is because they have been figured and described (and are clearly valid species), but they have no records in the data compiled (ommitted in the counts by the corre-

sponding author). These taxa are: *Arachnosphaera* sp. 1, *Clathrocyclas* sp. 1, *Clathromitra pterophormis*, Cromyomma sp. 1, *Dictyophimus* sp. 1, *Heliosoma* sp. 1, *Liriospyris* sp. 1, *Phrenocodon clathrostomium*, *Plegmosphaera oblonga*, *Styptosphaera* sp. B, and *Tetraplecta corynephorum*?

Maps and graphs

Illustrations depicting the quantitative distribution of radiolarian species are based on percentage data (either reported as such in the original paper, or recalculated from absolute or relative counting figures), and because of the nature of the information used, they are subject to some constraints:

These representations assume that the totals of the samples involved include unidentified specimens so that the percentages in question are effectively of the overall assemblage, rather than proportions of identified specimens only. Data sets that did not meet this condition (e.g., Hays 1965), or recorded only binary information (presence-absence; e.g., Johnson and Nigrini 1980, 1982) were incorporated but with a notation that the taxon in question was present only. Percentage values are given only in those cases when the corresponding estimate was based on counts of a reasonably high number of specimens per sample. In some of the surveys used, the numbers of radiolarians per sample retrieved were extremely low, yielding unreliable percentage values. For the maps, we used a cutoff value of 50 identified specimens per sample; below this figure, the species (if recorded) is designated as "present" only.

One of the problems of representating these data is associated with the absences of species. Negative records in original sources may result from different circumstances: (1) the species was looked for but was not found, or (2) the species was present in the sample(s) but was excluded from the counting categories used by the author. These two circumstances have quite different implications, yet their graphic representation is identical. We therefore indicated absences only for those data sets where the taxon was recorded at least once. Thus, its presence in at least one sample indicates that it has been searched for and recognized when present. For example: in the database of Hollis and Neil (2005) *Didymocyrtis tetrathalamus* was recorded in 11 of the 31 samples, therefore for the 20 samples where it was not found, it is denoted as absent in the maps. On the other hand, Casey (1971) did not include *Didymocyrtis tetrathalamus* (=*Panartus tetrathalamus*, =*Ommatartus tetrathalamus*) in his survey (although given its known distribution it must have been present in most of his samples, see Figure 37 below). Thus, in Casey´s (1971) mapped samples *Didymocyrtis tetrathalamus* is not indicated as absent.

Because of the extremely high numbers of data points, and the fact that many of them overlap (especially in water-column materials), graphic representation of all the records on a reasonably sized map is impossible. Furthermore, because of the large sample-to-sample variability, it is more important in this type of review to offer a clear picture of the overall distributional trend, rather than to show all the raw, unprocessed information. Thus, in order to circumvent the problem of overlapping data points and extract meaningful trends from the data, distributional maps are based on information averaged for 5 x 5 degree Marsden squares.

Graphic representation of summarized vertical distribution data is complicated by the fact that plankton tow intervals vary widely between surveys and are often not based on established oceanographic depth zones. To circumvent this problem for each plankton tow we calculated the central depth and subsequently used this value for grouping the vertical plankton data illustrated in the diagrams. In most cases the nominal (figured) depth interval is reasonably close to the actual depth interval sampled. In some, however, the intervals sampled were very large, in which case the nominal depth interval may not adequately reflect the actual depth interval sampled (see below).

List of species (Appendix 2)

Taxa are listed alphabetically. For each entry the following information is given: species name, authority, family (in parentheses), up to 3 references illlustrating the species concept used ("Ref."), other names used variously for this species in the literature surveyed ("Syn."), and remarks ("Rem.").

NUMBERS OF RADIOLARIAN SHELLS

Vertical distribution of cell numbers (Figure 3)

Included are all plankton samples with absolute quantitative polycystine data. Depth intervals shown are calculated as half of the distance between the bottom and the top of each plankton tow. For example, for a tow from 550 to 320 m the mid-depth is 435 m [((550-320)/2)+320], and the corresponding data are included in the 300 to 500 nominal depth interval. Agreement between nomi-

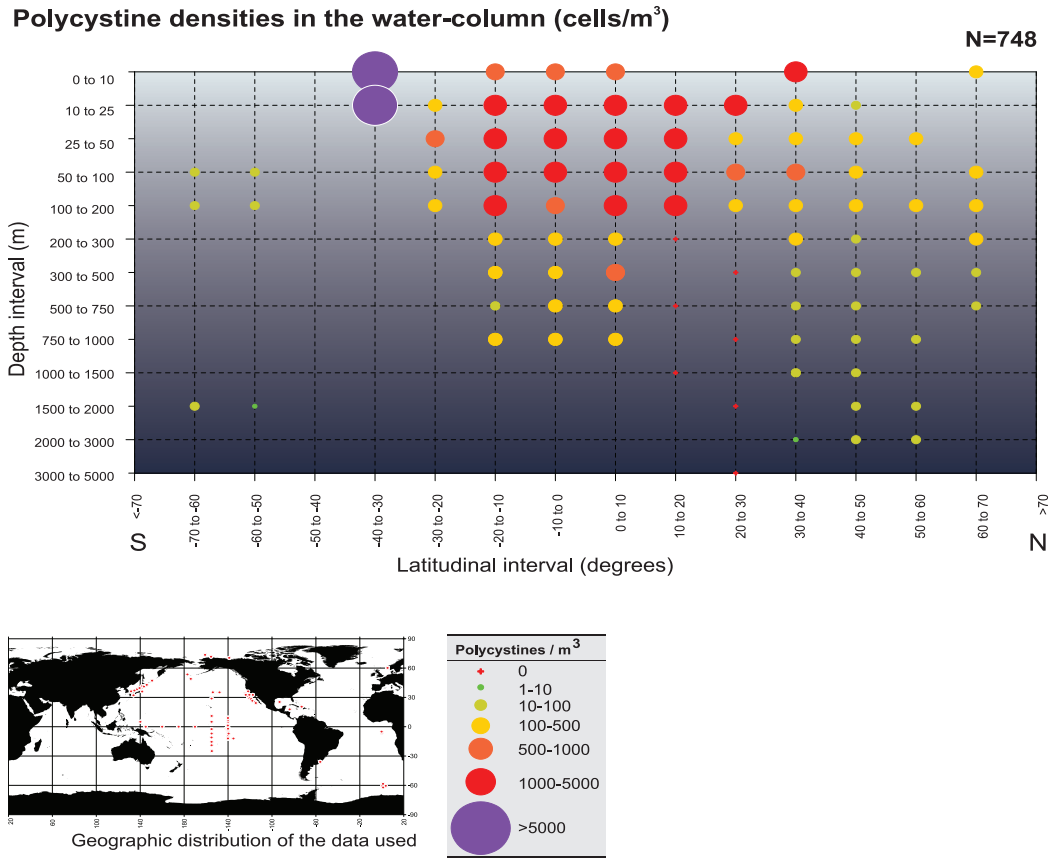

Figure 3. Vertical distribution of cell numbers (depth intervals shown are calculated as half of the distance between the bottom and the top of each plankton tow). N: number of samples used.

nal and actual depth intervals is best in the upper 100 m where the mean difference between nominal and actual top and bottom depths is around 3 m. Between 100 and 500 m this mean difference is ca. 19 m, whereas at 500 to 5000 m it is around 90 m.

Polycystine fluxes (Figure 4)

Data illustrated are mean annual values based on sediment trap deployments of at least 9 consecutive months. Total sediment trap samples used for deriving the means: 905, total datapoints illustrated: 45.

Polycystine fluxes vs. mean annual chlorophyll a and (Figure 5.1)

Polycystine flux data are the same as those in Figure 4. Chlorophyll data are mean annual values at 10 m depth (from Conkright et al. 1998a, b, c).

Polycystine production half-time as a function of latitude (Figure 5.2)

Graph illustrates the time (as a percentage of overall trapping time) it takes to generate ≥50, 75, and 90% of the overall radiolarian flux during the entire trapping period when chronological flux data are sorted in descending order. This measure gives an idea of the intermittency or seasonality of polycystine flux (see Berger and Wefer 1990). Figures are based on a total of 44 sediment trap moorings (1225 discrete trapping periods) deployed for at least 300 consecutive days.

Geographic distribution of the numbers of shells in the surface sediments (Figure 6)

Map is based on a total of 11 reports, but over 85% of the data are from Goll and Bjørklund (1971, 1974) (Atlantic Ocean, 59% of the datapoints), Bjørklund and Kruglikova (2003) (northern North Atlantic, 17%), and Kruglikova (1966) (North Pacific, 9%). Since these figures are based on dried samples, where radiolarian shells have been

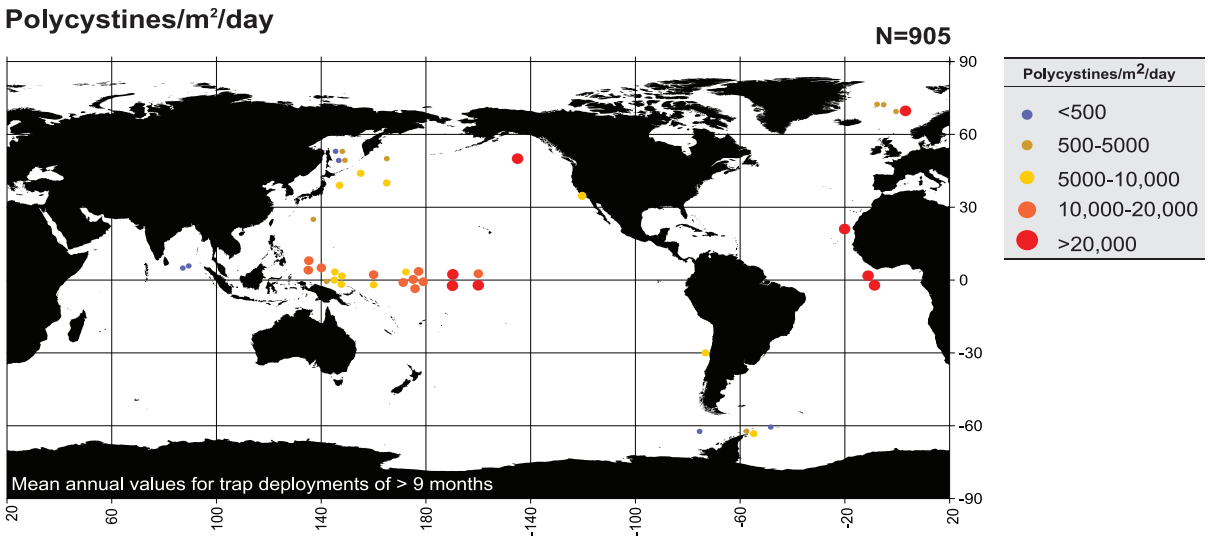

Figure 4. Polycystine fluxes (mean annual values based on sediment trap deployments of at least 9 consecutive months). N: number of samples used.

shown to undergo sometimes significant destruction (Itaki and Hasegawa, 2000), the values depicted may be underestimated.

Shell concentrations in the sediments vs. mean annual chlorophyll a and dissolved Si (Figure 7)

Chlorophyll data are mean annual values at 10 m depth (from Conkright et al. 1998a, b, c). Si data (mean annual values for 10 and 1500 m) are from García et al. (2006)

GEOGRAPHIC DISTRIBUTION OF THE SPECIES (FIGURES 8-229)

Note: figures 10-262 appear after ReferenceS and BEFORE appendix pages

This section consists of maps depicting the geographic distribution of the species. Of the 307 radiolarian taxa covered in this survey, 222 are included in these maps (asterisked in Appendix 2).

Three levels of detail are used depending on the amount and type of distributional information available:

1. For the most abundant taxa (94 radiolarians; Figures 8-101) data are presented separately for the upper 150 m of the water-column (plankton samples), for depths below 150 m (plankton and sediment trap samples), and for the sediments. The plankton tows included in each category were recorded as the mid-depth of the layer sampled. Thus, a few of the samples included in the 0 to150 m category actually collected materials from depths deeper than 150 m, while some of those included in the >150 m group sampled shallower layers. The map data are plotted in these categories: (a) relative abundance (percentage of the overall polycystine assemblage) in 6 classes (<0.5 to >10%), (b) “present” - where the species was recorded but not quantified, and (c) “absent” - where it was not recorded but had positive records in other samples from the same survey.
2. For the less abundant forms (128 species; Figures 102-229) a single map for each species is given. In this case, depending on the numbers of datapoints available, maps show either absences, presences, and percentages (4 classes) for water-column and sedimentary materials separately, or positive records only (in the water-column and in the sediments separately).

In all cases original percentage data were pooled or averaged in 5 x 5 degree Marsden squares. For maps where water-column and sedimentary records are graphed separately, symbols are located in the middle of each Marsden square. For those where all available data are represented on a single map, to avoid overlaps symbols are slightly offset from the center of the square (position of symbols that fall on land has not been corrected).

N-values at the top of the maps indicate total number of positive records (first number), and total

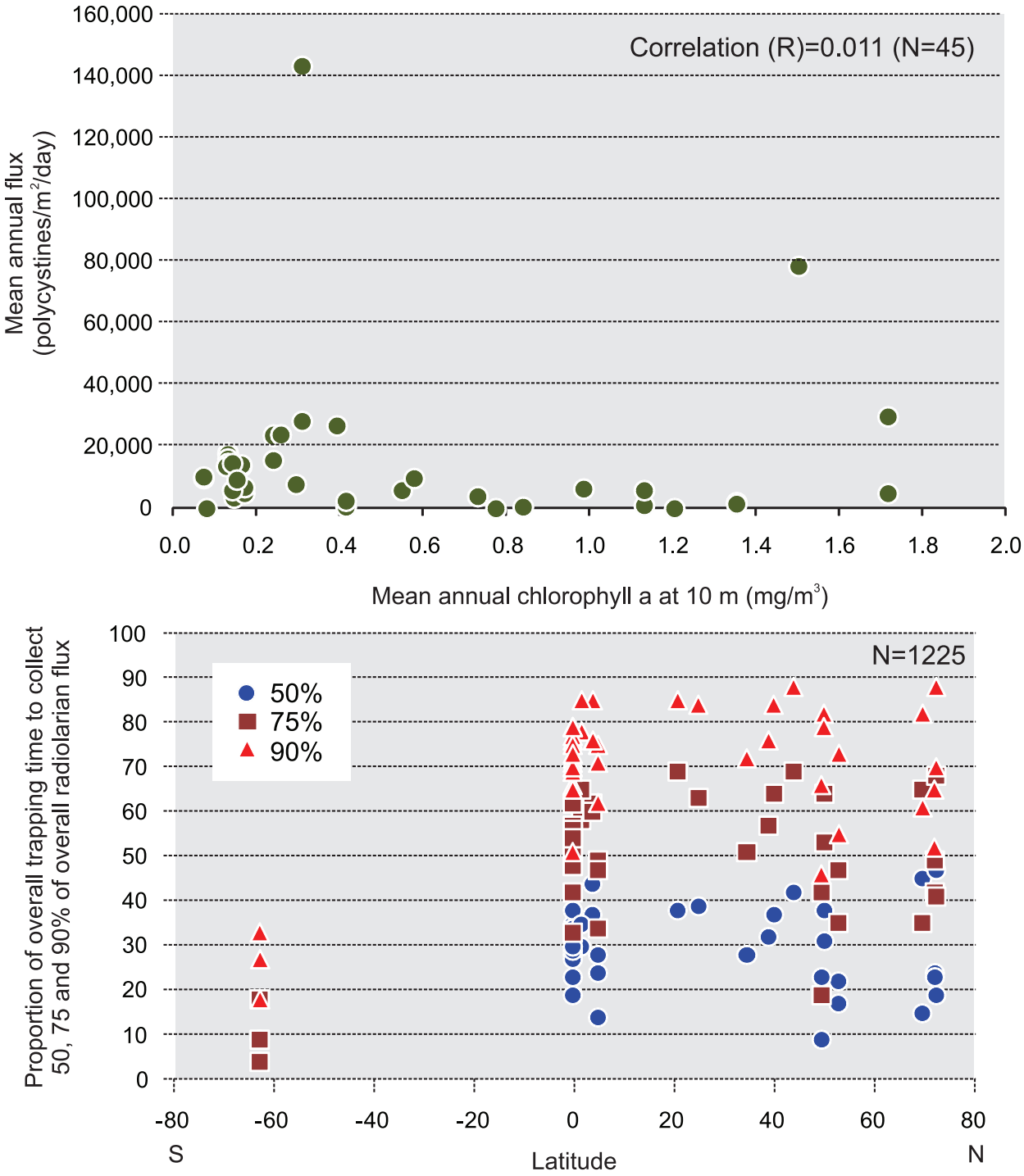

Figure 5.1. Polycystine fluxes vs. mean annual chlorophyll a. Polycystine flux data are the same as those in Figure 4; chlorophyll data are mean annual values at 10 m depth (from Conkright et al. 1998a, 1988b, 1988c). Figure 5.2. Polycystine production half-time (i.e., the time it takes to generate ≥50, 75 and 90% of the overall radiolarian flux during the entire trapping period when chronological flux data are sorted in descending order; as a percentage of overall trapping time) as a function of latitude. Based on 44 sediment trap moorings deployed for at least 300 consecutive days.

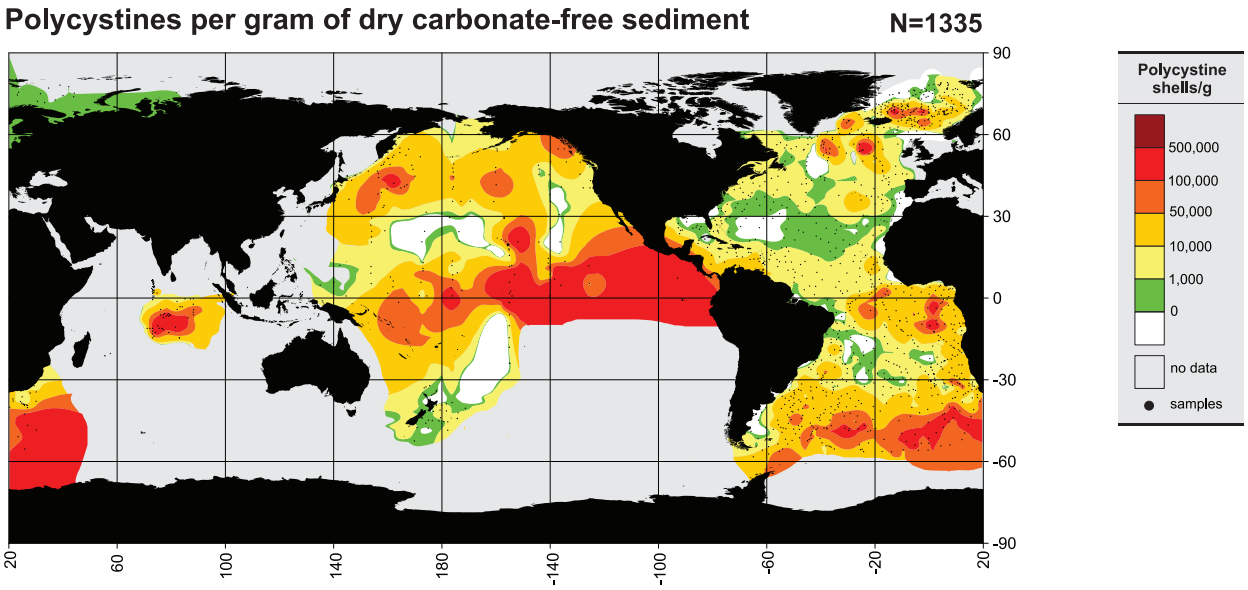

Figure 6. Geographic distribution of the numbers of shells in the surface sediments. N: number of samples used.

number of samples where the species was presumably sought (that is, samples forming part of data sets where the species was recoded at least once; second number, in square brackets).

Shadings are intended to serve as an aid for fast visual identification of the general area where the species was recorded, rather than denoting its distribution range. Shadings have not been extrapolated on the basis of the distribution of oceanographic parameters (currents, temperature, salinity, etc.). Negative records are usually outside of the shaded areas, except when densely surrounded by positive records.

Empty circles, indicating absence of the corresponding species, should not necessarily be interpreted as indicative of areas beyond the distribution range of the species; however, they do provide a general idea of the area where the species is at least scarcer.

No maps are given for the very scarce species, as well as for some poorly defined morphotypes for which the distributional information is quite likely inconsistent because of disagreements in their nomeclature and taxonomy.

Maps are arranged alphabetically within the two abundance categories defined above: first the 94 abundant taxa and then the 128 less abundant ones.

VERTICAL DISTRIBUTION OF THE SPECIES (Figures 230-236)

Although our database covers a large number of plankton tows (1854), summarization of this informantion is strongly hindered by the fact that radiolarian vertical density profiles in the plankton are affected by many variables, both environmental (e.g., latitude and longitude, season) and methodological (plankton net mesh size, sieve mesh size, preparation procedures), which complicate comparisons across surveys.

For species with reasonably abundant information, we reviewed vertical distribution patterns from two different perspectives: (a) The depth of maximum abundance of the taxon ("Vertical abundance profiles of individual species," Figures 230-234); and (b) the species that dominate the radiolarian assemblage at different depth layers in warm and cold waters ("Dominant species at different depths," Figures 235, 236).

For category (a) the information in the figures of vertical distribution of selected species was derived as follows:

1. We selected the 857 plankton tows with absolute cell concentrations per unit water filtered;
2. within each series of vertical plankton tows from the same location (450 series in total), absolute abundances were pooled and averaged for the following depth intervals: 0-50 m, 50-150 m, 150-500 m, 500-1000 m, and 1000-5000 m;
3. each of these series of 5 values (in numbers of shells per unit volume filtered) was transformed to percentages. Thus, for each geographic location and each species considered we derived the proportions of individuals

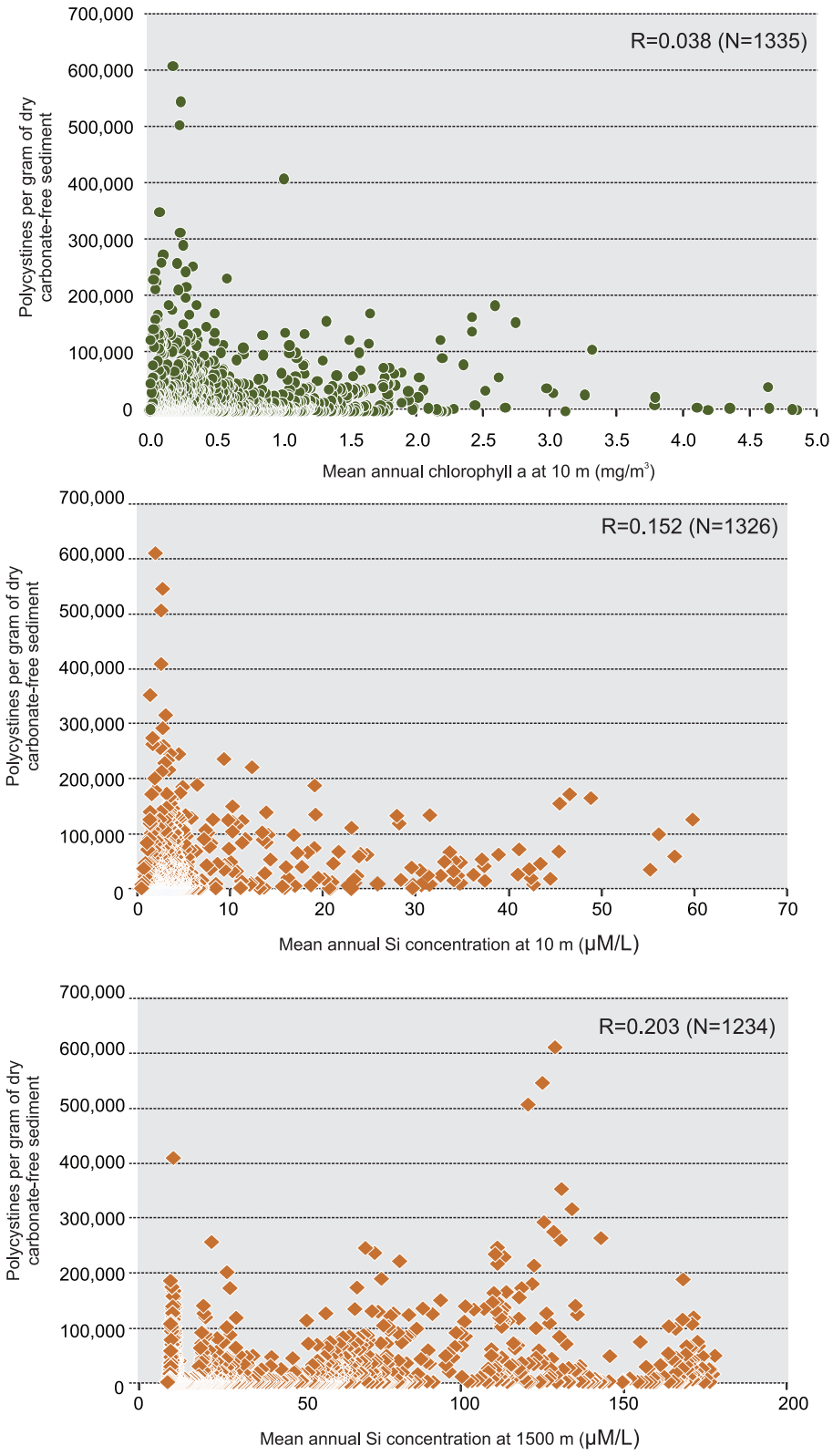

Figure 7.1. Shell concentrations in the sediments vs. mean annual chlorophyll a at 10 m (chlorophyll data from Conkright et al. 1998a, 1988b, 1988c). Figure 7.2. Shell concentrations in the sediments vs. mean annual Si concentration at the surface (10 m) (Si data from García et al. 2006). Figure 7.3. Shell concentrations in the sediments vs. mean annual Si concentration at depth (1500 m) (Si data from García et al. 2006).

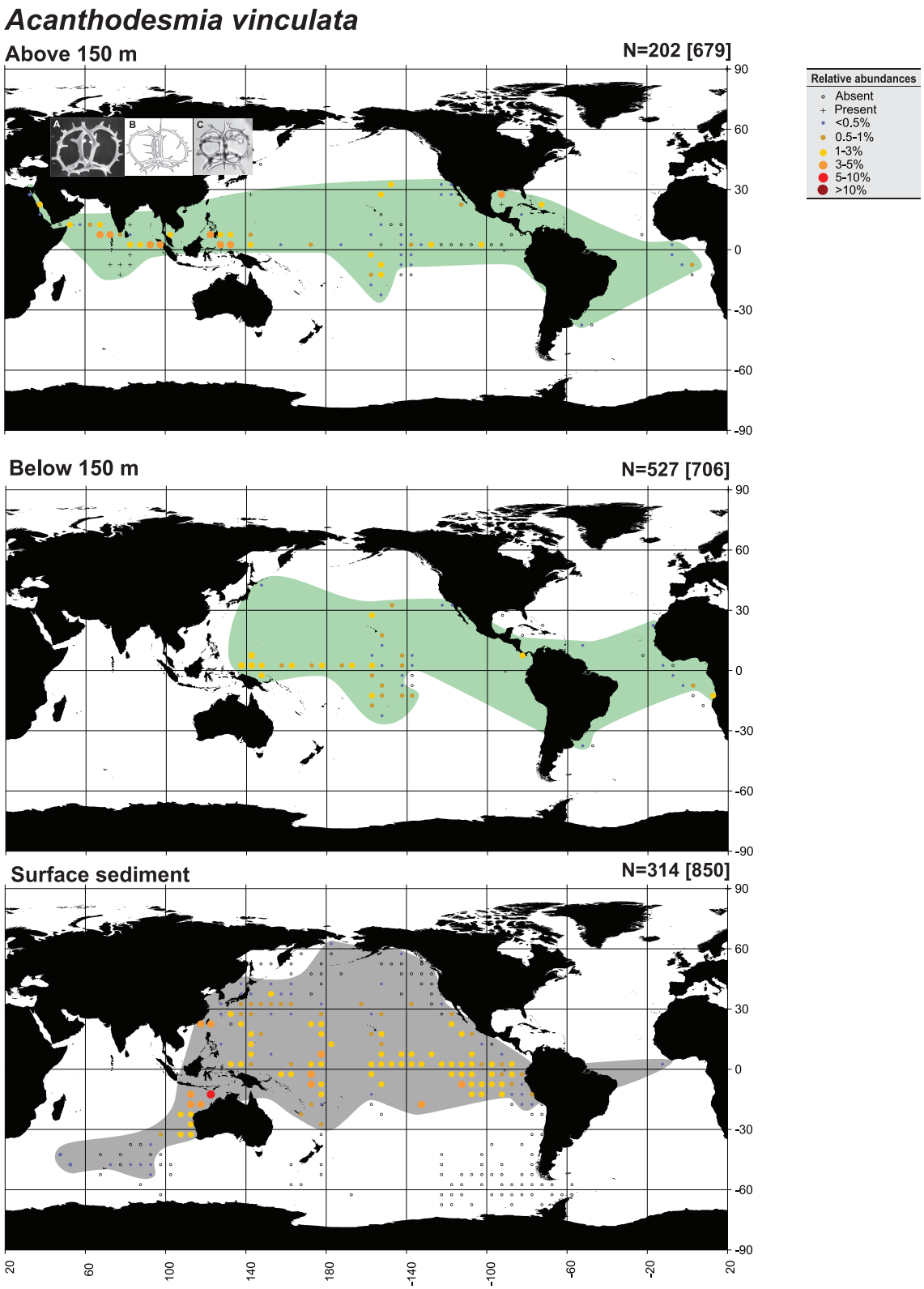

Figure 8. Geographic distribution of *Acanthodesmia vinculata*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (above 150 m and below 150 m; plankton and sediment trap materials) and surface sediment materials. Sources of species illustrations: A, Original; B, Petrushevskaya (1971); C, Itaki (2009).

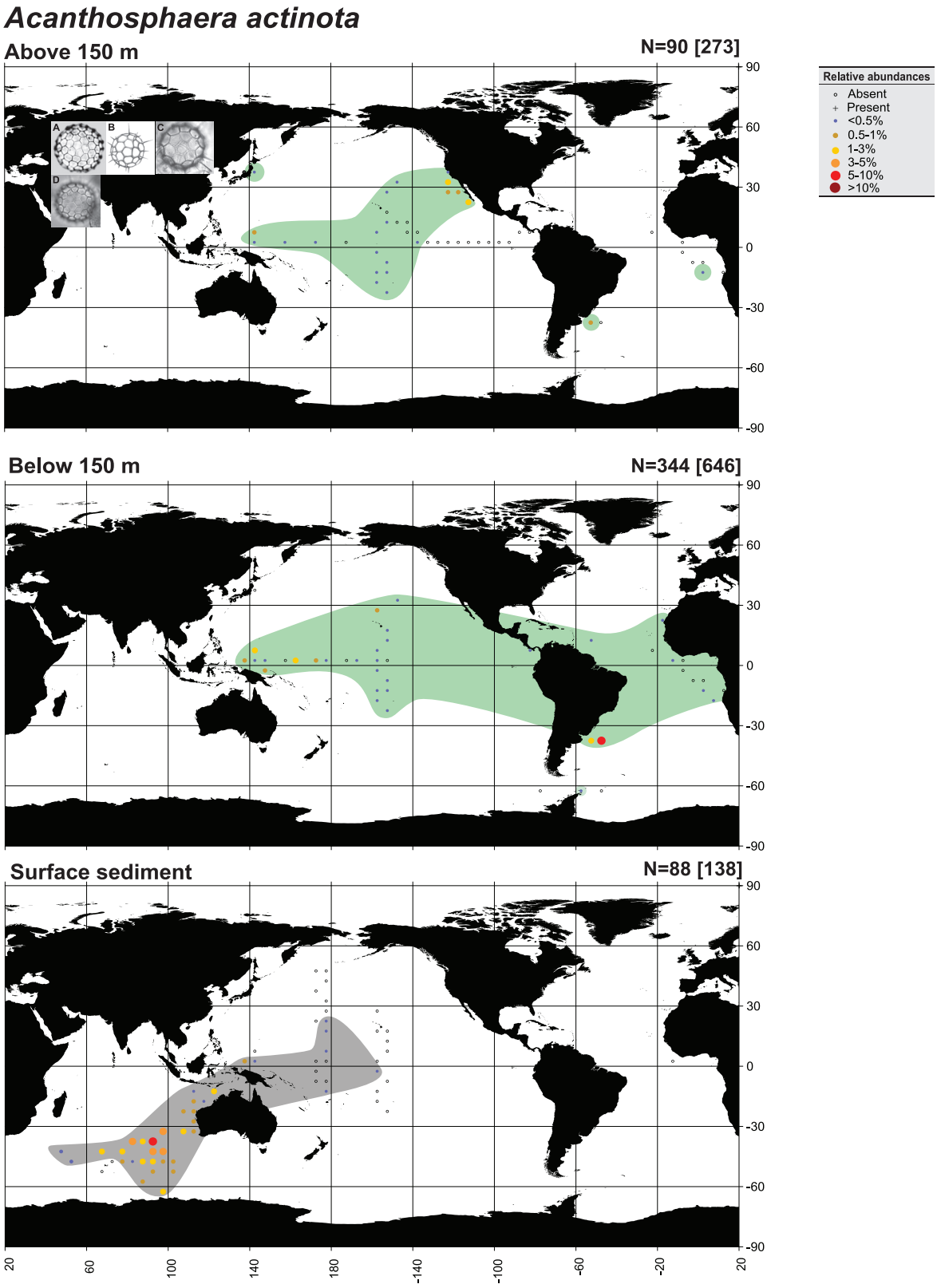

Figure 9. Geographic distribution of *Acanthosphaera actinota*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (above 150 m and below 150 m; plankton and sediment trap materials) and surface sediment materials. Sources of species illustrations: A, Boltovskoy (1999); B, Popofsky (1913); C, Original; D, Original.

recovered from the various depth intervals; (4) for each species, these percentages were averaged across all geographic sites.

For category (b) we selected the 50 species with highest numbers of records in the 857 plankton samples available. Proportions of each of these in the overall polycystine assemblage were averaged for the same 5 depth intervals as above and for samples obtained in warm waters (mean annual water temperature at 10 m >12°C, according to Antonov et al. 1998a, b, c), and samples obtained in cold waters of the northern hemisphere (mean annual water temperature at 10 m <12°C). A similar data set for the southern hemisphere was too small to yield meaningful information.

RADIOLARIAN DIVERSITY (FIGURES 237-241)

Numbers of species in the plankton (Figure 237), in sediment trap samples Figure 238), and in the sediments (Figure 239).

Data were pooled in 5 x 5 degree bins.The figures shown are averages and maximum values for these sectors. Plankton data include tows at all depths. For sediment trap data, each cup is a discrete sample. Data are restricted to materials where all radiolarians present in the slides were identified.

Mean number of species per sample (Figure 240)

Comparative figures of numbers of species identified in plankton, sediment trap, and surface sediment samples. Graph shows the average numbers of species in samples collected with different techniques. Data are restricted to materials where all radiolarians present in the slides were identified, and numbers of specimens per sample scanned were at least 100. Data were averaged for 20 x 20 degree sectors. Total numbers of samples included in this figure: plankton - 760, sediment traps - 983, surface sediments - 761.

Number of species identified as a function of the number of specimens scanned (Figure 241)

These graphs show how the overall specific inventory increases as more specimens are incorporated in the analysis. Increases are less pronounced in the polar waters, where species numbers are lower, and therefore the sample size needed to account for the entire specific inventory is smaller. Data are restricted to samples where (a) all radiolarian species were identified, (b) information on the numbers of specimens scanned was provided, and (c) at least 50 specimens per sample were observed.

TABLE 2. Taxa recorded in <10% of the samples from the Atlantic and >50% of the samples from the Indian and/or Pacific (body of table indicates numbers of samples where the species was recorded).

	Atlantic	Indian	Pacific
Actinomma delicatulum	8	6	1744
Cycladophora davisiana cornutoides	14	2	1671
Dictyophimus infabricatus	51	0	1479
Druppatractus irregularis	80	95	1509
Lamprocyrtis nigriniae	86	178	1575
Larcospira quadrangula	85	298	1732
Peripyramis circumtexta	84	101	1532
Phormospyris stabilis scaphipes	70	95	1557
Pterocanium korotnevi	8	0	1772

DISTRIBUTION OF HIGHER-LEVEL TAXA (FIGURES 242-258)

Maps are based on all the publications (including plankton, sediment trap, and surface sediment materials) where we assume that the entire radiolarian assemblage was identified (rather than subsets of selected species). Original percentages were pooled in 5 x 5 degree bins and averaged.

INTEROCEANIC COMPARISONS (TABLES 2, 3, 4)

Interoceanic differences (Tables 2, 3)

The tables included in this section list taxa that are absent or very scarce in either the Atlantic or the Indian Ocean, and quite abundant in either of the other two major oceanic basins. None of the species covered was scarce in the Pacific but abundant in either the Atlantic or the Indian oceans. Figures are based on all samples where radiolarians were identified (Atlantic: 982 samples, Indian: 698 samples, and Pacific: 2953 samples).

Endemisms (Table 4)

Species recorded at one of the poles only or restricted to the tropics and subtropics. Figures based on the entire dataset.

TABLE 3. Taxa recorded in <10% of the samples from the Indian Ocean and >50% of the samples from the Atlantic and/or Pacific (body of table indicates numbers of samples where the species was recorded).

	Atlantic	Indian	Pacific
Actinomma delicatulum	8	6	1744
Cycladophora davisiana cornutoides	14	2	1671
Dictyophimus infabricatus	51	0	1479
Pterocanium korotnevi	8	0	1772
Larcopyle buetschlii	245	52	2186
Stylochlamydium venustum	219	0	1876

WATER-COLUMN VS. SEDIMENTS COMPARISONS (FIGURES 259-275)

Comparison of specific occurrences of selected species in water column and sediment samples (Figure 259)

All water-column (N: 3562) and sediment (N: 3157) samples were used for this graph. The figure for each species is the average latitude (absolute values) of all the samples where the species was present. Because the mean latitude of sedimentary samples is 1.32 times that of all plankton samples, their index was divided by this figure. The graph is restricted to the 100 most abundant species.

Comparison of the occurrences of selected species in water column and sediment samples (Figure 260)

This graph illustrates the most important differences in the numbers of times a given species was recorded in the water-column vs. the number of times it was recorded in the sediments. Species selected are those that had at least 70 records in the water column or sediments and occurred at least 16 times more frequently in one of the two types of materials than in the other. Numbers in parentheses after each species name denote numbers of samples where it was recorded in water column materials (first figure) and in sedimentary materials (second figure). For columns graphed, the total number of occurrrences in the water column and in the sediments were corrected for total number of water column and sediment samples in the database.

Comparison of mean species percentages in the water-column and the sediments (data averaged for 5x5 degree Marsden squares) (Figures 261, 262)

All available percentage data were pooled in 5 x 5 degree Marsden squares and averaged for water column (plankton and sediment traps) and sedimentary materials separately. For those Marsden squares where data for both the water-column and the sediments were available mean proportions in the sediments were substracted from the mean proportions in the water-column. N values indicate total numbers of original data points involved in each comparison. Graphs are restricted to species where a strong bias toward one of the sources is apparent.

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TABLE 4. Species recorded at one of the poles only or restricted to the tropics and subtropics.

Taxon	Total number of positive records	Number of records north of 40°N	Number of records between 40°N and 40°S	Number of records south of 40°S
No records north of 40°N, >10 records south of 40°S				
** Acanthosphaera actinota*	522	0	491	31
** Actinomma sol*	146	0	93	53
** Actinosphaera acanthophora*	179	0	149	30
** Cubotholus sp.*	89	0	65	24
Heliodiscus echiniscus	206	0	185	21
** Hexacontium arachnoidale*	38	0	27	11
** Lophophaena hispida-cylindrica*	750	0	732	18
** Ommatodiscus murrayi*	66	0	51	15
** Plegmosphaera pachyplegma*	41	0	30	11
** Triceraspyris antarctica*	270	0	36	234
No records south of 40°S, >10 records north of 40°N				
** Actinomma sp. 1*	68	68	0	0
** Amphimelissa setosa*	516	512	4	0
** Artobotrys borealis*	475	465	10	0
** Ceratospyris borealis*	885	674	211	0
** Cladococcus cervicornis*	363	161	202	0
** Cladococcus viminalis*	140	26	114	0
** Conarachnium polyacanthum*	292	194	98	0
** Drymyomma elegans*	23	23	0	0
** Euscenium corynephorum*	35	35	0	0
Gonosphaera primordialis	206	160	46	0
** Lipmanella dictyoceras*	454	208	246	0
** Lithocampe platycephala*	259	259	0	0
** Lithostrobus hexagonalis*	446	83	363	0
** Lophophaena capito*	483	106	377	0
**** Lophospyris pentagona*	556	35	521	0
** Plectacantha cremastoplegma*	145	140	5	0
** Plegmosphaera coelopila*	149	64	85	0
** Plegmosphaera lepticali*	132	86	46	0
No records polewards of 40°, >10 records between 40°N and 40°S				
Acanthodesmia zonaria	15	0	15	0
** Acanthosphaera castanea*	35	0	35	0
Acrobotrys sp. group	196	0	196	0
** Actinosphaera capillacea*	73	0	73	0
** Androspyris ramosa*	35	0	35	0
** Arachnocorys circumtexta*	90	0	90	0
** Arachnosphaera myriacantha*	304	0	304	0
** Astrosphaera hexagonalis*	224	0	224	0
** Botryocephalina armata*	36	0	36	0
** Buccinosphaera invaginata*	235	0	235	0
** Centrobotrys thermophila*	278	0	278	0
** Cephalospyris cancellata*	44	0	44	0
Cephalospyris platybursa	348	0	348	0
Cladococcus megaceros	34	0	34	0
** Clathrocorys teuscheri*	570	0	570	0
** Conarachnium facetum*	78	0	78	0
** Corocalyptra krugeri*	79	0	79	0

Table 4 (continued).

Taxon	Total number of positive records	Number of records north of 40°N	Number of records between 40°N and 40°S	Number of records south of 40°S
* *Dictyocodon elegans*	41	0	41	0
* *Dictyocodon palladius*	86	0	86	0
* *Dictyospyris sp. 1*	36	0	36	0
* *Drymosphaera dendrophora*	12	0	12	0
* *Elatomma penicillus*	13	0	13	0
* *Haeckeliella macrodoras*	41	0	41	0
* *Haliomma castanea*	30	0	30	0
* *Hexacromyum elegans*	207	0	207	0
* *Hexalonche amphisiphon*	144	0	144	0
* *Liriospyris thorax thorax*	262	0	262	0
* *Lithopera bacca*	294	0	294	0
Myelinastrinae	190	0	190	0
* *Nephrospyris paradictyum*	117	0	117	0
* *Nephrospyris renilla*	163	0	163	0
* *Octodendron cubocentron*	17	0	17	0
* *Phormospyris stabilis capoi*	167	0	167	0
* *Sethoconus myxobrachia*	26	0	26	0
* *Sethodiscus macrococcus*	37	0	37	0
* *Solenosphaera polysolenia*	60	0	60	0
* *Solenosphaera zanguebarica*	601	0	601	0
* *Sphaeropyle mespilus*	29	0	29	0
* *Spongobrachium sp. 1*	60	0	60	0
* *Spongodictyon spongiosum*	50	0	50	0
* *Spongolena sp. 1*	45	0	45	0
* *Tessarastrum straussii*	38	0	38	0
* *Tholospyris anthophora*	25	0	25	0
* *Tholospyris baconiana*	125	0	125	0
* *Tholospyris procera*	13	0	13	0
* *Tholospyris tripodiscus*	38	0	38	0
* *Udan undulata*	11	0	11	0
* *Xiphosphaera tessaractis*	105	0	105	0
All other species				
* *Acanthodesmia vinculata*	1043	8	1028	7
* *Acanthosphaera dodecastyla*	64	0	62	2
* *Acanthosphaera pinchuda*	20	0	19	1
* *Acrosphaera cyrtodon*	27	1	26	0
* *Acrosphaera murrayana*	603	37	552	14
* *Acrosphaera spinosa*	1238	145	1071	22
* *Actinomma antarcticum*	328	1	103	224
* *Actinomma arcadophorum*	694	76	607	11
Actinomma capillaceum	2	0	2	0
Actinomma delicatulum	919	313	501	105
Actinomma leptodermum	1584	826	594	164
* *Actinomma medianum*	529	112	311	106
Actinosphaera tenella	3	0	3	0
* *Amphirhopalum ypsilon*	435	4	422	9
* *Androcyclas gamphonycha*	105	1	40	64

Table 4 (continued).

Taxon	Total number of positive records	Number of records north of 40°N	Number of records between 40°N and 40°S	Number of records south of 40°S
* *Androspyris huxleyi*	10	0	10	0
Androspyris reticulodisca	1	0	1	0
Anomalacantha dentata	174	57	104	13
* *Antarctissa denticulata-strelkovi*	705	115	280	310
* *Anthocyrtidium ophirense*	1087	6	1071	10
* *Anthocyrtidium zanguebaricum*	690	28	655	7
Arachnocorallium sp. group	1525	614	900	11
Arachnocorys sp. group	472	177	293	2
Arachnosphaera sp. 1	1	0	1	0
* *Archipilium sp. 1*	13	3	9	1
* *Artostrobus annulatus*	422	299	115	8
* *Artostrobus jorgenseni*	343	319	22	2
* *Bathropyramis woodringii*	51	2	49	0
* *Botryocyrtis scutum*	998	51	933	14
* *Botryopyle dictyocephalus*	85	2	79	4
* *Botryostrobus aquilonaris*	1041	444	456	141
* *Botryostrobus auritus-australis*	1437	380	956	101
* *Callimitra carolotae*	466	0	461	5
* *Callimitra solocicribrata*	72	55	16	1
* *Calocyclas monumentum*	58	0	56	2
* *Carpocanarium papillosum*	572	150	393	29
* *Carpocanium sp.*	1142	124	992	26
* *Carposphaera acanthophora*	113	12	97	4
Carposphaera capillacea	1	0	1	0
Cenosphaera cristata	194	21	77	96
Cenosphaera elysia	117	38	62	17
Cenosphaera hirsuta	3	0	2	1
Cenosphaera spp.	130	78	39	13
* *Centrocubus cladostylus*	158	29	128	1
Ceratocyrtis sinuosa	6	1	5	0
* *Cladococcus abietinus*	117	29	80	8
Cladococcus bifurcus	1	0	1	0
* *Cladococcus scoparius*	227	3	224	0
Cladococcus sp. 1	5	0	5	0
* *Cladoscenium ancoratum*	759	295	460	4
* *Cladoscenium limbatum*	19	5	14	0
* *Clathrocanium coarctatum*	491	2	484	5
Clathrocyclas sp. 1	1	0	1	0
Clathromitra pentacantha	2	0	0	2
Clathromitra pterophormis	1	0	1	0
Clathrosphaera arachnoides	1	0	1	0
* *Collosphaera huxleyi*	433	46	373	14
* *Collosphaera macropora*	269	2	265	2
* *Collosphaera tuberosa*	772	4	764	4
Conarachnium sp. 1	4	4	0	0
Conicavus tipiopsis	1	0	1	0
* *Cornutella profunda*	865	240	587	38

Table 4 (continued).

Taxon	Total number of positive records	Number of records north of 40°N	Number of records between 40°N and 40°S	Number of records south of 40°S
Corocalyptra cervus	951	236	702	13
* *Cromyechinus antarctica*	964	512	339	113
Cromyechinus sp. 1	5	0	5	0
* *Cromyomma circumtextum*	7	0	7	0
Cromyomma sp. 1	1	0	1	0
* *Cromyomma villosum*	9	0	9	0
** *Cycladophora davisiana cornutoides*	816	389	408	19
** *Cycladophora davisiana davisiana*	1519	916	414	189
Cyclampterium neatum	1	0	1	0
* *Cyrtidosphaera reticulata*	15	9	6	0
* *Cyrtolagena laguncula*	390	209	172	9
* *Dictyocoryne profunda*	1661	164	1417	80
* *Dictyocoryne truncatum*	787	23	754	10
* *Dictyophimus hirundo*	1027	403	529	95
* *Dictyophimus histricosus*	23	21	0	2
* *Dictyophimus infabricatus*	427	78	346	3
Dictyophimus mawsoni	4	0	0	4
Dictyophimus sp. 1	1	0	1	0
* *Didymocyrtis tetrathalamus*	1860	106	1694	60
* *Dipylissa bensoni*	8	2	5	1
Druppatractus irregularis	803	273	521	9
* *Ellipsoxiphium palliatum*	16	1	15	0
* *Enneaphormis rotula*	680	312	336	32
* *Eucecryphalus clinatus*	98	2	93	3
* *Euchitonia elegans-furcata*	1471	45	1391	35
* *Eucyrtidium acuminatum*	1293	289	891	113
* *Eucyrtidium anomalum*	375	26	347	2
Eucyrtidium erythromystax	157	17	125	15
* *Eucyrtidium hexagonatum*	1008	67	923	18
* *Eucyrtidium hexastichum*	403	0	401	2
* *Haliomma macrodoras*	10	0	10	0
Haliomma sp. 1	1	0	1	0
Haliomma sp. 2	5	0	5	0
* *Heliodiscus asteriscus*	1184	60	980	144
Heliodiscus sp. 1	6	0	6	0
Heliosoma sp. 1	1	0	1	0
* *Helotholus histricosa*	1056	629	277	150
Heterosphaera sp. 1	8	0	8	0
Heterosphaera sp. 2	4	0	4	0
Hexacontium armatum-hostile group	1420	395	993	32
Hexacontium heracliti	5	0	5	0
Hexacontium heteracantha	7	0	3	4
Hexacontium hystricina	1	0	1	0
* *Hexacontium laevigatum*	141	47	71	23
* *Hexastylus dimensivius*	27	0	26	1
Hexastylus triaxonius	1	0	1	0
* *Lamprocyclas maritalis*	858	65	707	86

Table 4 (continued).

Taxon	Total number of positive records	Number of records north of 40°N	Number of records between 40°N and 40°S	Number of records south of 40°S
* *Lamprocyrtis junonis*	608	113	440	55
* *Lamprocyrtis nigriniae*	765	93	651	21
* *Lampromitra cracenta*	20	0	19	1
* *Lampromitra quadricuspis*	607	158	430	19
* *Lampromitra schultzei*	142	2	139	1
* *Larcopyle buetschlii*	1582	491	988	103
* *Larcospira quadrangula*	1011	53	934	24
* *Larnacalpis* sp. 1	41	2	39	0
Leptosphaera minuta	1	0	1	0
* *Lipmanella bombus*	116	0	115	1
* *Lipmanella virchowii*	337	5	327	5
* *Liriospyris reticulata*	867	5	861	1
Liriospyris sp. 1	1	0	1	0
Liriospyris thorax laticapsa	8	0	8	0
* *Litharachnium tentorium*	966	346	613	7
Lithelius minor group	2065	668	1204	193
* *Lithelius nautiloides*	768	169	372	227
* *Lithocampe* sp. 1	234	49	163	22
Lithomelissa hystrix	441	362	70	9
* *Lithomelissa setosa*	981	756	201	24
* *Lithopilium reticulatum*	6	0	6	0
Lithostrobus cornutus	3	0	3	0
* *Lophocorys polyacantha*	324	37	286	1
Lophophaena decacantha group	566	193	367	6
Lophophaena rioplatensis	4	0	4	0
Lophophaena variabilis group	868	86	775	7
Lophospyris pentagona pentagona	1174	202	967	5
Lophospyris pentagona quadriforis	496	40	297	159
Lychnosphaera regina	2	0	2	0
* *Mitrocalpis araneafera*	137	112	16	9
* *Neosemantis distephanus*	859	196	661	2
* *Octopyle stenozona/Tetrapyle octacantha*	2010	321	1596	93
* *Otosphaera polymorpha*	227	1	226	0
* *Peripyramis circumtexta*	696	82	530	84
* *Peromelissa phalacra*	705	84	618	3
* *Phormacantha hystrix*	709	450	231	28
Phormospyris sp. 1	2	0	2	0
* *Phormospyris stabilis scaphipes*	948	79	812	57
* *Phormospyris stabilis stabilis*	305	58	244	3
* *Phormostichoartus corbula*	824	162	639	23
* *Phorticium pylonium*	1080	516	445	119
Phrenocodon clathrostomium	2	0	2	0
Plectacantha oikiskos	289	164	92	33
* *Plectacantha trichoides*	30	6	24	0
Plectanium sp. 1	6	0	6	0
* *Plectopyramis dodecomma*	27	3	12	12
Plegmosphaera entodictyon	135	0	130	5

Table 4 (continued).

Taxon	Total number of positive records	Number of records north of 40°N	Number of records between 40°N and 40°S	Number of records south of 40°S
Plegmosphaera oblonga	2	0	2	0
* *Porodiscus microporus*	51	1	50	0
* *Pseudocubus obeliscus*	663	163	496	4
Pseudocubus octostylus	1	0	1	0
* *Pseudodictyophimus bicornis*	156	49	106	1
* *Pseudodictyophimus gracilipes*	2107	1088	951	68
* *Pterocanium auritum*	127	3	103	21
* *Pterocanium korotnevi*	747	305	418	24
* *Pterocanium praetextum*	1243	43	1169	31
* *Pterocanium trilobum*	1239	103	1105	31
* *Pterocorys hertwigii*	322	5	313	4
* *Pterocorys minythorax*	333	1	322	10
* *Pterocorys zancleus*	1660	269	1283	108
* *Pterocyrtidium dogieli*	21	1	13	7
Pteropilium stratiotes	3	0	3	0
* *Pteroscenium pinnatum*	304	4	294	6
* *Pylolena armata*	665	16	606	43
* *Pylospira octopyle*	224	52	168	4
* *Rhizoplegma boreale*	817	773	27	17
* *Saccospyris antarctica*	218	165	1	52
* *Saccospyris conithorax*	422	354	51	17
* *Saturnalis circularis*	163	16	127	20
* *Sethoconus anthocyrtis*	81	0	79	2
* *Sethoconus tabulatus*	199	165	26	8
* *Sethophormis aurelia*	284	10	271	3
* *Siphocampe arachnea*	443	285	153	5
* *Siphocampe lineata*	374	326	40	8
* *Siphonosphaera martensi*	151	4	140	7
* *Siphonosphaera polysiphonia*	605	18	581	6
* *Siphonosphaera socialis*	129	4	124	1
* *Solenosphaera collina*	69	2	67	0
Solenosphaera tenuissima	4	0	4	0
* *Spirocyrtis scalaris*	606	5	598	3
Spongaster pentas	104	1	102	1
* *Spongaster tetras*	1457	40	1397	20
* *Spongodiscus resurgens*	855	177	635	43
Spongodrymus elaphococcus	1	0	1	0
* *Spongoliva ellipsoides*	183	23	152	8
Spongoplegma antarcticum	4	0	4	0
* *Spongoplegma rugosa*	20	0	17	3
* *Spongopyle osculosa*	1098	344	612	142
Spongosphaera sp. aff. *S. helioides*	4	0	4	0
* *Spongosphaera streptacantha*	345	13	331	1
* *Spongotrochus glacialis*	1975	792	1064	119
* *Spongurus cylindricus*	862	177	635	50
* *Spongurus pylomaticus*	725	210	355	160
* *Spongurus* sp. 1	1102	417	590	95

Table 4 (continued).

Taxon	Total number of positive records	Number of records north of 40°N	Number of records between 40°N and 40°S	Number of records south of 40°S
* *Stichopilium bicorne*	534	96	431	7
Stigmosphaera cruciata	2	0	2	0
Stylatractus sp. 1	1075	325	608	142
* *Stylochlamydium asteriscus*	501	94	392	15
* *Stylochlamydium venustum*	1087	482	599	6
* *Stylodictya aculeata*	501	159	249	93
Stylodictya aculeata-multispina	544	60	480	4
* *Stylodictya multispina*	1378	461	805	112
* *Stylosphaera melpomene*	308	0	303	5
Styptosphaera sp. 1	1	0	1	0
Styptosphaera sp. 2	1	0	1	0
Styptosphaera spongiacea	384	4	380	0
* *Styptosphaera spumacea*	229	114	87	28
* *Tetracorethra tetracorethra*	169	0	168	1
Tetraplecta corynephorum?	1	0	1	0
* *Tetraplecta pinigera*	722	285	435	2
Tetraplecta plectaniscus	4	0	4	0
* *Thecosphaera inermis*	275	2	255	18
* *Theocalyptra bicornis*	970	314	470	186
* *Theocorys veneris*	443	2	440	1
* *Theocorythium trachelium*	981	59	855	67
* *Theopilium tricostatum*	637	69	554	14
Tholospyris macropora	6	0	6	0
* *Tribonosphaera centripetalis*	9	0	9	0
* *Tricolocampe cylindrica*	99	0	97	2
* *Trisulcus triacanthus*	147	17	129	1
Xiphosphaera gaea	4	0	4	0
* *Zygocircus productus*	1384	432	951	1

* Map of geographic distribution provided

** Both subspecies pooled in distributional map

*** *Lophospyris pentagona pentagona, L. p. hyperborea* and *L. p. quadriforis* pooled in distributional map

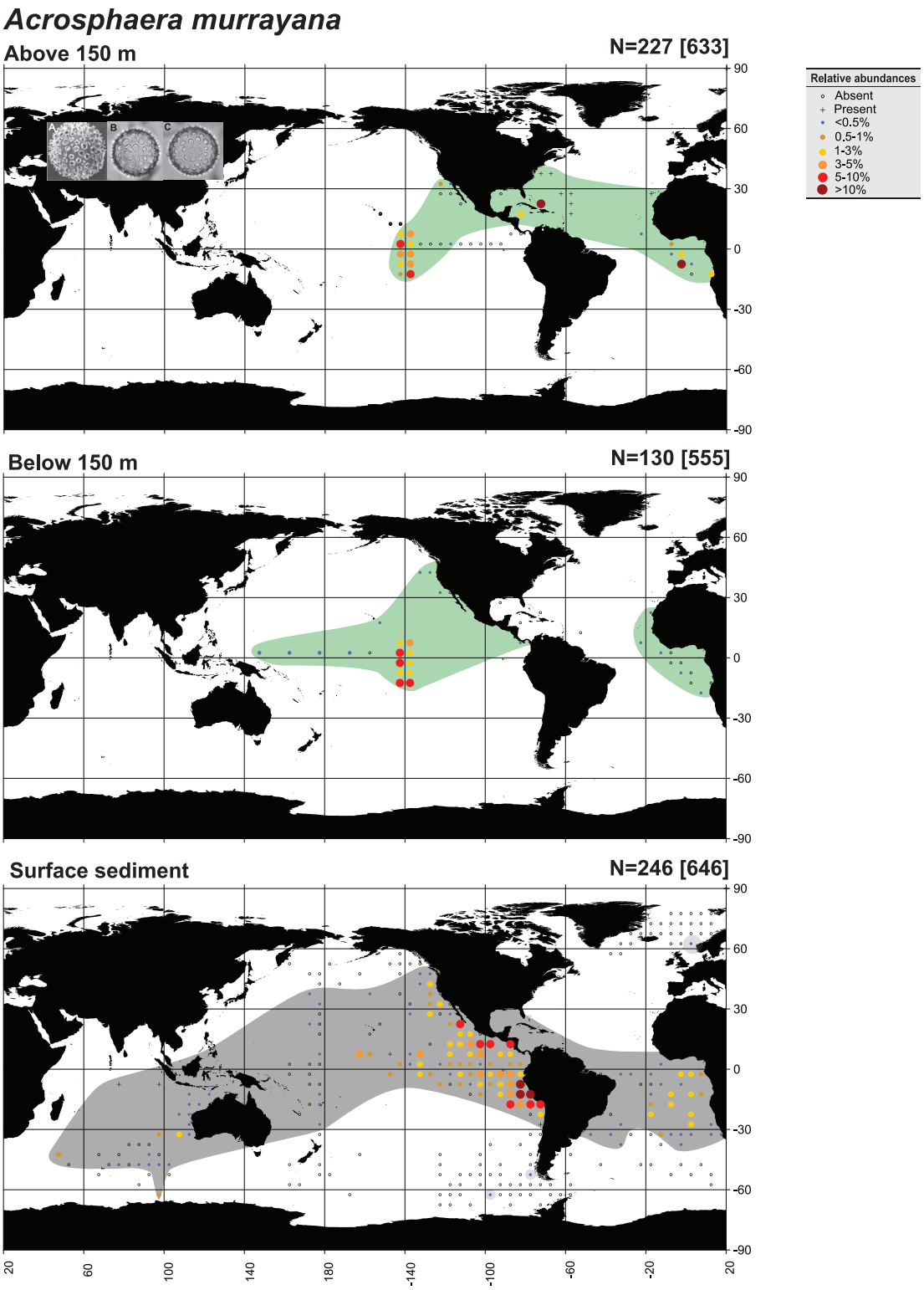


Figure 10. Geographic distribution of *Acrosphaera murrayana*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (above 150 m and below 150 m; plankton and sediment trap materials) and surface sediment materials. Sources of species illustrations: A, Takahashi (1991); B, Original; C, Original.

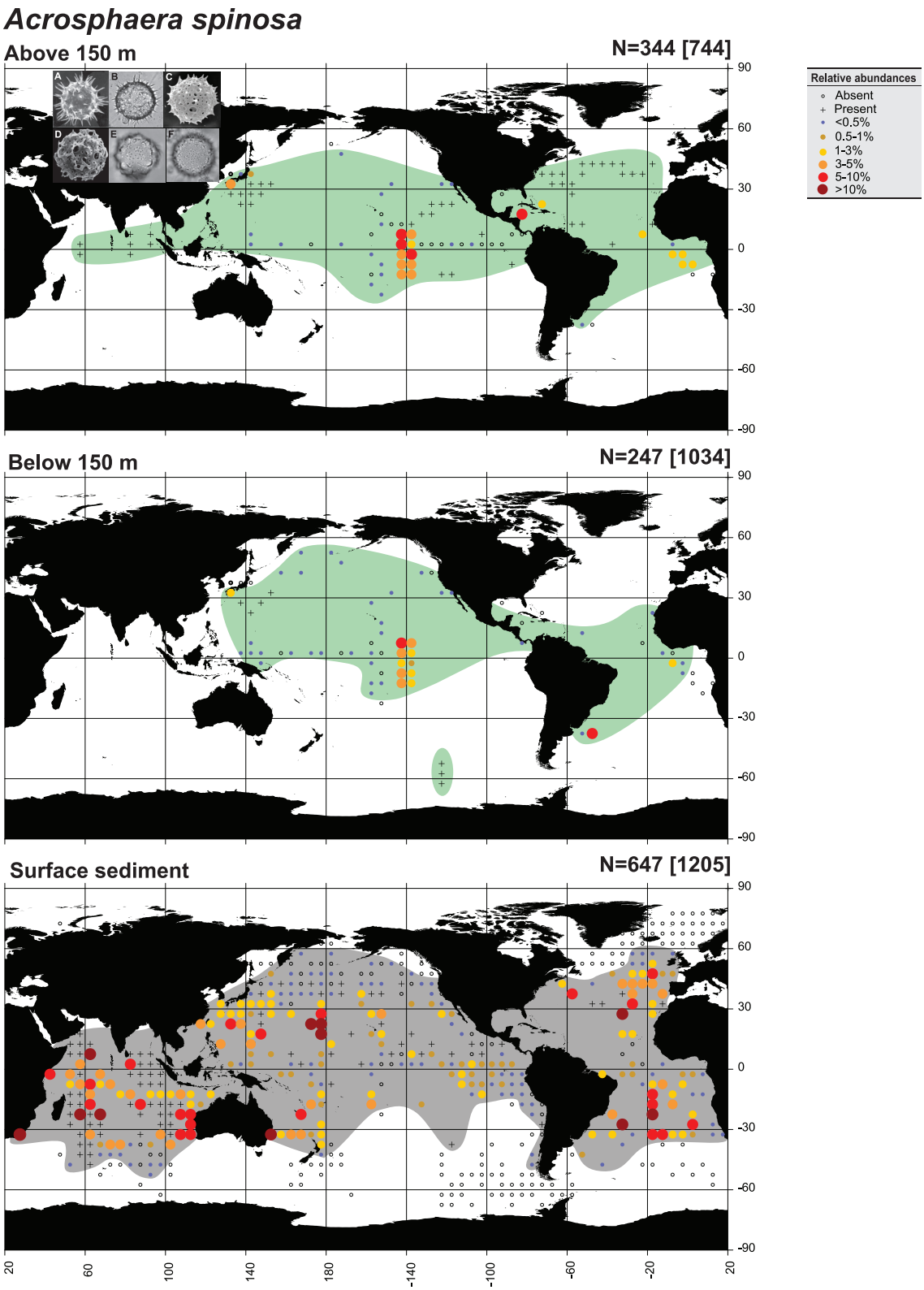


Figure 11. Geographic distribution of *Acrosphaera spinosa*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (above 150 m and below 150 m; plankton and sediment trap materials) and surface sediment materials. Sources of species illustrations: A, Takahashi (1991); B, Original; C, Original; D, Ishitani and Takahashi (2007).

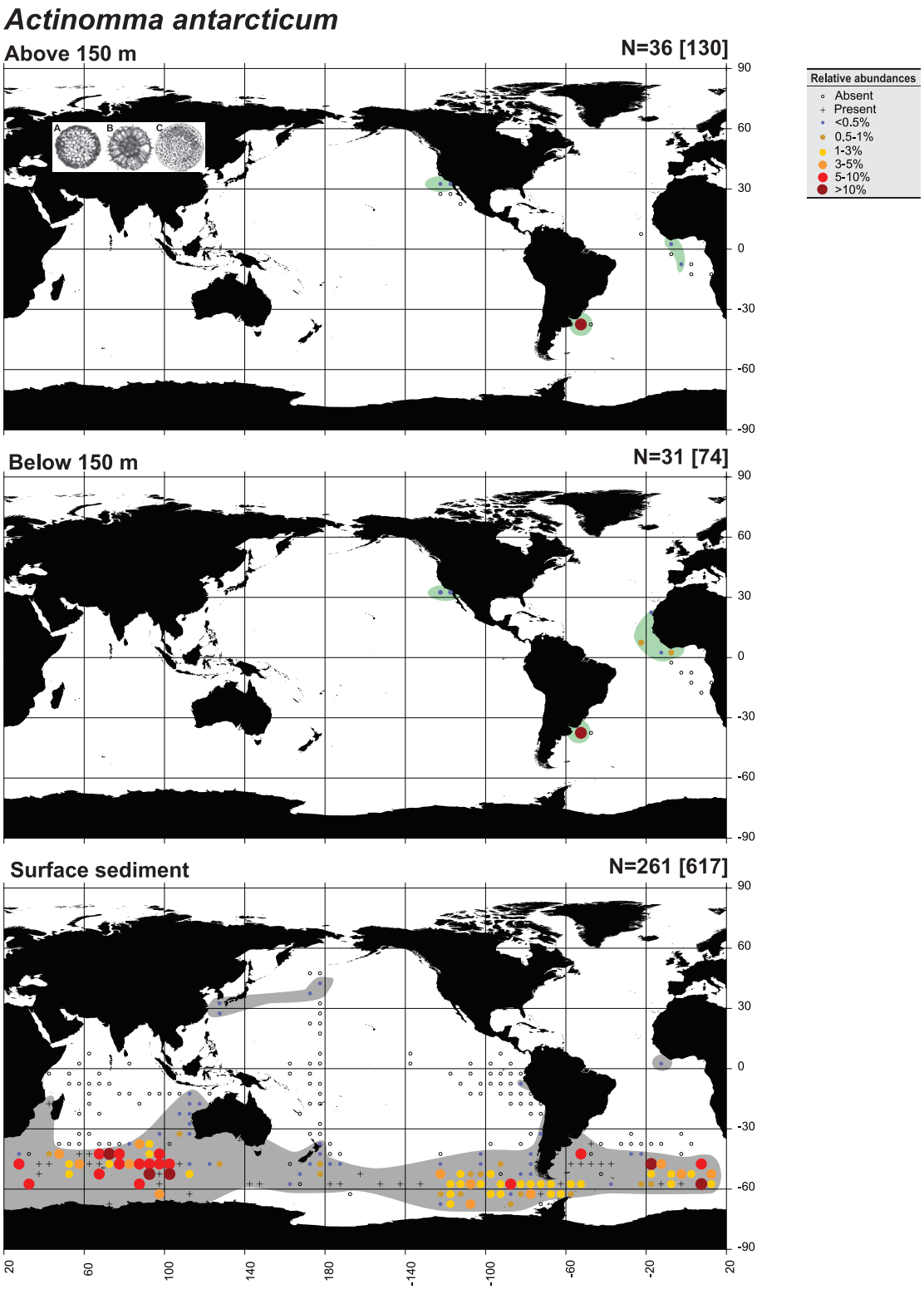


Figure 12. Geographic distribution of *Actinomma antarcticum*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (above 150 m and below 150 m; plankton and sediment trap materials) and surface sediment materials. Sources of species illustrations: A, Nigrini (1968); B, Boltovskoy (1999); C, Riedel (1958).

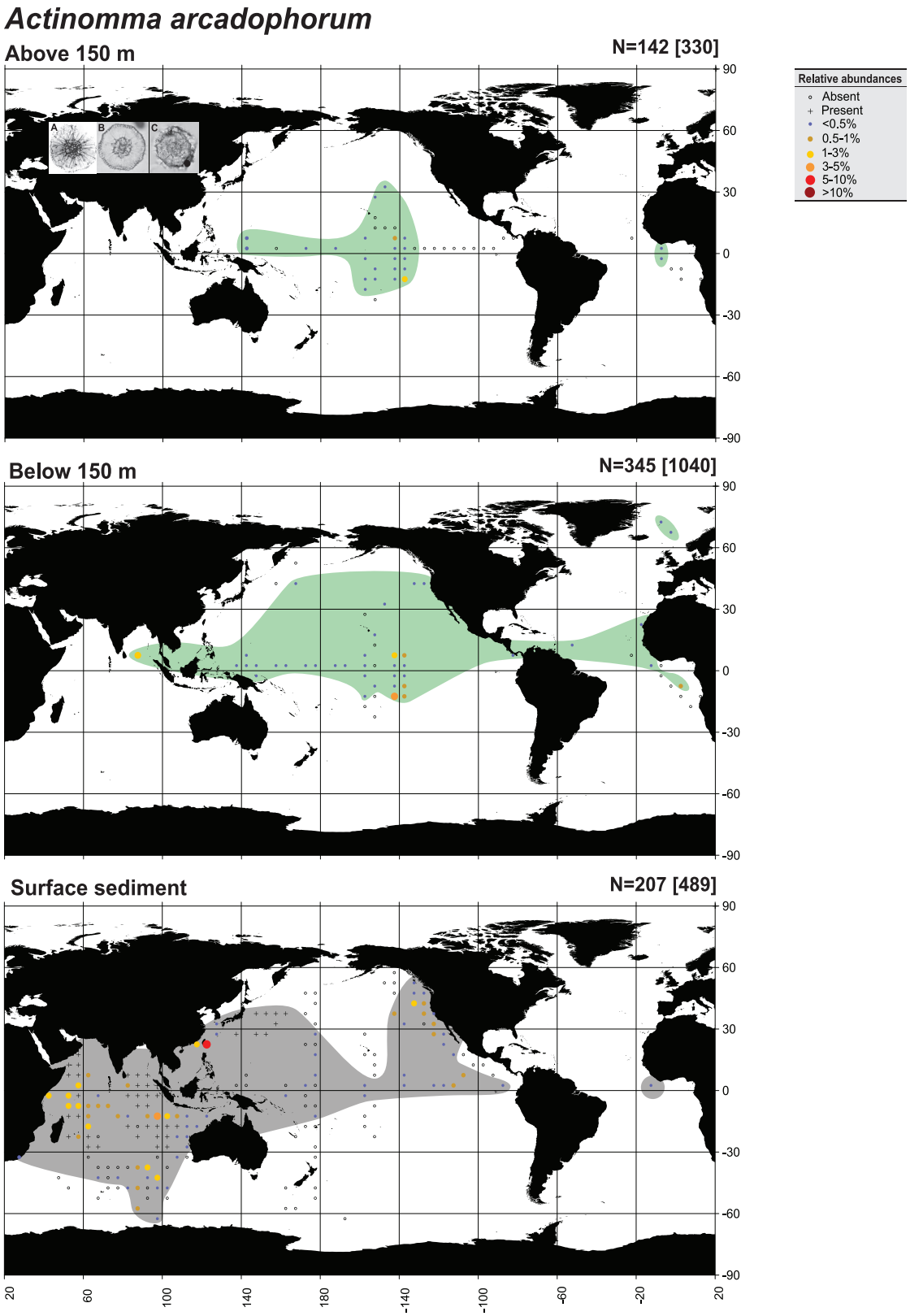


Figure 13. Geographic distribution of *Actinomma arcadophorum*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (above 150 m and below 150 m; plankton and sediment trap materials) and surface sediment materials. Sources of species illustrations: A, Boltovskoy (1999); B, Nigrini (1967); C, Original.

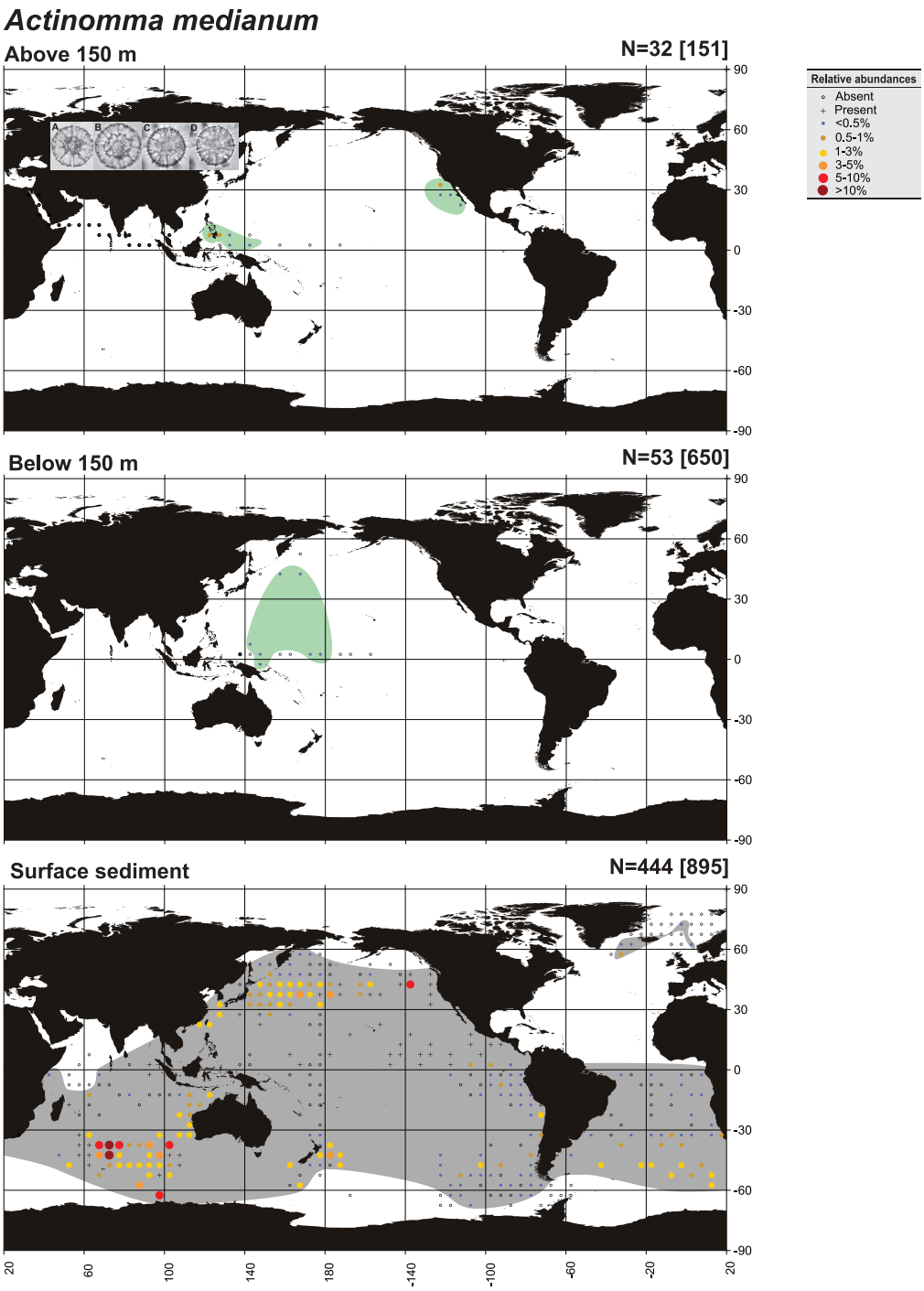


Figure 14. Geographic distribution of *Actinomma medianum*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (above 150 m and below 150 m; plankton and sediment trap materials) and surface sediment materials. Sources of species illustrations: A, Nigrini (1967); B, Itaki (2009); C, Original; D, Original.

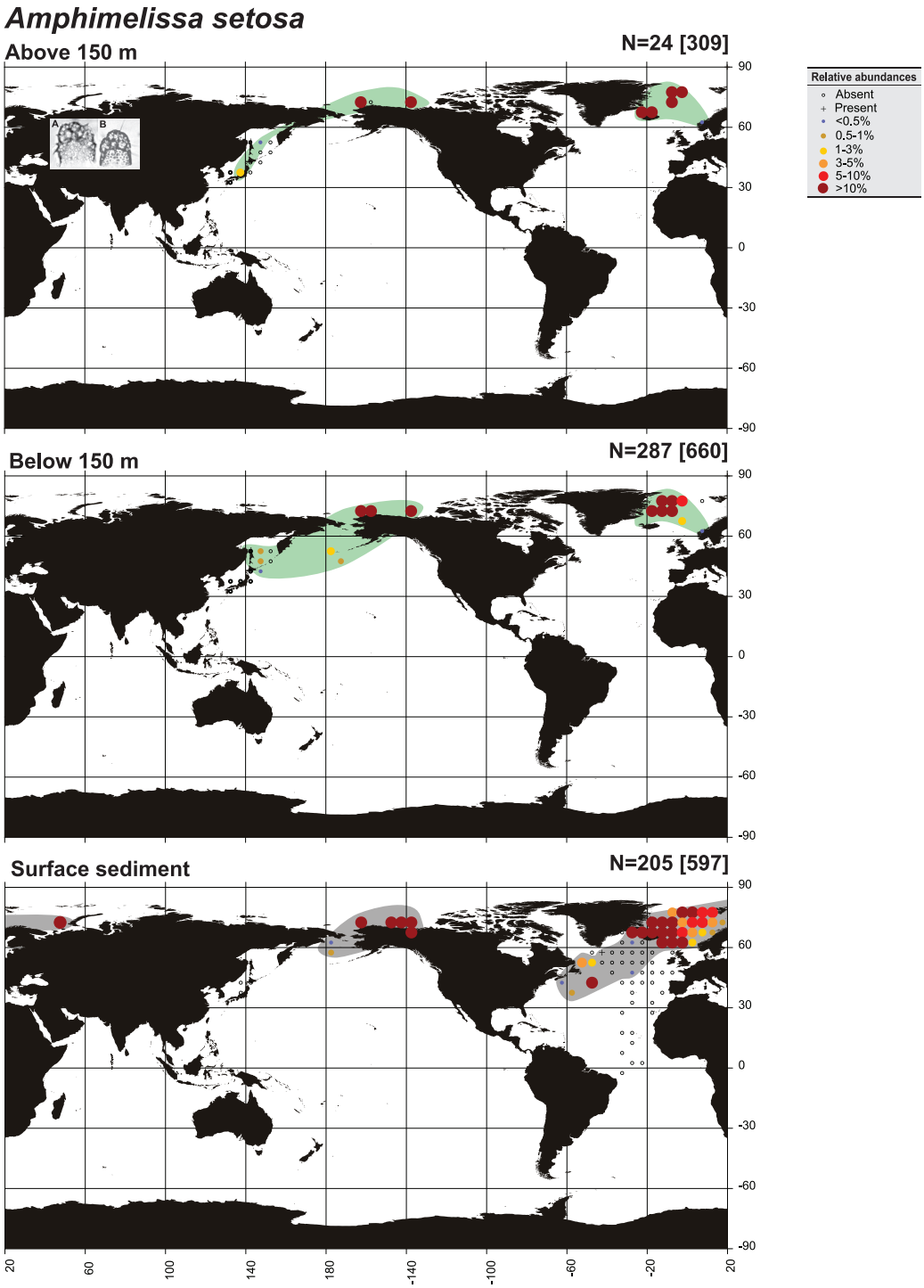


Figure 15. Geographic distribution of *Amphimelissa setosa*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (above 150 m and below 150 m; plankton and sediment trap materials) and surface sediment materials. Sources of species illustrations: A, Radiolaria.org (photo Bjørklund and Kruglikova); B, Bjørklund and Swanberg (1987).

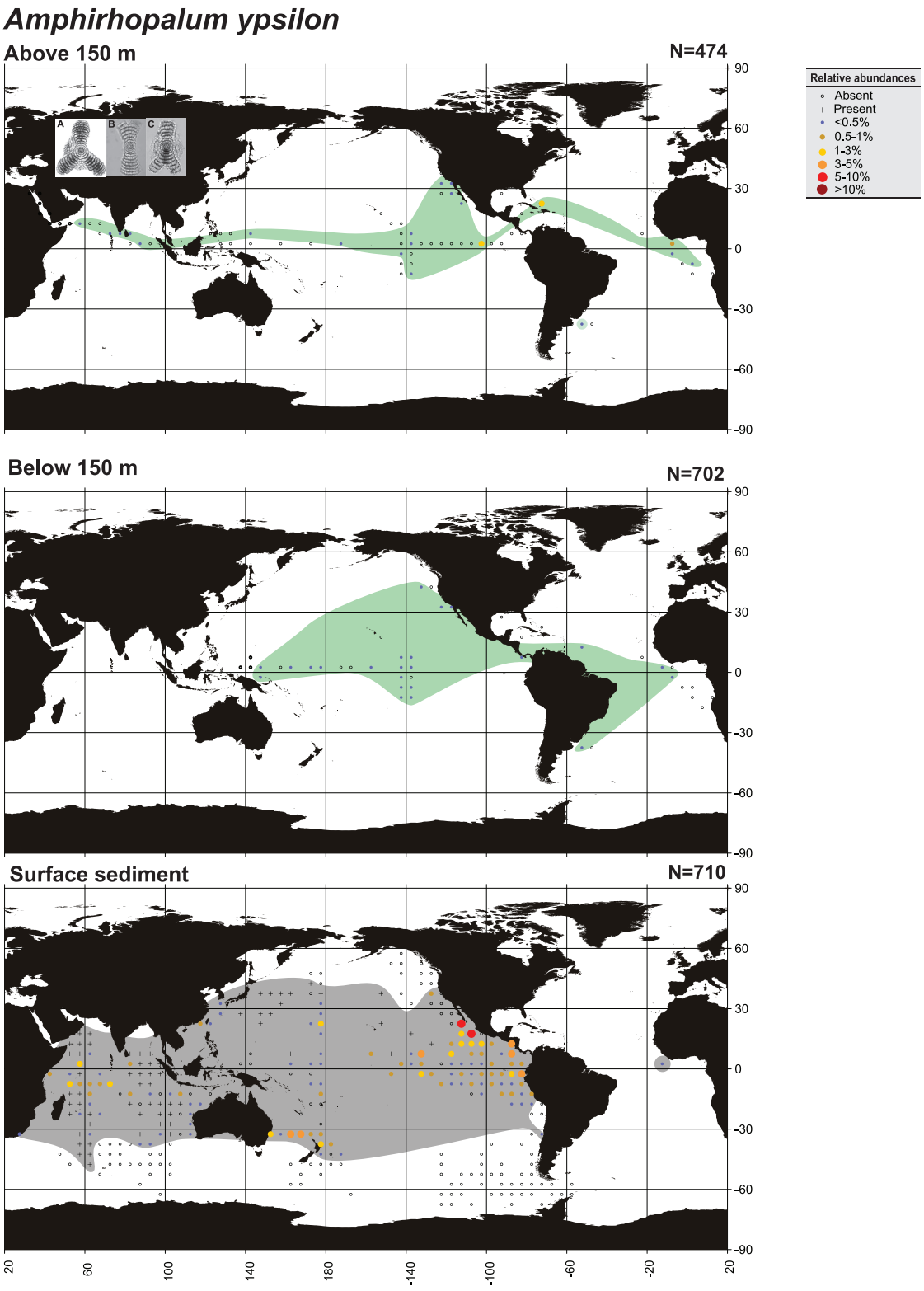


Figure 16. Geographic distribution of *Amphirhopalum ypsilon*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (above 150 m and below 150 m; plankton and sediment trap materials) and surface sediment materials. Sources of species illustrations: A, Nigrini (1971); B, Original; C, Original.

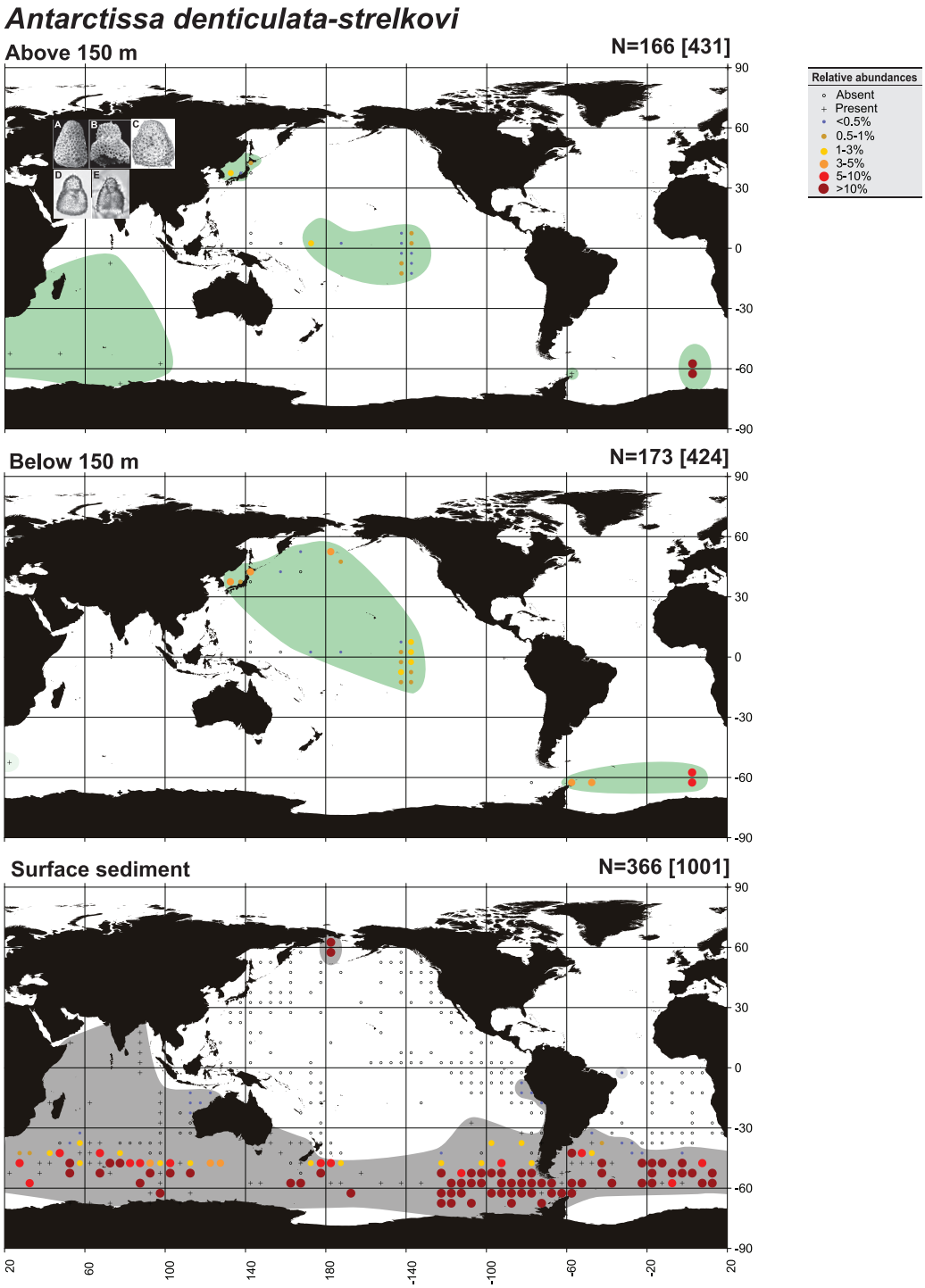


Figure 17. Geographic distribution of *Antarctissa denticulata-strelkovi*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (above 150 m and below 150 m; plankton and sediment trap materials) and surface sediment materials. Sources of species illustrations: A, Boltovskoy (1999); B, Boltovskoy (1999); C, Petrushevskaya (1967); D, Original; E, Original.

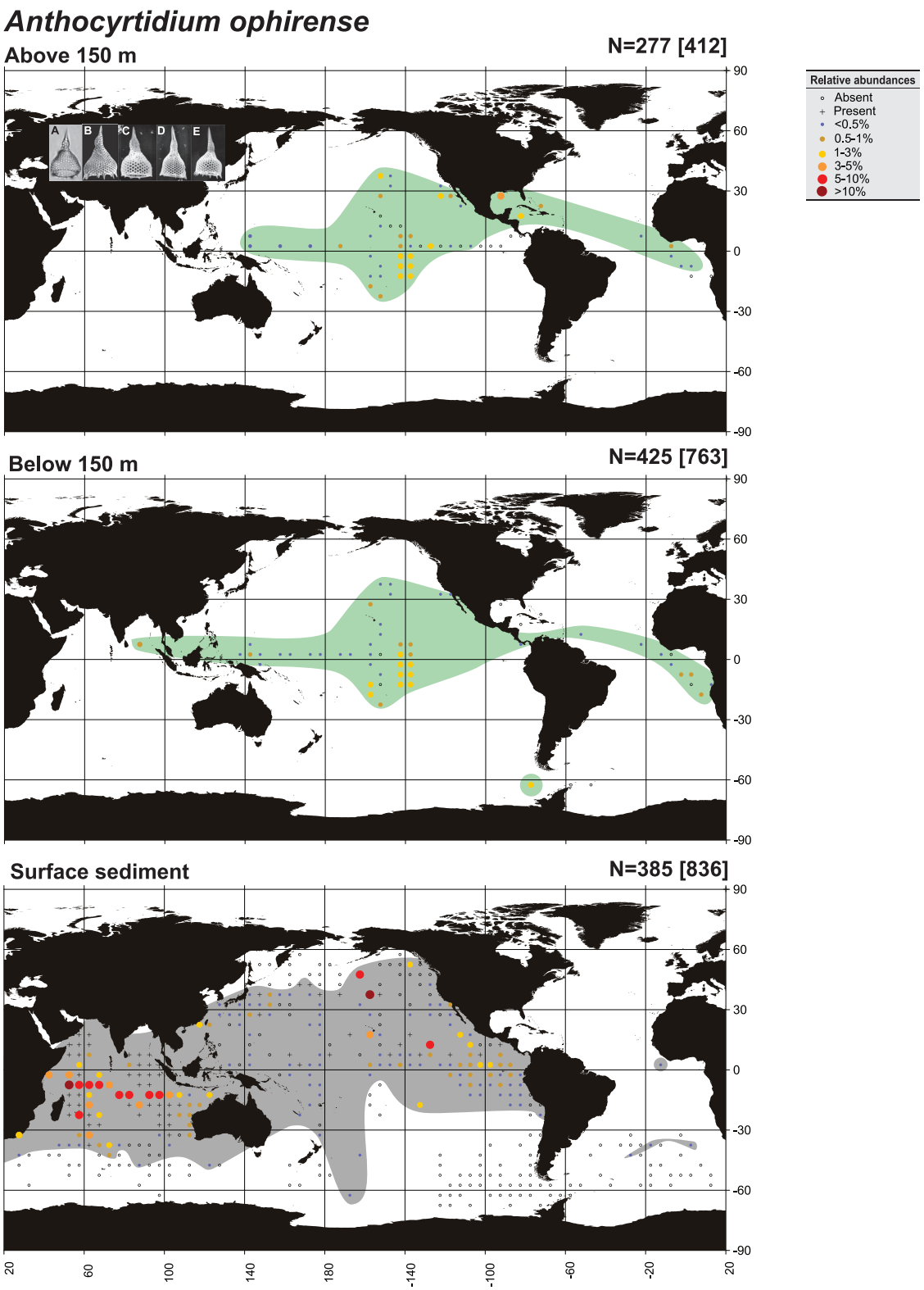


Figure 18. Geographic distribution of *Anthocyrtidium ophirense*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (above 150 m and below 150 m; plankton and sediment trap materials) and surface sediment materials. Sources of species illustrations: A, Original; B, Boltovskoy (1999); C, Original; D, Original; E, Original.

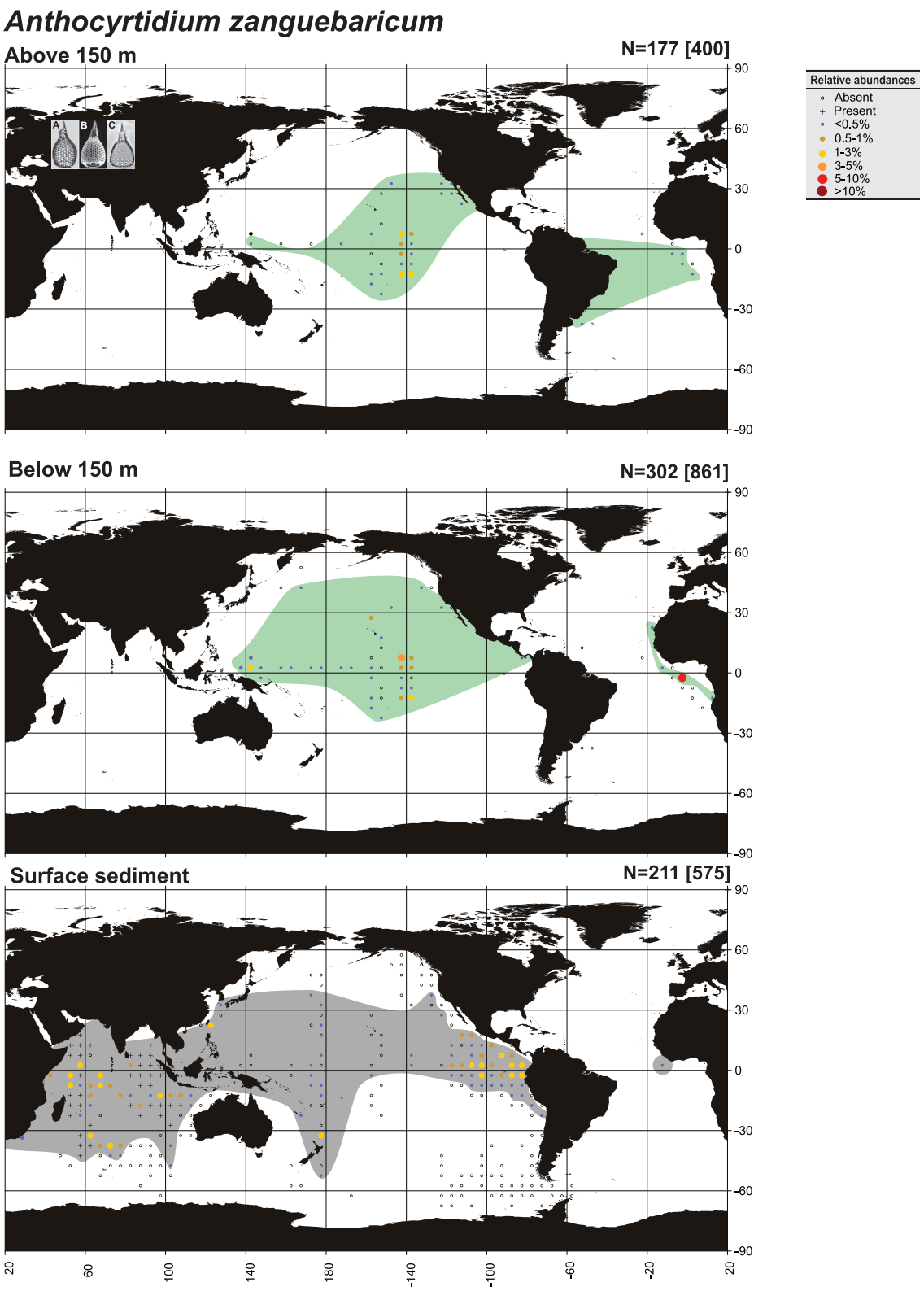


Figure 19. Geographic distribution of *Anthocyrtidium zanguebaricum*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (above 150 m and below 150 m; plankton and sediment trap materials) and surface sediment materials. Sources of species illustrations: A, Boltovskoy (1999); B, Boltovskoy (1999); C, Original.

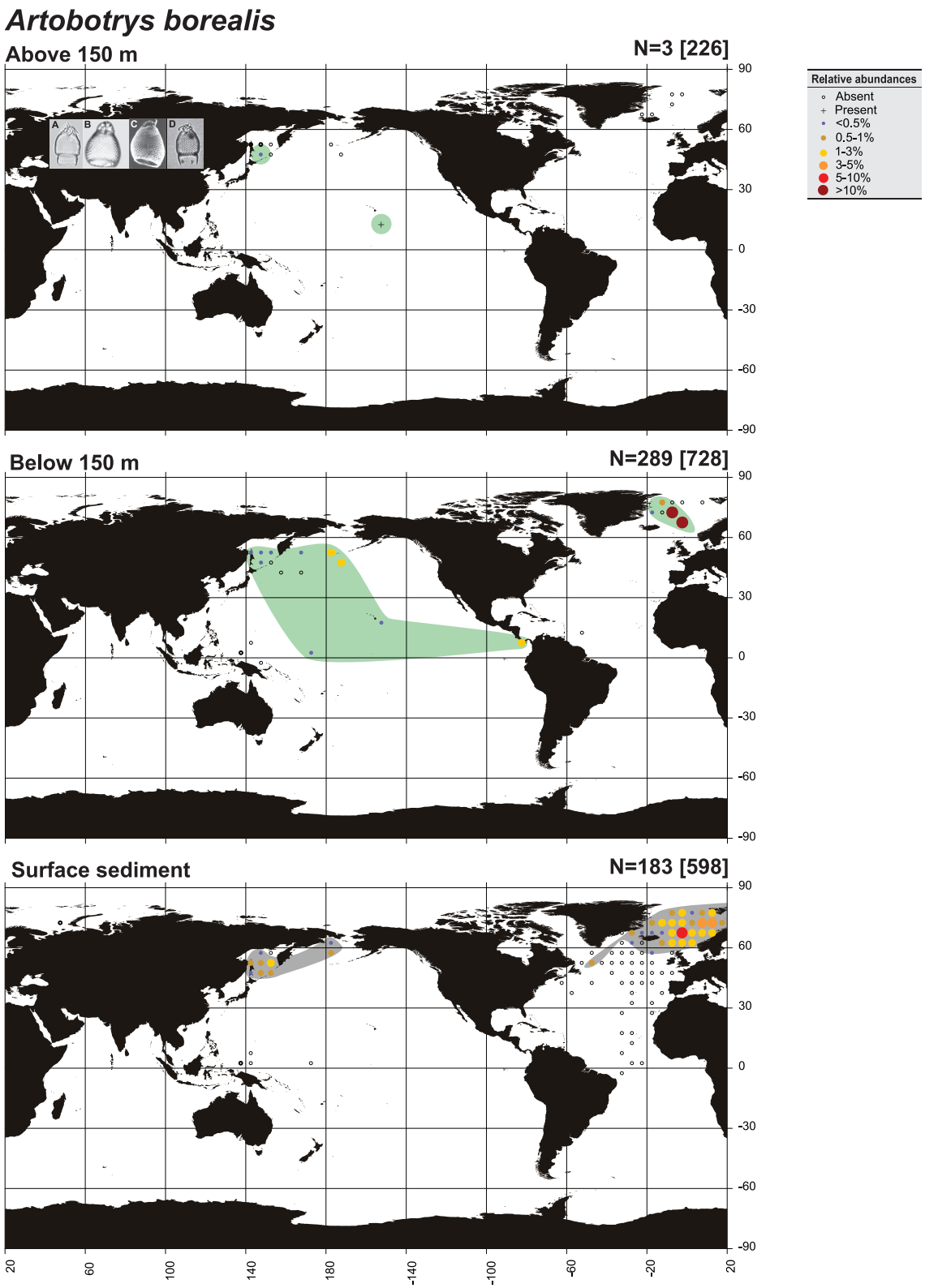


Figure 20. Geographic distribution of *Artobotrys borealis*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (above 150 m and below 150 m; plankton and sediment trap materials) and surface sediment materials. Sources of species illustrations: A, Radiolaria.org (photo K. Bjørklund); B, Radiolaria.org (photo J. Dolven); C, Takahashi (1991); D, Original.

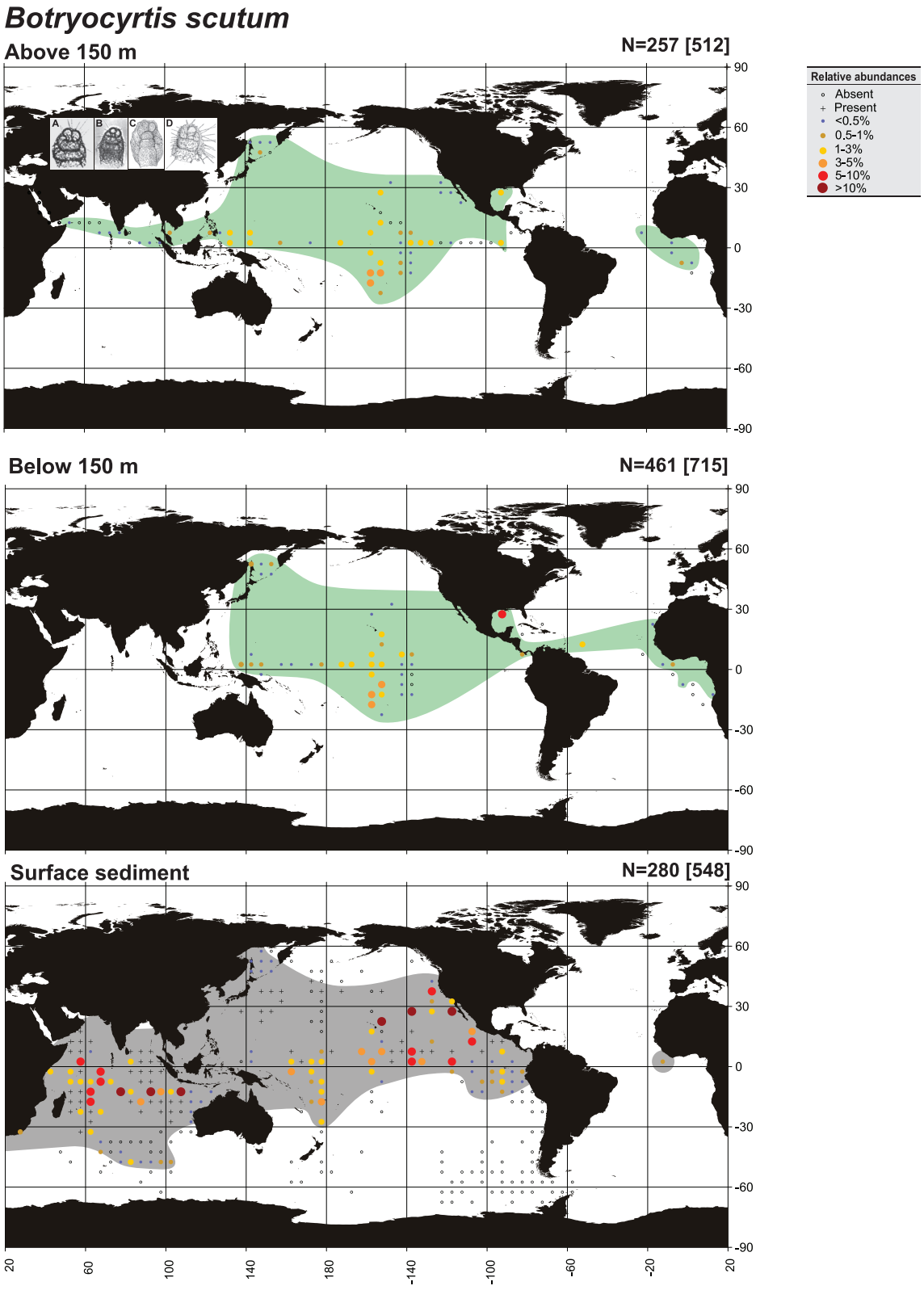


Figure 21. Geographic distribution of *Botryocyrtis scutum*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (above 150 m and below 150 m; plankton and sediment trap materials) and surface sediment materials. Sources of species illustrations: A, Boltovskoy and Riedel (1987); B, Boltovskoy (1999); C, Petrushevskaya (1971); D, Petrushevskaya (1971).

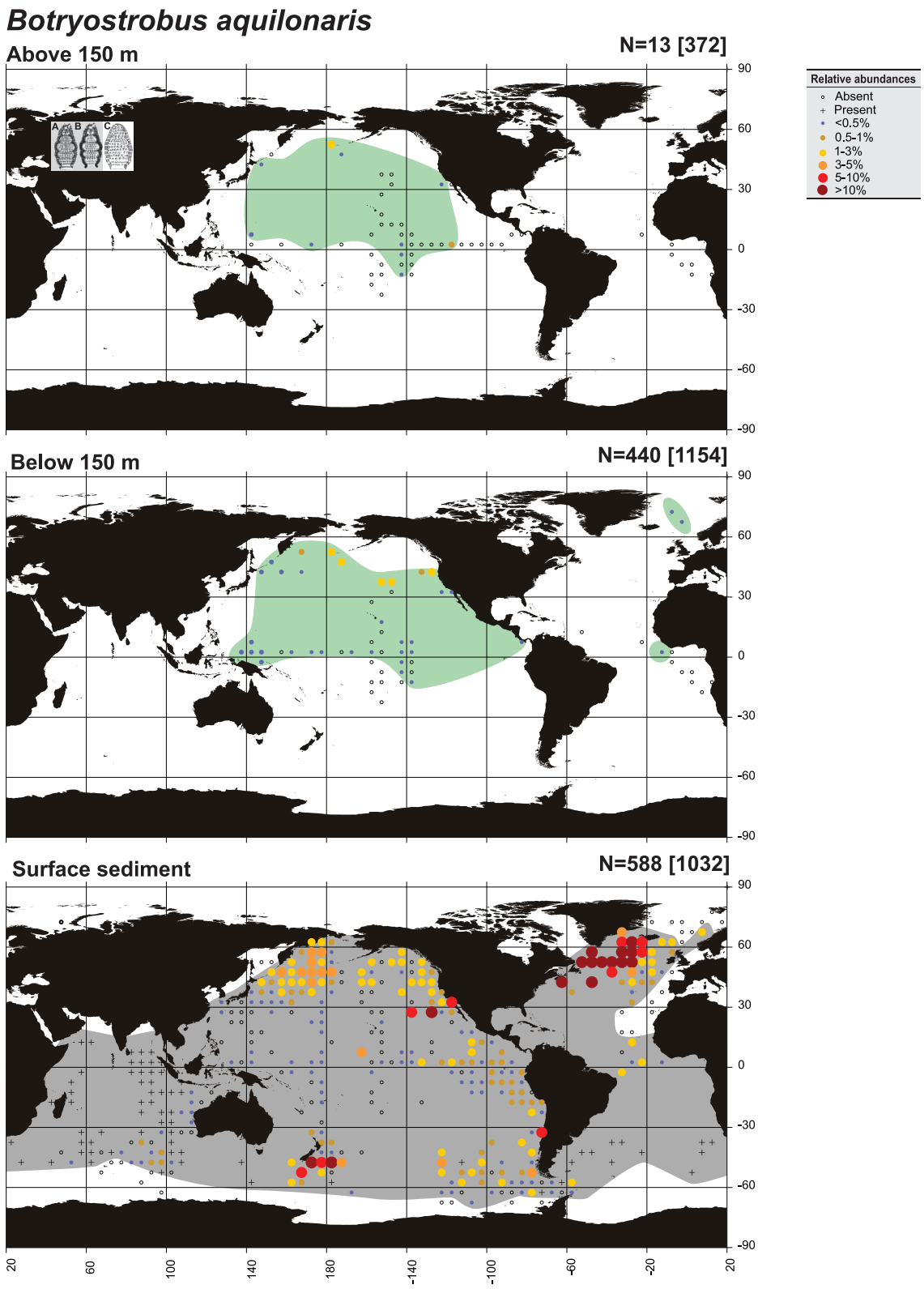


Figure 22. Geographic distribution of *Botryostrobus aquilonaris*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (above 150 m and below 150 m; plankton and sediment trap materials) and surface sediment materials. Sources of species illustrations: A, Boltovskoy (1999); B, Boltovskoy (1999); C, Petrushevskaya (1967).

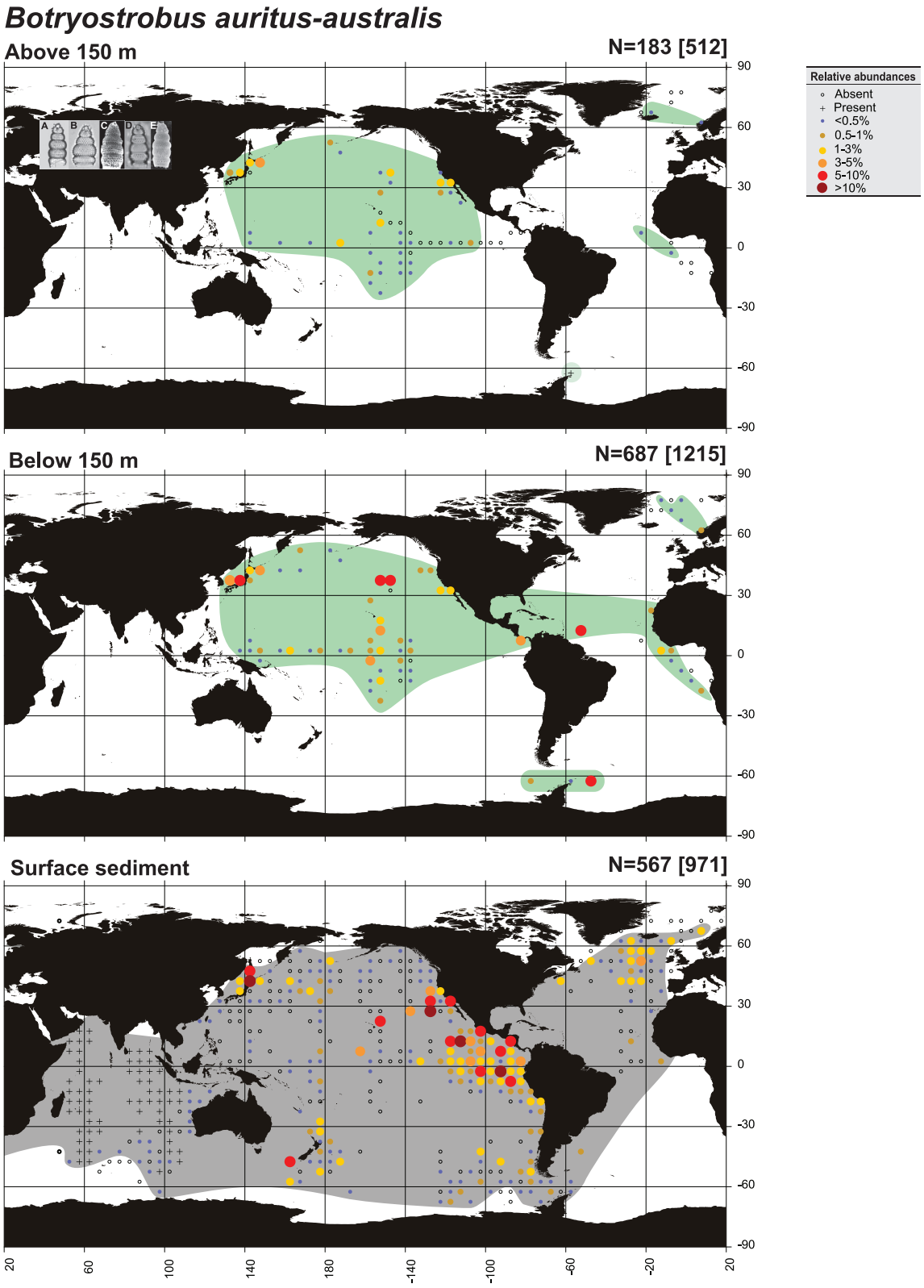


Figure 23. Geographic distribution of *Botryostrobus auritus-australis*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (above 150 m and below 150 m; plankton and sediment trap materials) and surface sediment materials. Sources of species illustrations: A, Boltovskoy (1999); B, Original; C, Boltovskoy (1999); D, Original; E, Original.

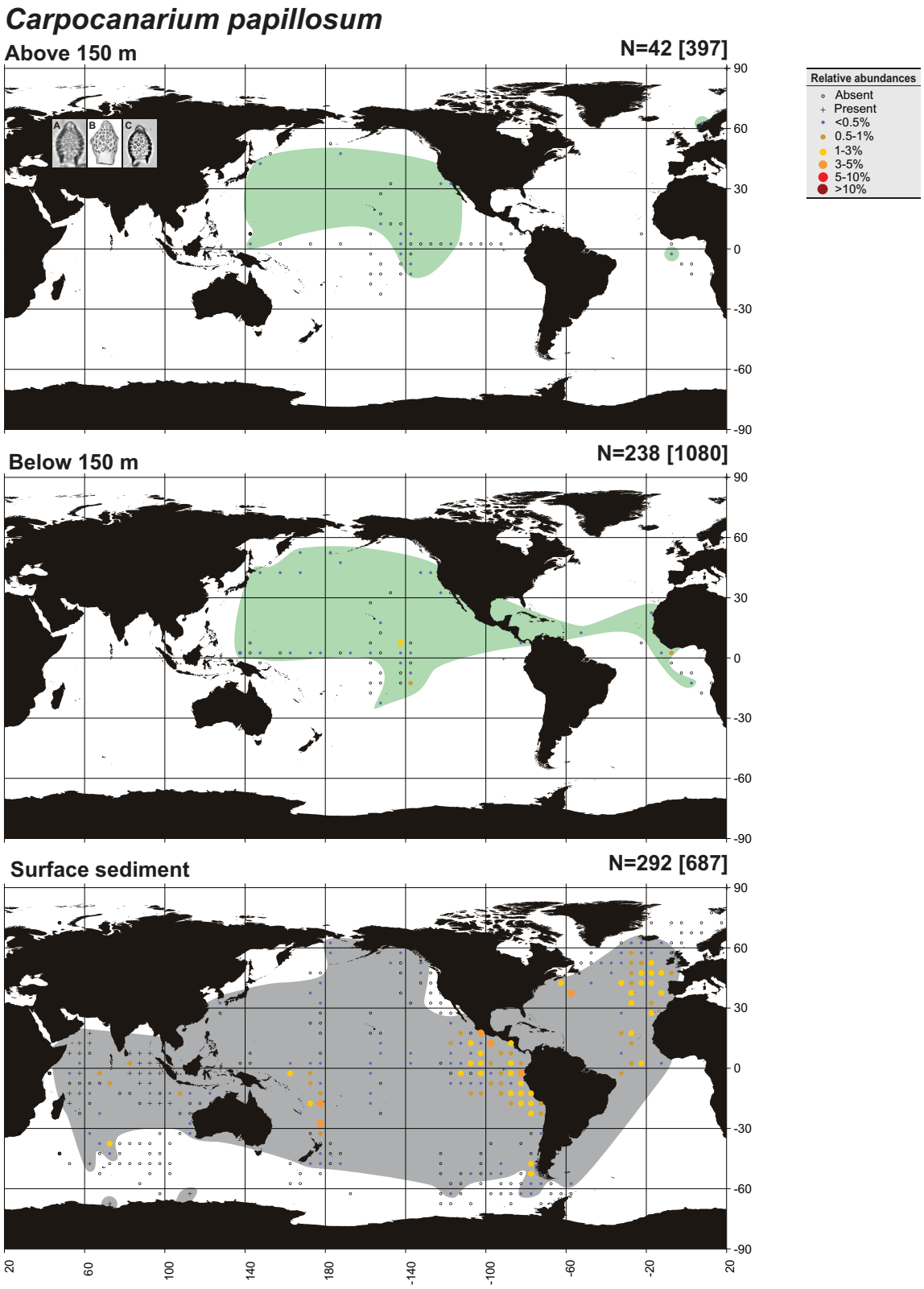


Figure 24. Geographic distribution of *Carpocanarium papillosum*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (above 150 m and below 150 m; plankton and sediment trap materials) and surface sediment materials. Sources of species illustrations: A, Original; B, Riedel (1958); C, Original.

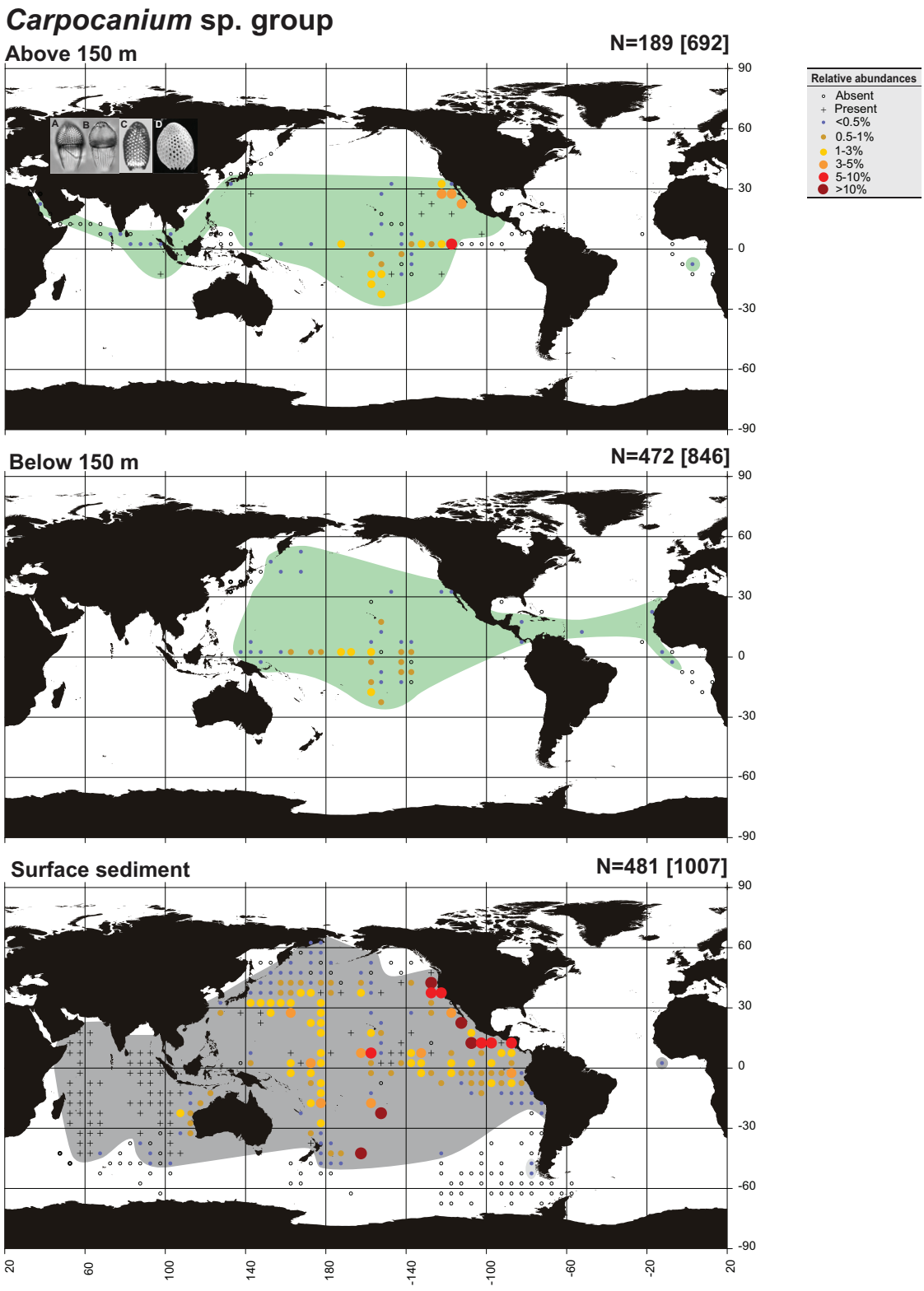


Figure 25. Geographic distribution of *Carpocanium*sp. group. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (above 150 m and below 150 m; plankton and sediment trap materials) and surface sediment materials. Sources of species illustrations: A, Original; B, Original; C, Nigrini (1968); D, Original.

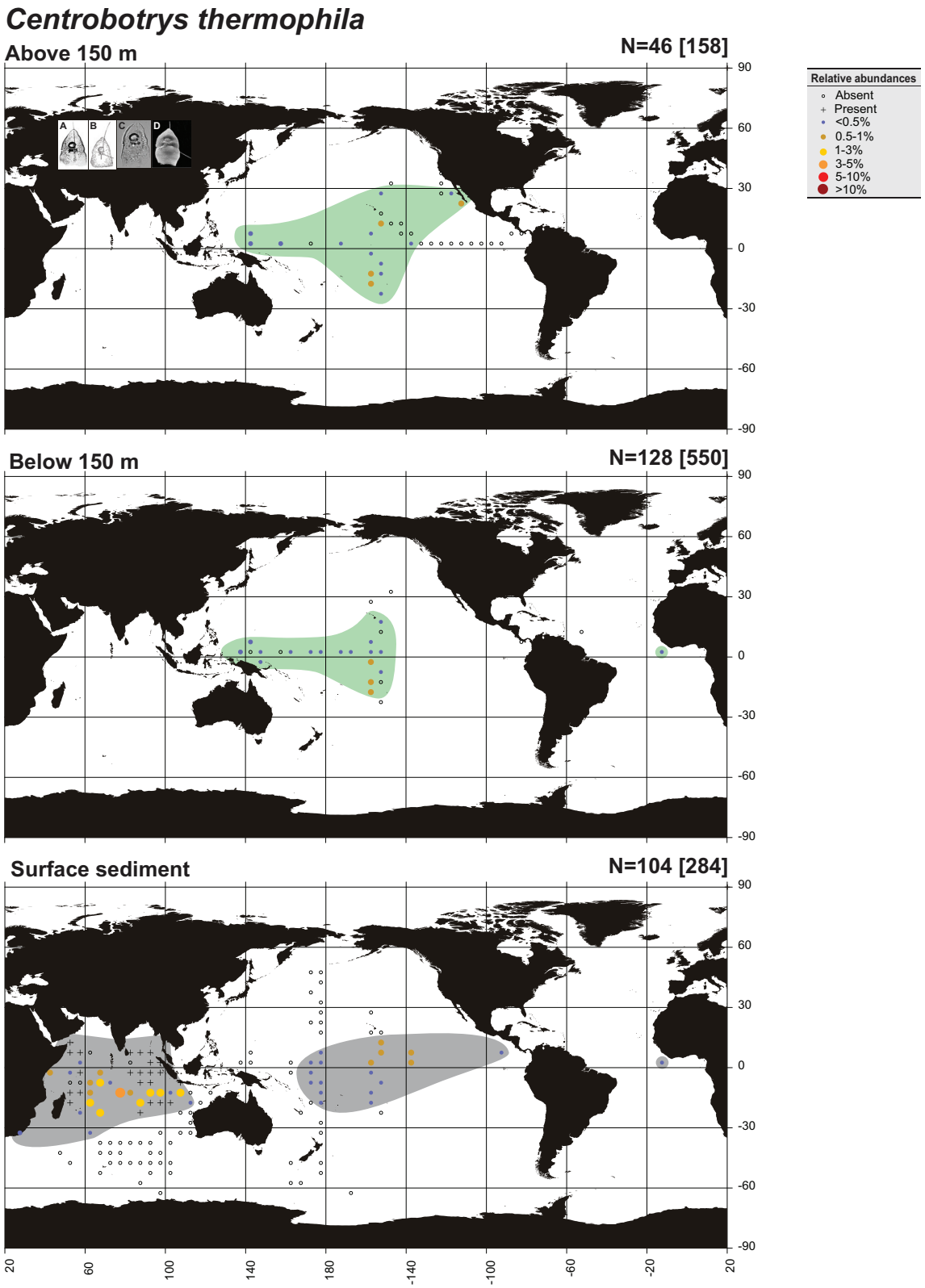


Figure 26. Geographic distribution of *Centrobotrys thermophila*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (above 150 m and below 150 m; plankton and sediment trap materials) and surface sediment materials. Sources of species illustrations: A, Boltovskoy (1999); B, Petrushevskaya (1965); C, Original; D, Takahashi (1991).

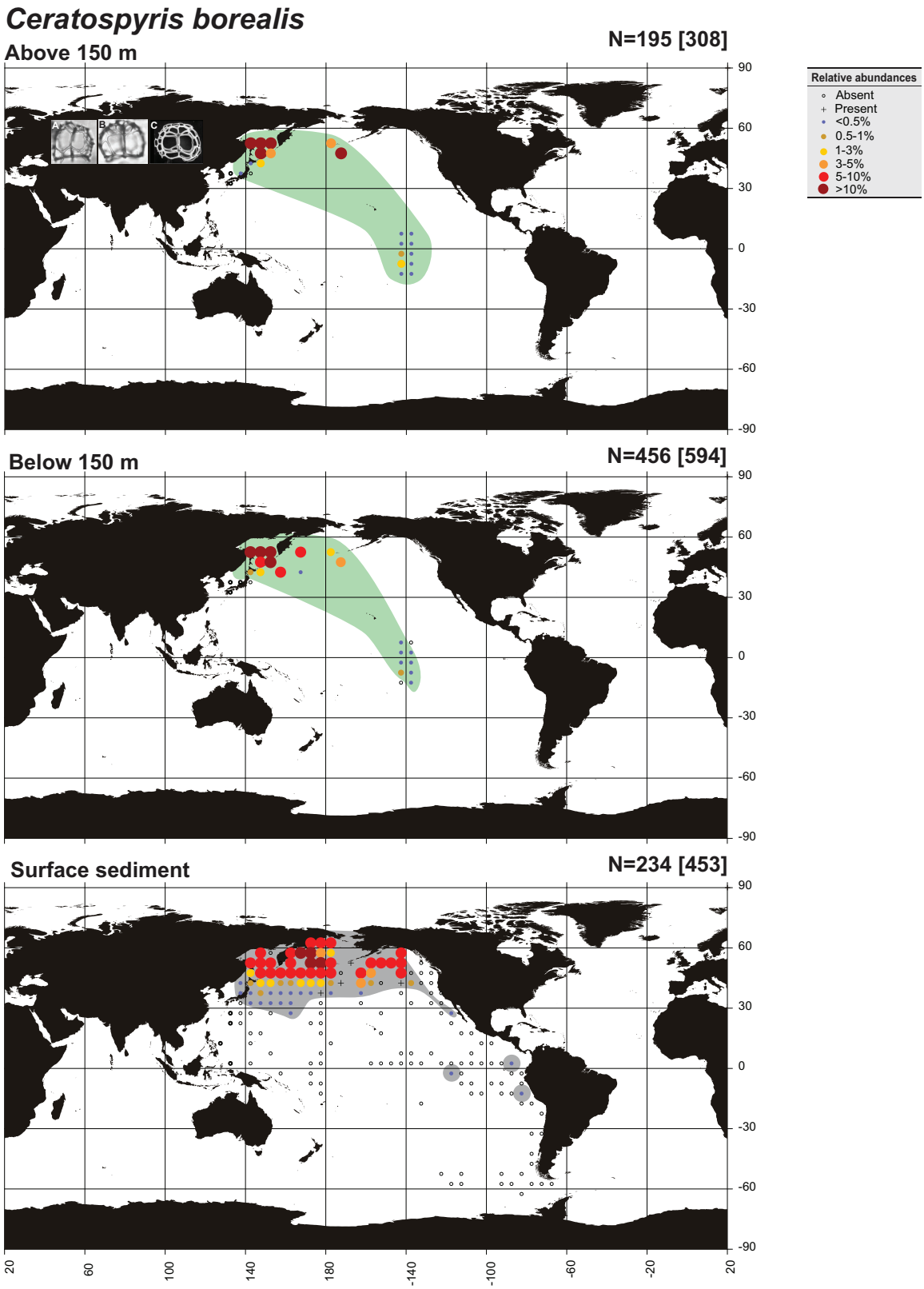


Figure 27. Geographic distribution of *Ceratospyris borealis*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (above 150 m and below 150 m; plankton and sediment trap materials) and surface sediment materials. Sources of species illustrations: A, Itaki (2009); B, Itaki (2009); C, Original.

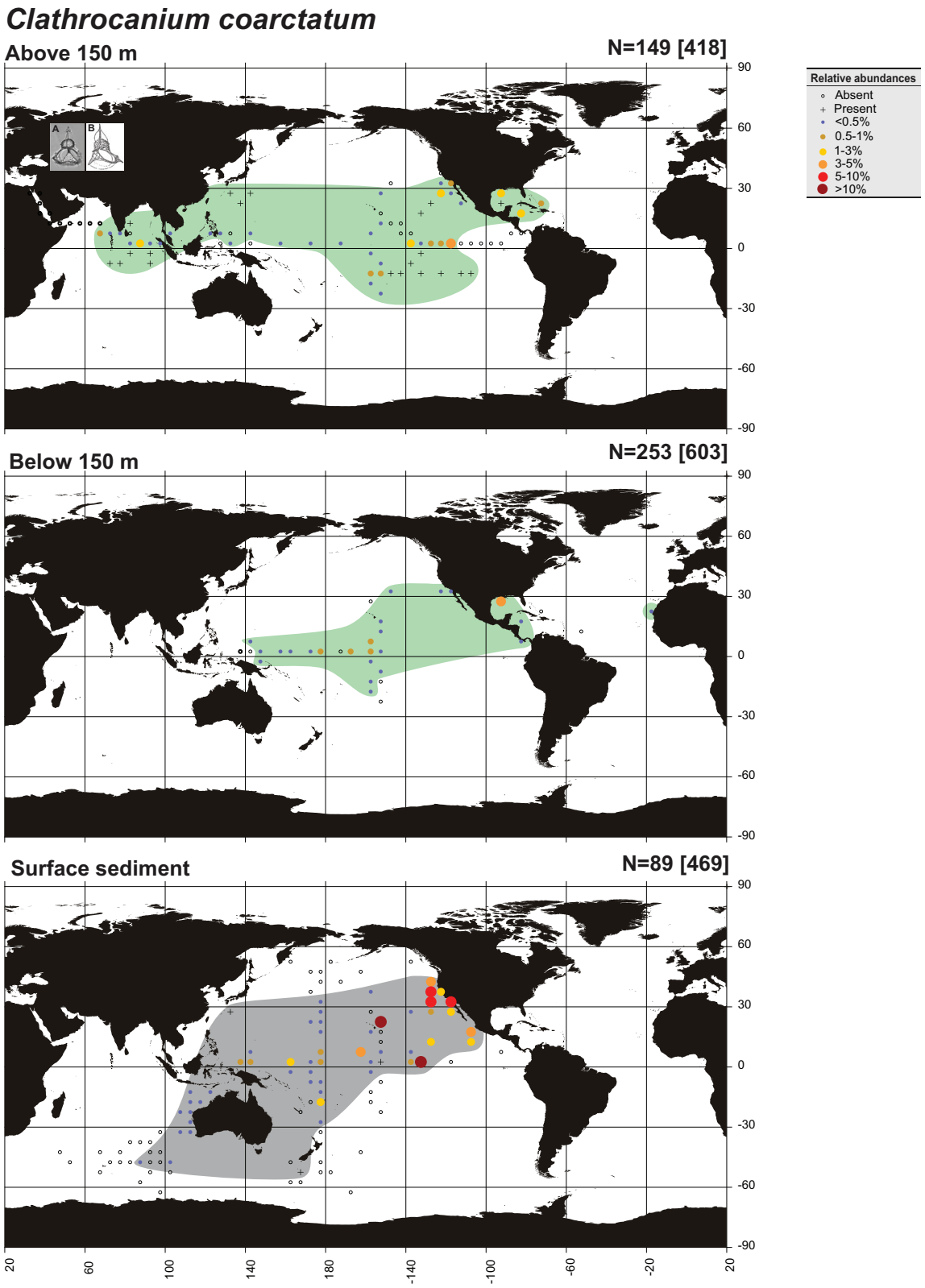


Figure 28. Geographic distribution of *Clathrocanium coarctatum*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (above 150 m and below 150 m; plankton and sediment trap materials) and surface sediment materials. Sources of species illustrations: A, Original; B, Petrushevskaya (1971).

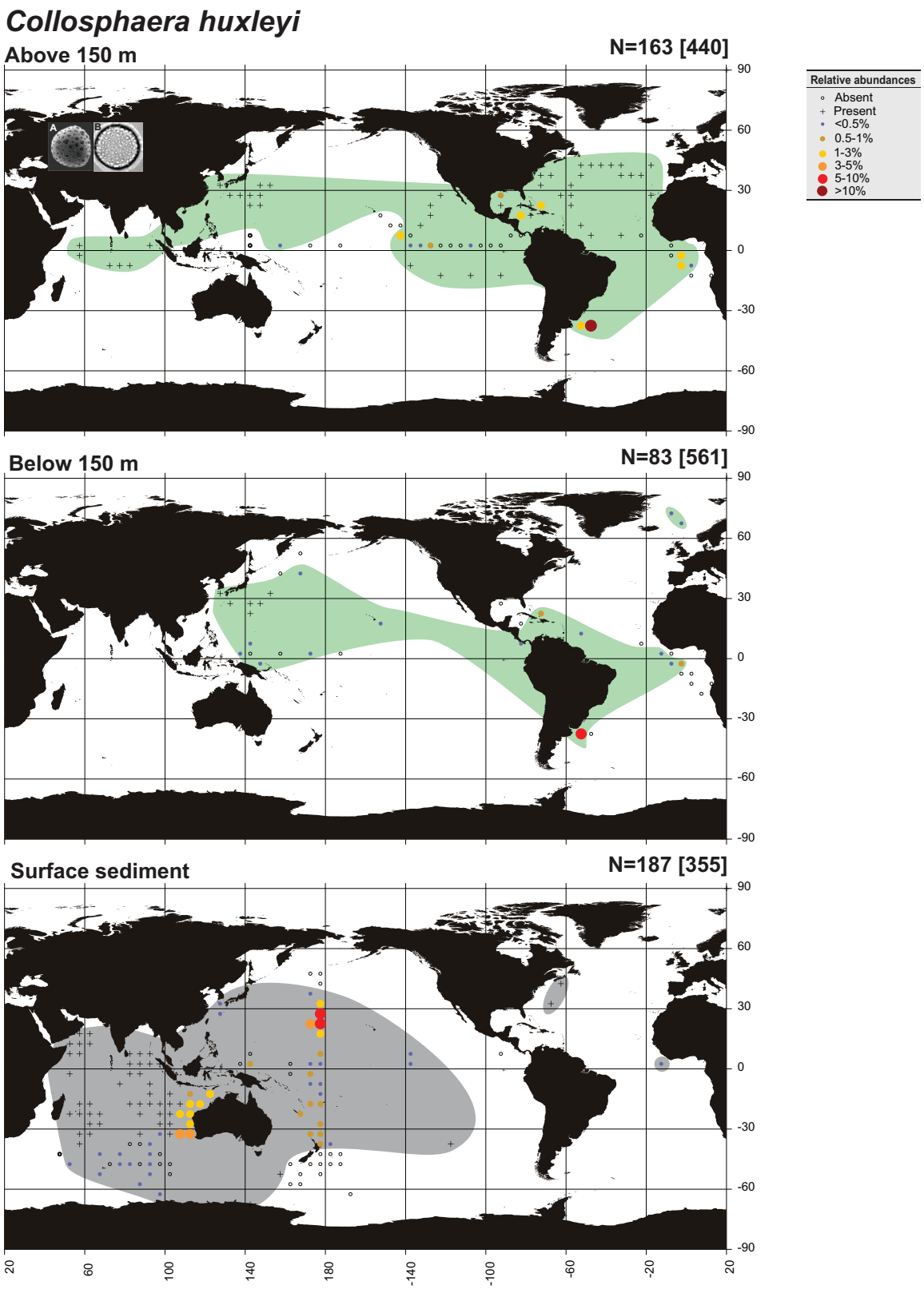


Figure 29. Geographic distribution of *Collosphaera huxleyi*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (above 150 m and below 150 m; plankton and sediment trap materials) and surface sediment materials. Sources of species illustrations: A, Paverd (1995); B, Kamikuri et al. (2008).

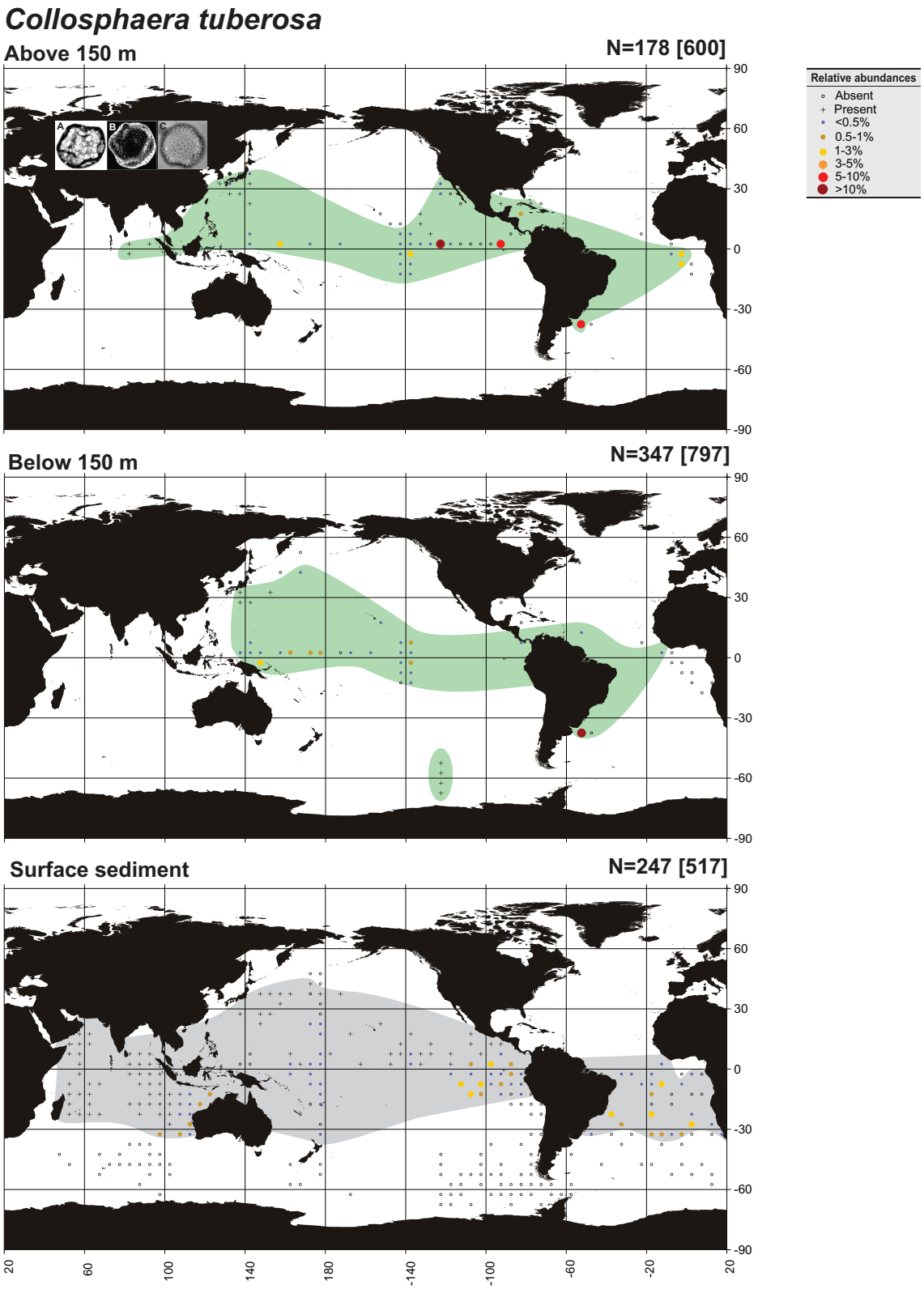


Figure 30. Geographic distribution of *Collosphaera tuberosa*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (above 150 m and below 150 m; plankton and sediment trap materials) and surface sediment materials. Sources of species illustrations: A, Boltovskoy (1999); B, Paverd (1995); C, Original.

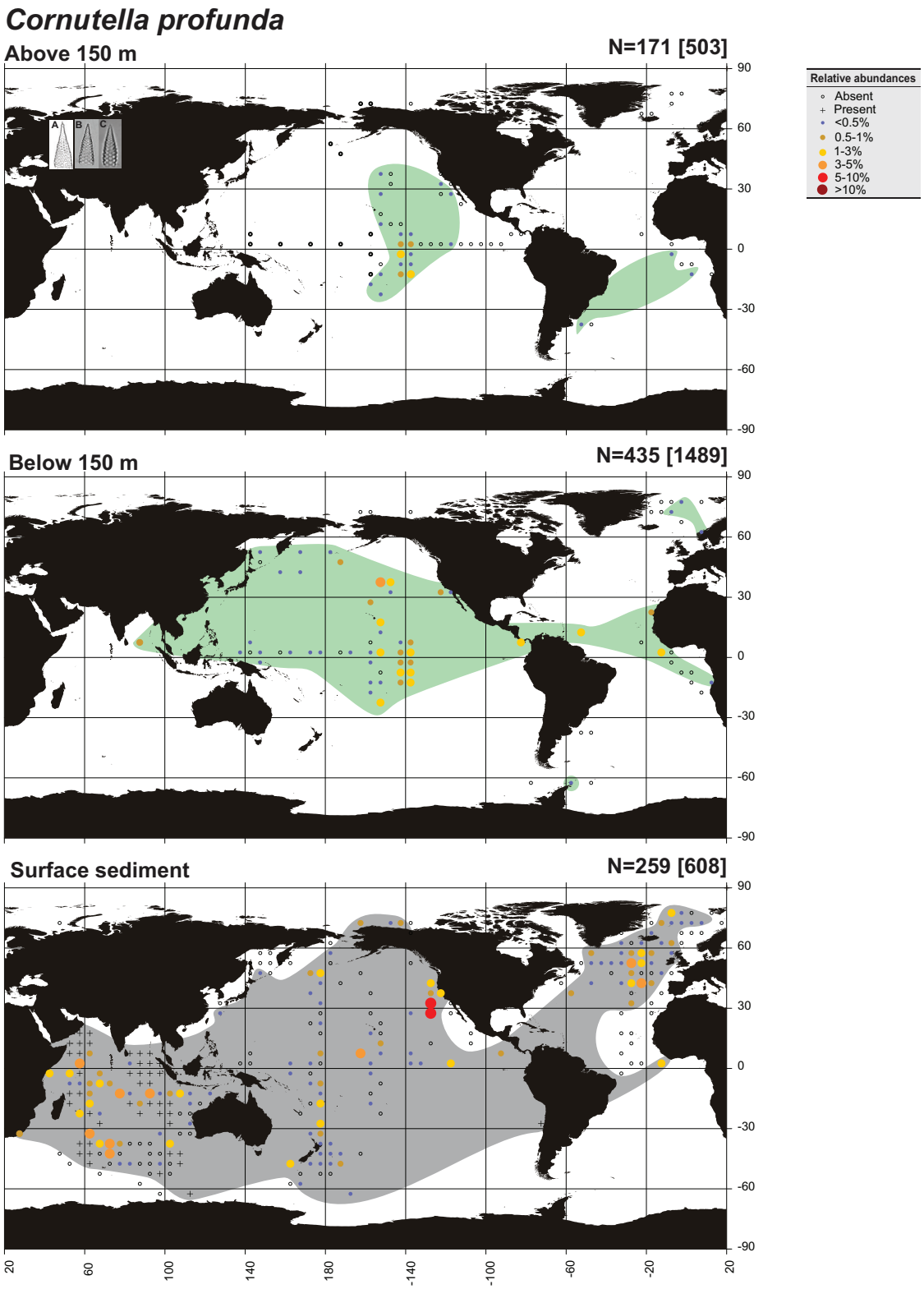


Figure 31. Geographic distribution of *Cornutella profunda*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (above 150 m and below 150 m; plankton and sediment trap materials) and surface sediment materials. Sources of species illustrations: A, Petrushevskaya (1971); B, Original; C, Original.

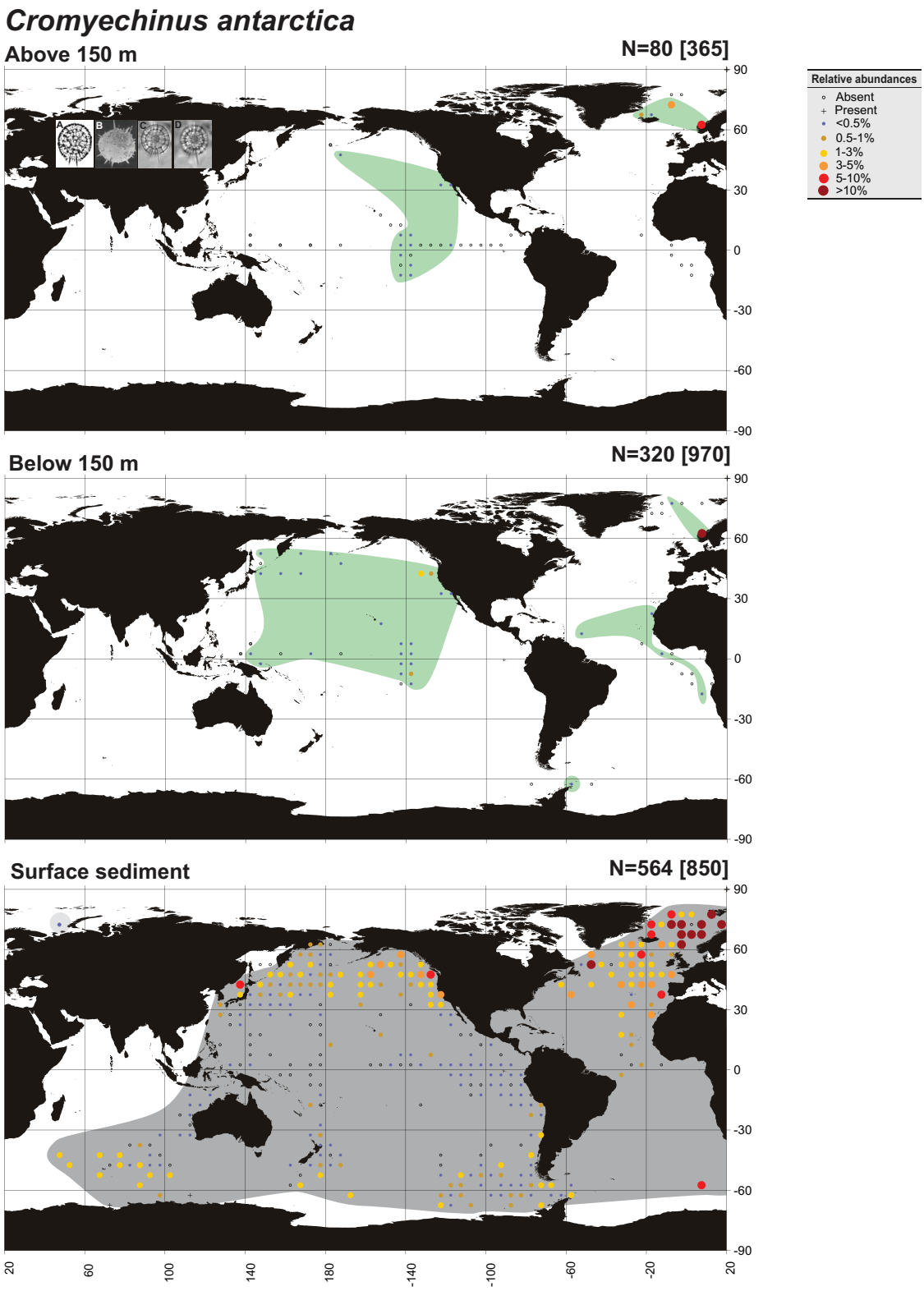


Figure 32. Geographic distribution of *Cromyechinus antarctica*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (above 150 m and below 150 m; plankton and sediment trap materials) and surface sediment materials. Sources of species illustrations: A, Original; B, Boltovskoy et al. (1983); C, Original; D, Original.

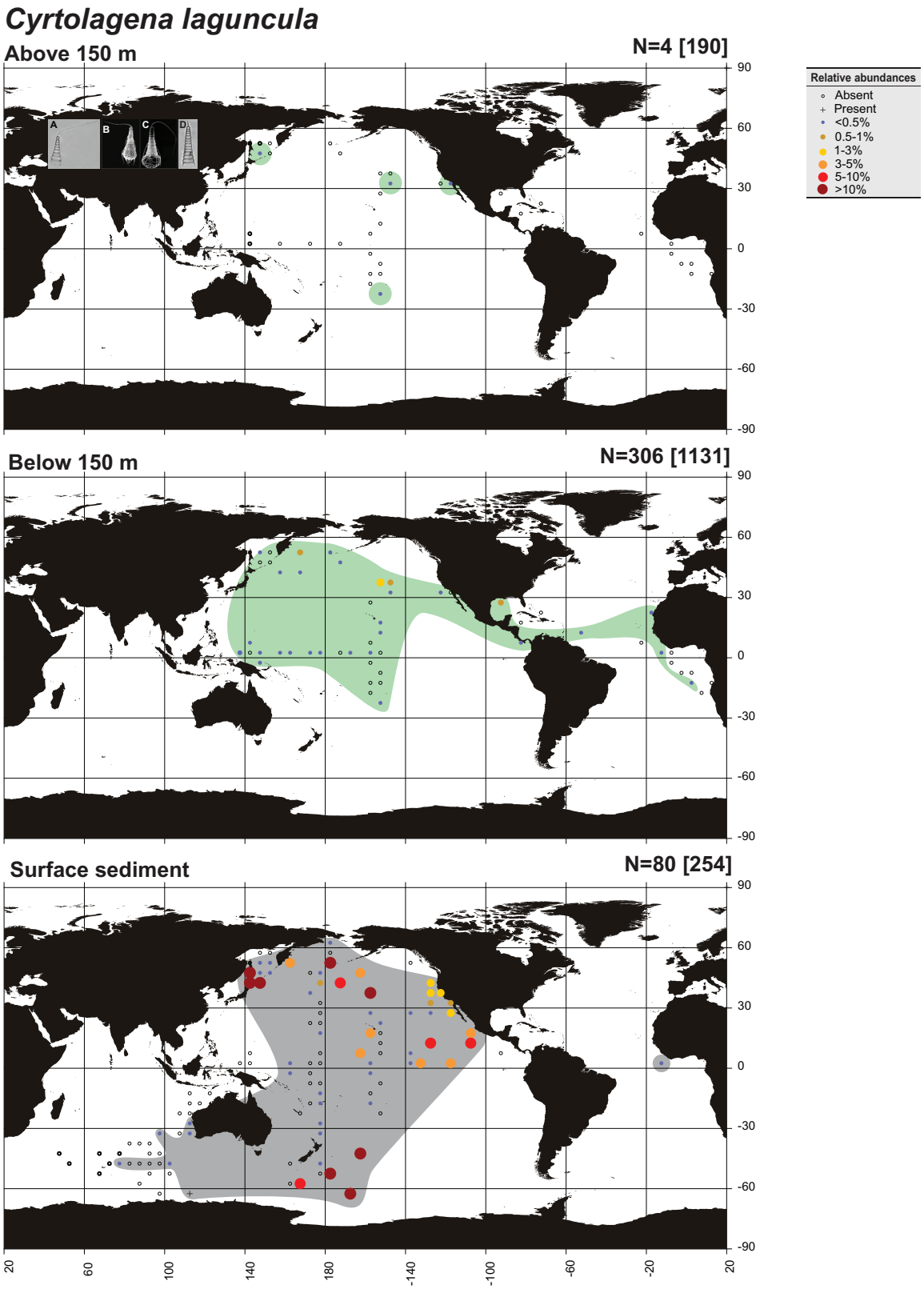


Figure 33. Geographic distribution of *Cyrtolagena laguncula*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (above 150 m and below 150 m; plankton and sediment trap materials) and surface sediment materials. Sources of species illustrations: A, Original; B, Original; C, Original; D, Original.

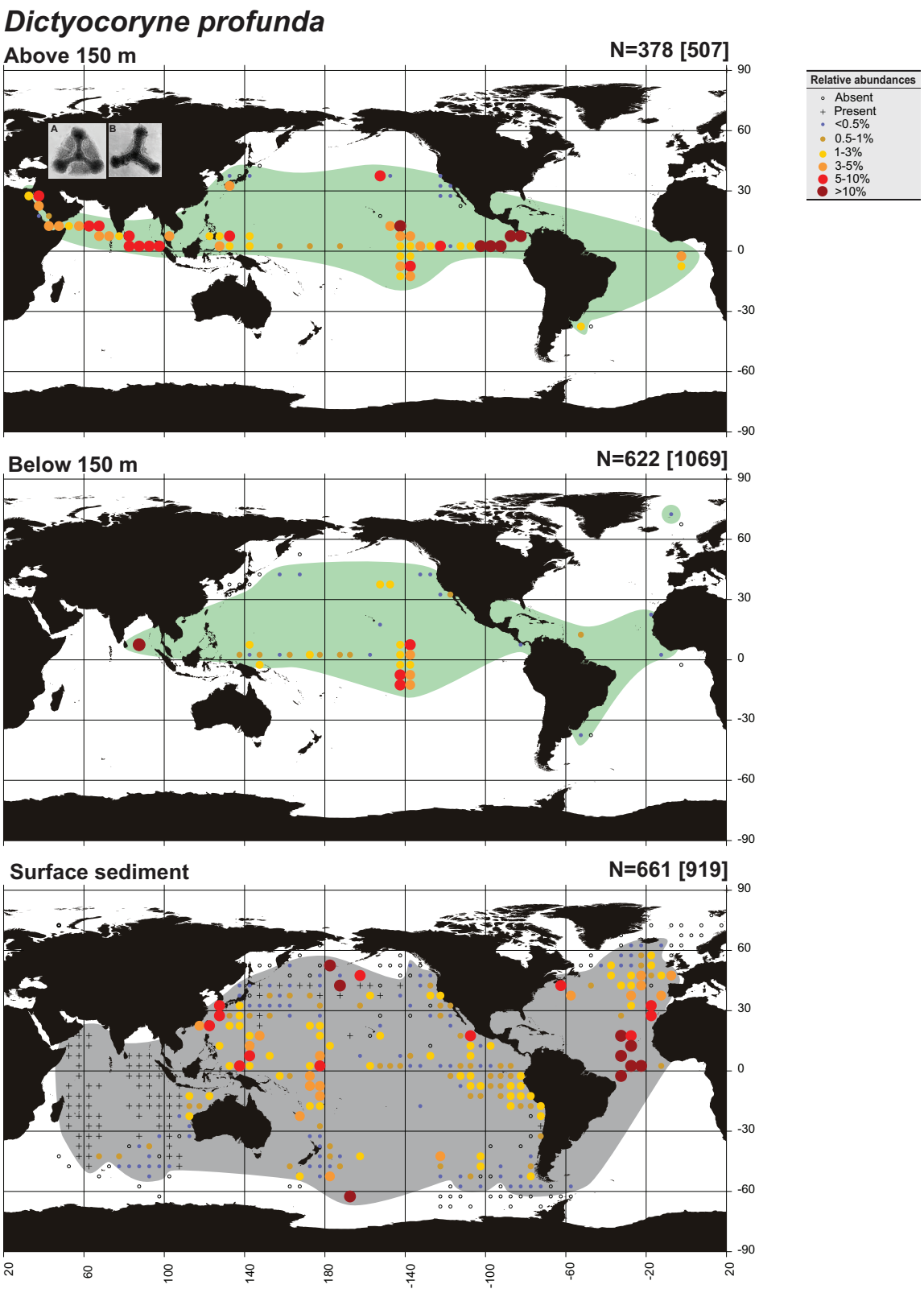


Figure 34. Geographic distribution of *Dictyocoryne profunda*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (above 150 m and below 150 m; plankton and sediment trap materials) and surface sediment materials. Sources of species illustrations: A, Original; B, Original.

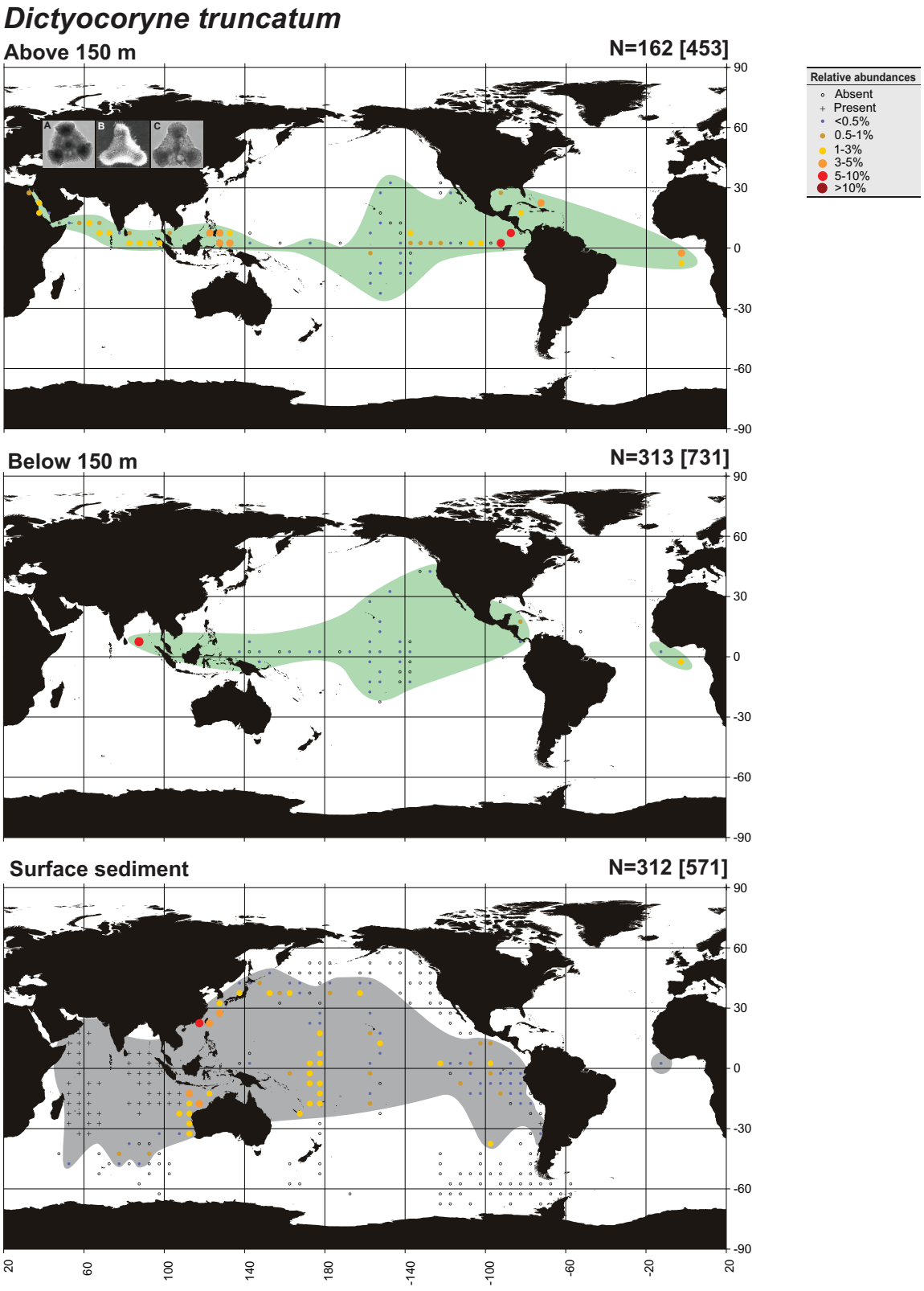


Figure 35. Geographic distribution of *Dictyocoryne truncatum*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (above 150 m and below 150 m; plankton and sediment trap materials) and surface sediment materials. Sources of species illustrations: A, Original; B, Takahashi (1991); C, Original.

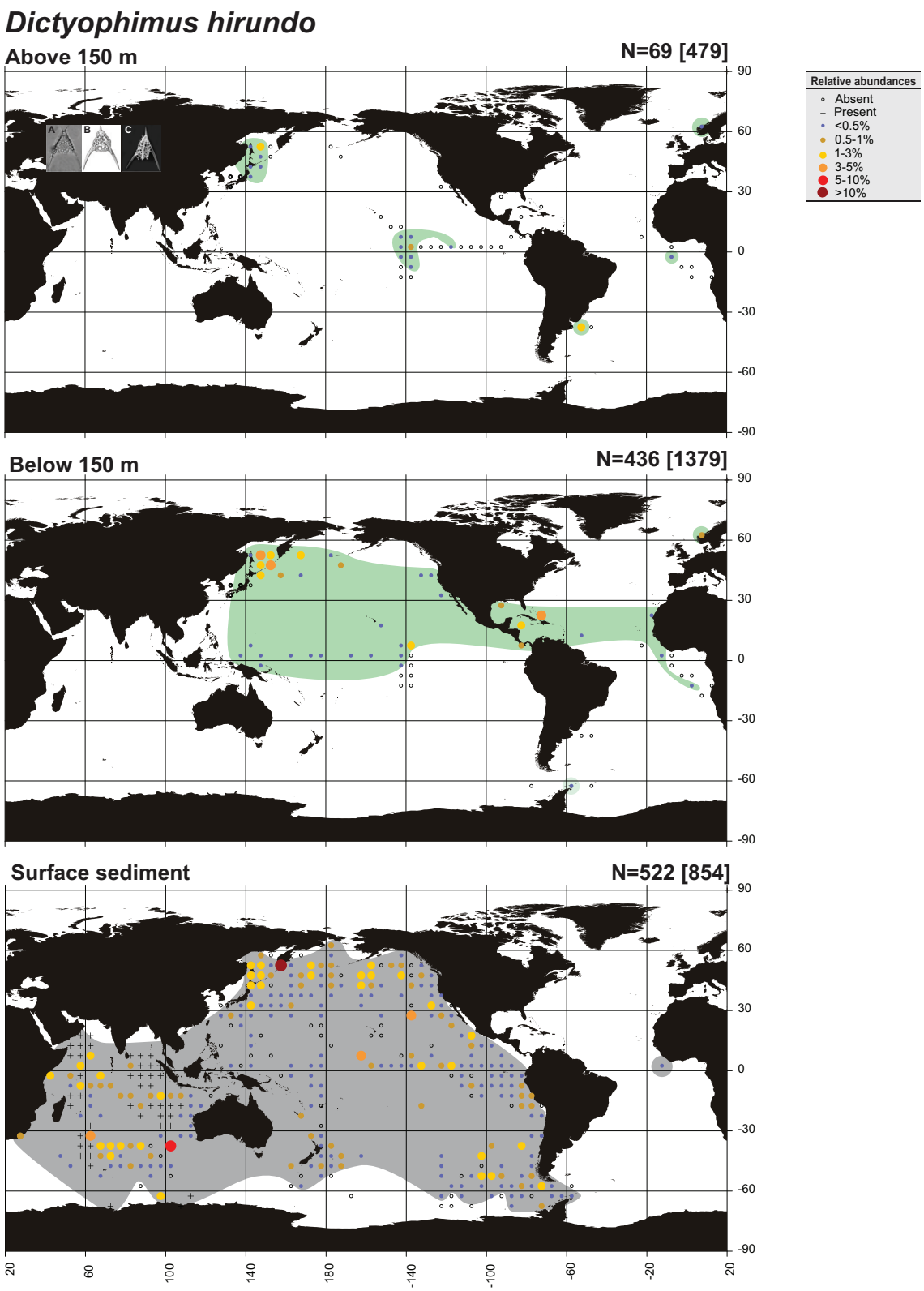


Figure 36. Geographic distribution of *Dictyophimus hirundo*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (above 150 m and below 150 m; plankton and sediment trap materials) and surface sediment materials. Sources of species illustrations: A, Original; B, Riedel (1958); C, Paverd (1995).

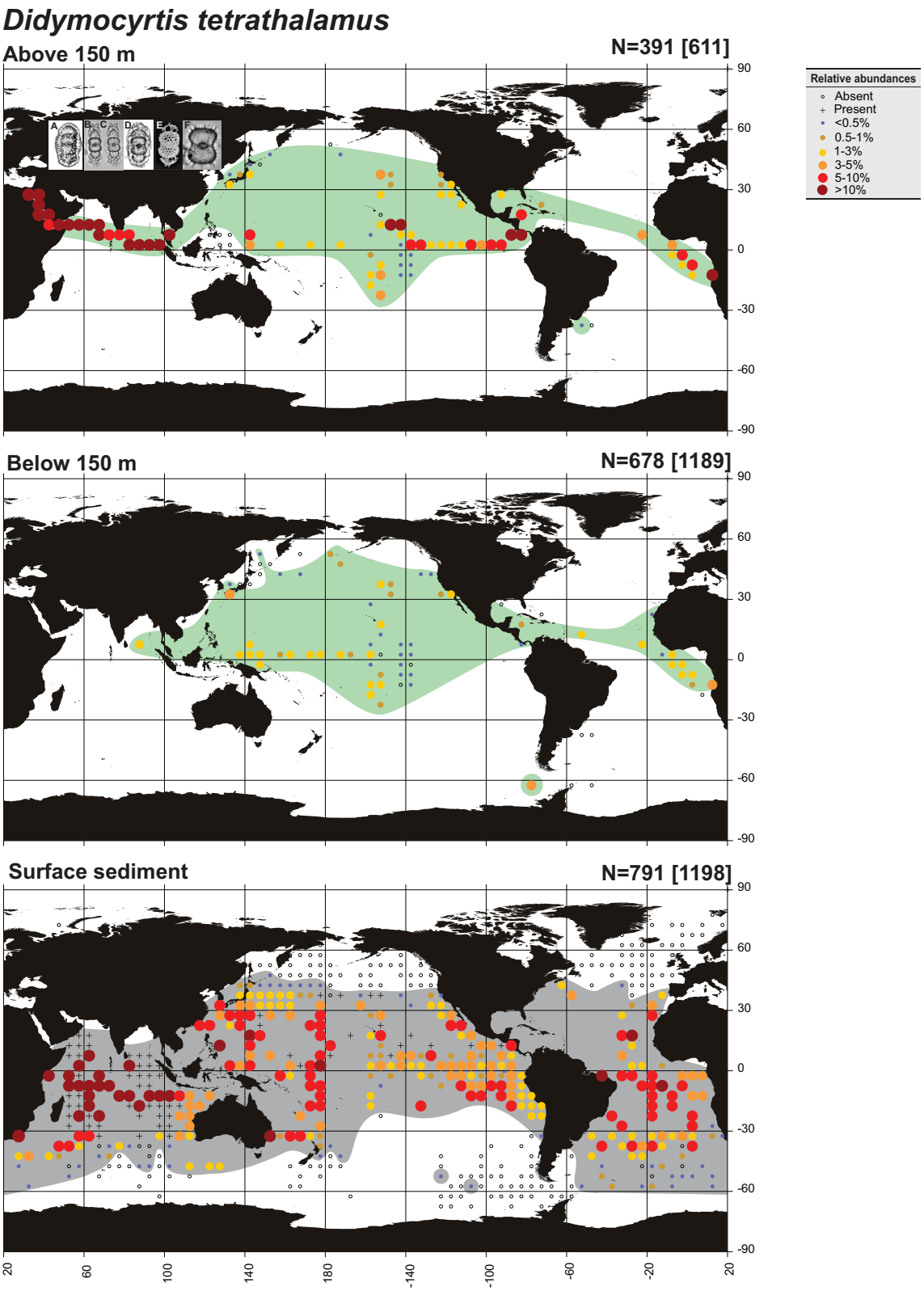


Figure 37. Geographic distribution of *Didymocyrtis tetrathalamus*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (above 150 m and below 150 m; plankton and sediment trap materials) and surface sediment materials. Sources of species illustrations: A, Popofsky (1913); B, Original; C, Original; D, Original; E, Original; F, Original.

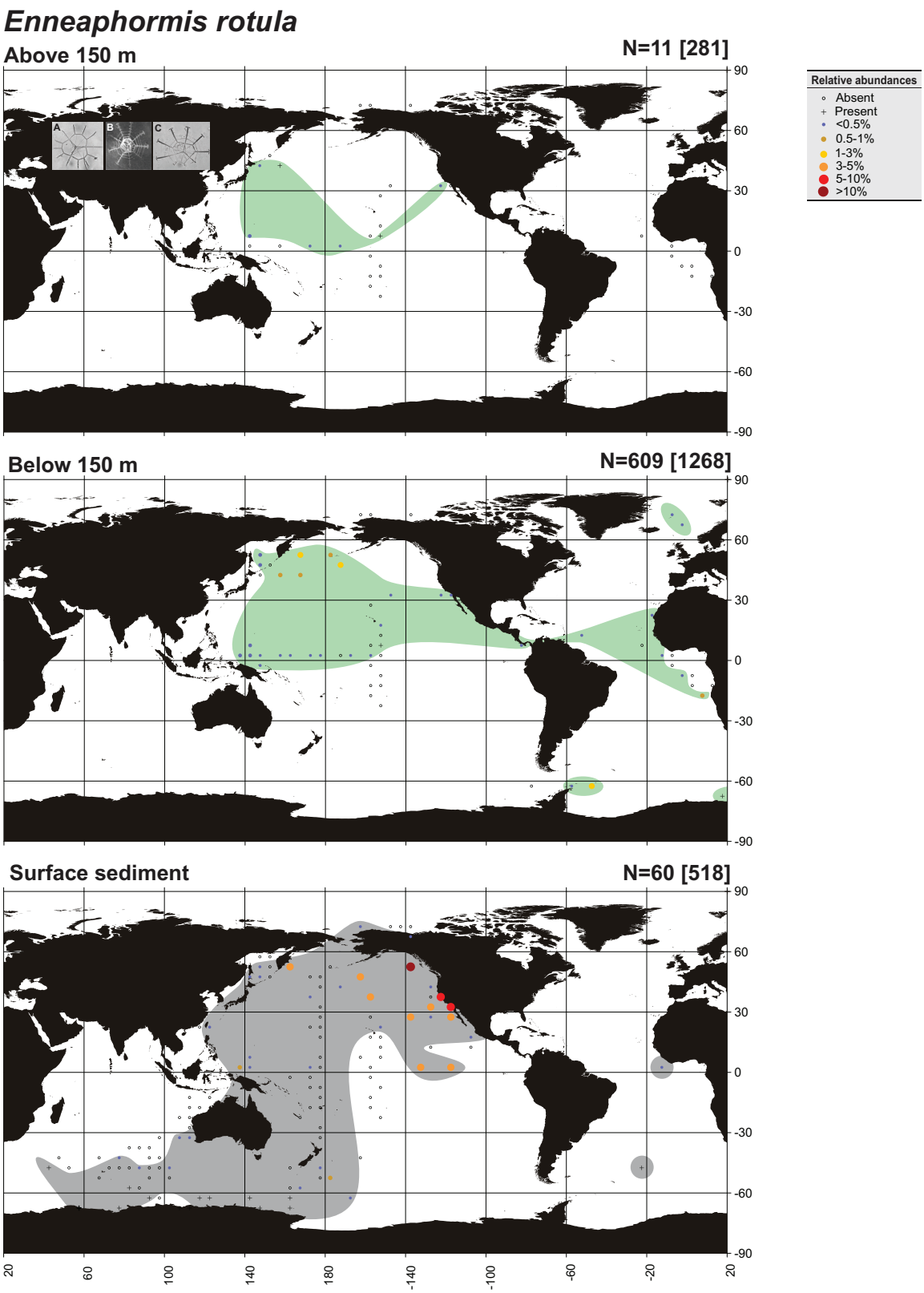


Figure 38. Geographic distribution of *Enneaphormis rotula*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (above 150 m and below 150 m; plankton and sediment trap materials) and surface sediment materials. Sources of species illustrations: A, Original; B, Takahashi (1991); C, Original.

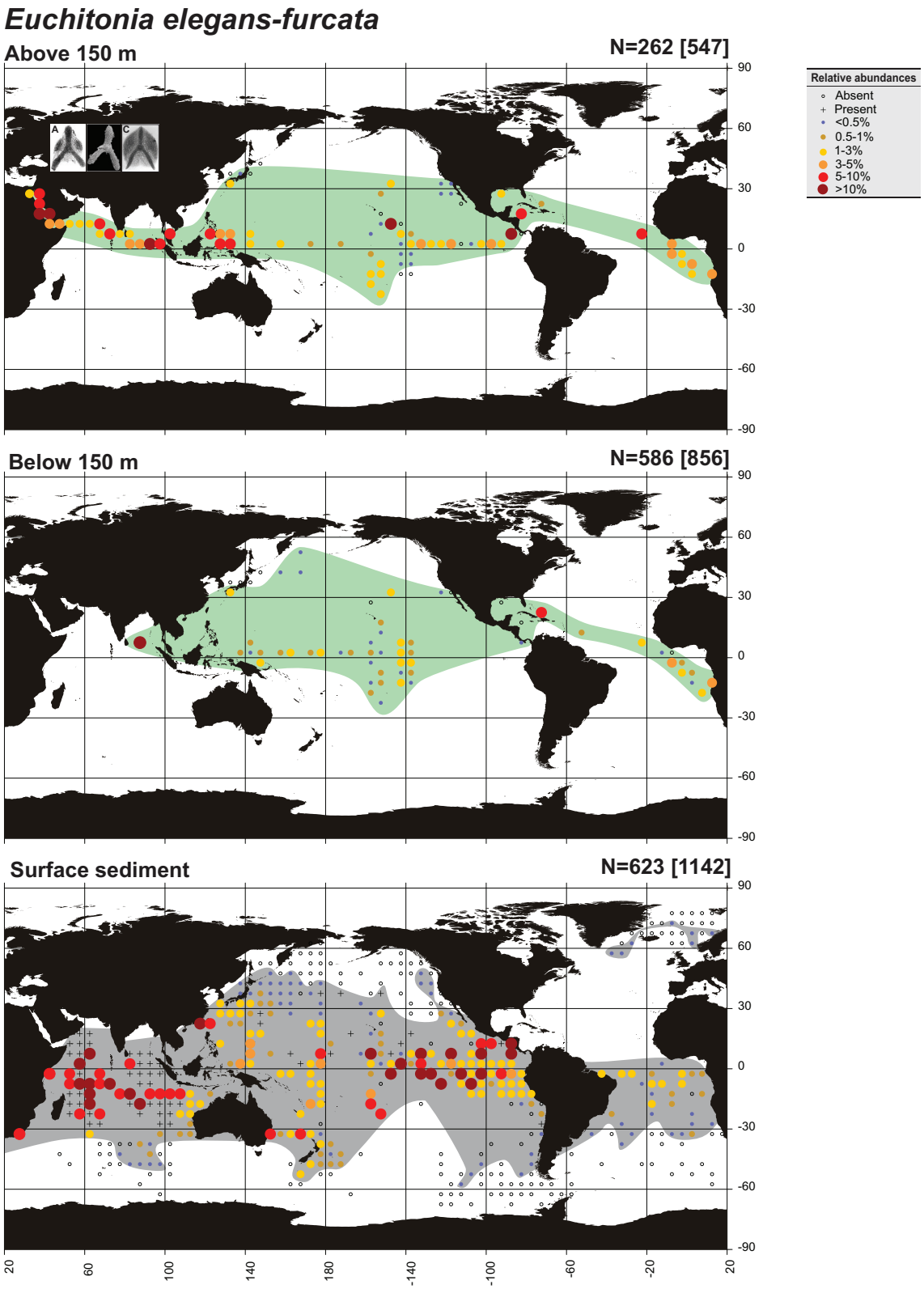


Figure 39. Geographic distribution of *Euchitonia elegans-furcata*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (above 150 m and below 150 m; plankton and sediment trap materials) and surface sediment materials. Sources of species illustrations: A, Boltovskoy (1999); B, Boltovskoy (1999); C, Boltovskoy (1999).

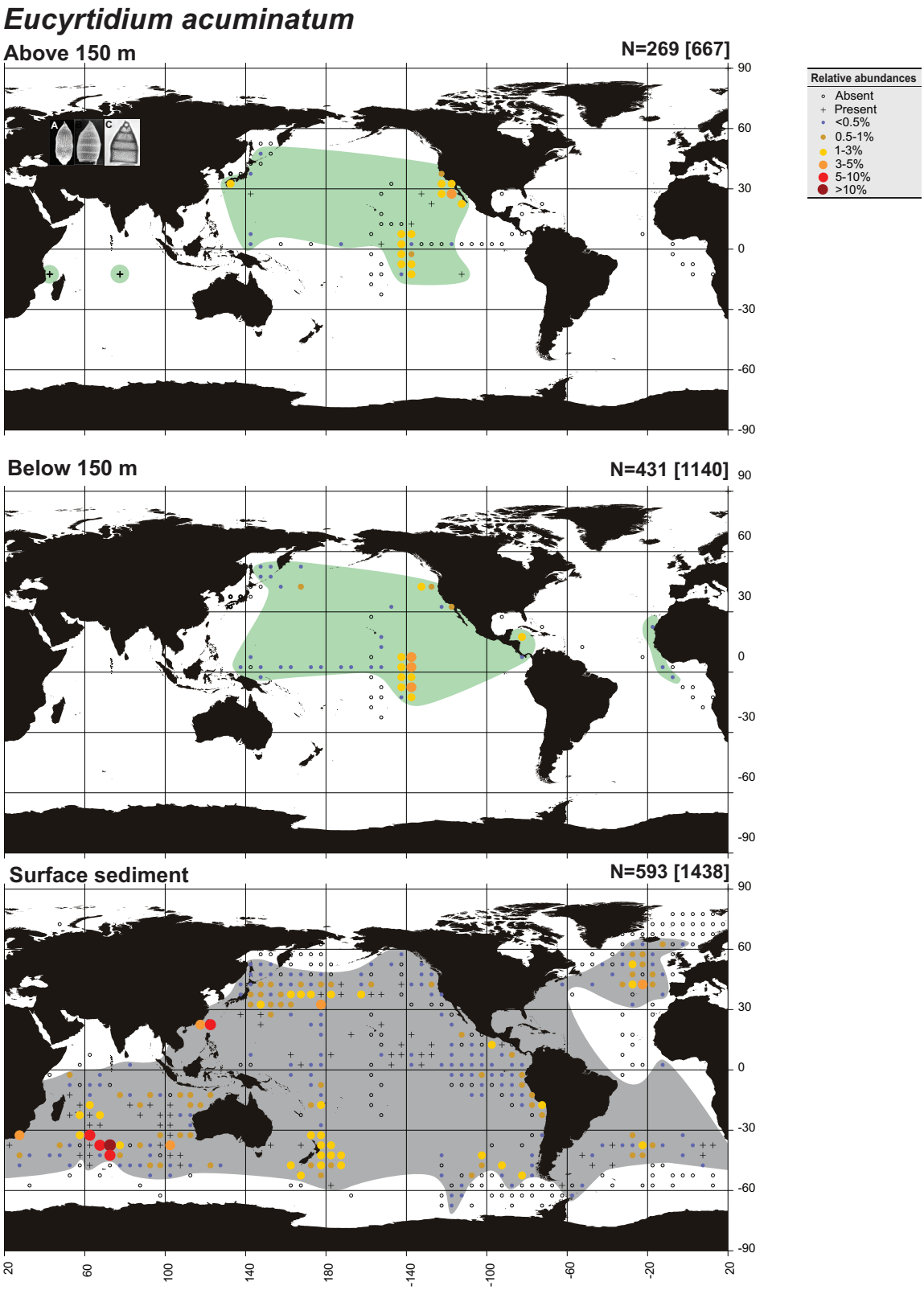


Figure 40. Geographic distribution of *Eucyrtidium acuminatum*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (above 150 m and below 150 m; plankton and sediment trap materials) and surface sediment materials. Sources of species illustrations: A, Takahashi (1991); B, Original; C, Itaki (2009).

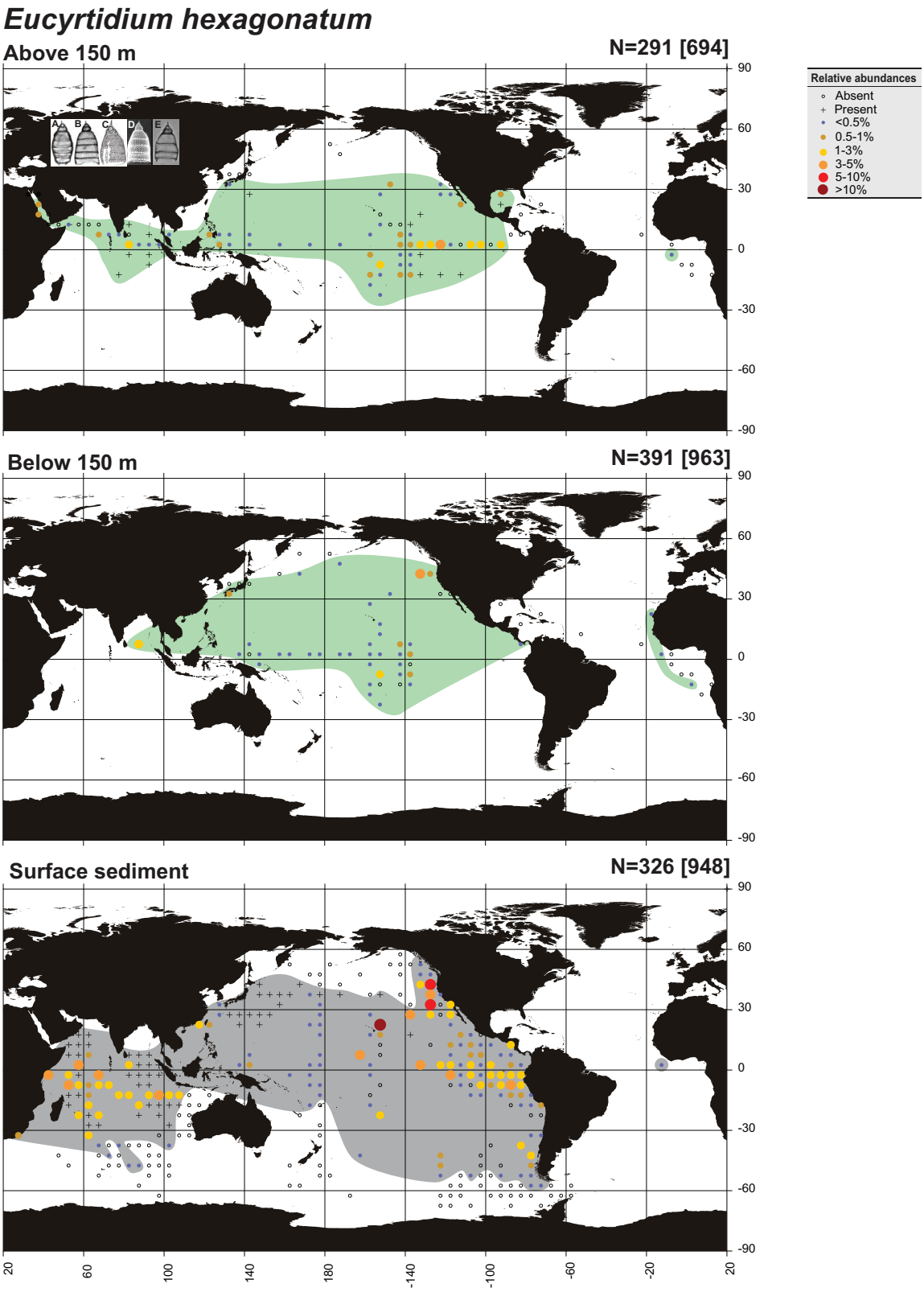


Figure 41. Geographic distribution of *Eucyrtidium hexagonatum*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (above 150 m and below 150 m; plankton and sediment trap materials) and surface sediment materials. Sources of species illustrations: A, Boltovskoy (1999); B, Boltovskoy (1999); C, Petrushevskaya (1971); D, Takahashi (1991); E, Original.

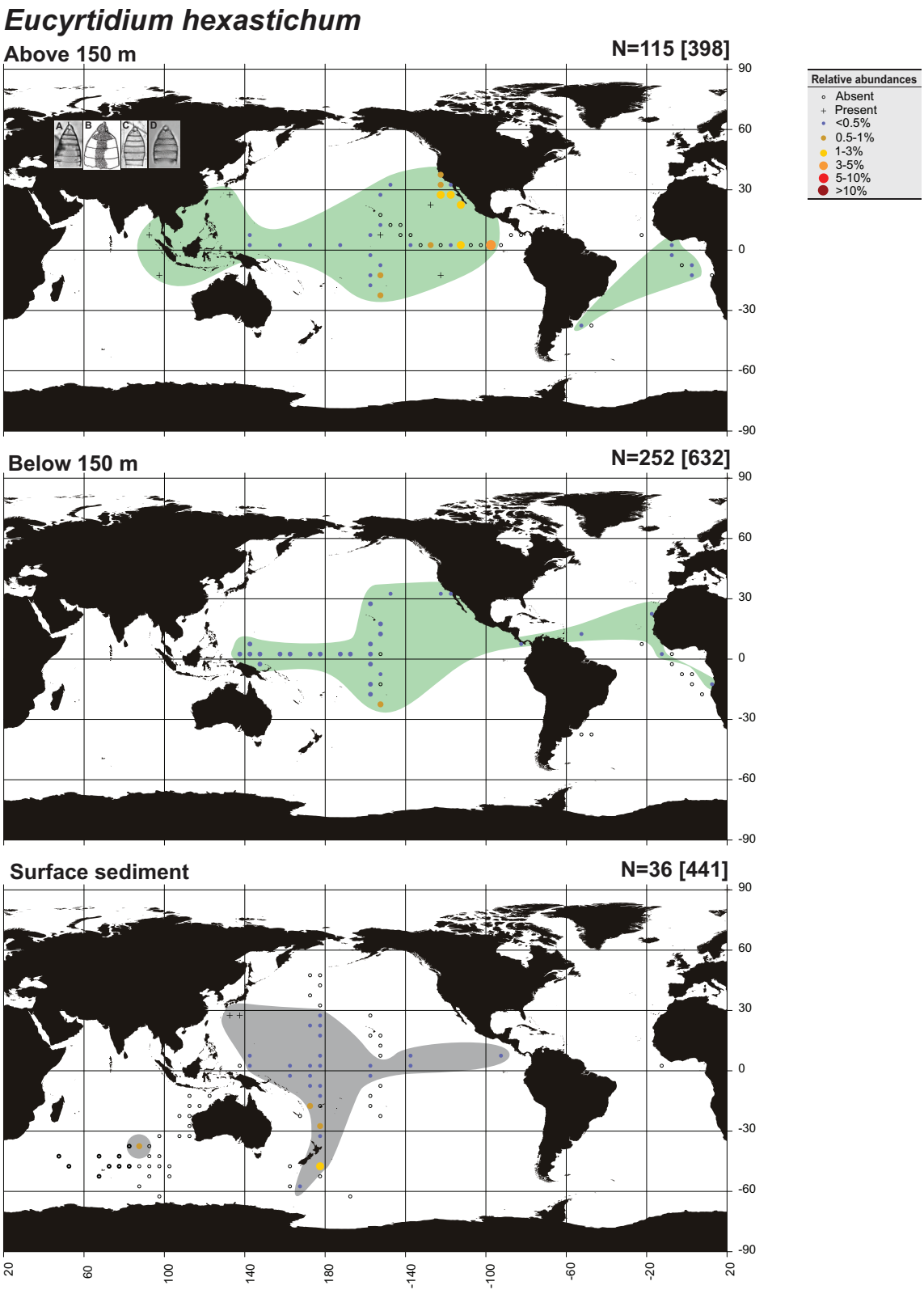


Figure 42. Geographic distribution of *Eucyrtidium hexastichum*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (above 150 m and below 150 m; plankton and sediment trap materials) and surface sediment materials. Sources of species illustrations: A, Boltovskoy (1999); B, Petrushevskaya (1971); C, Original; D, Original.

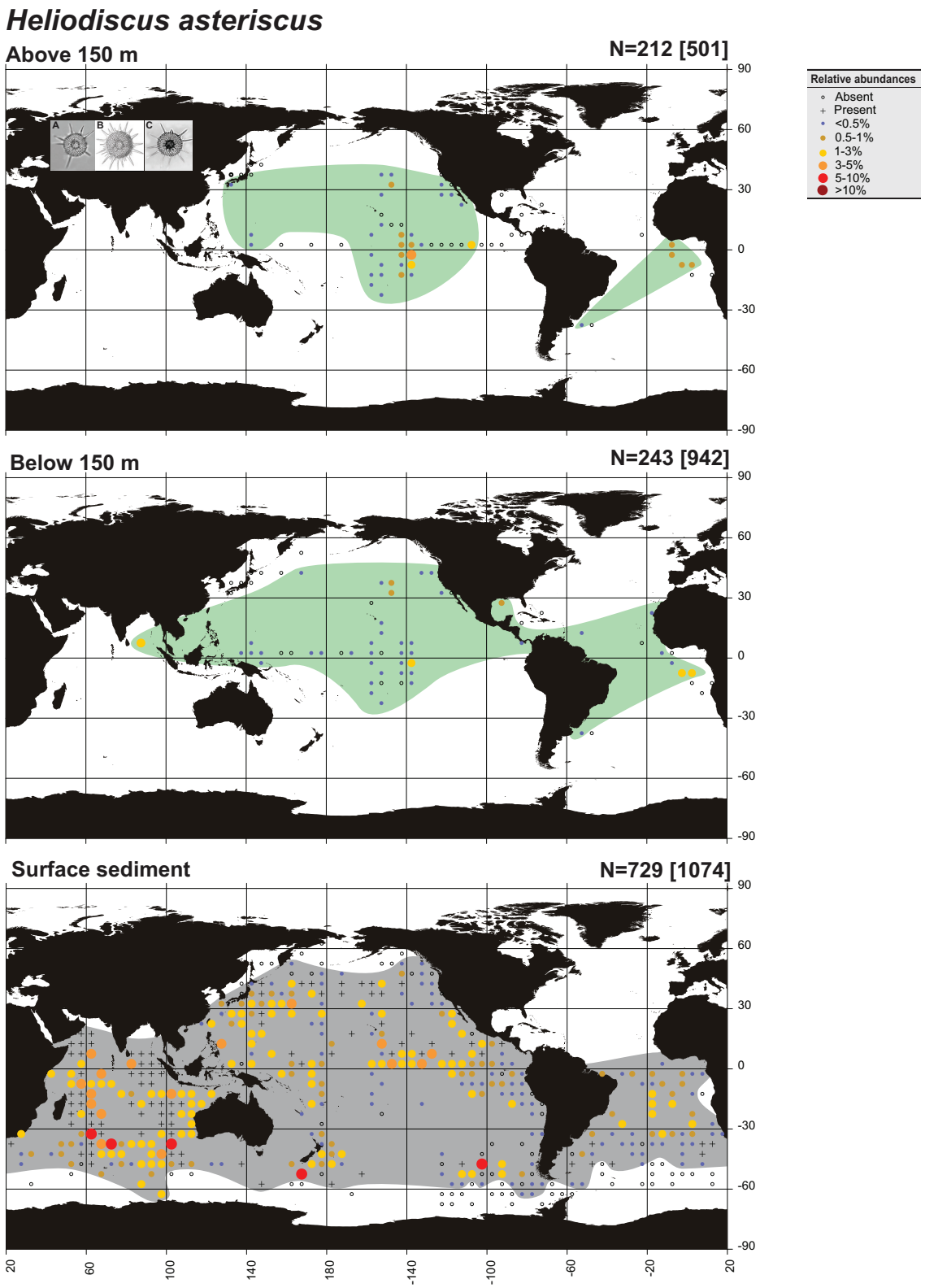


Figure 43. Geographic distribution of *Heliodiscus asteriscus*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (above 150 m and below 150 m; plankton and sediment trap materials) and surface sediment materials. Sources of species illustrations: A, Original; B, Haeckel (1887); C, Paverd (1995).

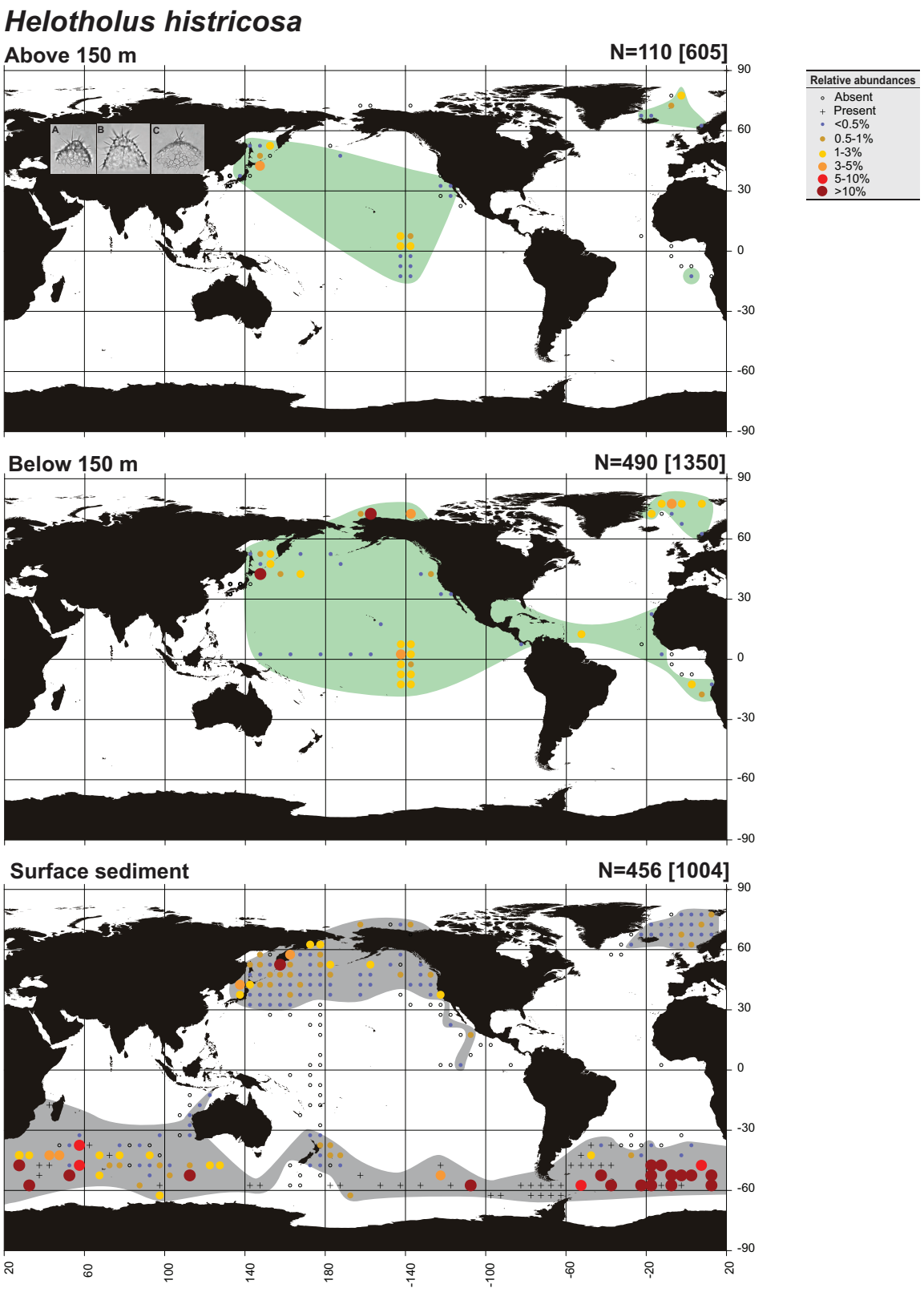


Figure 44. Geographic distribution of *Helotholus histricosa*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (above 150 m and below 150 m; plankton and sediment trap materials) and surface sediment materials. Sources of species illustrations: A, Radiolaria.org (photo K. Bjørklund); B, Itaki (2009); C, Original.

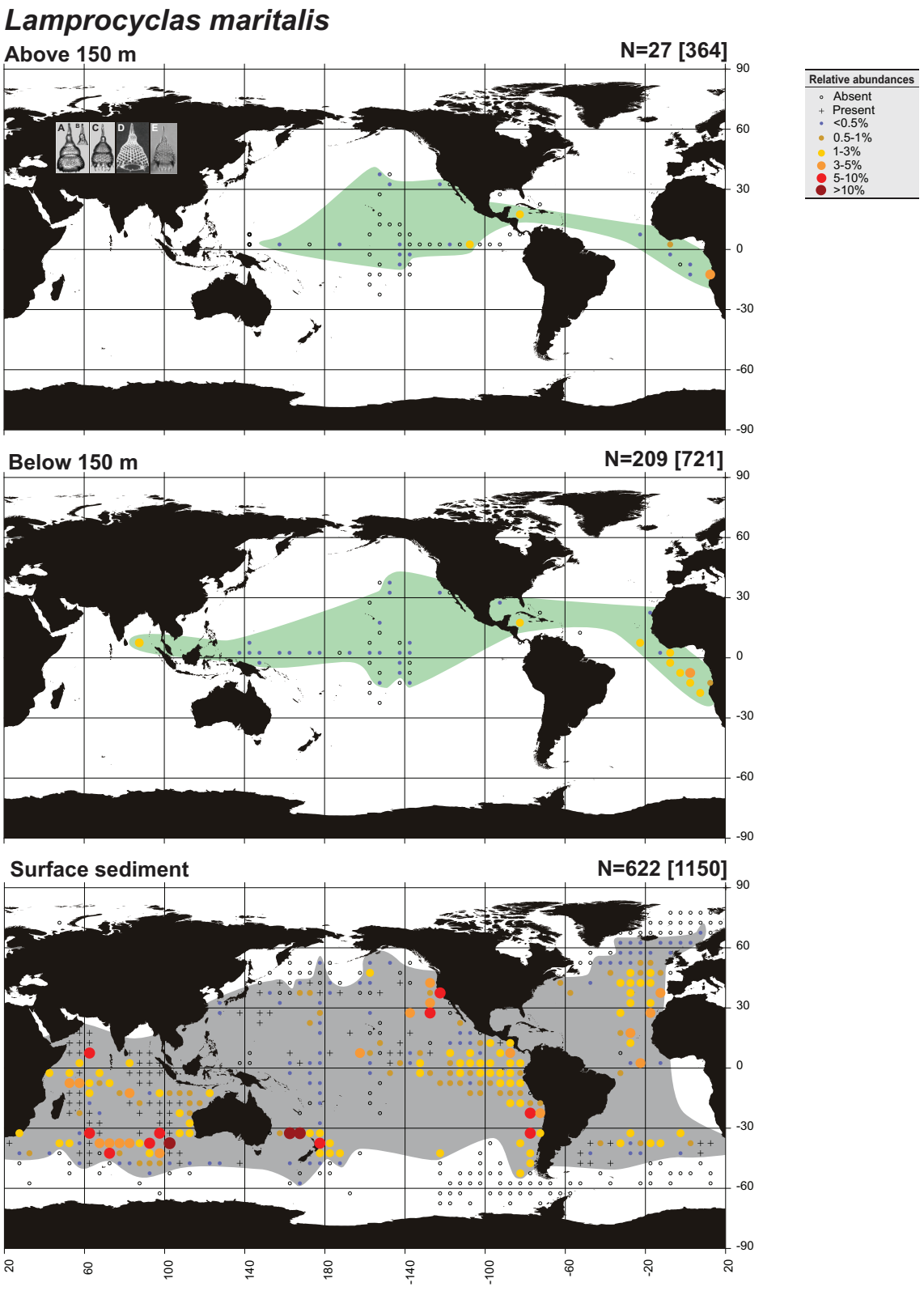


Figure 45. Geographic distribution of *Lamprocyclas maritalis*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (above 150 m and below 150 m; plankton and sediment trap materials) and surface sediment materials. Sources of species illustrations: A, Boltovskoy (1999); B, Boltovskoy (1999); C, Takahashi (1991); D, Original.

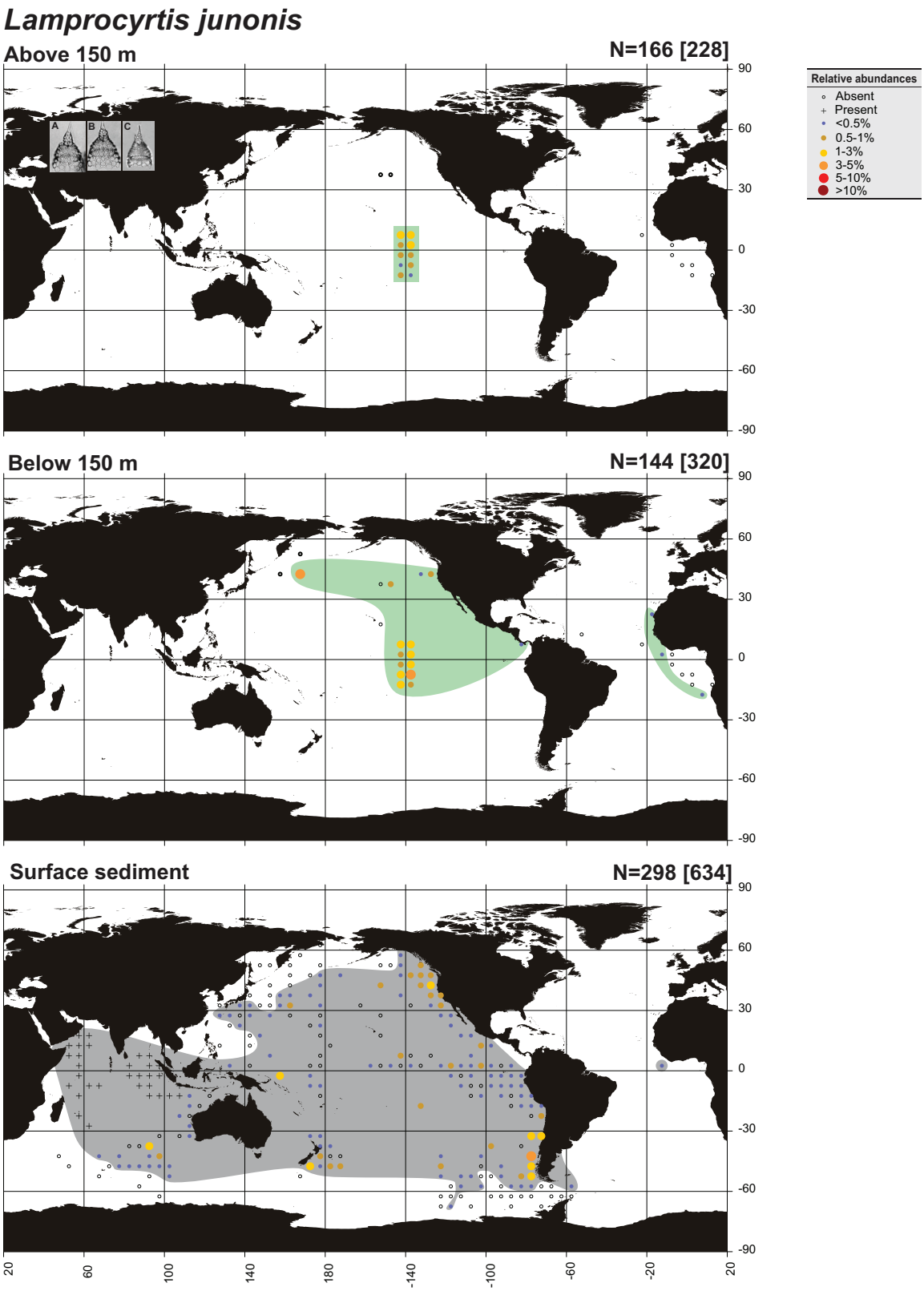


Figure 46. Geographic distribution of *Lamprocyrtis junonis*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (above 150 m and below 150 m; plankton and sediment trap materials) and surface sediment materials. Sources of species illustrations: A, Welling (1997); B, Welling (1997); C, Original.

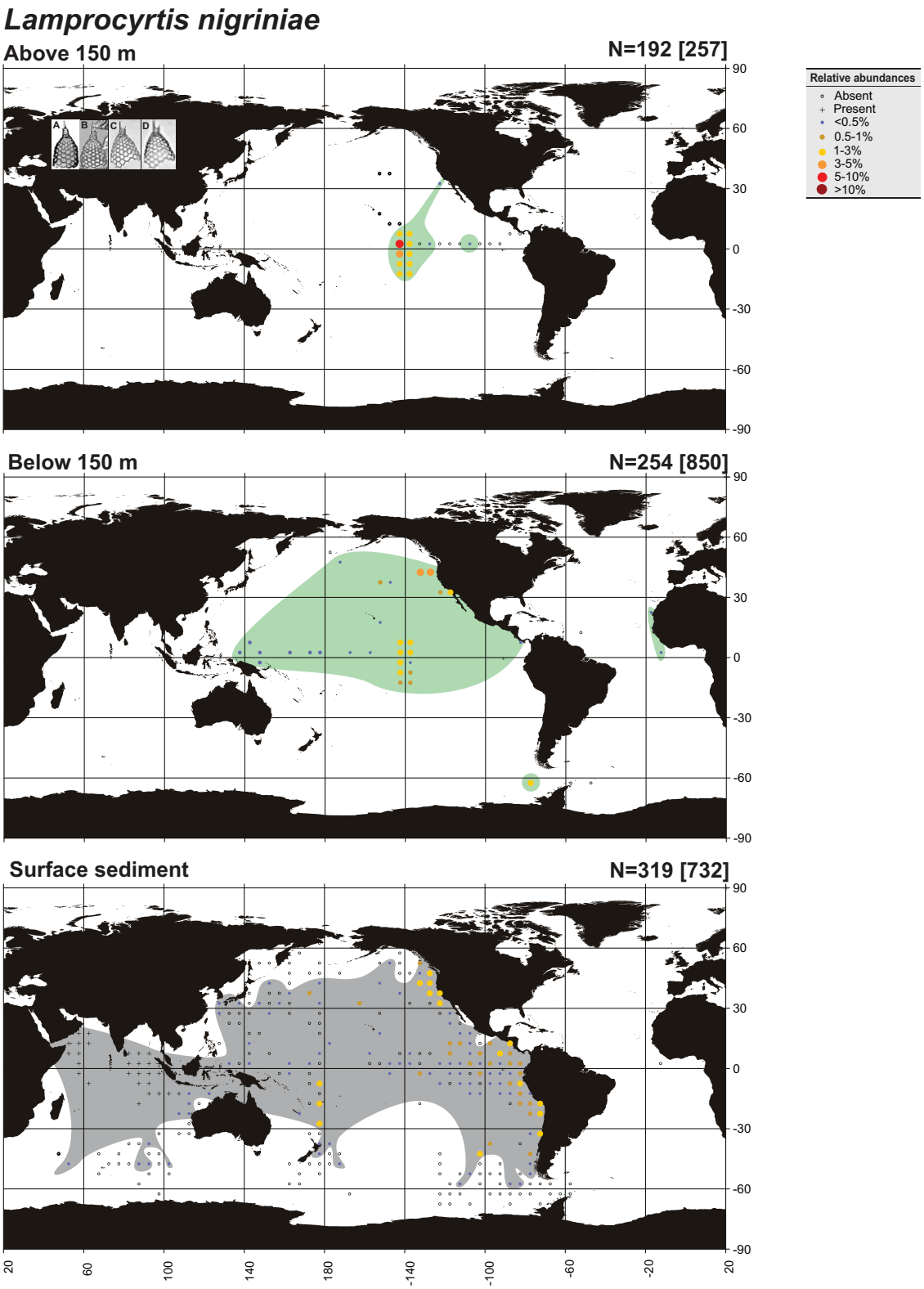


Figure 47. Geographic distribution of *Lamprocyrtis nigriniae*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (above 150 m and below 150 m; plankton and sediment trap materials) and surface sediment materials. Sources of species illustrations: A, Goll (1980); B, Hollis and Neal (2005); C, Radiolaria.org (photo Bjørklund and Benson); D, Radiolaria.org (photo Bjørklund and Benson).

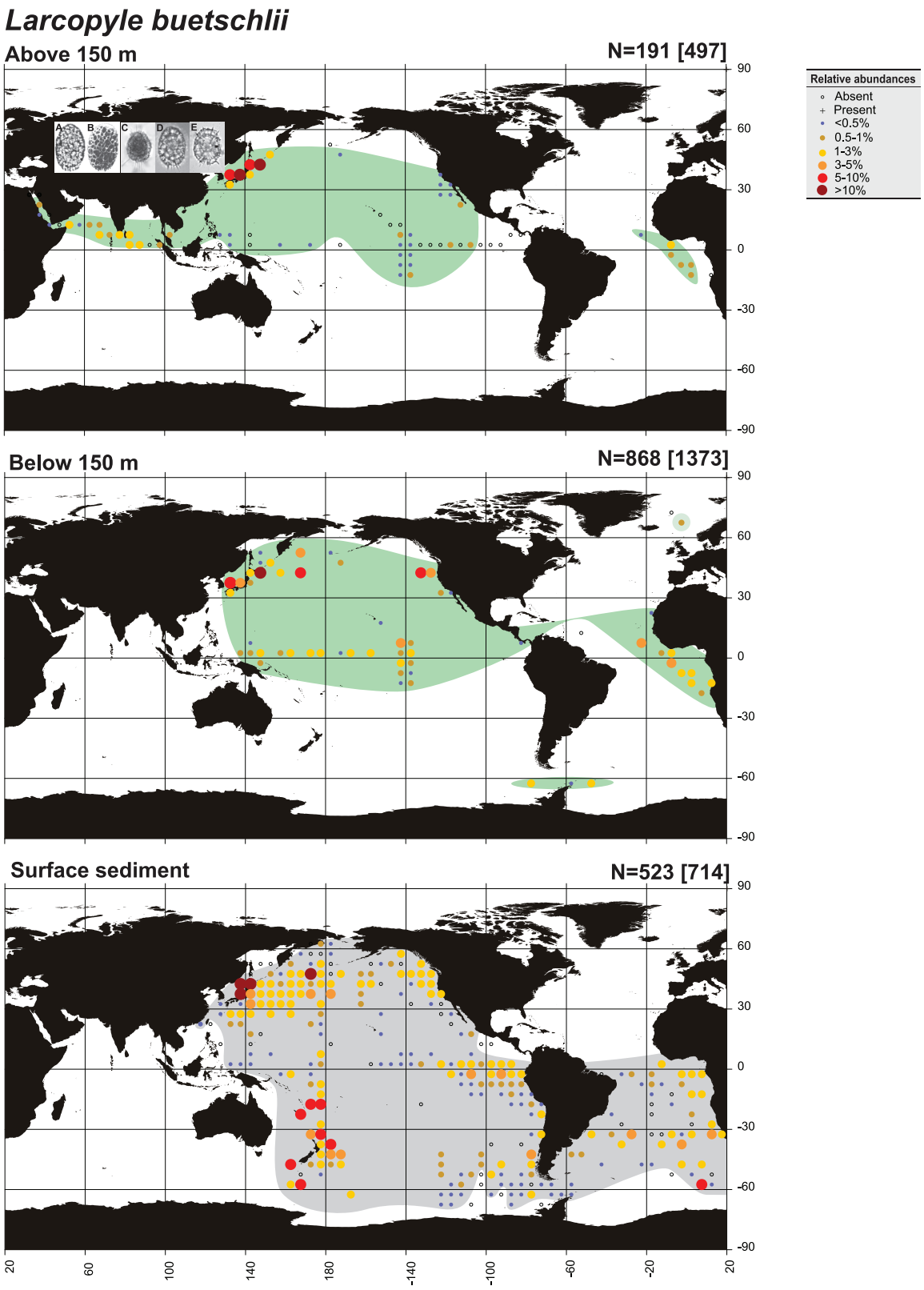


Figure 48. Geographic distribution of *Larcopyle buetschlii*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (above 150 m and below 150 m; plankton and sediment trap materials) and surface sediment materials. Sources of species illustrations: A, Boltovskoy (1999); B, Boltovskoy (1999); C, Itaki (2009); D, Original; E, Original.

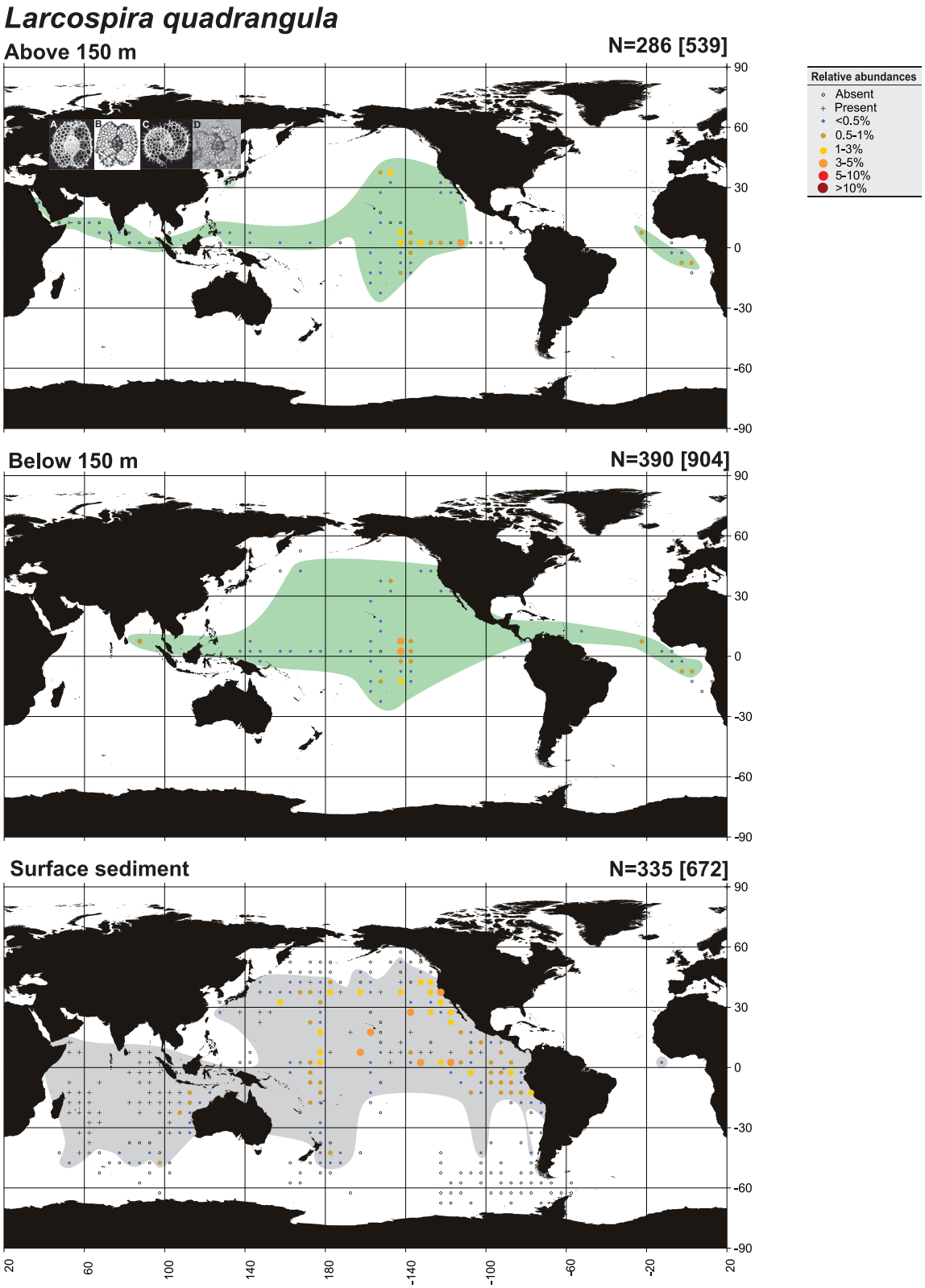


Figure 49. Geographic distribution of *Larcospira quadrangula*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (above 150 m and below 150 m; plankton and sediment trap materials) and surface sediment materials. Sources of species illustrations: A, Original; B, Boltovskoy (1999); C, Takahashi (1991); D, Original.

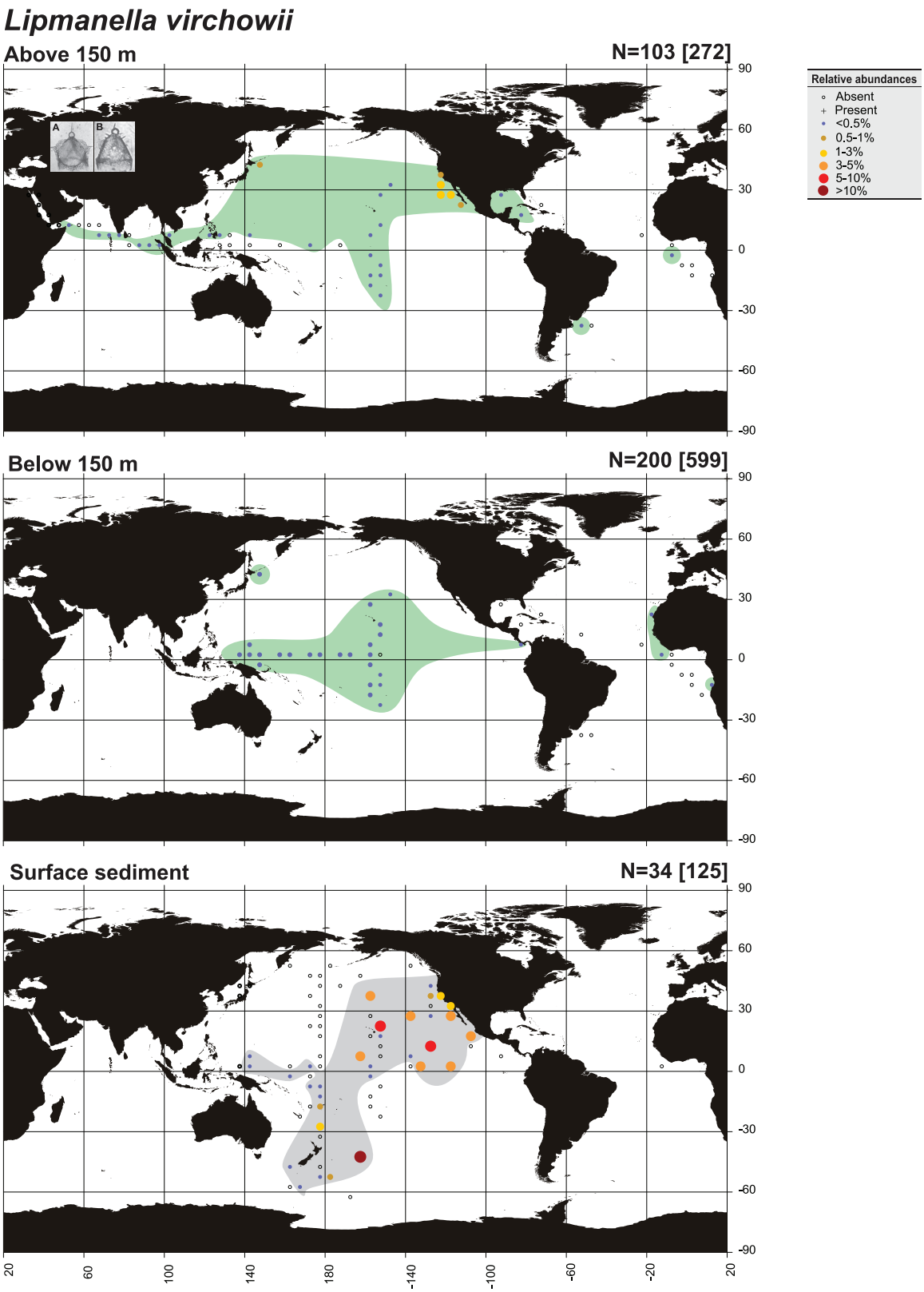


Figure 50. Geographic distribution of *Lipmanella virchowii*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (above 150 m and below 150 m; plankton and sediment trap materials) and surface sediment materials. Sources of species illustrations: A, Takahashi (1991); B, Takahashi (1991).

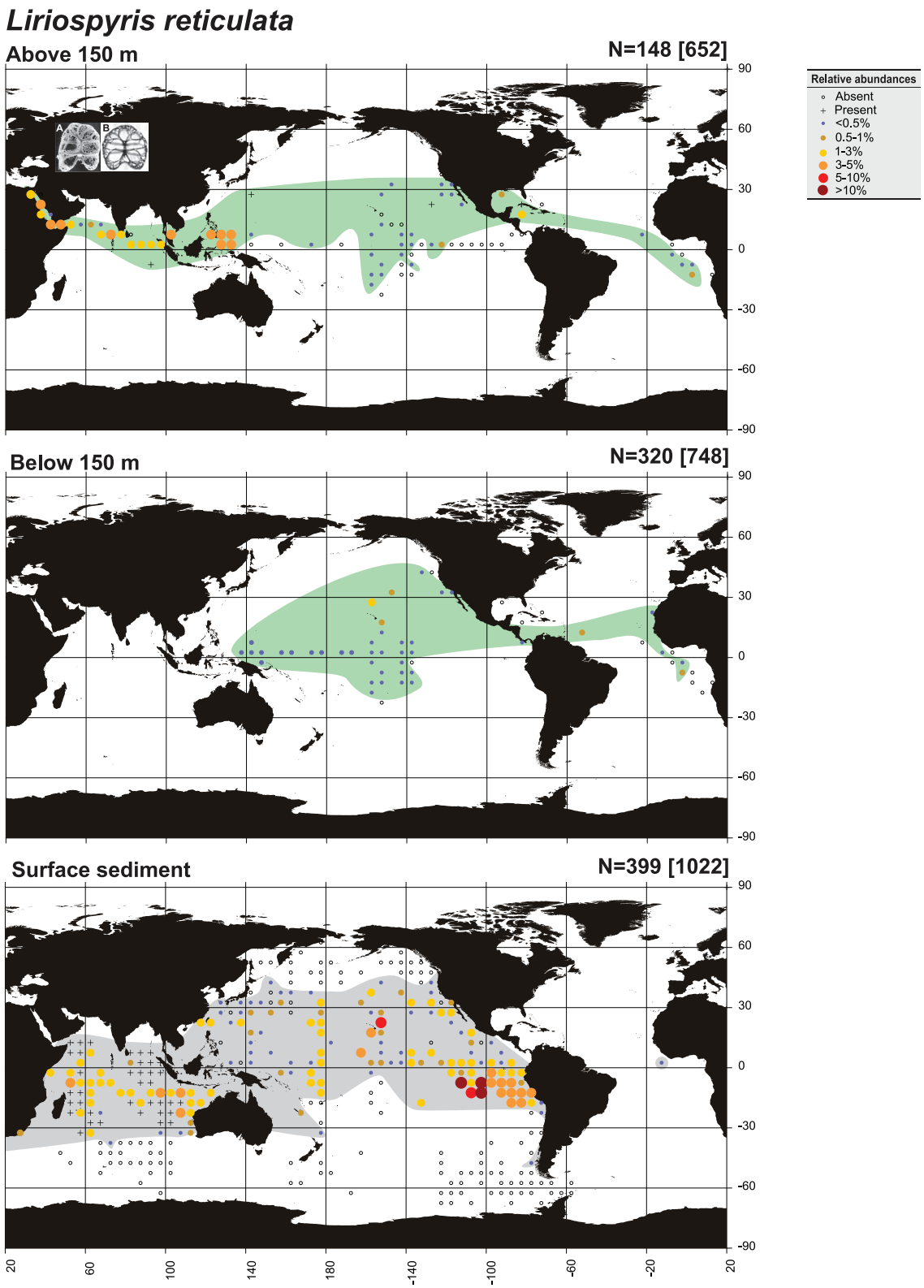


Figure 51. Geographic distribution of *Liriospyris reticulata*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (above 150 m and below 150 m; plankton and sediment trap materials) and surface sediment materials. Sources of species illustrations: A, Original; B, Boltovskoy (1999).

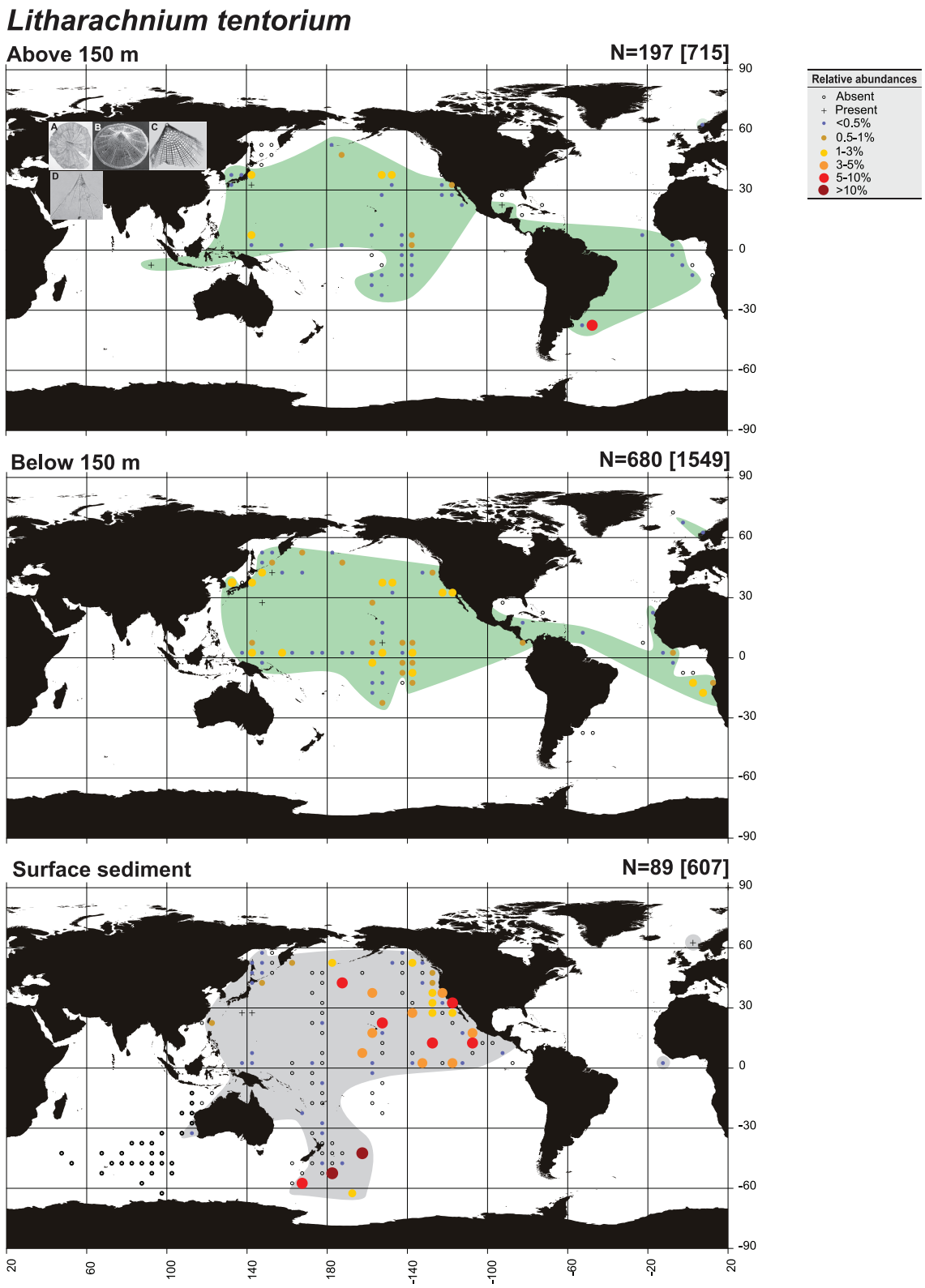


Figure 52. Geographic distribution of *Litharachnium tentorium*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (above 150 m and below 150 m; plankton and sediment trap materials) and surface sediment materials. Sources of species illustrations: A, Petrushevskaya (1971); B, Paverd (1995); C, Boltovskoy (1999); D, Original.

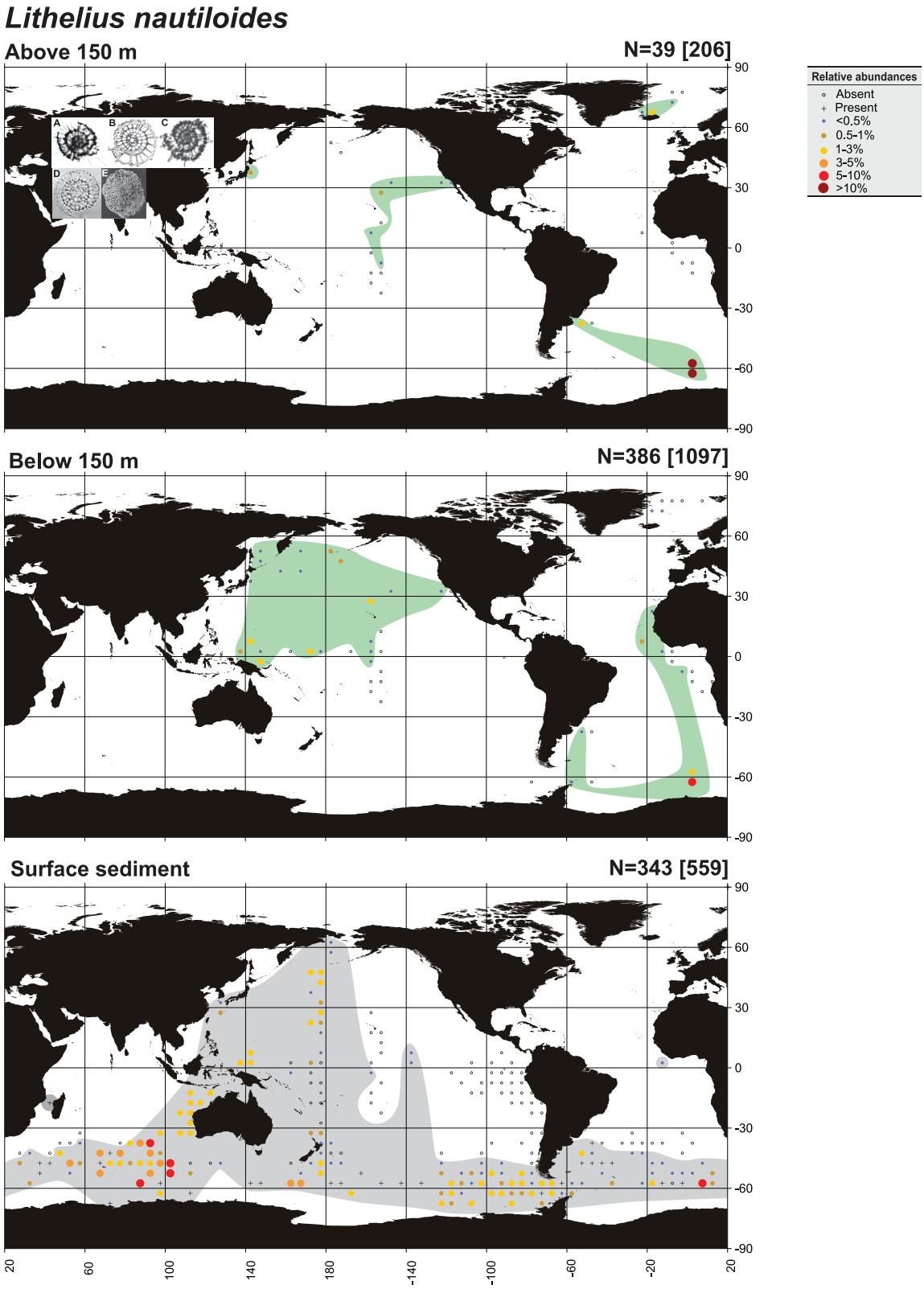


Figure 53. Geographic distribution of *Lithelius nautiloides*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (above 150 m and below 150 m; plankton and sediment trap materials) and surface sediment materials. Sources of species illustrations: A, Boltovskoy (1999); B, Petrushevskaya (1965); C, Boltovskoy (1999); D, Boltovskoy et al. (1983); E, Boltovskoy et al. (1983).

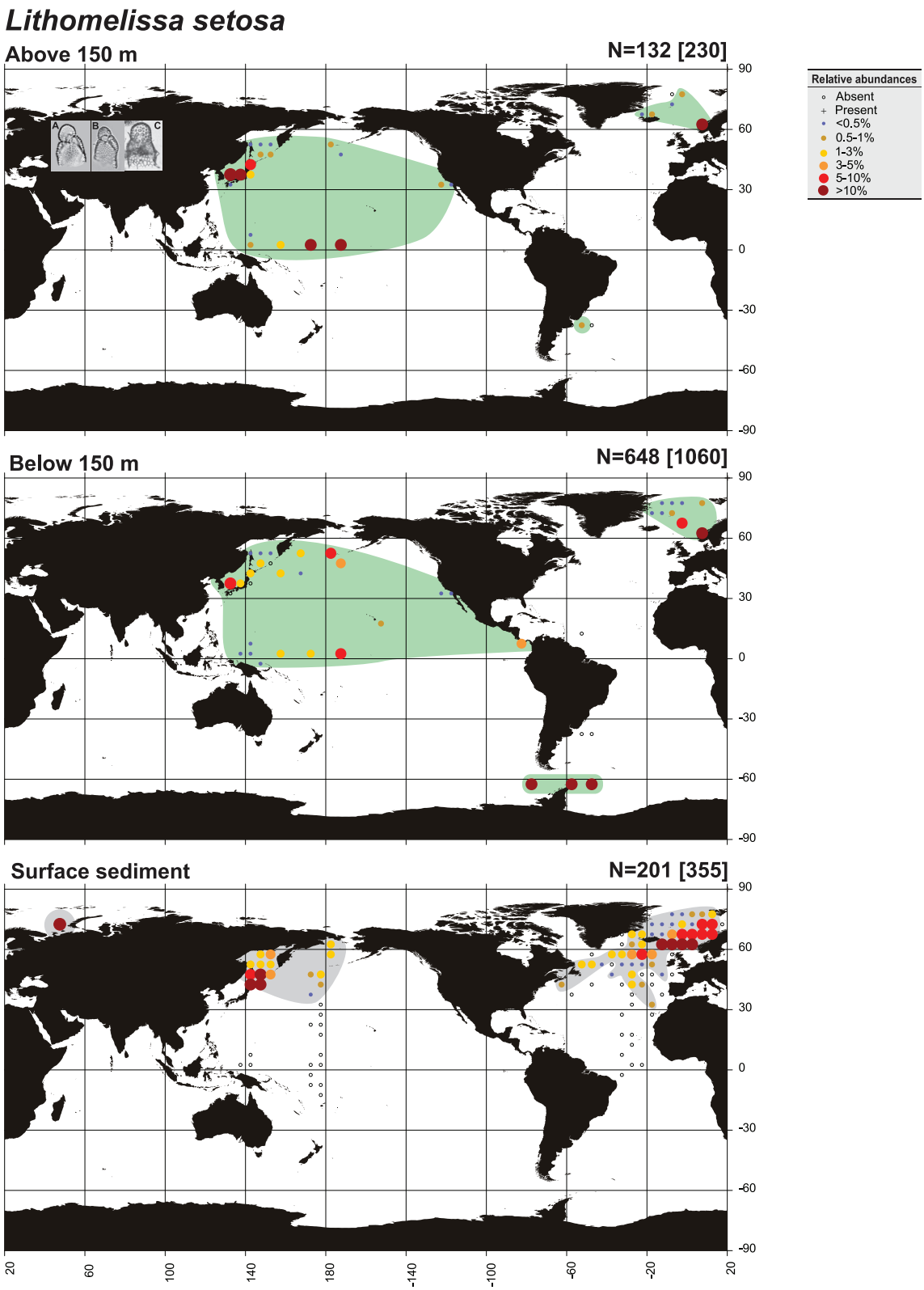


Figure 54. Geographic distribution of *Lithomelissa setosa*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (above 150 m and below 150 m; plankton and sediment trap materials) and surface sediment materials. Sources of species illustrations: A, Radiolaria.org (photo J. Dolven); B, Radiolaria.org (photo K. Bjørklund); C, Radiolaria.org (photo Bjørklund and Benson).

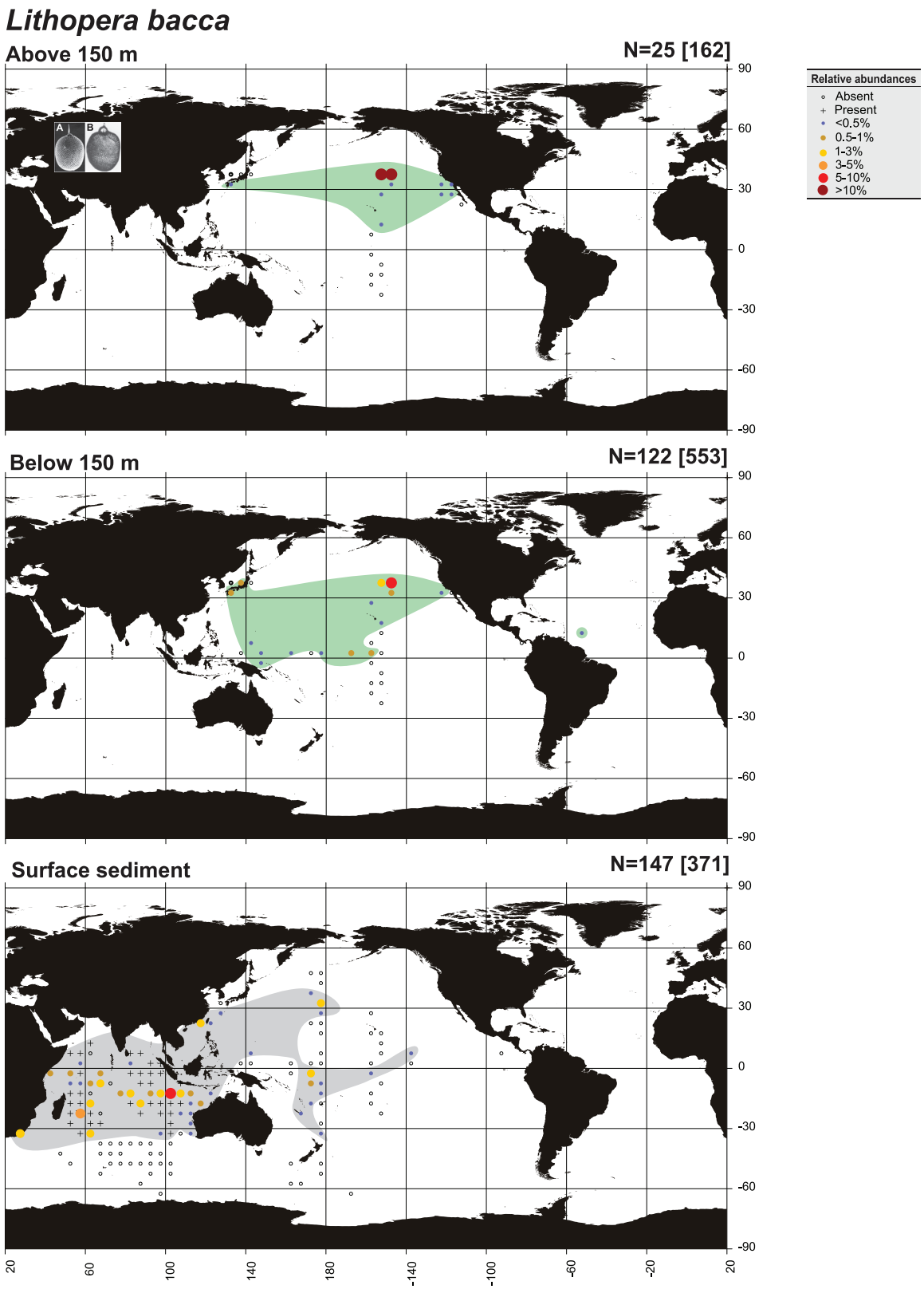


Figure 55. Geographic distribution of *Lithopera bacca*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (above 150 m and below 150 m; plankton and sediment trap materials) and surface sediment materials. Sources of species illustrations: A, Bjørklund and Goll (1986); B, Benson (1966).

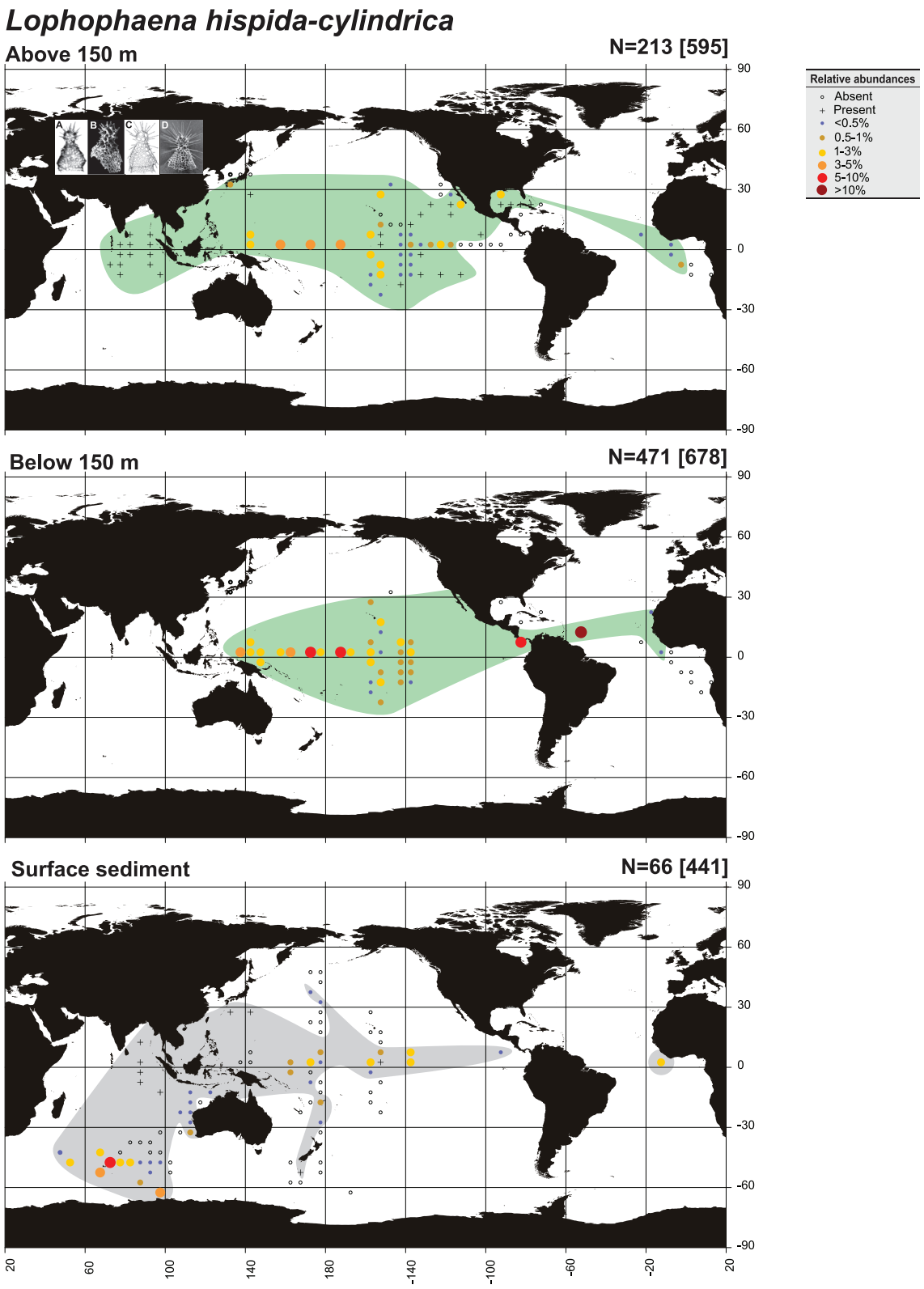


Figure 56. Geographic distribution of *Lophophaena hispida-cylindrica*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (above 150 m and below 150 m; plankton and sediment trap materials) and surface sediment materials. Sources of species illustrations: A, Boltovskoy (1999); B, Boltovskoy (1999); C, Petrushevskaya (1971); D, Matsuoka (2009).

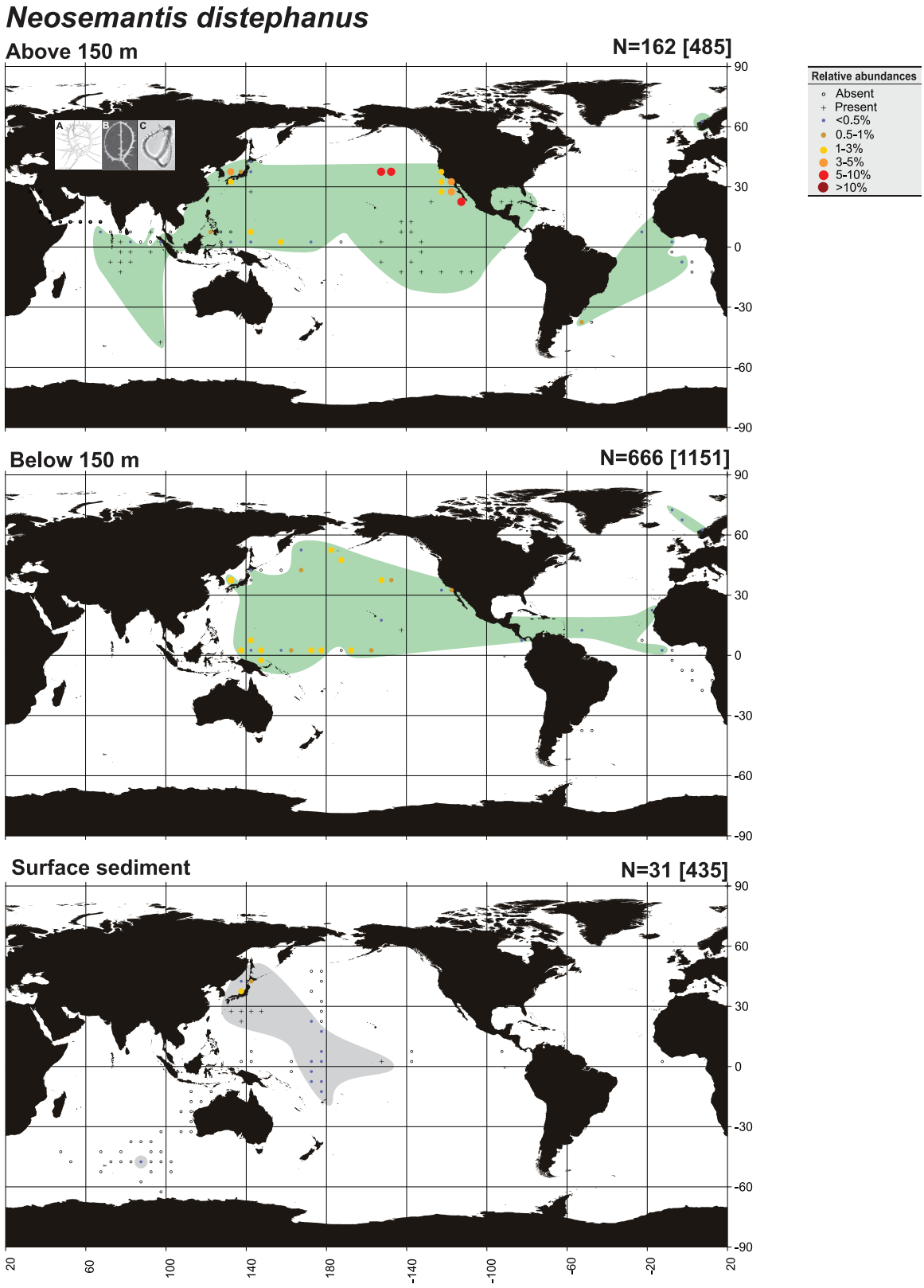


Figure 57. Geographic distribution of *Neosemantis distephanus*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (above 150 m and below 150 m; plankton and sediment trap materials) and surface sediment materials. Sources of species illustrations: A, Petrushevskaya (1971); B, Takahashi (1991); C, Paverd (1995).

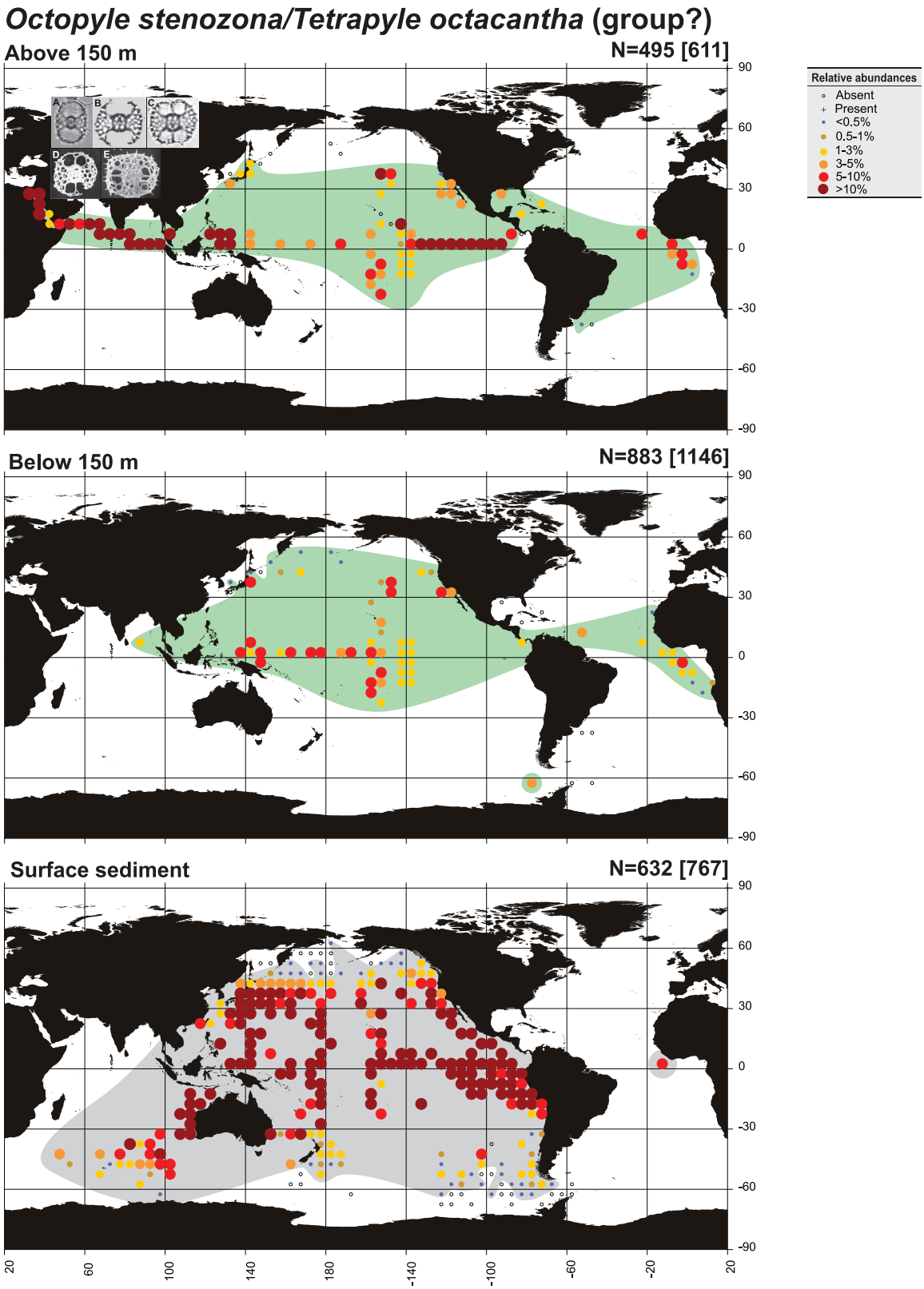


Figure 58. Geographic distribution of *Octopyle stenozona/Tetrapyle octacantha*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (above 150 m and below 150 m; plankton and sediment trap materials) and surface sediment materials. Sources of species illustrations: A, Original; B, Boltovskoy (1999); C, Original; D, Original; E, Original.

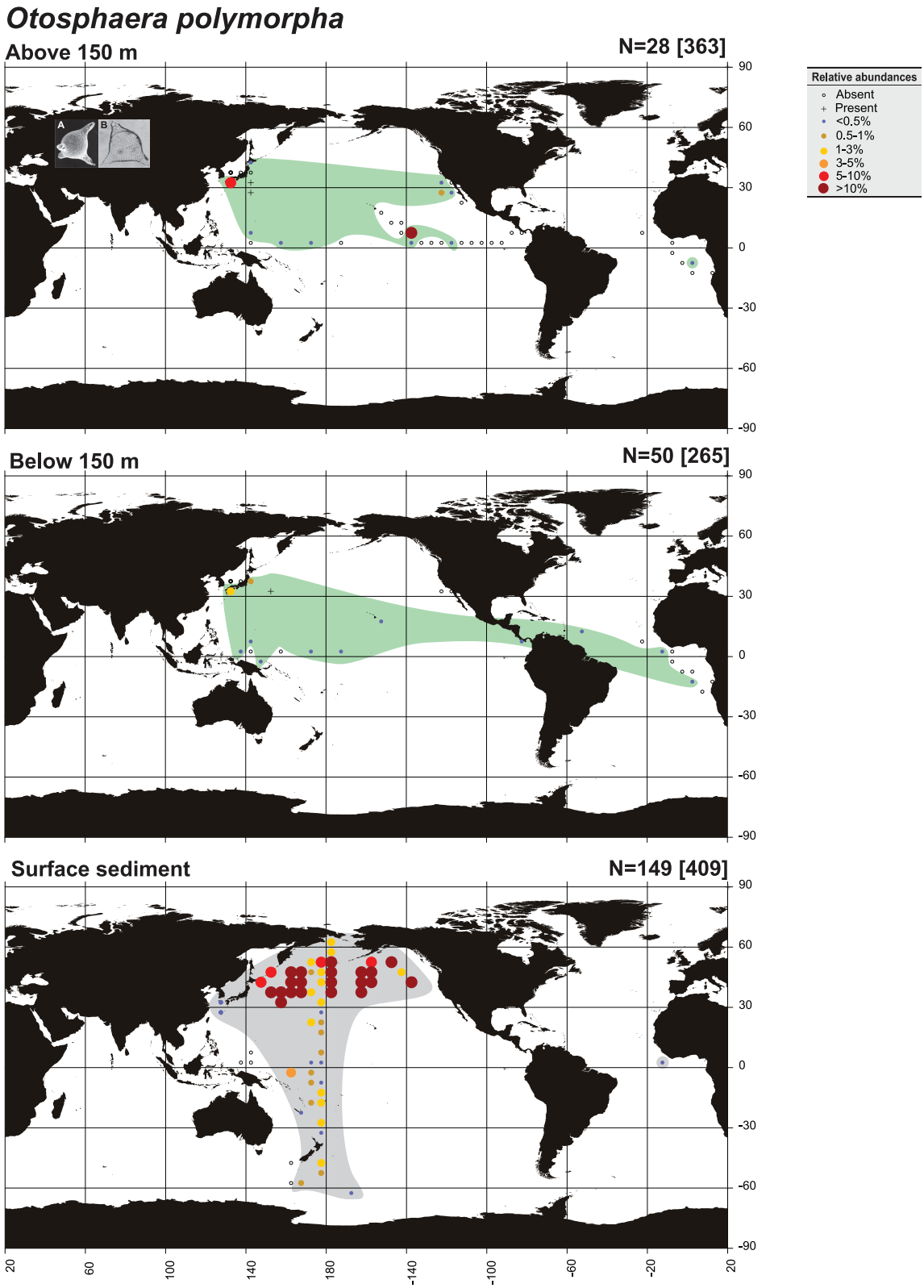


Figure 59. Geographic distribution of *Otosphaera polymorpha*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (above 150 m and below 150 m; plankton and sediment trap materials) and surface sediment materials. Sources of species illustrations: A, Original; B, Takahashi (1991).

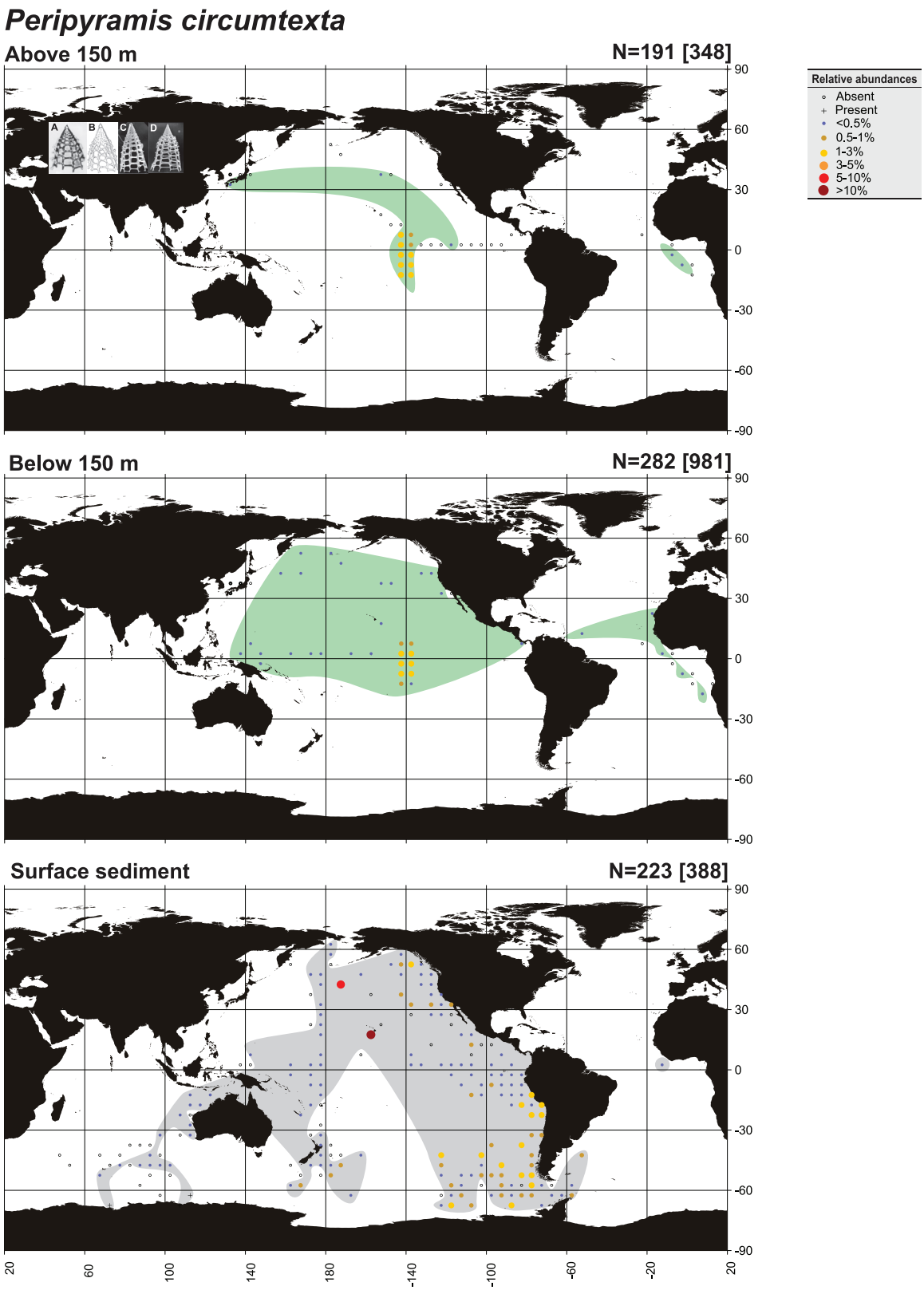


Figure 60. Geographic distribution of *Peripyramis circumtexta*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (above 150 m and below 150 m; plankton and sediment trap materials) and surface sediment materials. Sources of species illustrations: A, Benson (1966); B, Petrushevskaya (1971); C, Original; D, Original.

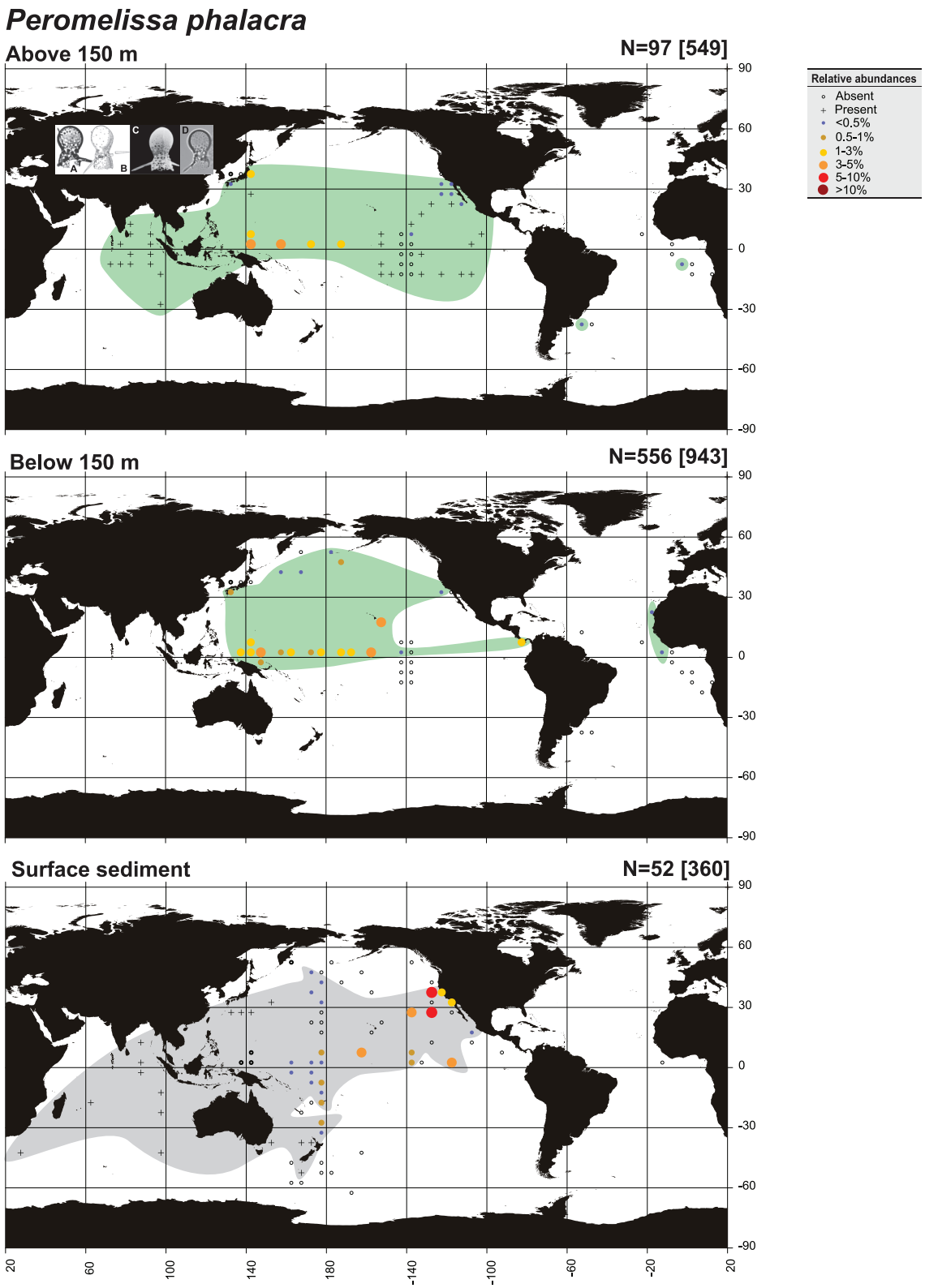


Figure 61. Geographic distribution of *Peromelissa phalacra*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (above 150 m and below 150 m; plankton and sediment trap materials) and surface sediment materials. Sources of species illustrations: A, Boltovskoy (1999); B, Petrushevskaya (1971); C, Takahashi (1991); D, Original.

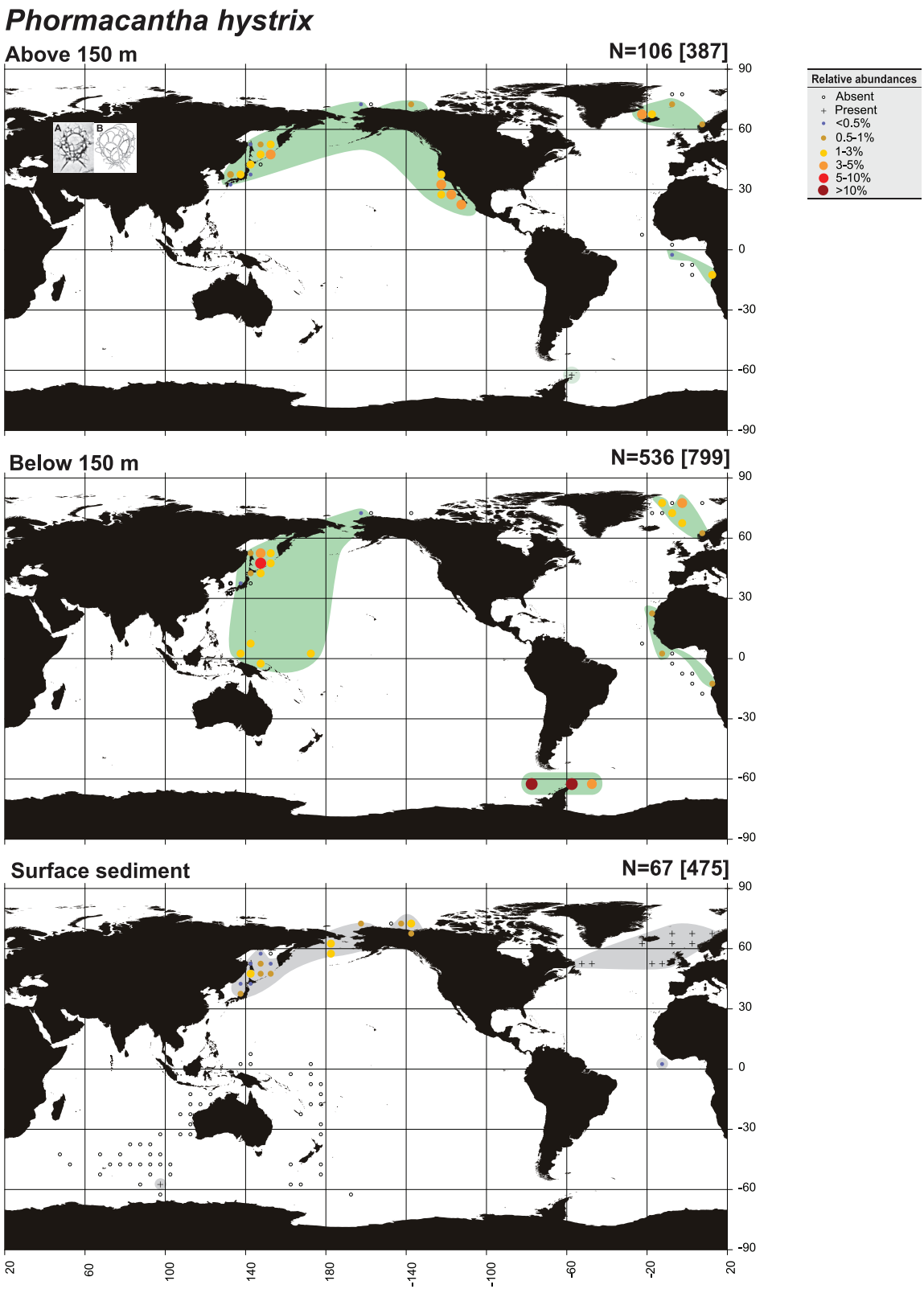


Figure 62. Geographic distribution of *Phormacantha hystrix*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (above 150 m and below 150 m; plankton and sediment trap materials) and surface sediment materials. Sources of species illustrations: A, Boltovskoy and Riedel (1987); B, Petrushevskaya (1971).

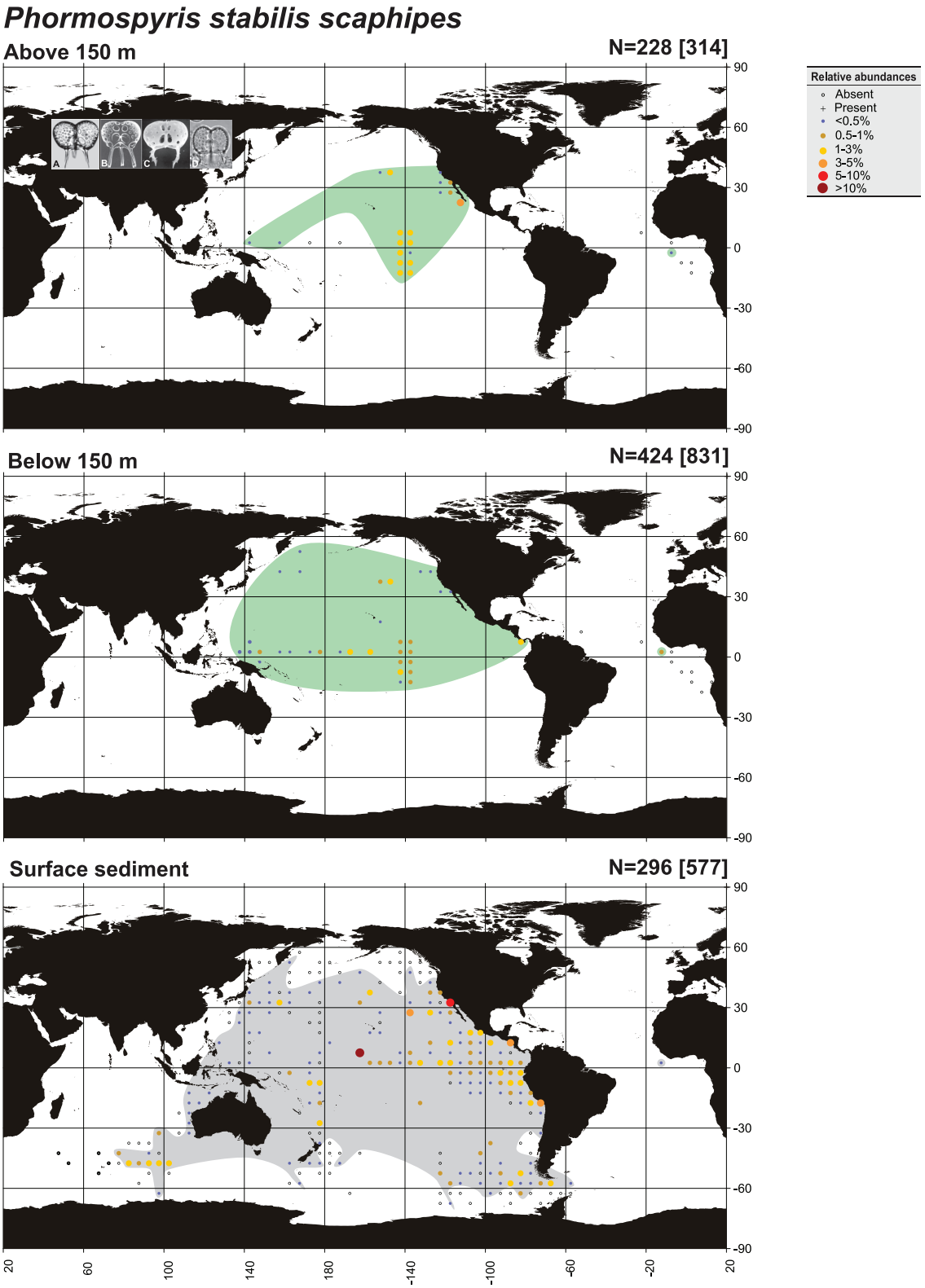


Figure 63. Geographic distribution of *Phormospyris stabilis scaphipes*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (above 150 m and below 150 m; plankton and sediment trap materials) and surface sediment materials. Sources of species illustrations: A, Goll (1976); B, Goll (1976); C, Original; D, Original.

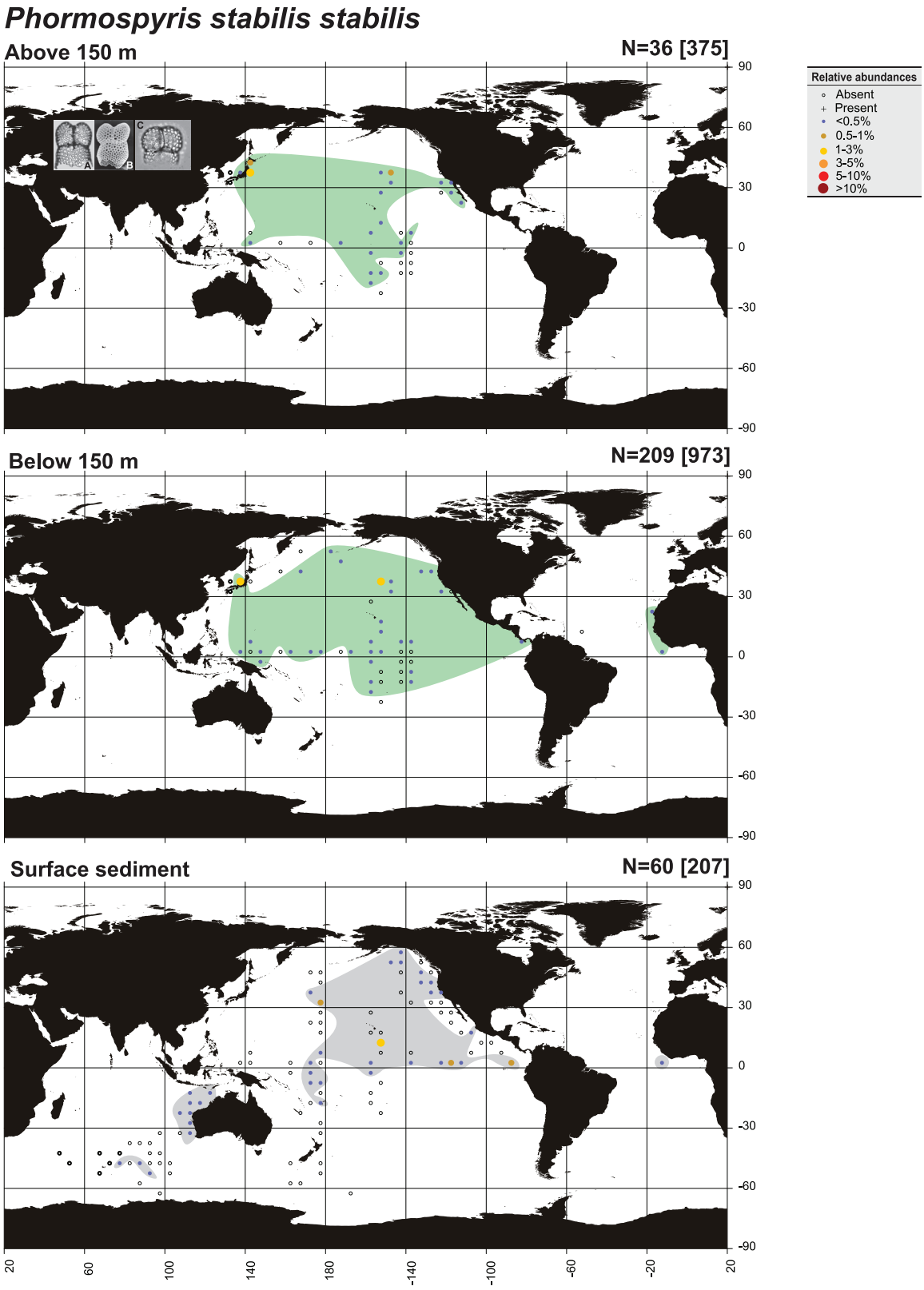


Figure 64. Geographic distribution of *Phormospyris stabilis stabilis*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (above 150 m and below 150 m; plankton and sediment trap materials) and surface sediment materials. Sources of species illustrations: A, Goll (1976); B, Original; C, Original.

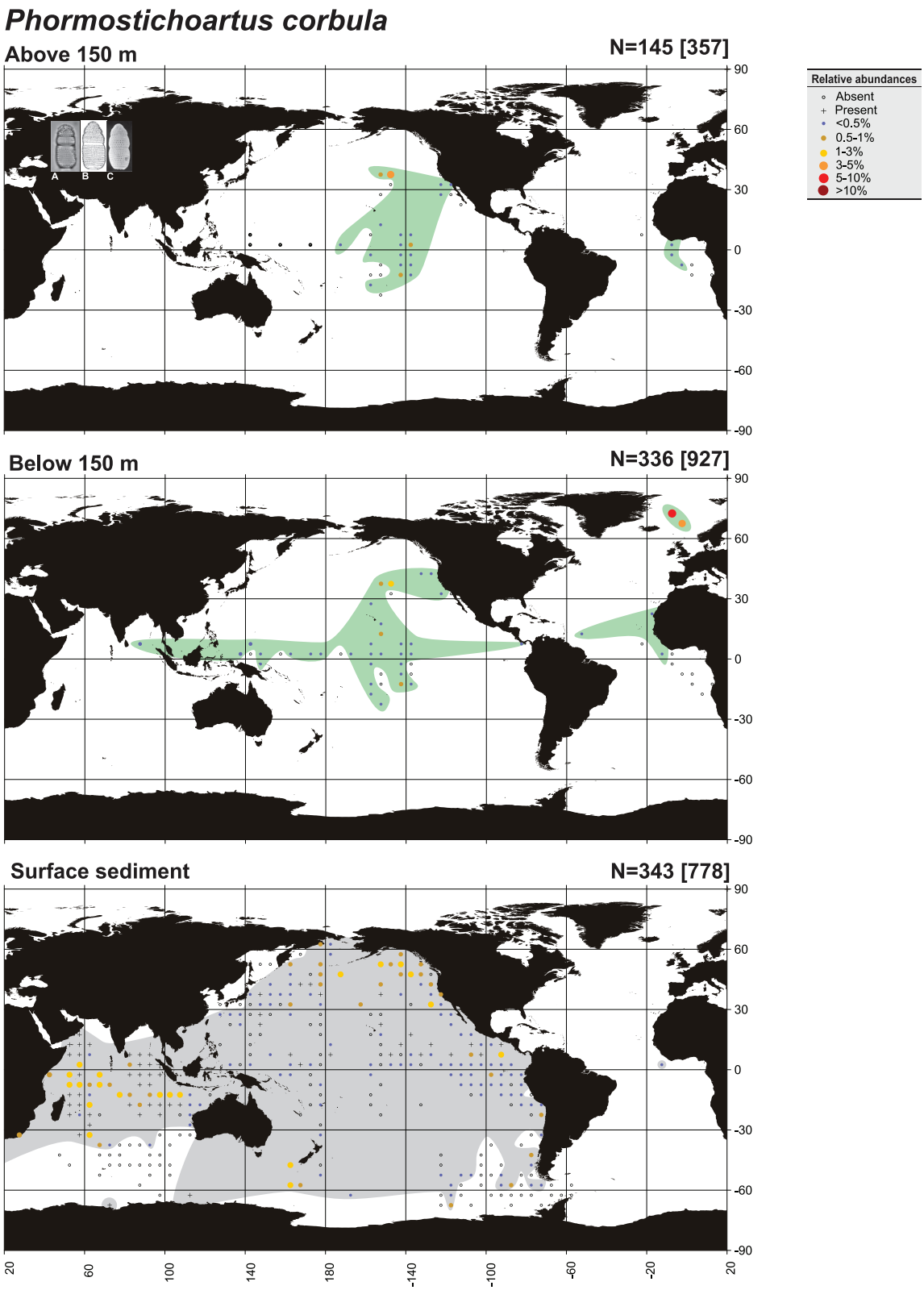


Figure 65. Geographic distribution of *Phormostichoartus corbula*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (above 150 m and below 150 m; plankton and sediment trap materials) and surface sediment materials. Sources of species illustrations: A, Original; B, Petrushevskaya (1971); C, Original.

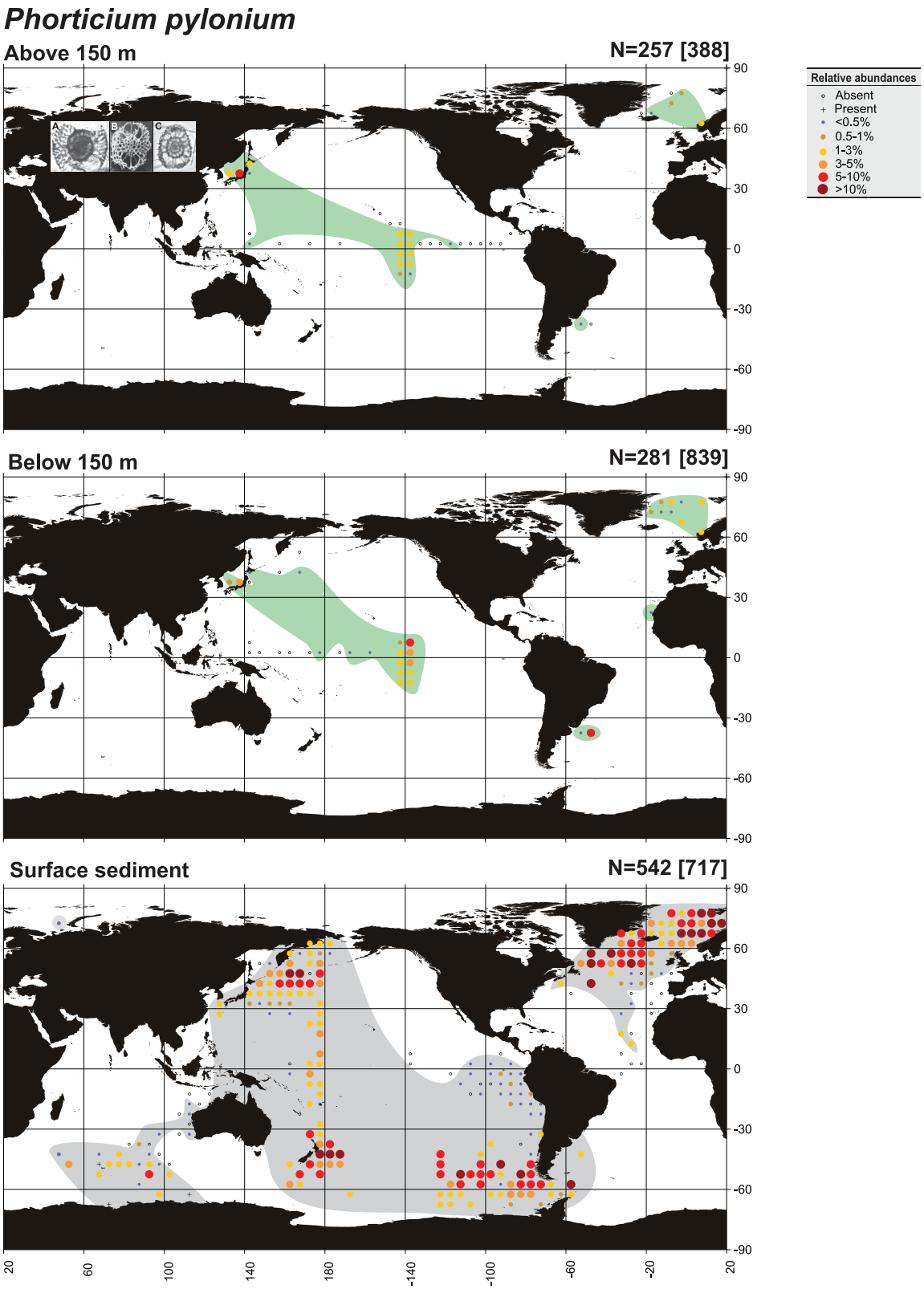


Figure 66. Geographic distribution of *Phorticium pylonium*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (above 150 m and below 150 m; plankton and sediment trap materials) and surface sediment materials. Sources of species illustrations: A, Original; B, Original; C, Original.

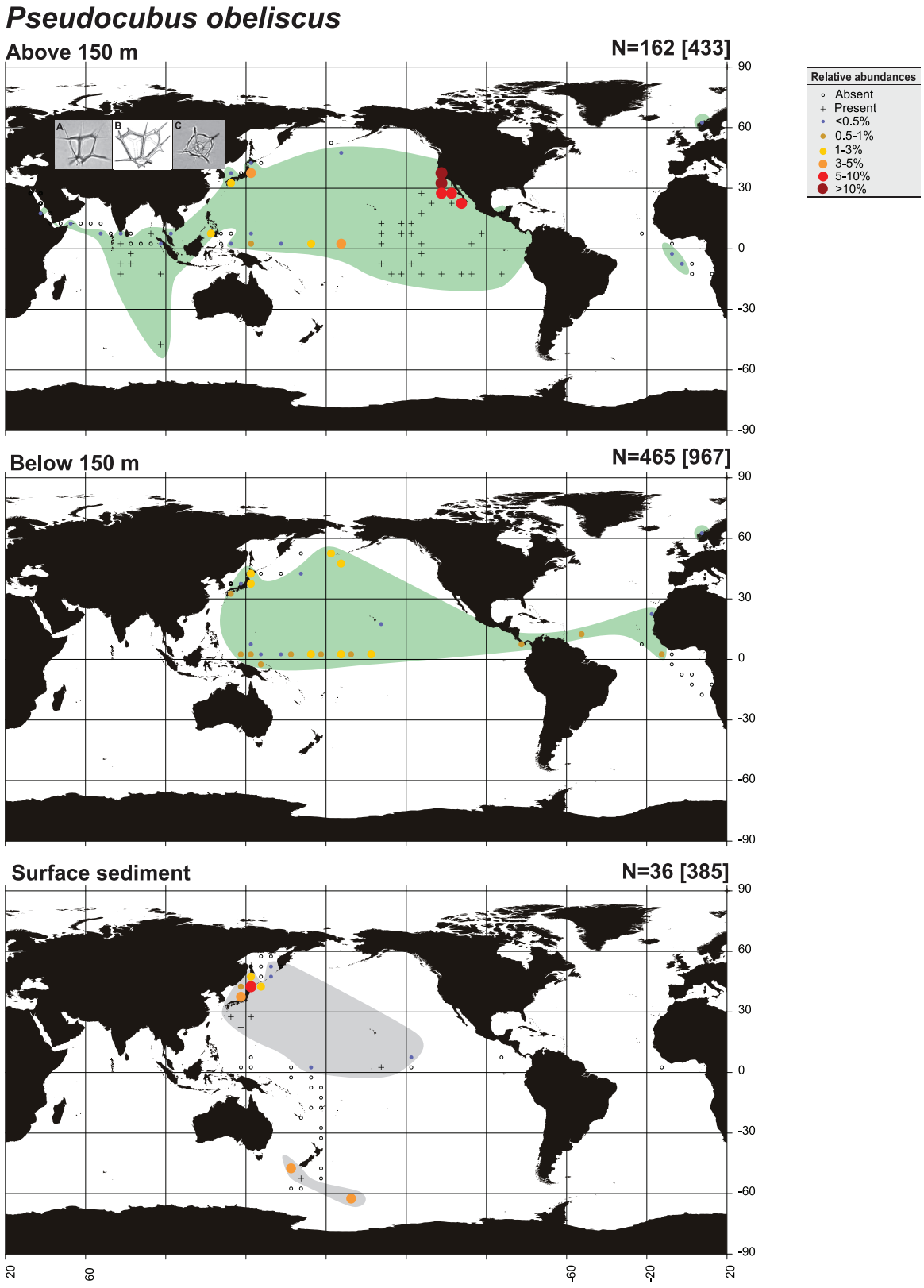


Figure 67. Geographic distribution of *Pseudocubus obeliscus*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (above 150 m and below 150 m; plankton and sediment trap materials) and surface sediment materials. Sources of species illustrations: A, Okazaki et al. (2008); B, Petrushevskaya (1971); C, Original.

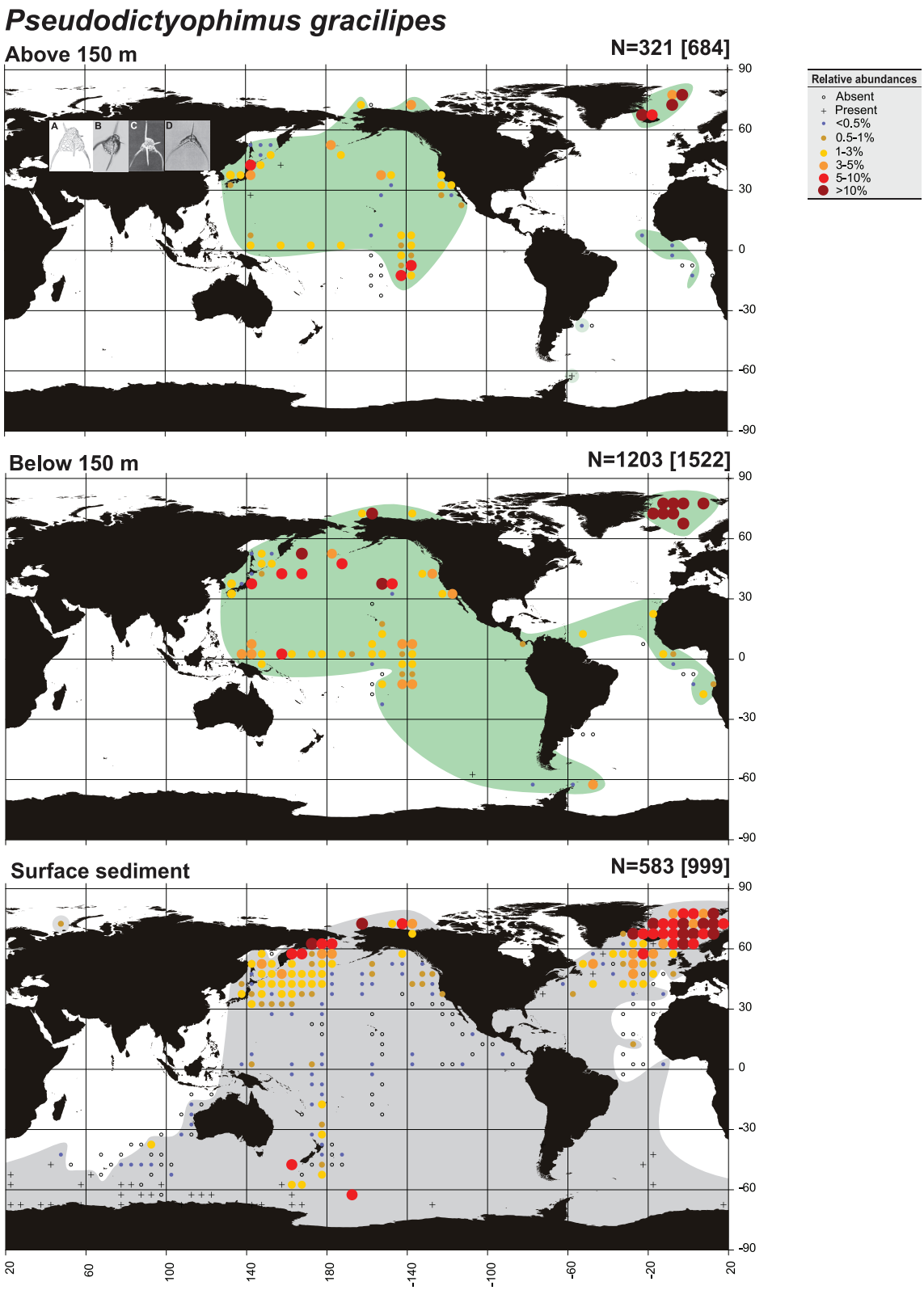


Figure 68. Geographic distribution of *Pseudodictyophimus gracilipes*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (above 150 m and below 150 m; plankton and sediment trap materials) and surface sediment materials. Sources of species illustrations: A, Petrushevskaya (1971); B, Paverd (1995); C, Takahashi (1991); D, Welling (1997).

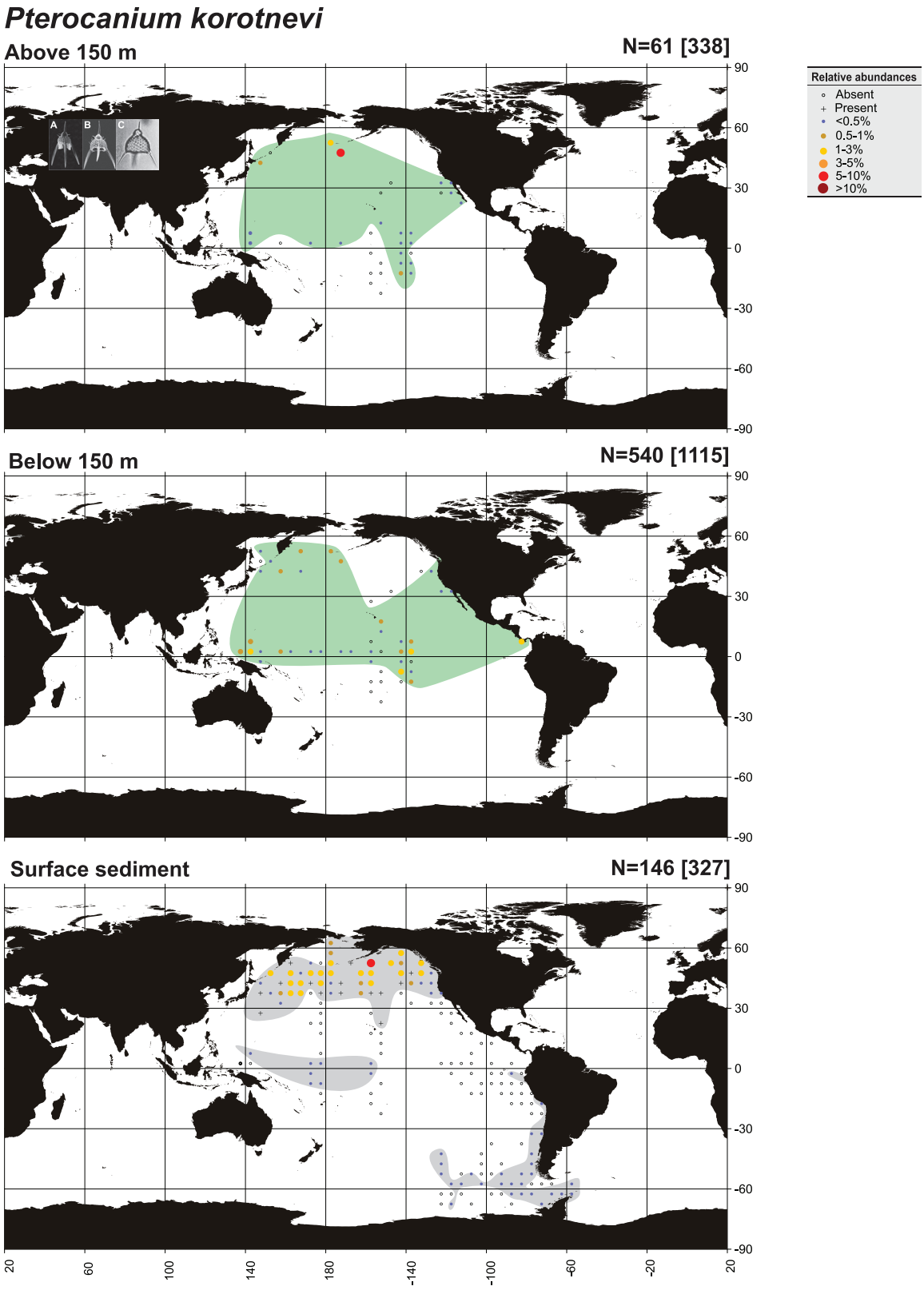


Figure 69. Geographic distribution of *Pterocanium korotnevi*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (above 150 m and below 150 m; plankton and sediment trap materials) and surface sediment materials. Sources of species illustrations: A, Original; B, Original; C, Welling (1997).

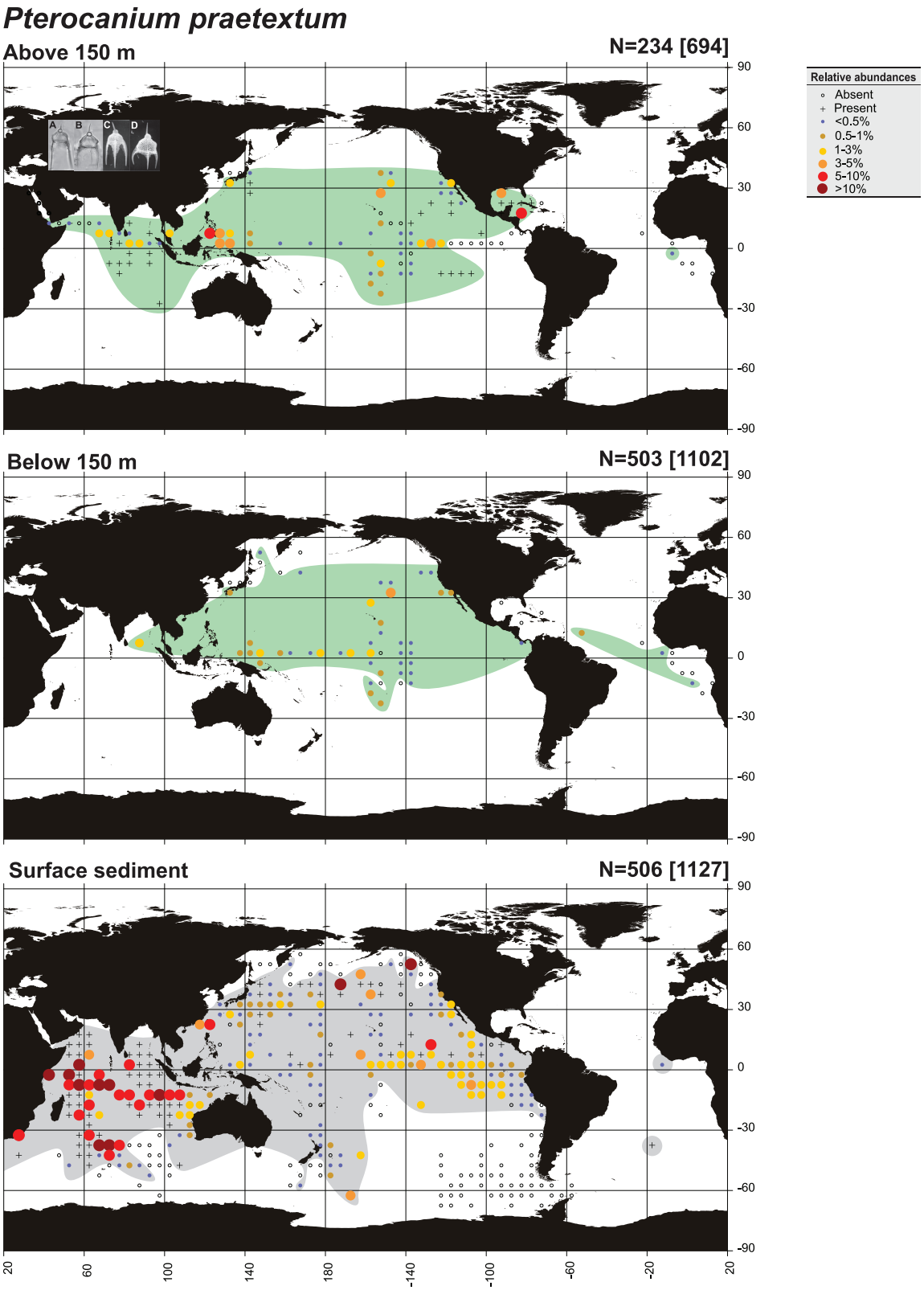


Figure 70. Geographic distribution of *Pterocanium praetextum*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (above 150 m and below 150 m; plankton and sediment trap materials) and surface sediment materials. Sources of species illustrations: A, Original; B, Original; C, Original; D, Original.

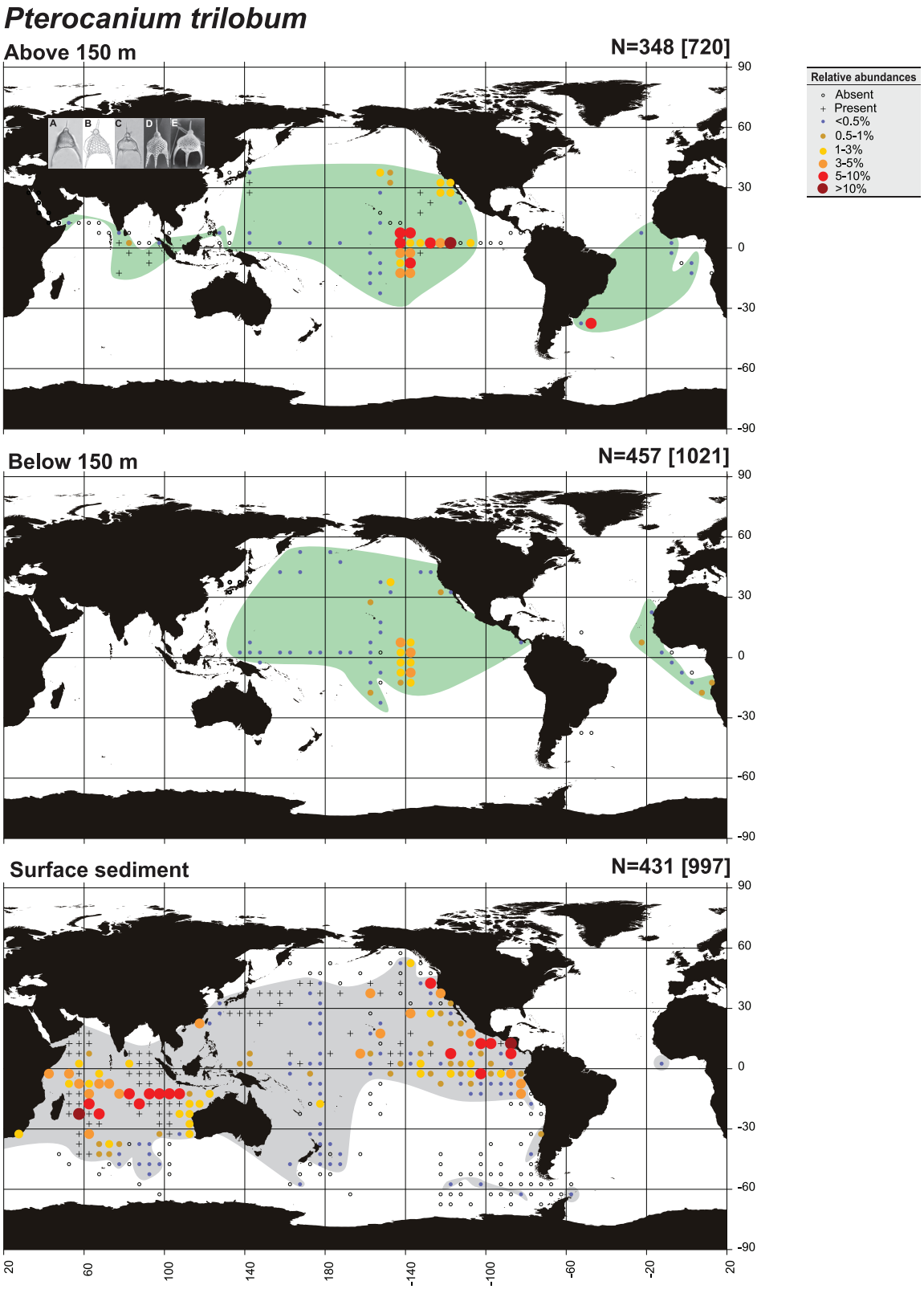


Figure 71. Geographic distribution of *Pterocanium trilobum*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (above 150 m and below 150 m; plankton and sediment trap materials) and surface sediment materials. Sources of species illustrations: A, Original; B, Petrushevskaya (1971); C, Original; D, Original; E, Original.

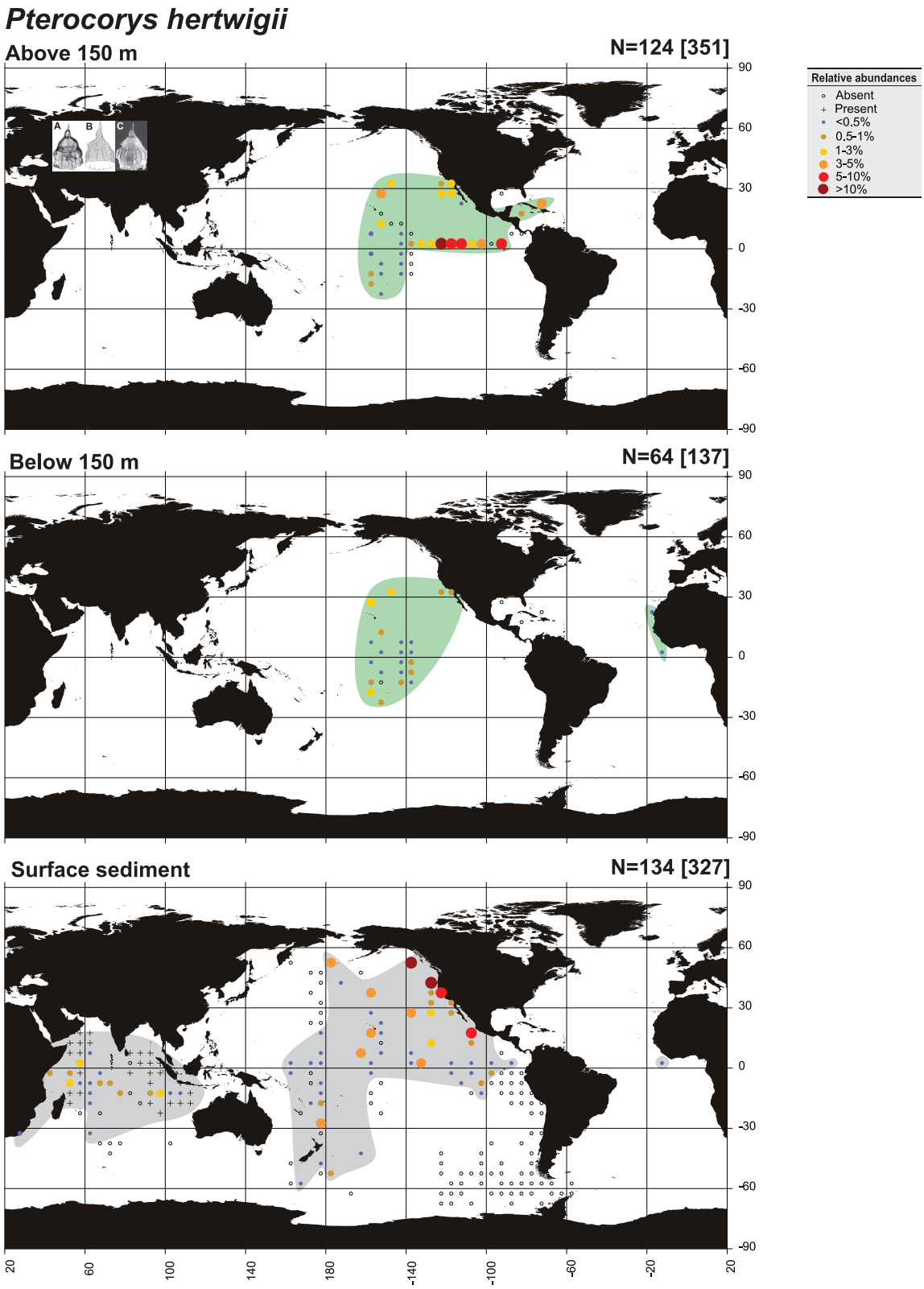


Figure 72. Geographic distribution of *Pterocorys hertwigii*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (above 150 m and below 150 m; plankton and sediment trap materials) and surface sediment materials. Sources of species illustrations: A, Boltovskoy (1999); B, Petrushevskaya (1971); C, Paverd (1995).

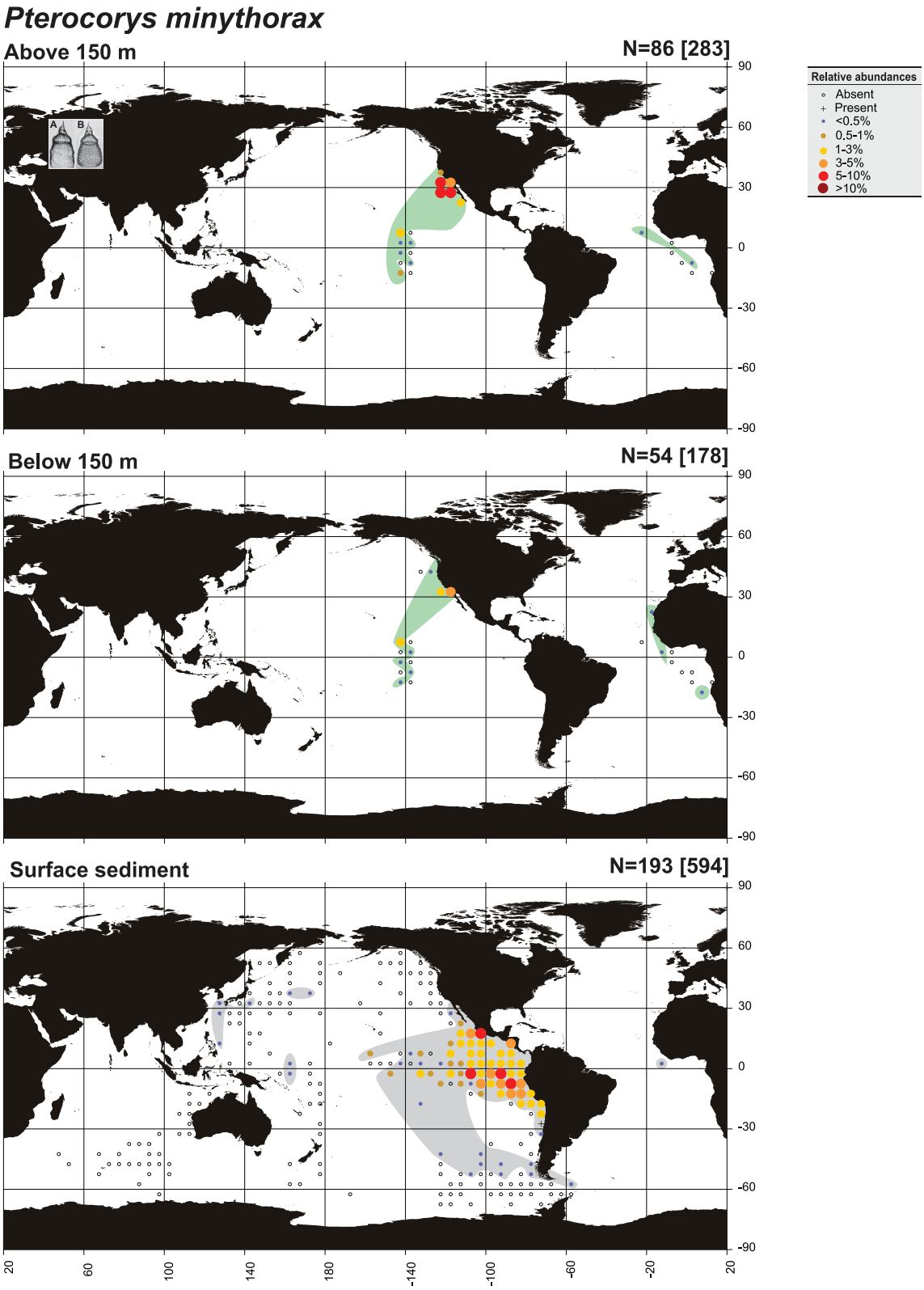


Figure 73. Geographic distribution of *Pterocorys minythorax*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (above 150 m and below 150 m; plankton and sediment trap materials) and surface sediment materials. Sources of species illustrations: A, Boltovskoy (1999); B, Welling (1997).

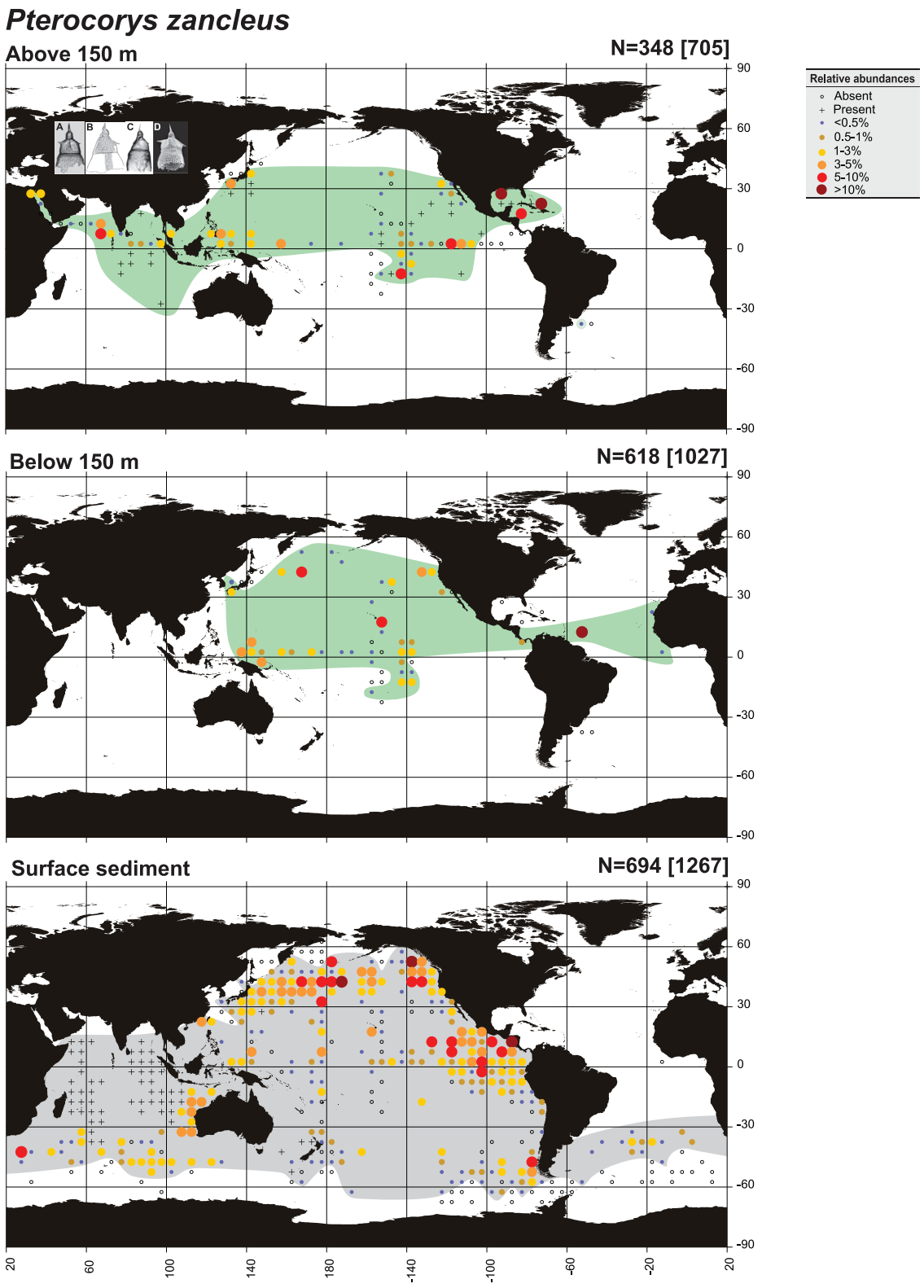


Figure 74. Geographic distribution of *Pterocorys zancleus*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (above 150 m and below 150 m; plankton and sediment trap materials) and surface sediment materials. Sources of species illustrations: A, Boltovskoy (1999); B, Petrushevskaya (1971); C, Boltovskoy (1999); D, Paverd (1995).

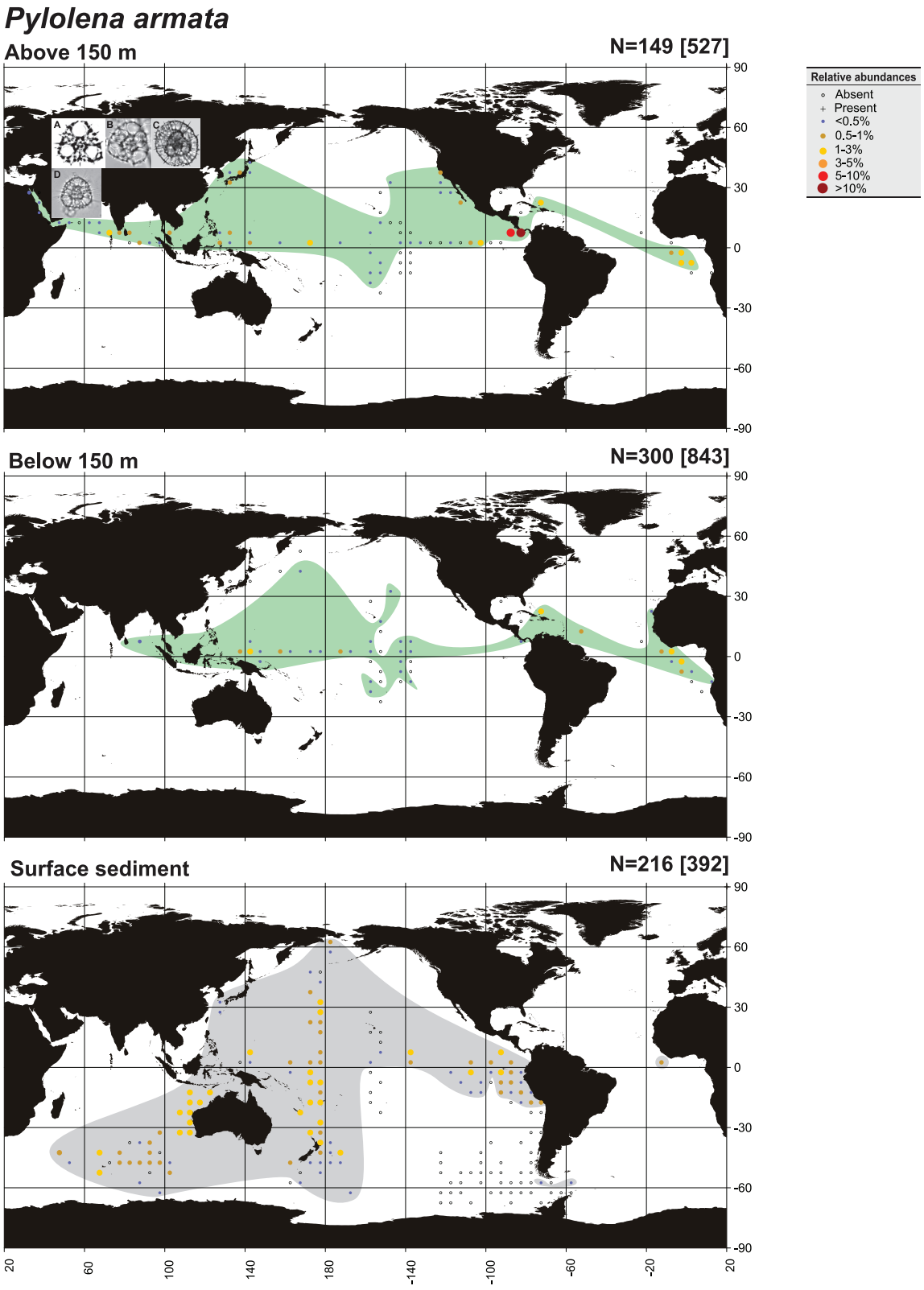


Figure 75. Geographic distribution of *Pylolena armata*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (above 150 m and below 150 m; plankton and sediment trap materials) and surface sediment materials. Sources of species illustrations: A, Boltovskoy (1999); B, Original; C, Boltovskoy (1999); D, Original.

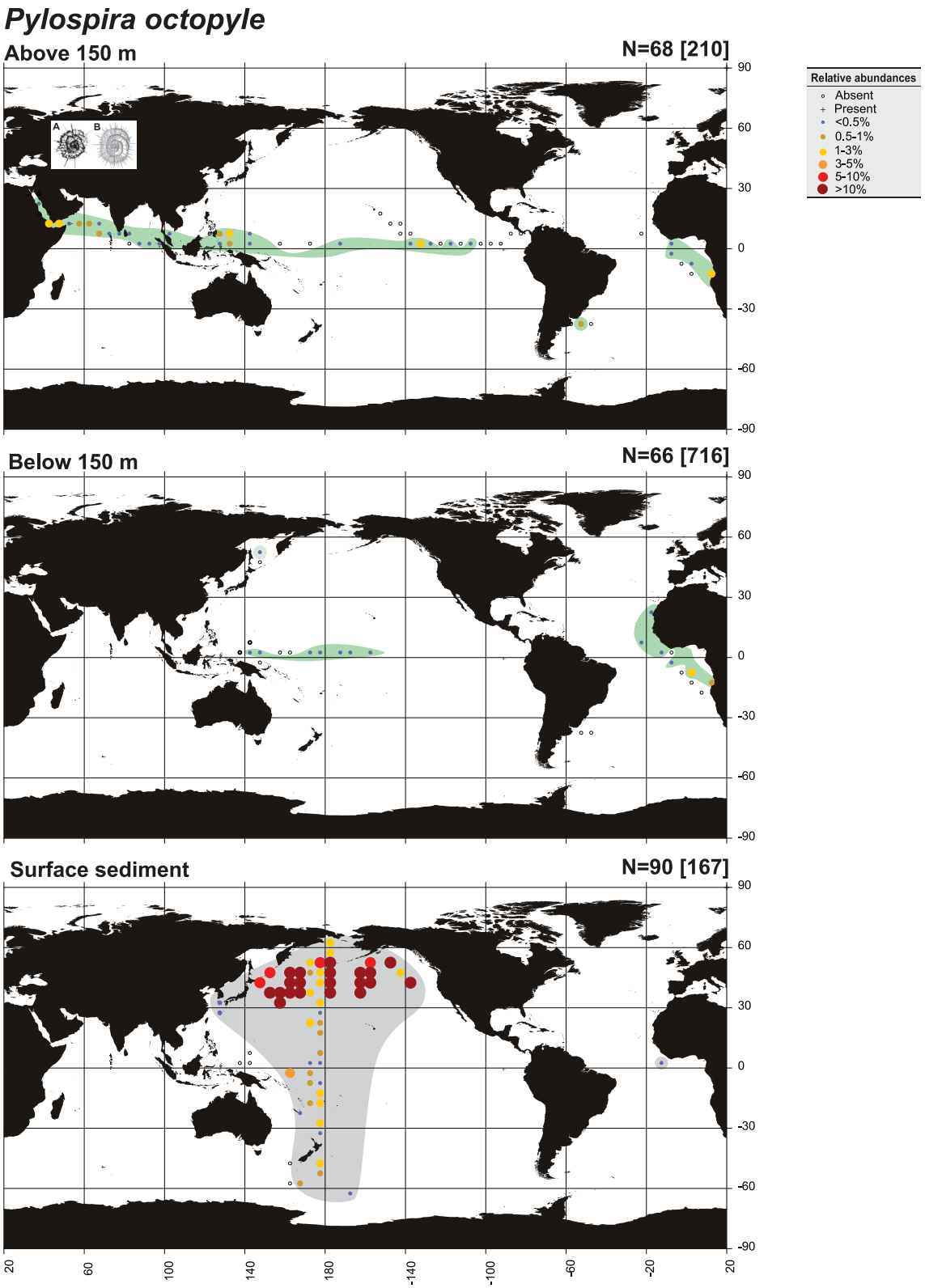


Figure 76. Geographic distribution of *Pylospira octopyle*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (above 150 m and below 150 m; plankton and sediment trap materials) and surface sediment materials. Sources of species illustrations: A, Paverd (1995); B, Haeckel (1887).

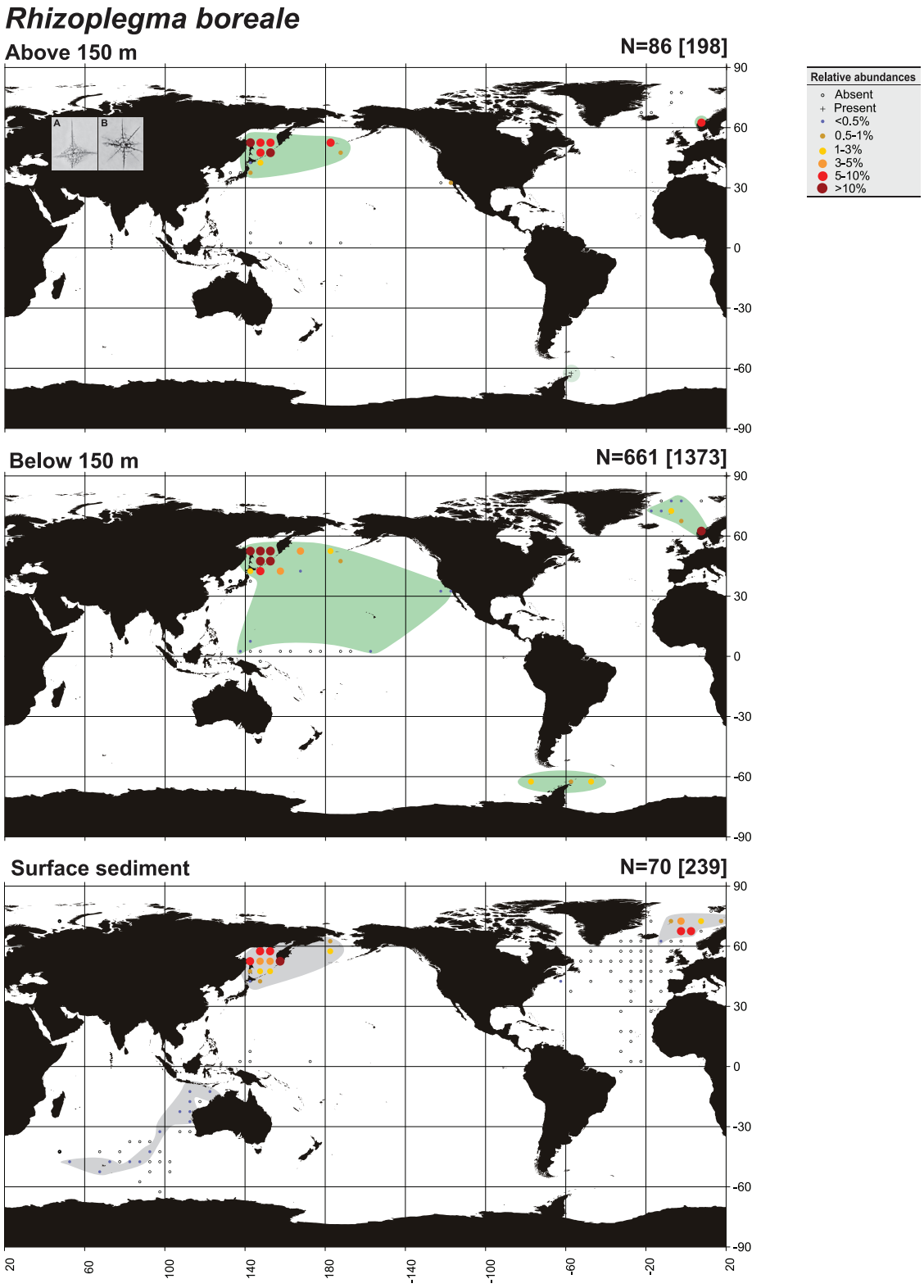


Figure 77. Geographic distribution of *Rhizoplegma boreale*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (above 150 m and below 150 m; plankton and sediment trap materials) and surface sediment materials. Sources of species illustrations: A, Bjørklund (1976); B, Bjørklund (1976).

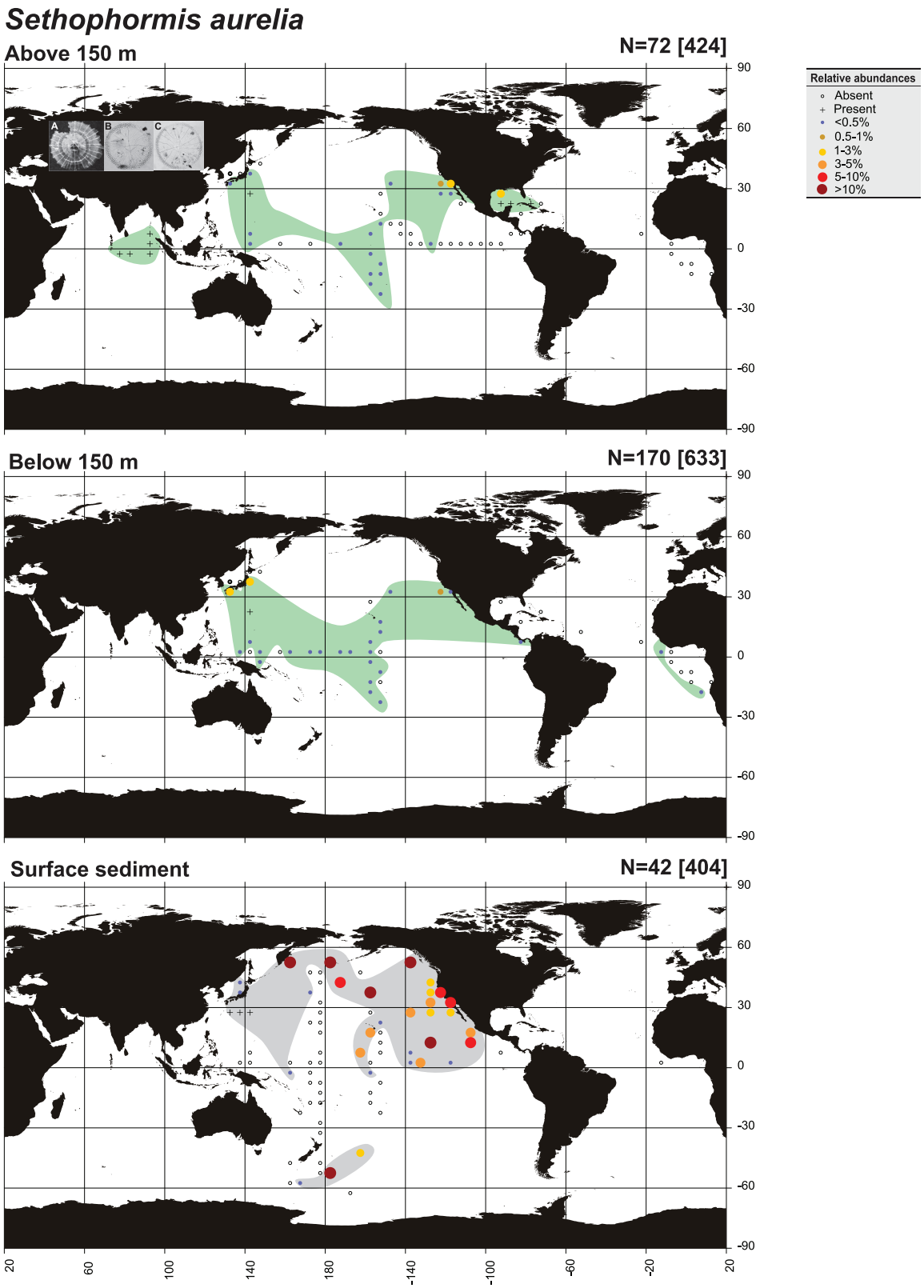


Figure 78. Geographic distribution of *Sethophormis aurelia*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (above 150 m and below 150 m; plankton and sediment trap materials) and surface sediment materials. Sources of species illustrations: A, Takahashi (1991); B, Original; C, Original.

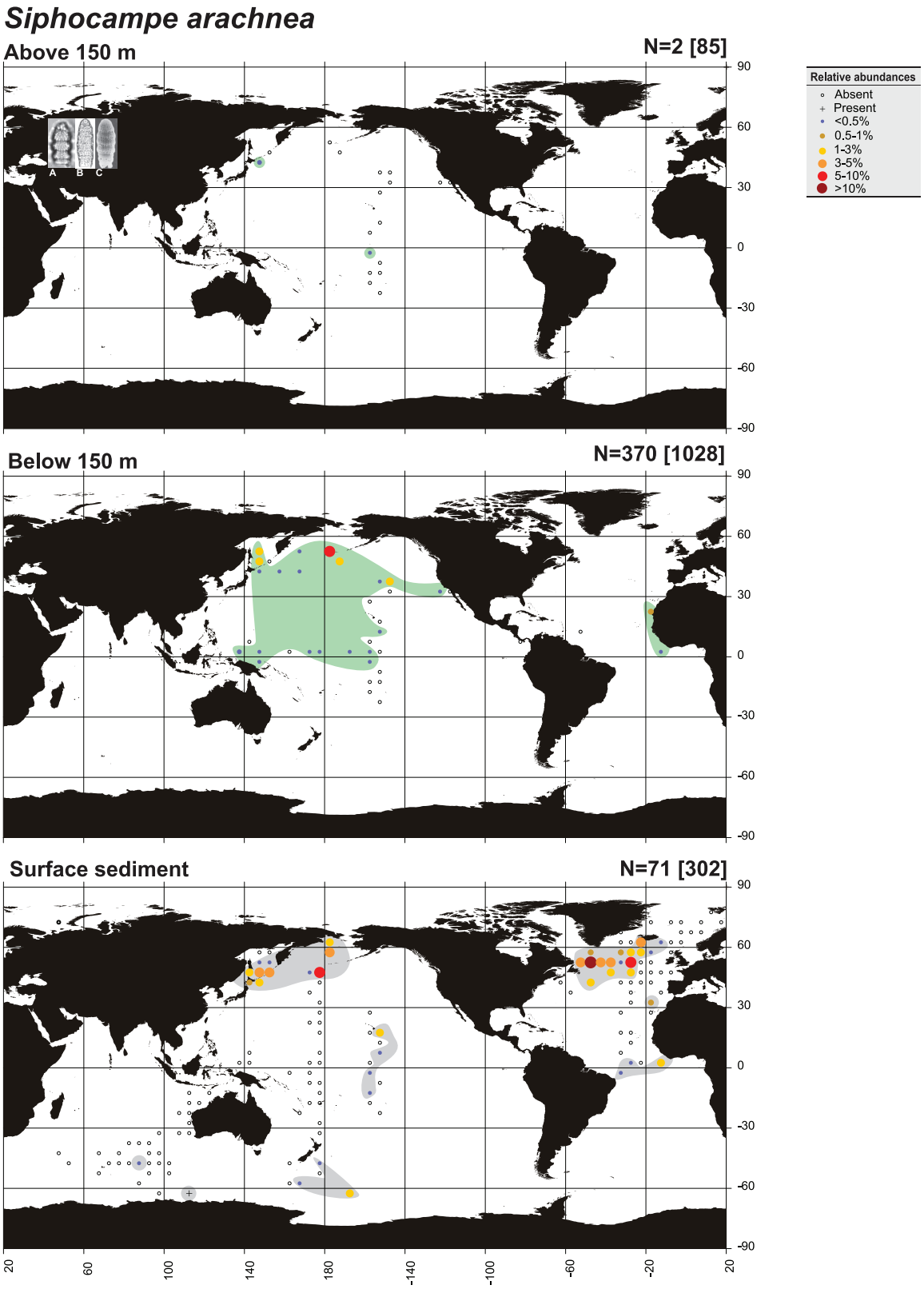


Figure 79. Geographic distribution of *Siphocampe arachnea*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (above 150 m and below 150 m; plankton and sediment trap materials) and surface sediment materials. Sources of species illustrations: A, Original; B, Petrushevskaya (1967); C, Takahashi (1991).

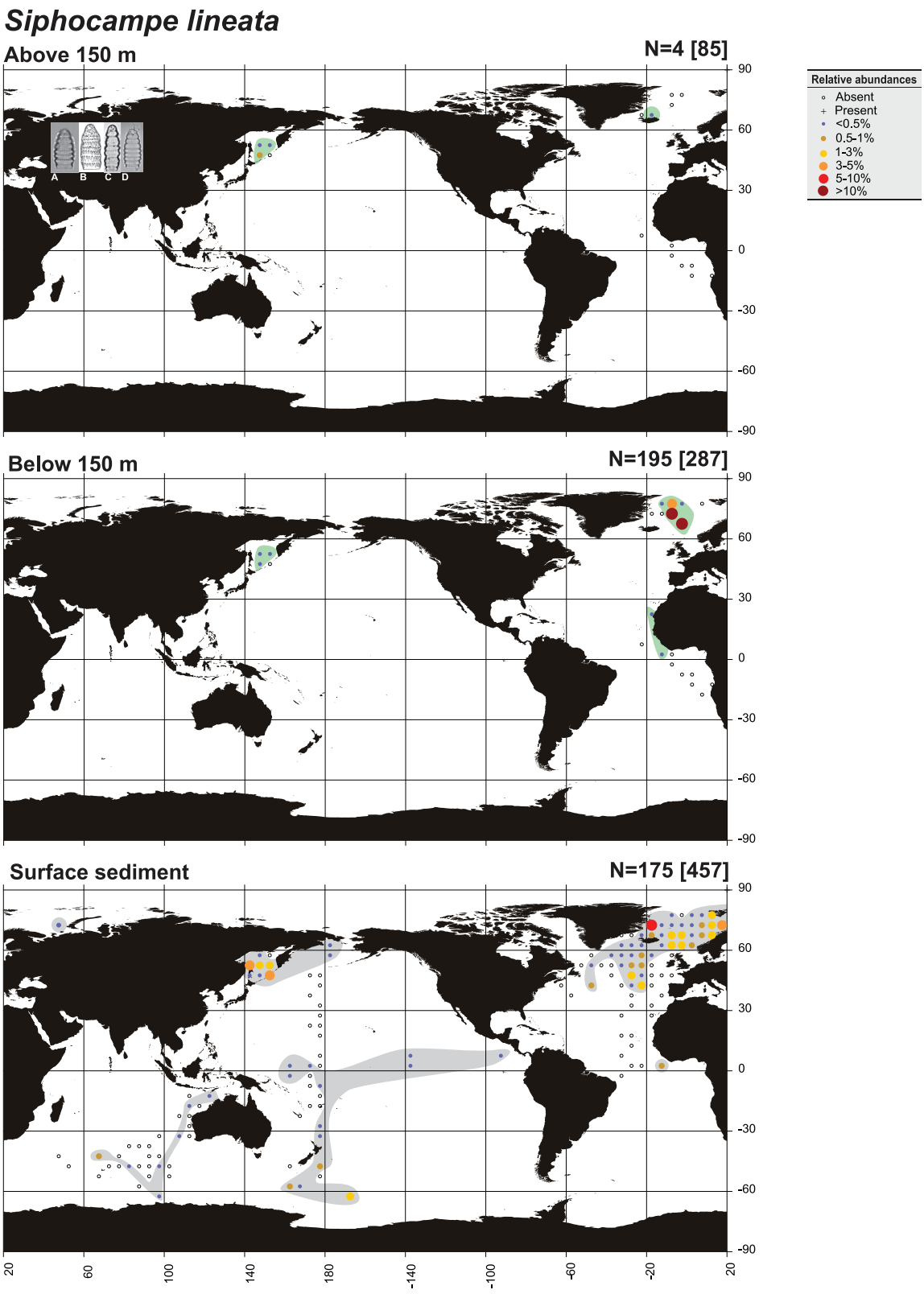


Figure 80. Geographic distribution of *Siphocampe lineata*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (above 150 m and below 150 m; plankton and sediment trap materials) and surface sediment materials. Sources of species illustrations: A, Original; B, Petrushevskaya (1967); C, Cortese et al. (2003); D, Original.

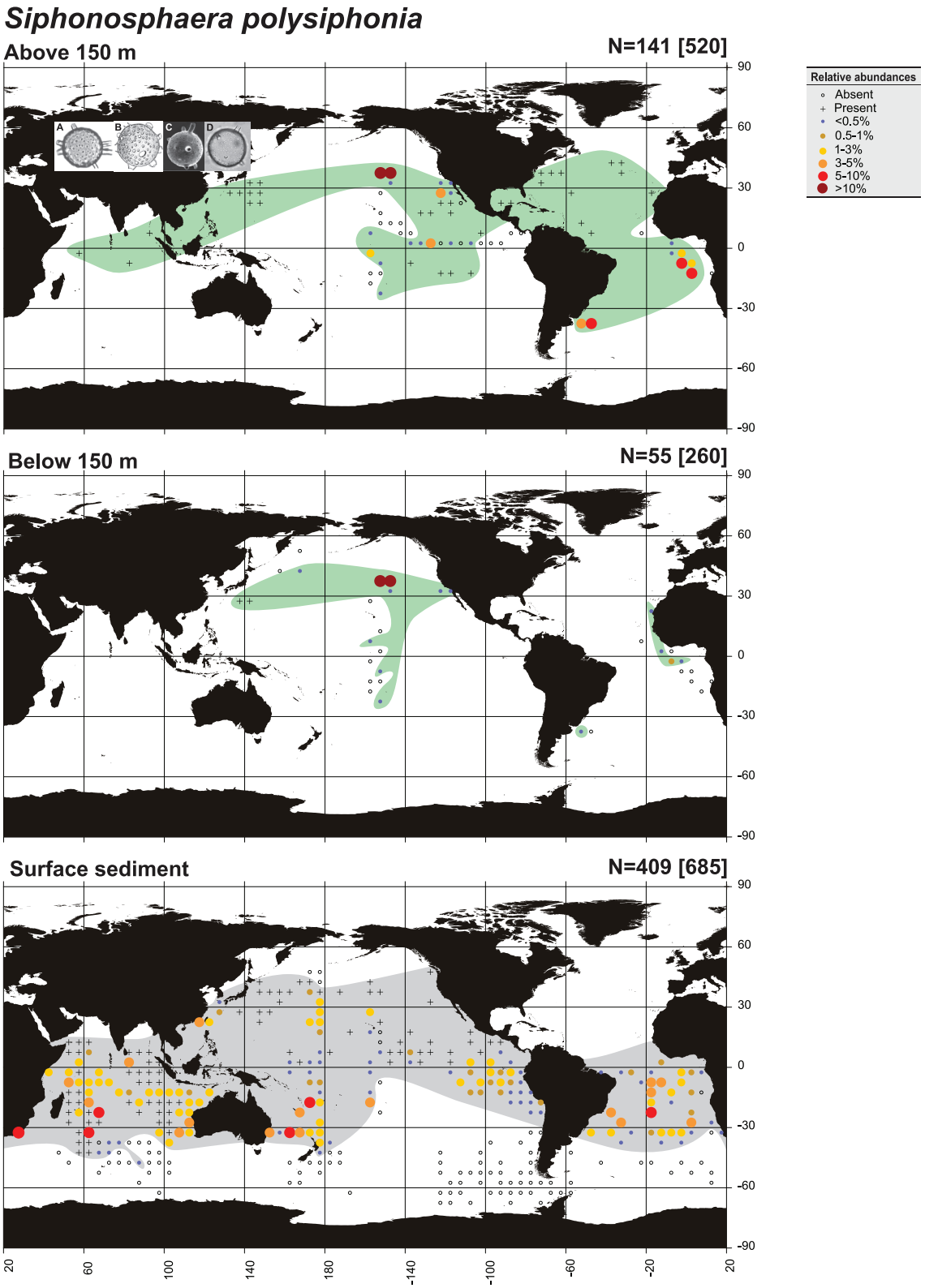


Figure 81. Geographic distribution of *Siphonosphaera polysiphonia*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (above 150 m and below 150 m; plankton and sediment trap materials) and surface sediment materials. Sources of species illustrations: A, Boltovskoy (1999); B, Stelkov and Reshetnjak (1971); C, Paverd (1995); D, Original.

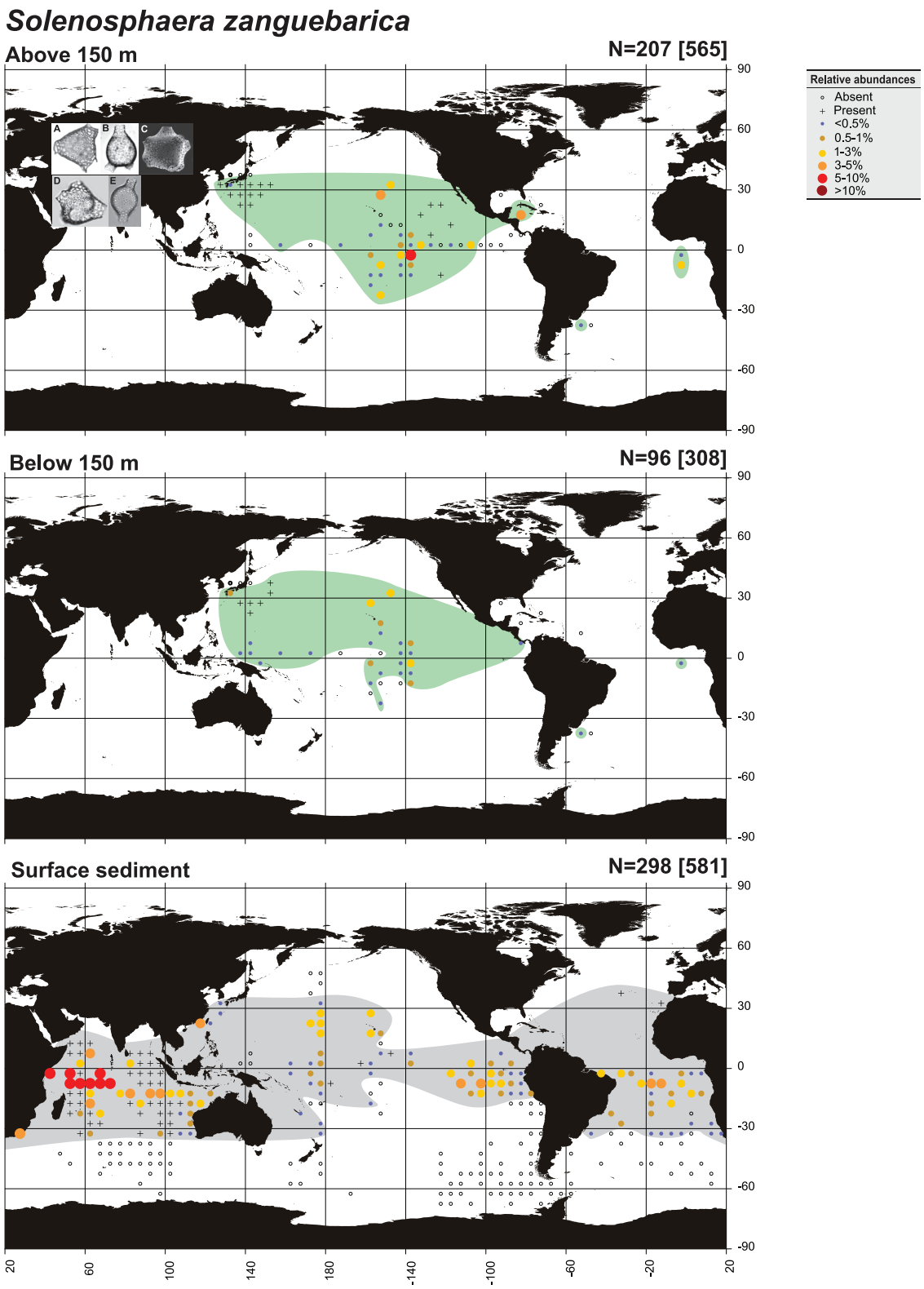


Figure 82. Geographic distribution of *Solenosphaera zanguebarica*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (above 150 m and below 150 m; plankton and sediment trap materials) and surface sediment materials. Sources of species illustrations: A, Boltovskoy (1999); B, Boltovskoy (1999); C, Paverd (1995); D, Paverd (1995); E, Original.

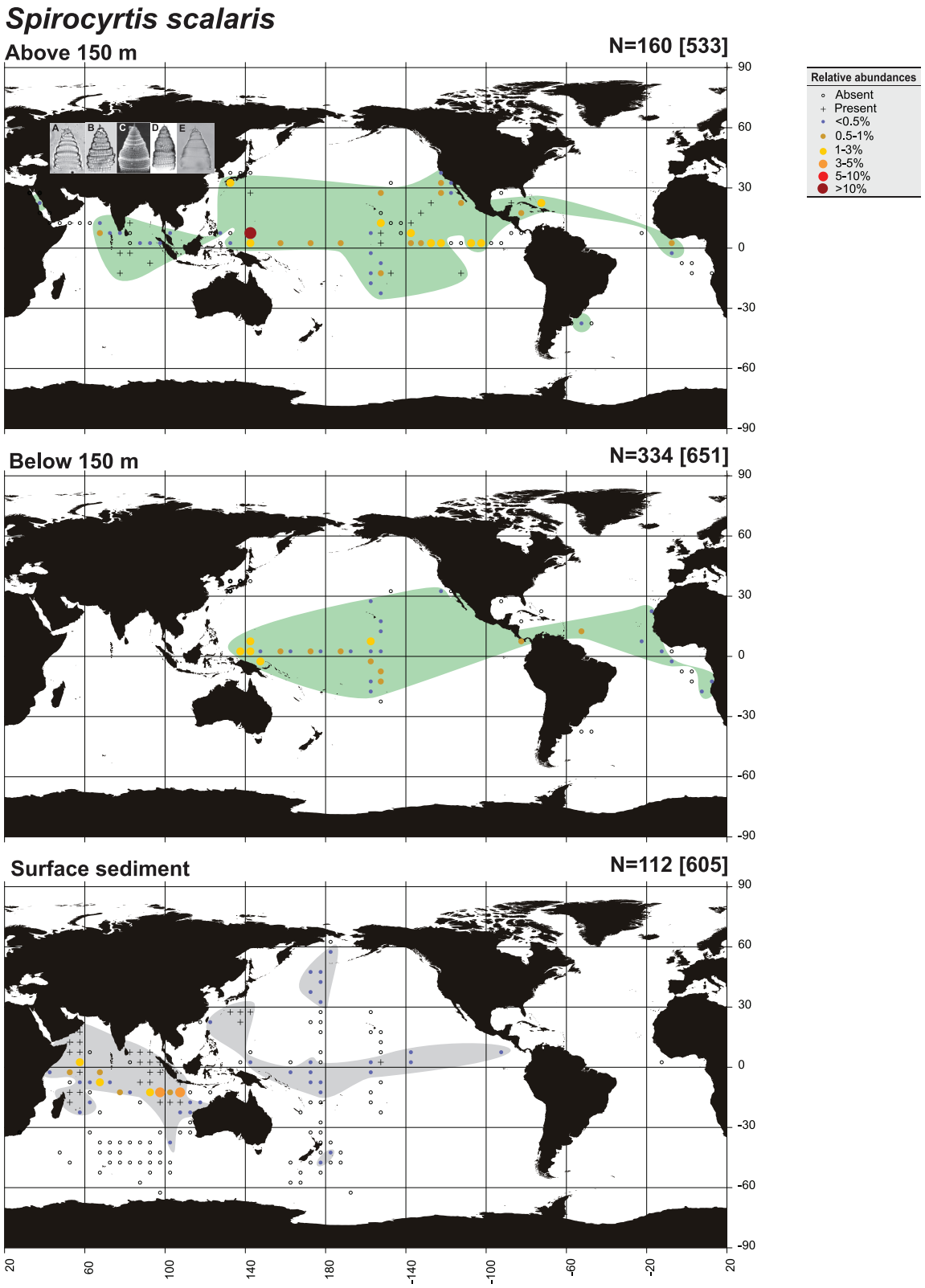


Figure 83. Geographic distribution of *Spirocyrtis scalaris*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (above 150 m and below 150 m; plankton and sediment trap materials) and surface sediment materials. Sources of species illustrations: A, Original; B, Boltovskoy (1999); C, Matsuoka (1993); D, Benson (1966); E, Original.

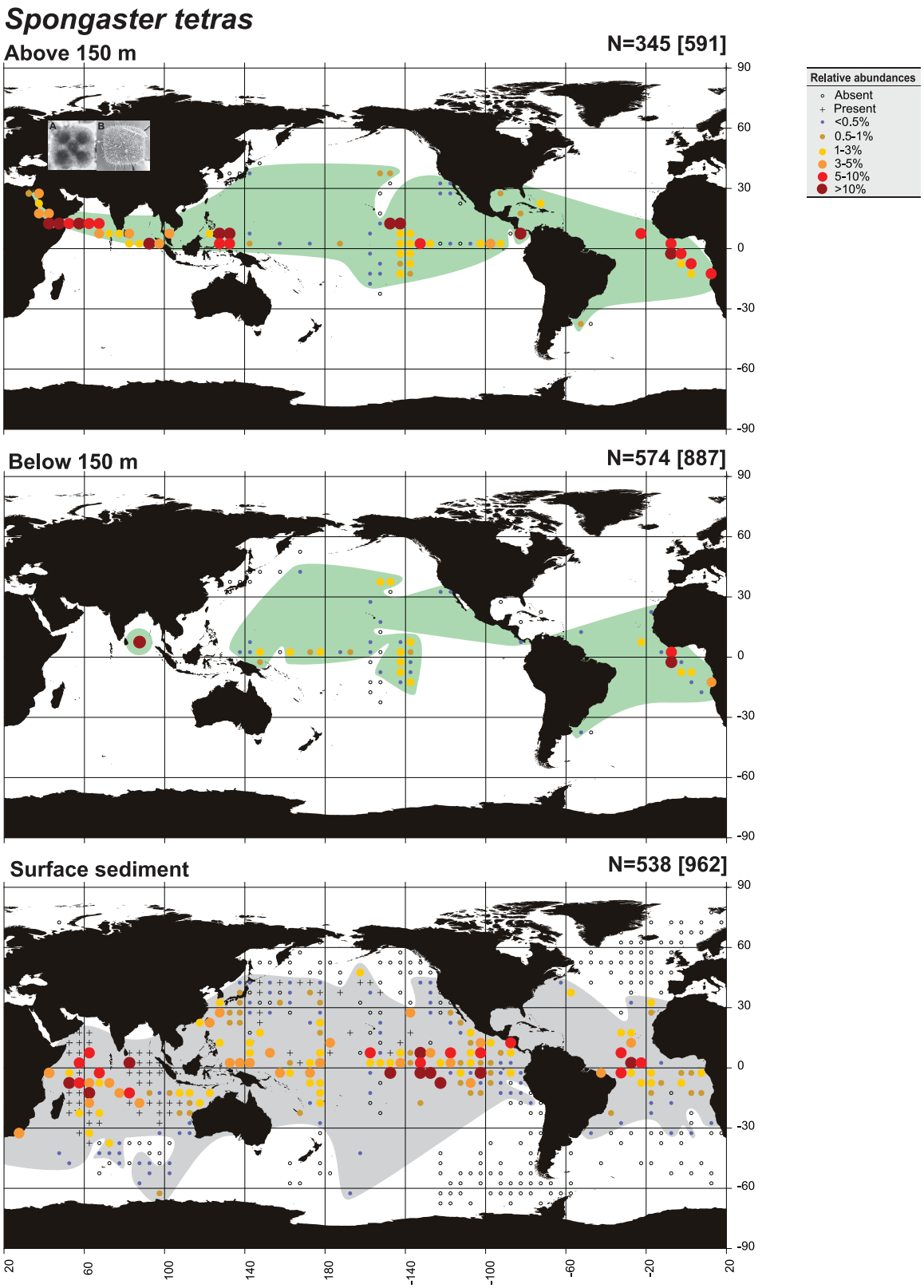


Figure 84. Geographic distribution of *Spongaster tetras*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (above 150 m and below 150 m; plankton and sediment trap materials) and surface sediment materials. Sources of species illustrations: A, Original; B, Matsuoka (2009).

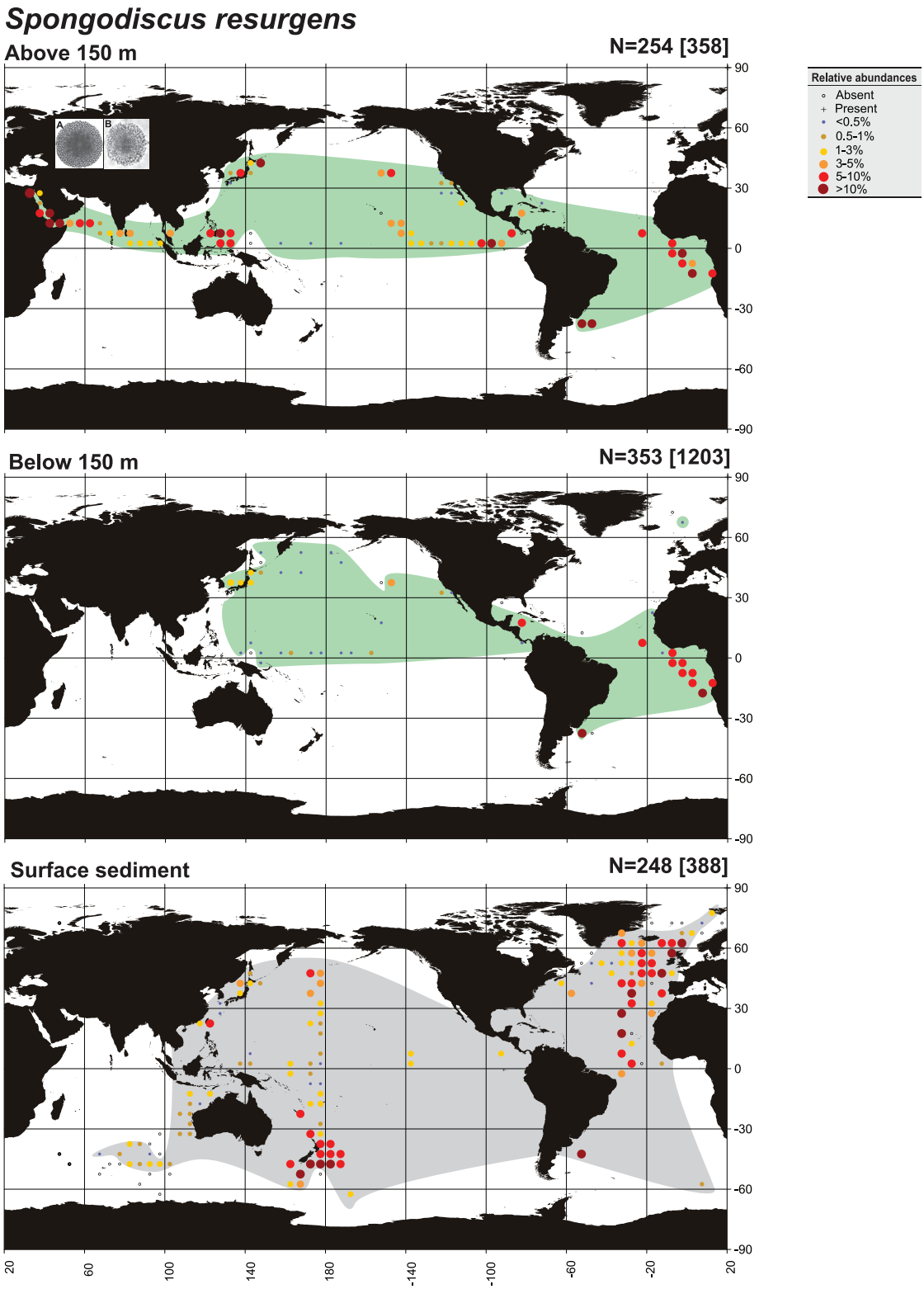


Figure 85. Geographic distribution of *Spongodiscus resurgens*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (above 150 m and below 150 m; plankton and sediment trap materials) and surface sediment materials. Sources of species illustrations: A, Boltovskoy (1999); B, Original.

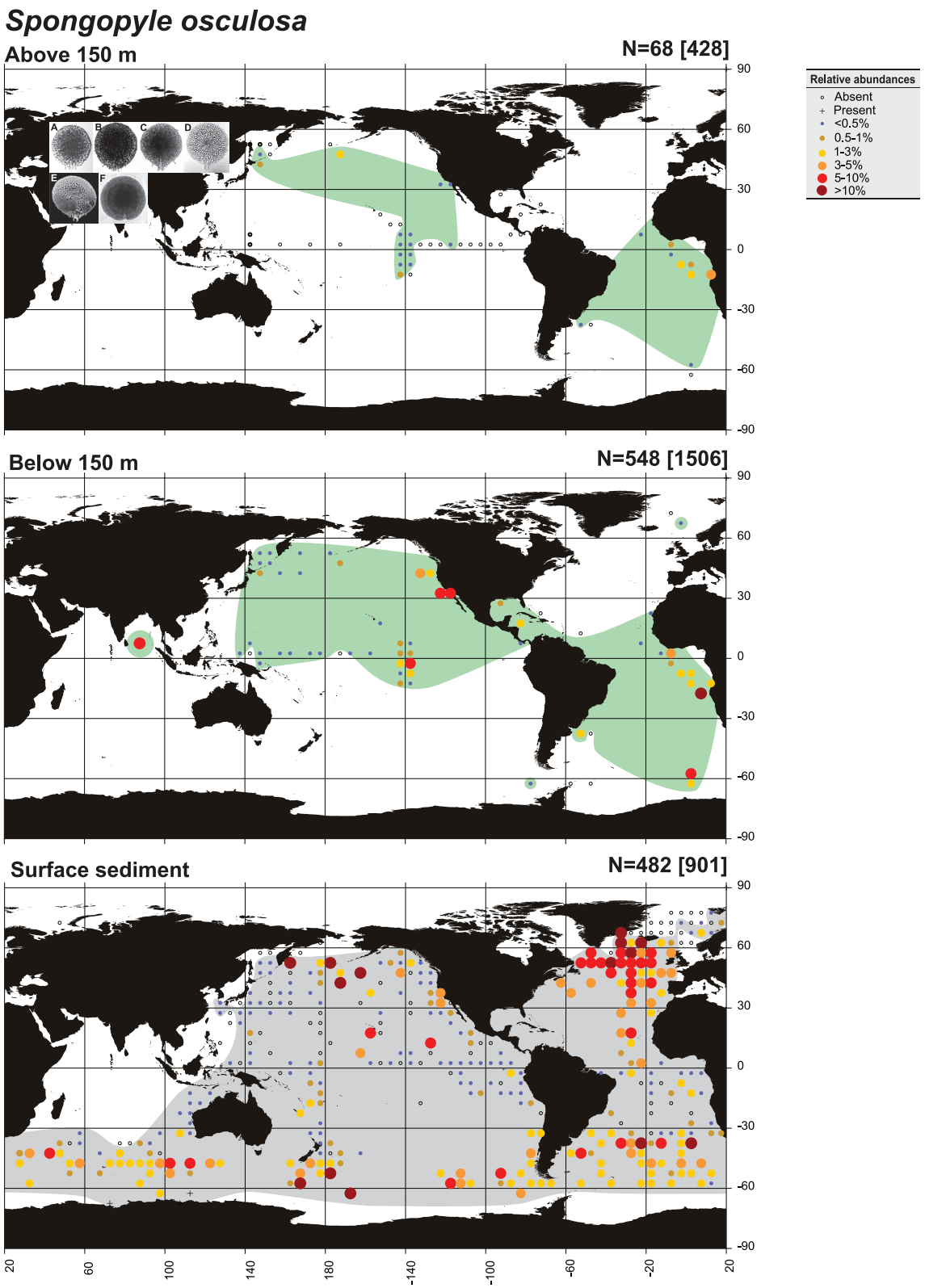


Figure 86. Geographic distribution of *Spongopyle osculosa*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (above 150 m and below 150 m; plankton and sediment trap materials) and surface sediment materials. Sources of species illustrations: A, Original; B, Takahashi (1991); C, Cortese et al. (2003); D, Original; E, Takahashi (1991); F, Original.

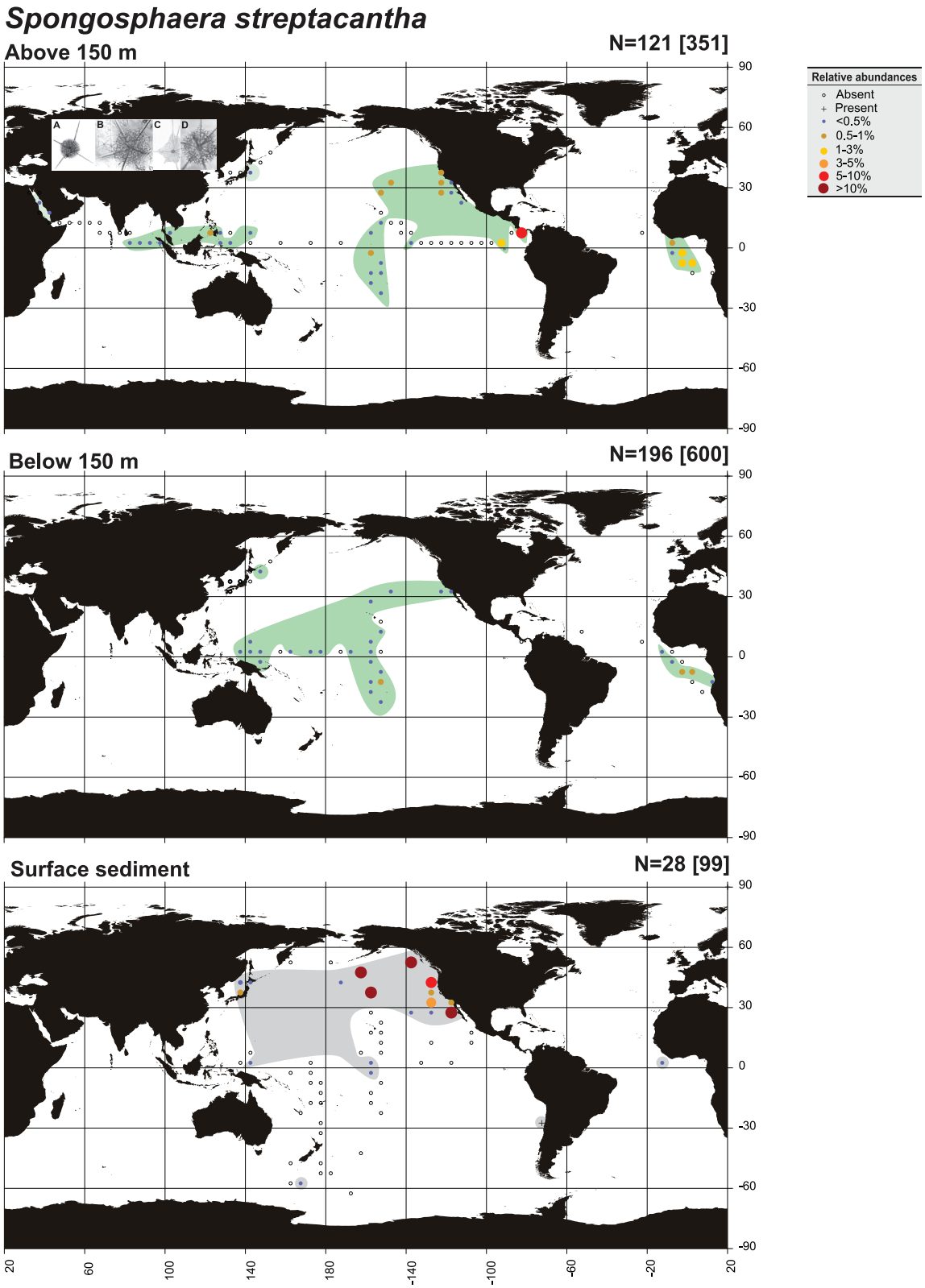


Figure 87. Geographic distribution of *Spongosphaera streptacantha*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (above 150 m and below 150 m; plankton and sediment trap materials) and surface sediment materials. Sources of species illustrations: A, Original; B, Original; C, Hackel (1862); D, Hollande and Enjumet (1960).

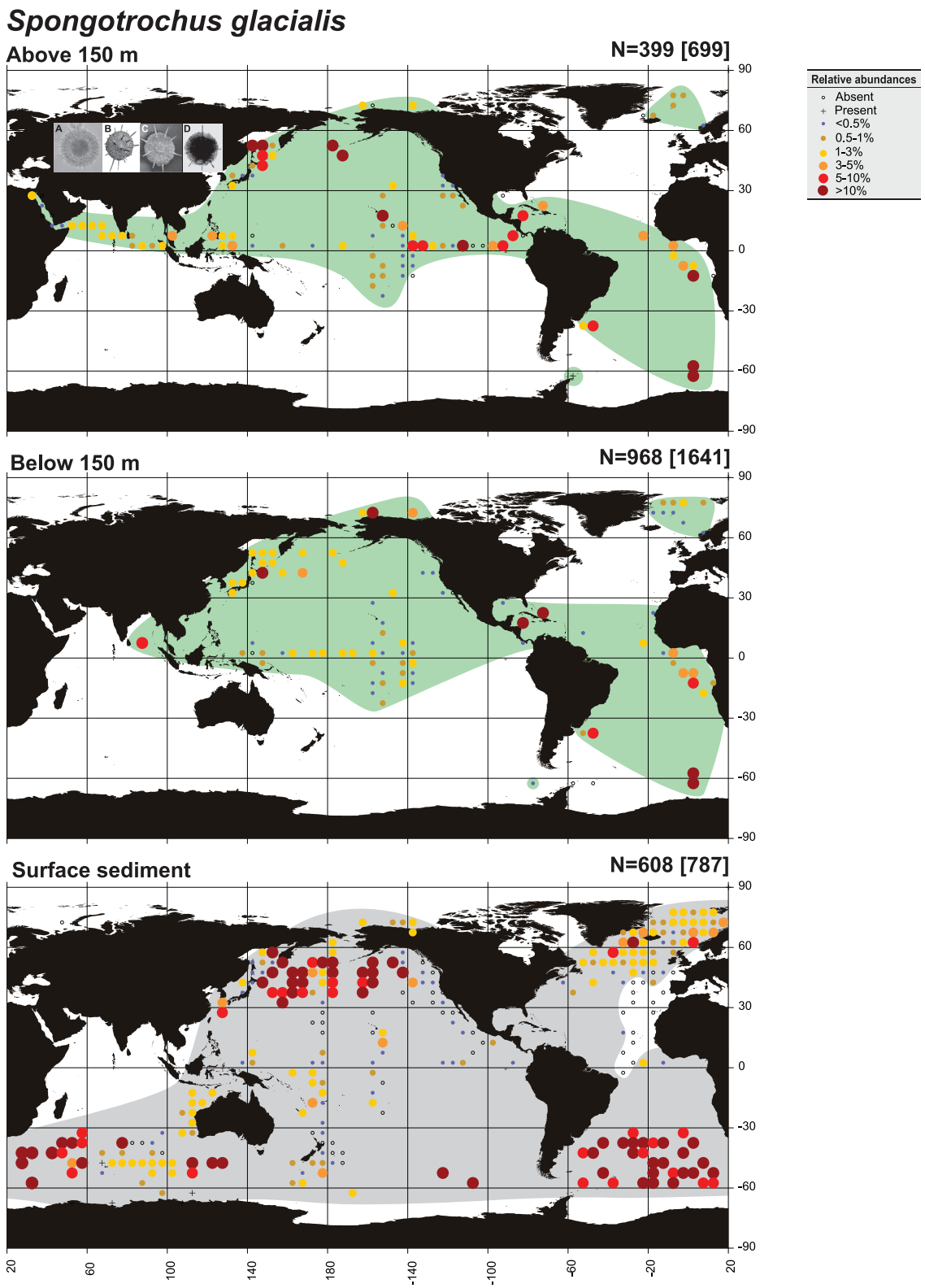


Figure 88. Geographic distribution of *Spongotrochus glacialis*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (above 150 m and below 150 m; plankton and sediment trap materials) and surface sediment materials. Sources of species illustrations: A, Original; B, Boltovskoy (1999); C, Original; D, Benson (1966).

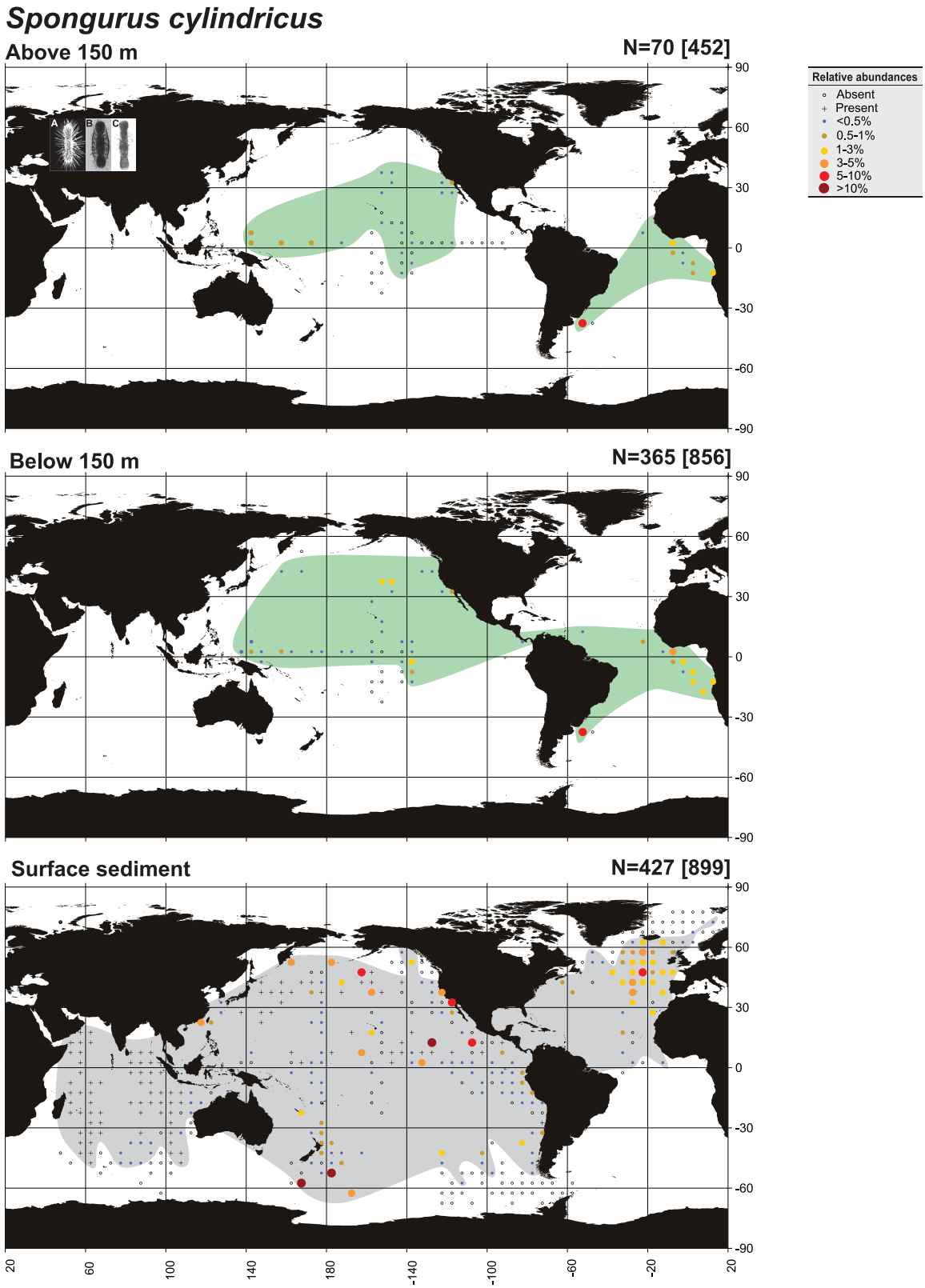


Figure 89. Geographic distribution of *Spongurus cylindricus*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (above 150 m and below 150 m; plankton and sediment trap materials) and surface sediment materials. Sources of species illustrations: A, Takahashi (1991); B, Takahashi (1991); C, Original.

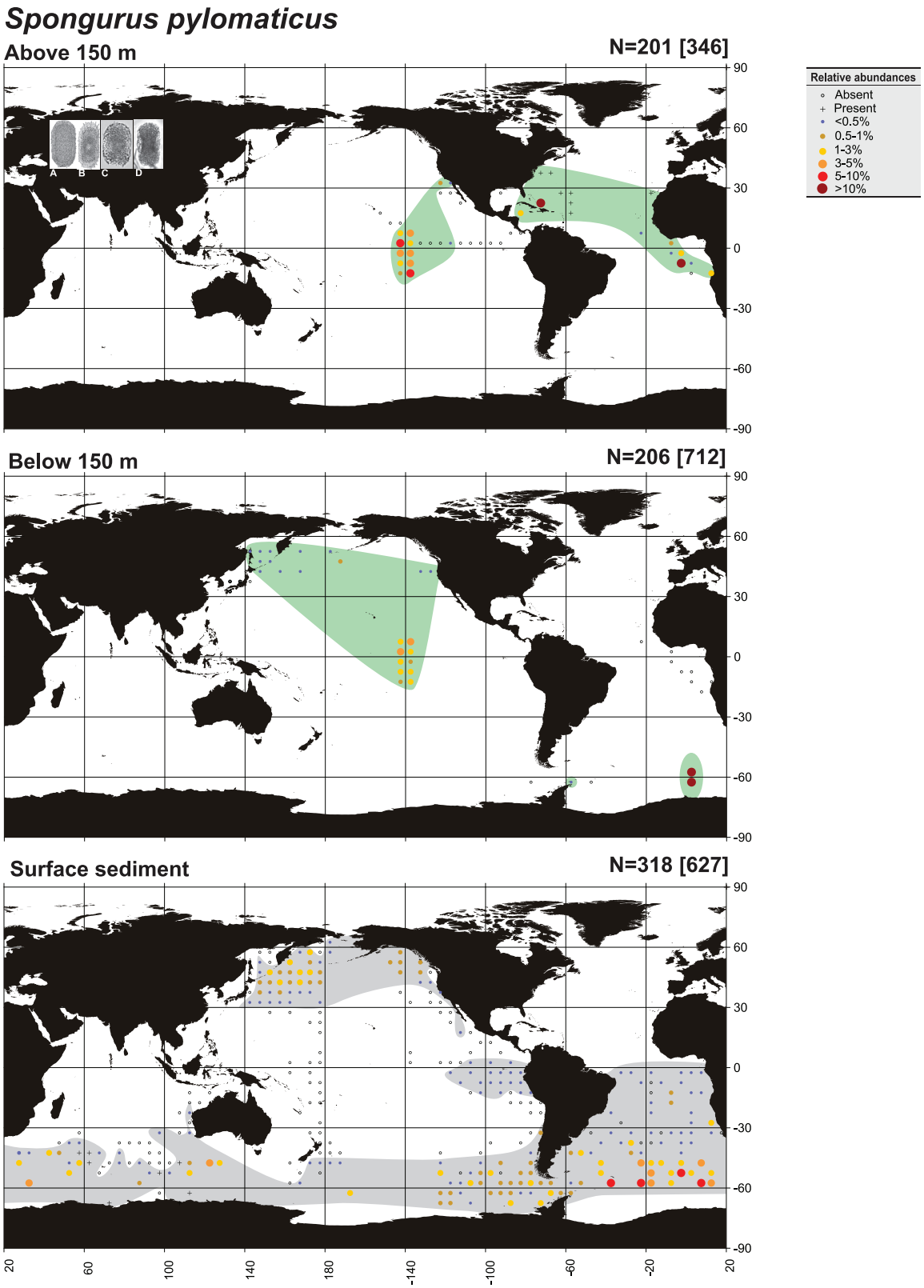


Figure 90. Geographic distribution of *Spongurus pylomaticus*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (above 150 m and below 150 m; plankton and sediment trap materials) and surface sediment materials. Sources of species illustrations: A, Riedel (1958); B, Petrushevskaya (1967); C, Itaki (2009); D, Original.

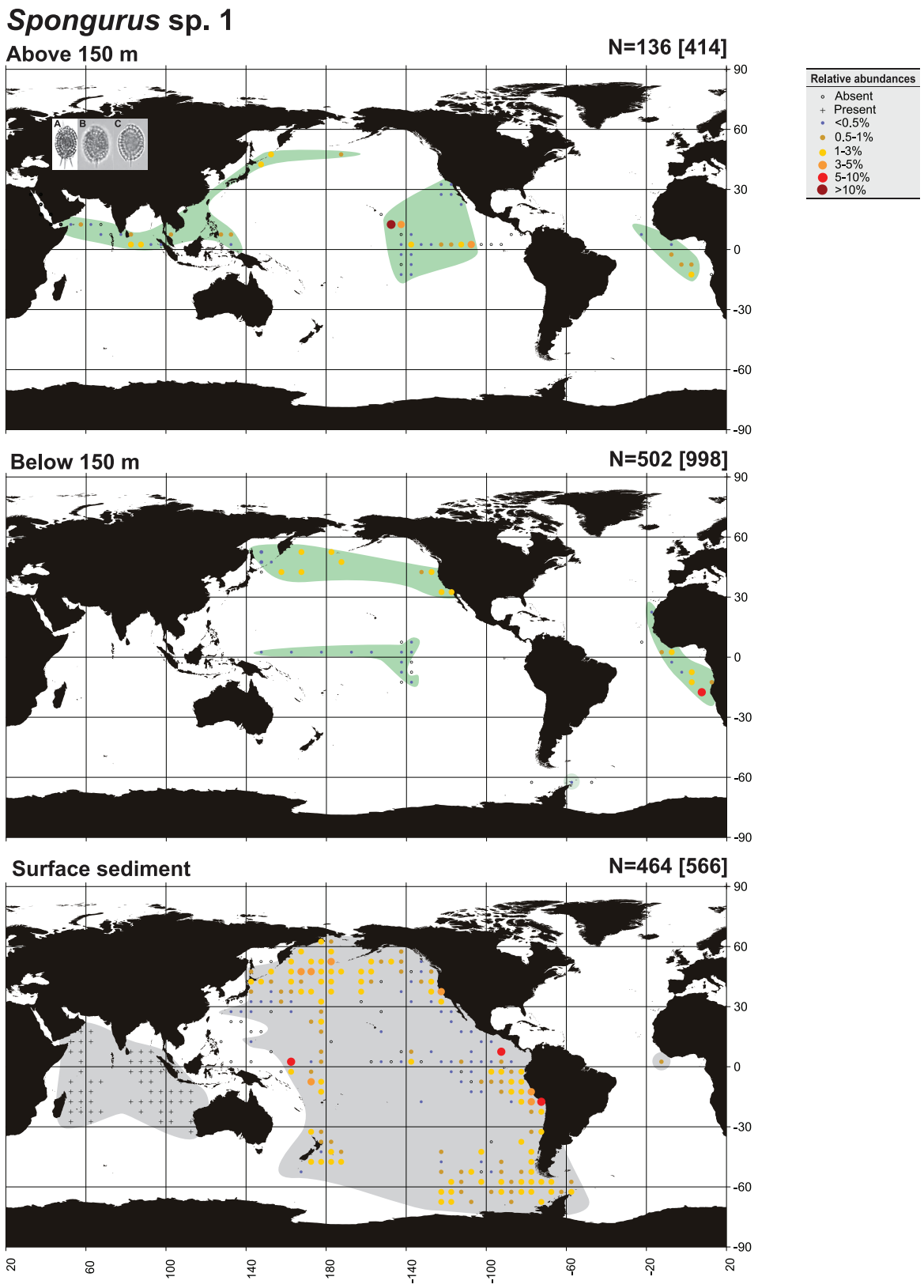


Figure 91. Geographic distribution of *Spongurus* sp. 1. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (above 150 m and below 150 m; plankton and sediment trap materials) and surface sediment materials. Sources of species illustrations: A, Boltovskoy (1999); B, Original; C, Original.

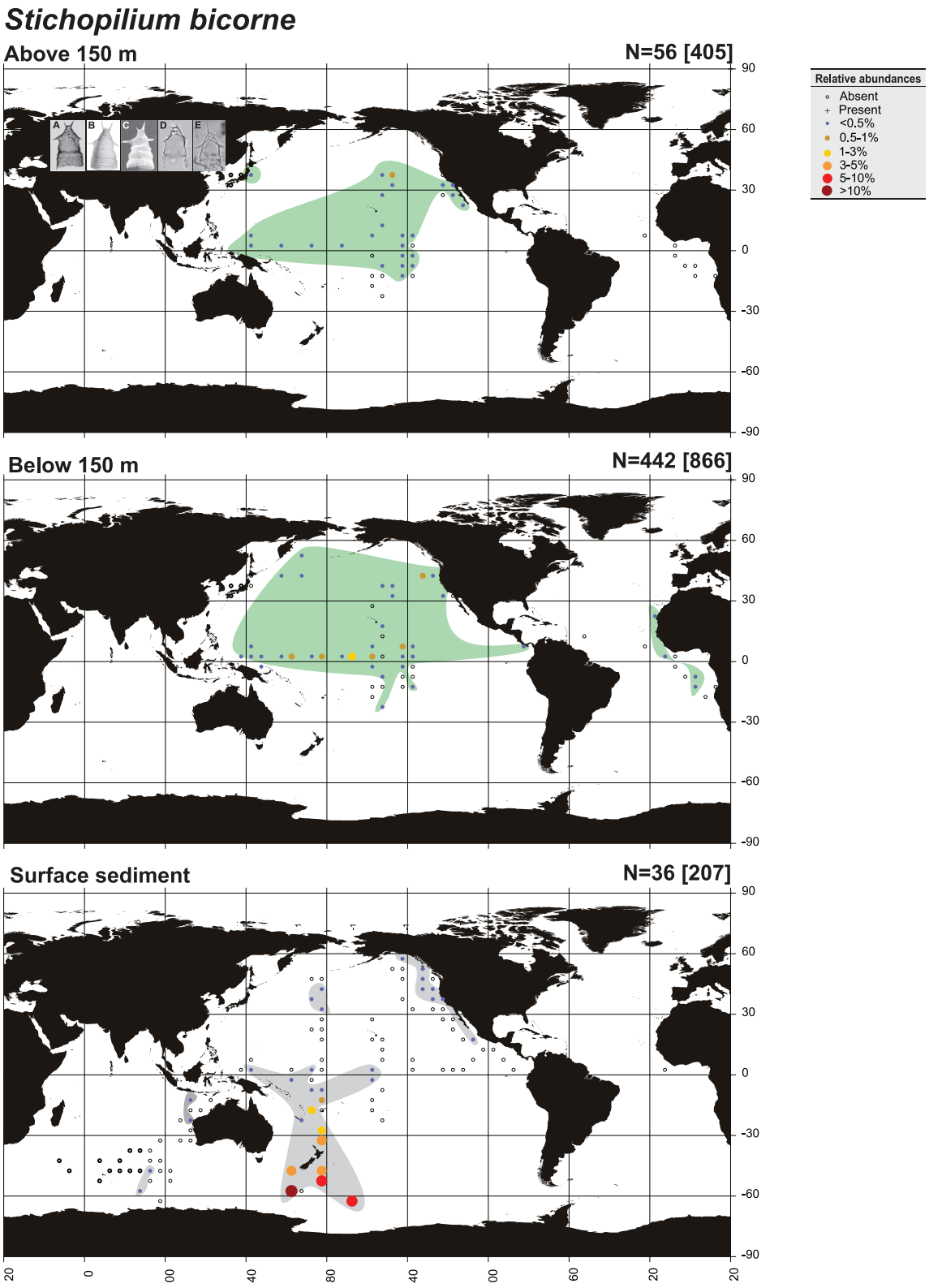


Figure 92. Geographic distribution of *Stichopilium bicorne*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (above 150 m and below 150 m; plankton and sediment trap materials) and surface sediment materials. Sources of species illustrations: A, Boltovskoy and Riedel (1987); B, Haeckel (1887); C, Takahashi (1991); D, Original; E, Original.

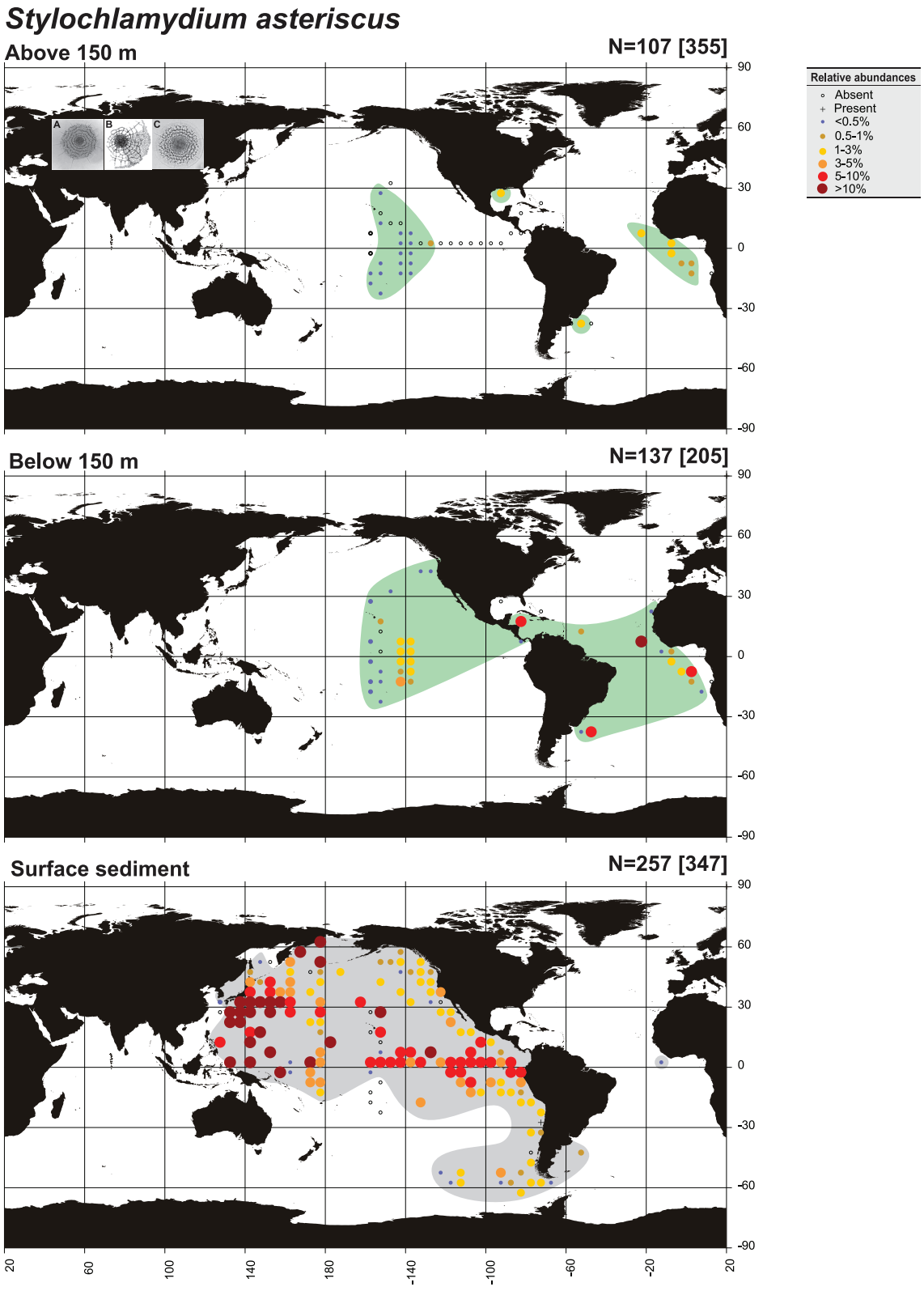


Figure 93. Geographic distribution of *Stylochlamydium asteriscus*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (above 150 m and below 150 m; plankton and sediment trap materials) and surface sediment materials. Sources of species illustrations: A, Boltovskoy and Riedel (1987); B, Petrushevskaya (1967); C, Okazaki et al. (2005).

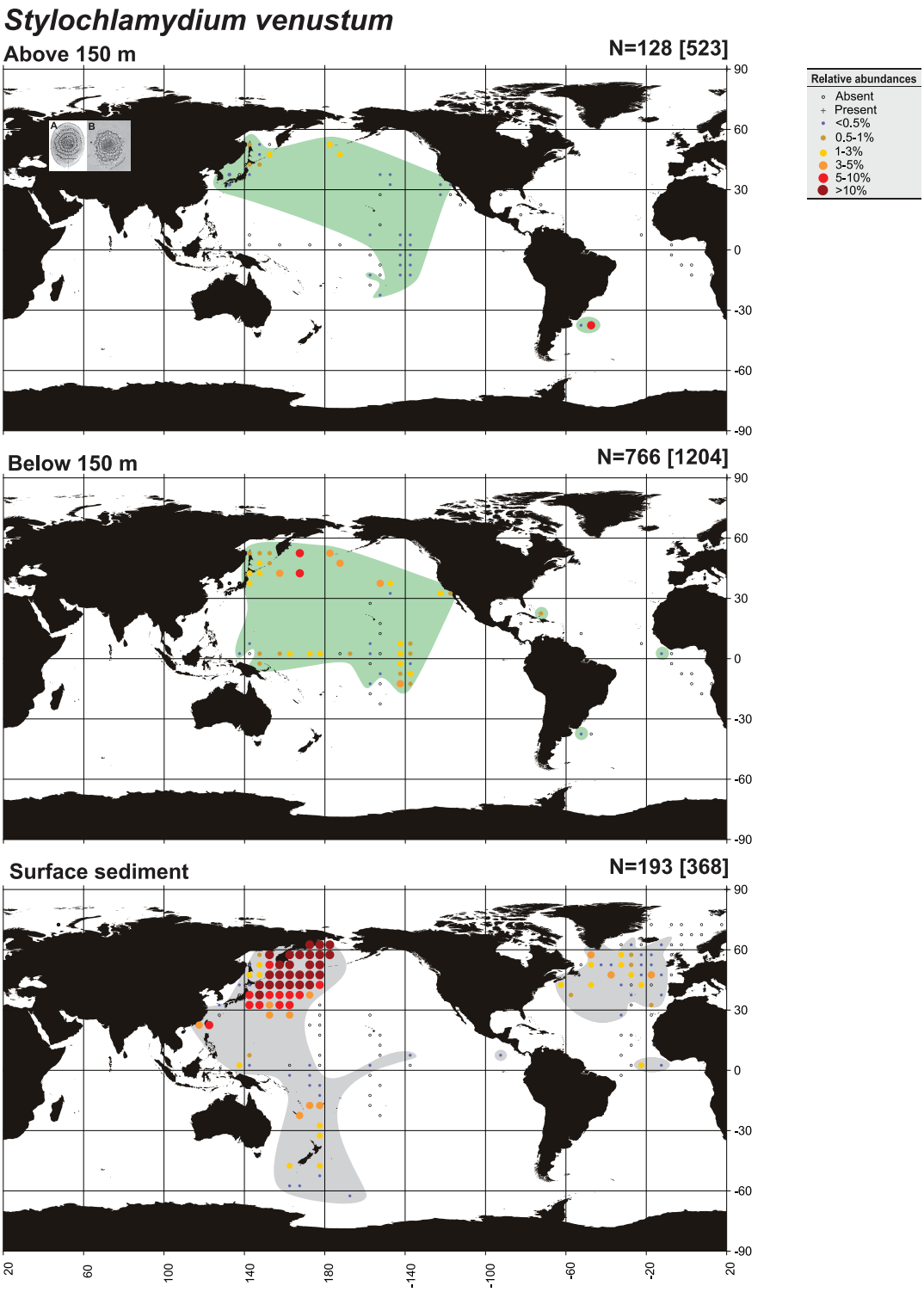


Figure 94. Geographic distribution of *Stylochlamydium venustum*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (above 150 m and below 150 m; plankton and sediment trap materials) and surface sediment materials. Sources of species illustrations: A, Boltovskoy (1999); B, Original.

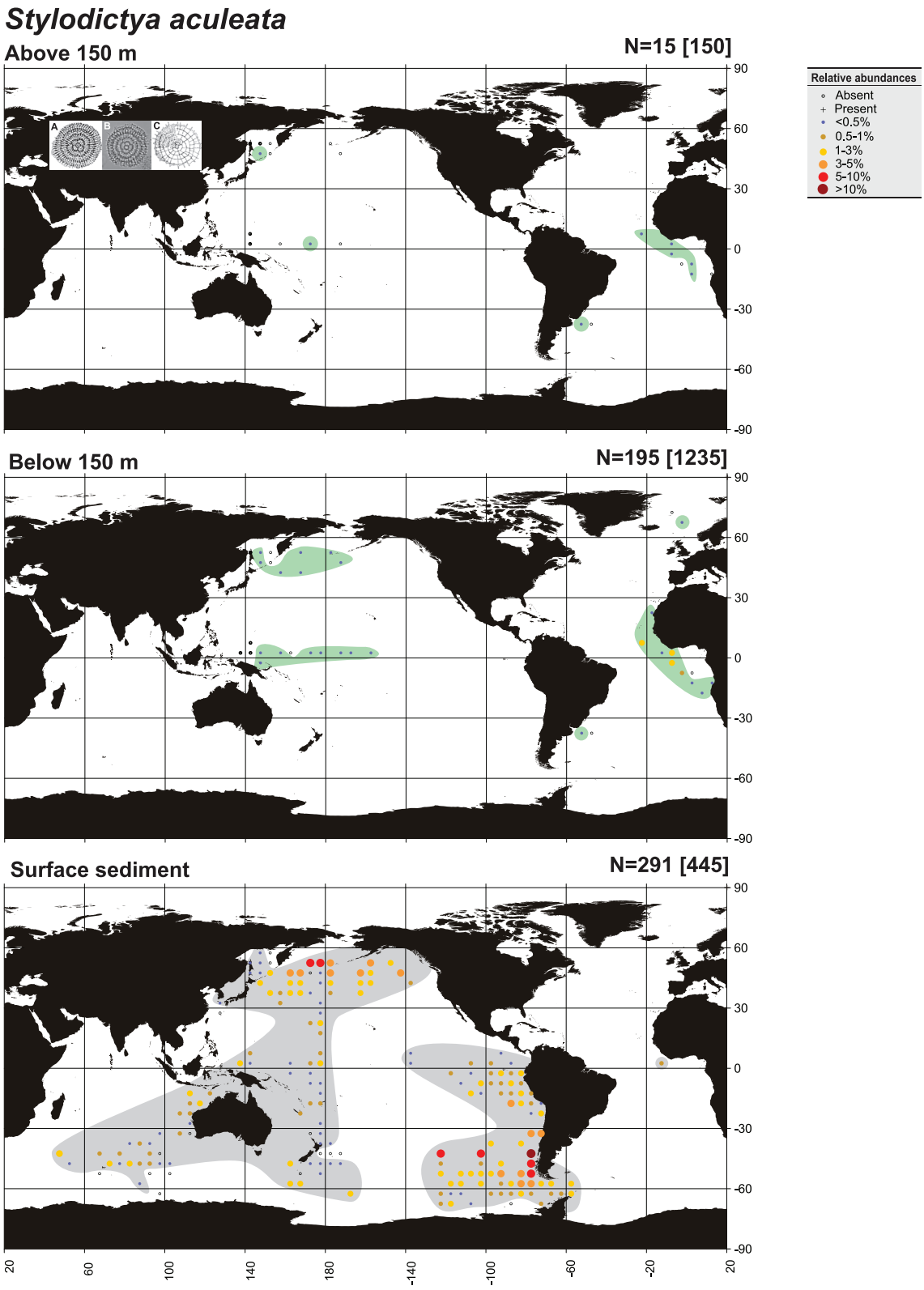


Figure 95. Geographic distribution of *Stylodictya aculeata*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (above 150 m and below 150 m; plankton and sediment trap materials) and surface sediment materials. Sources of species illustrations: A, Boltovskoy and Vrba (1988); B, Original; C, Petrushevskaya (1967).

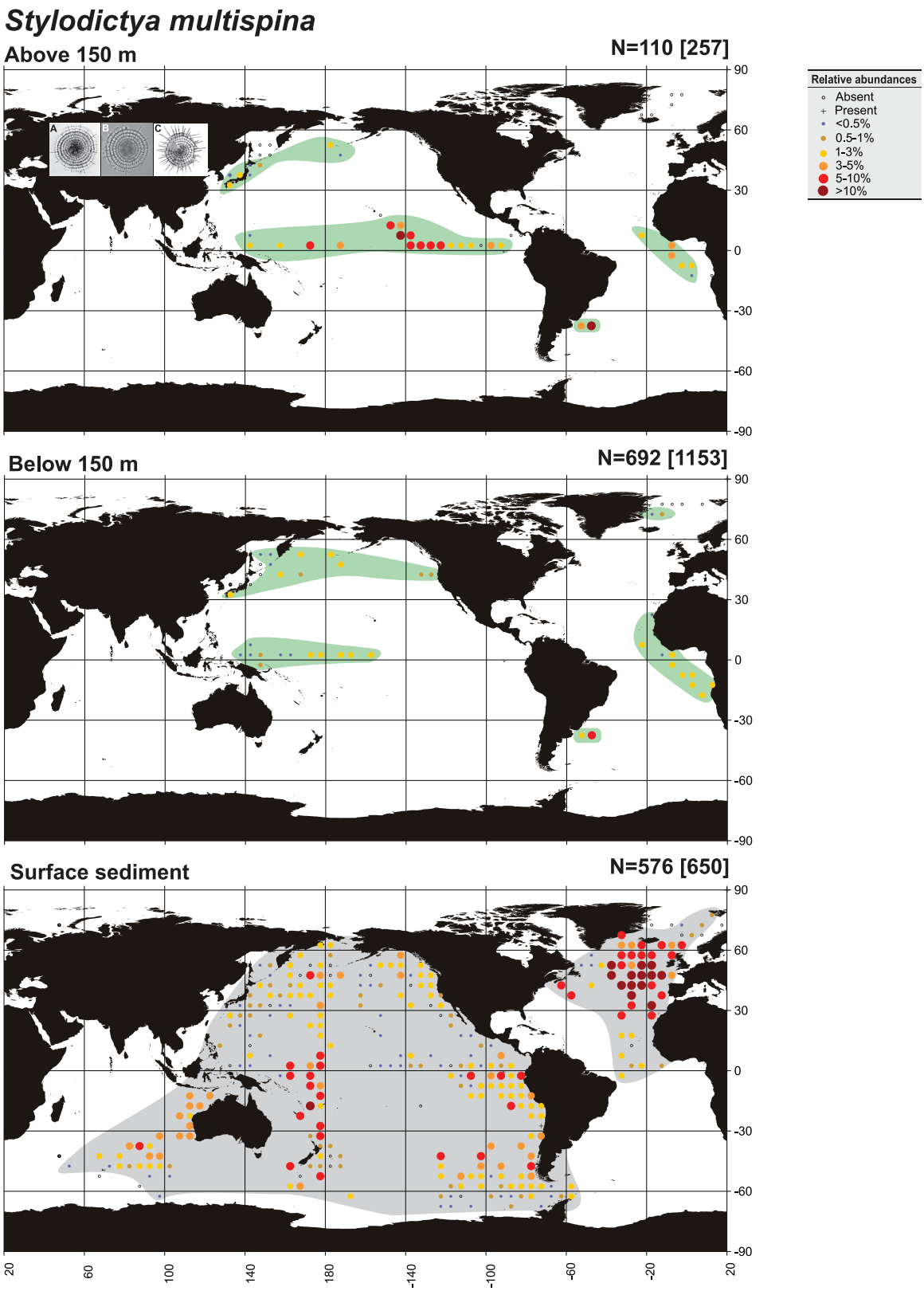


Figure 96. Geographic distribution of *Stylodictya multispina*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (above 150 m and below 150 m; plankton and sediment trap materials) and surface sediment materials. Sources of species illustrations: A, Original; B, Original; C, Petrushevskaya (1967).

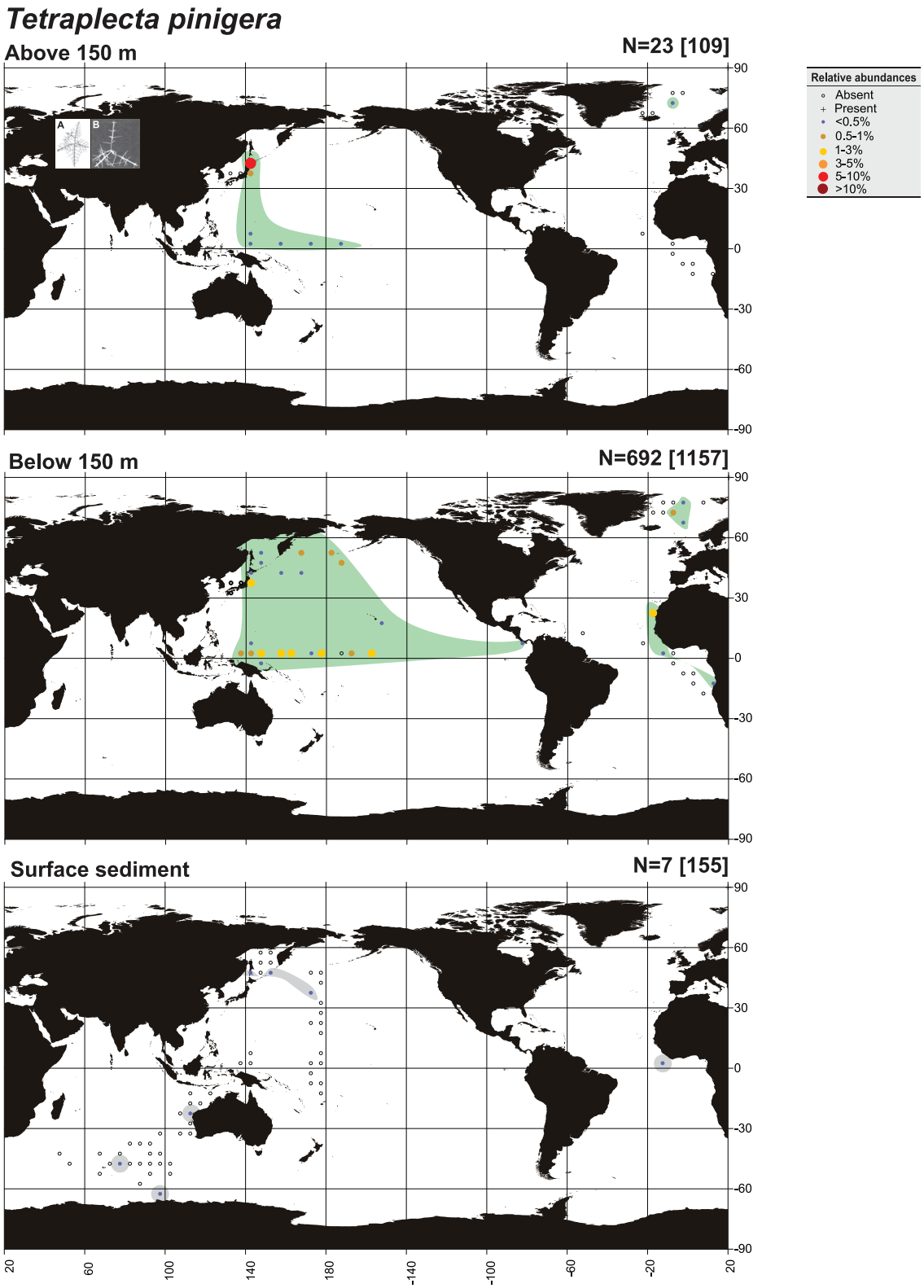


Figure 97. Geographic distribution of *Tetraplecta pinigera*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (above 150 m and below 150 m; plankton and sediment trap materials) and surface sediment materials. Sources of species illustrations: A, Haeckel (1887); B, Takahashi (1991).

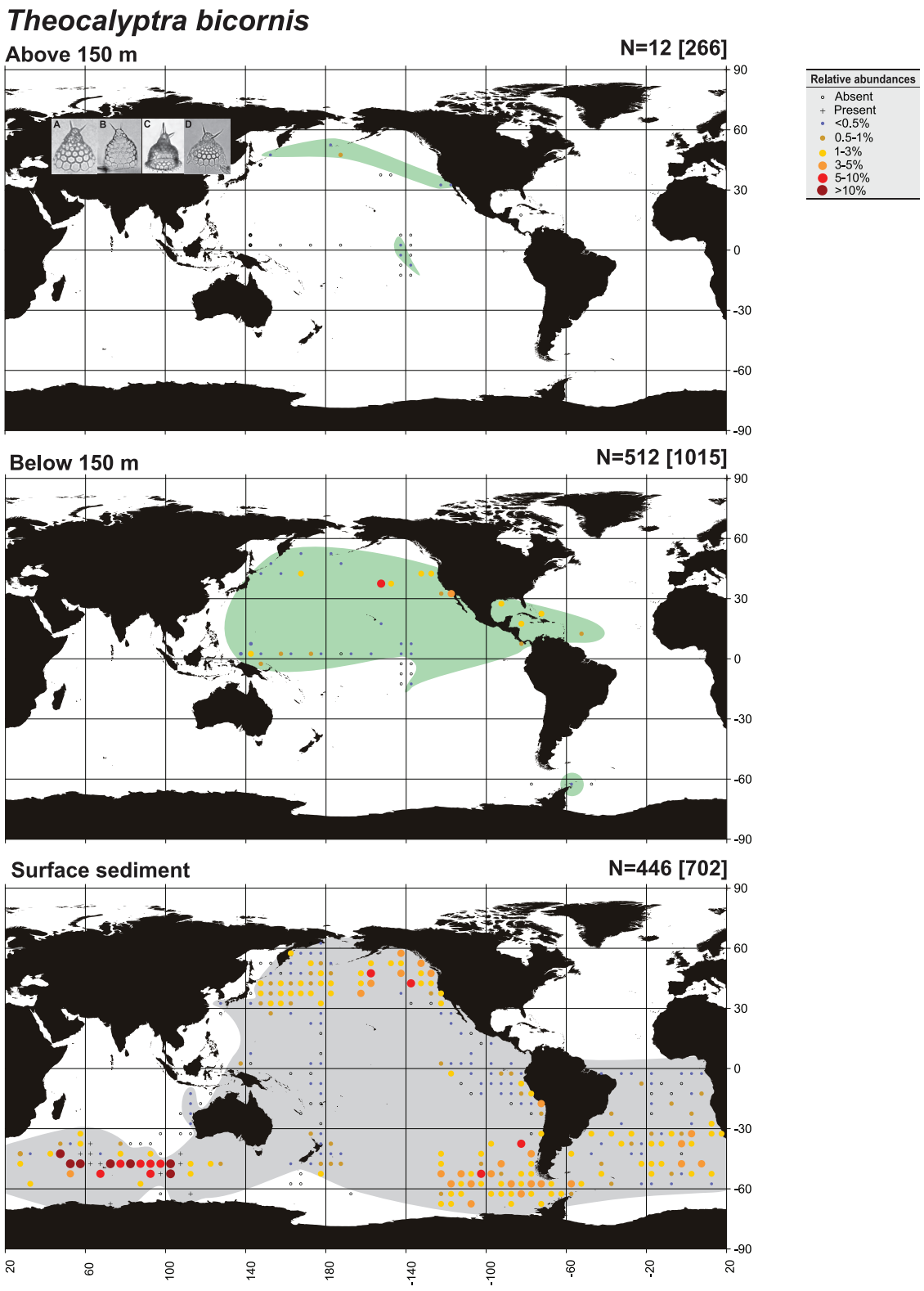


Figure 98. Geographic distribution of *Theocalyptra bicornis*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (above 150 m and below 150 m; plankton and sediment trap materials) and surface sediment materials. Sources of species illustrations: A, Takahashi (1991); B, Welling (1997); C, Original; D, Original.

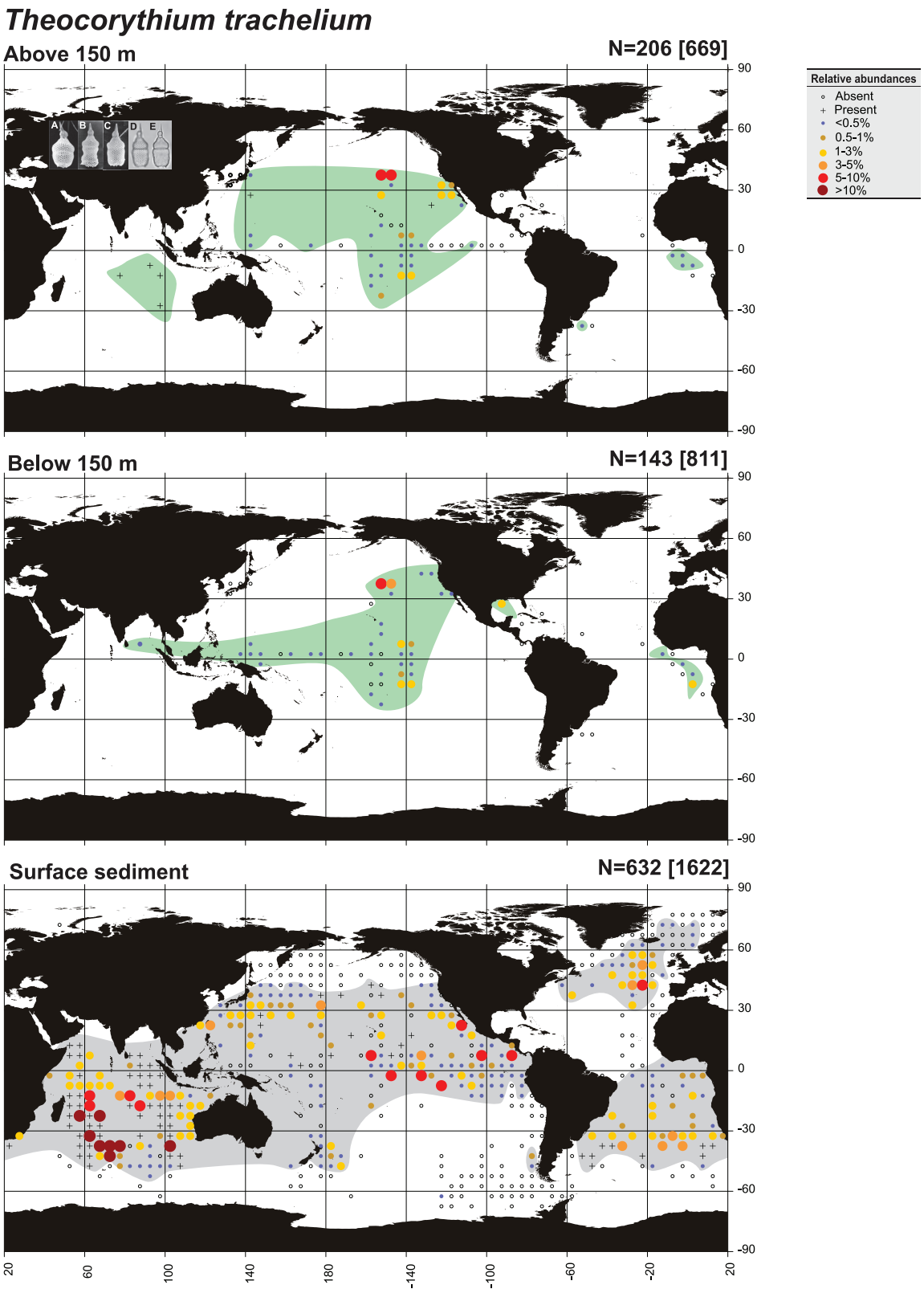


Figure 99. Geographic distribution of *Theocorythium trachelium*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (above 150 m and below 150 m; plankton and sediment trap materials) and surface sediment materials. Sources of species illustrations: A, Original; B, Original; C, Original; D, Original; E, Original.

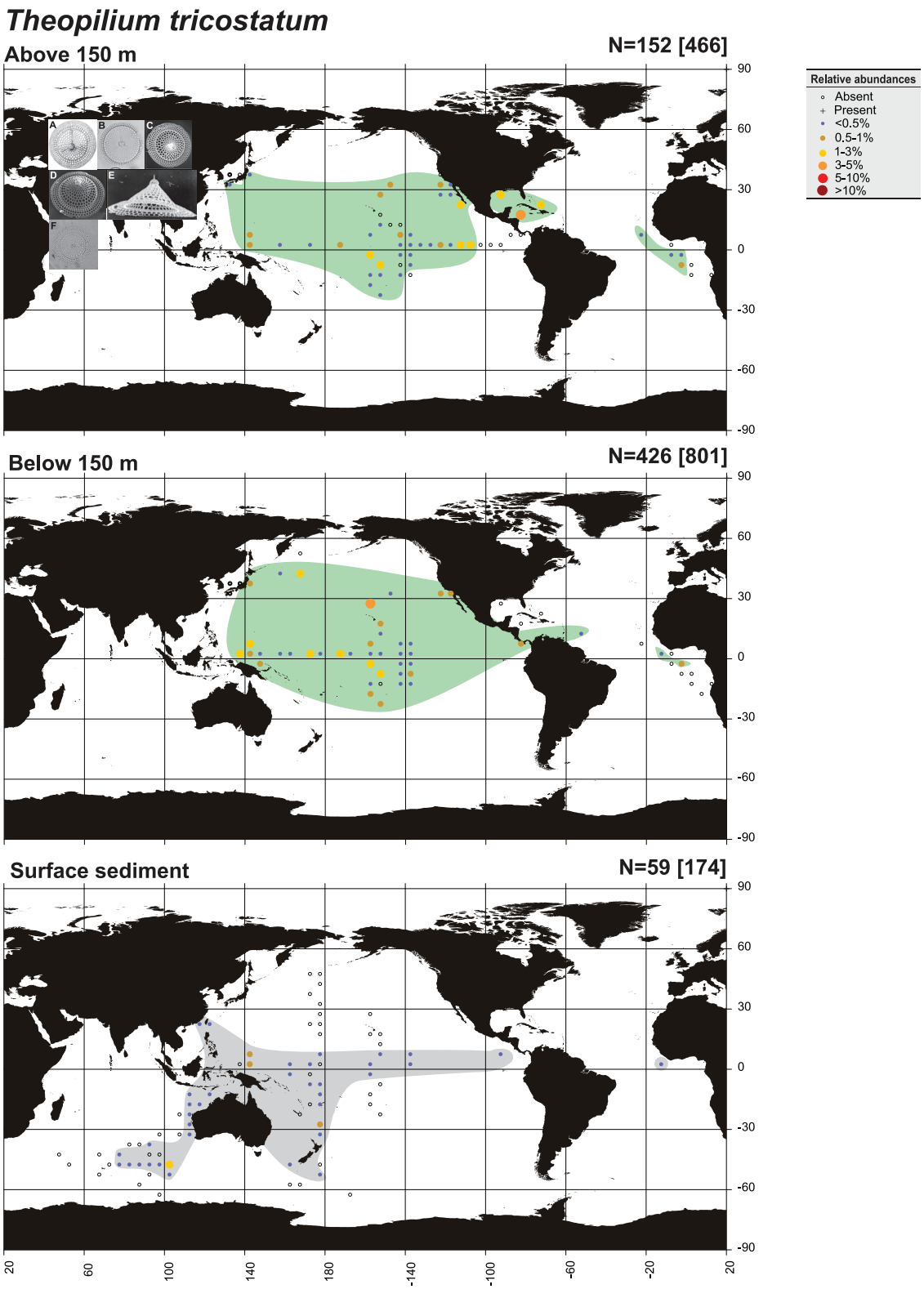


Figure 100. Geographic distribution of *Theopilium tricostatum*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (above 150 m and below 150 m; plankton and sediment trap materials) and surface sediment materials. Sources of species illustrations: A, Haeckel (1887); B, Original; C, Original; D, Original; E, Original; F, Original.

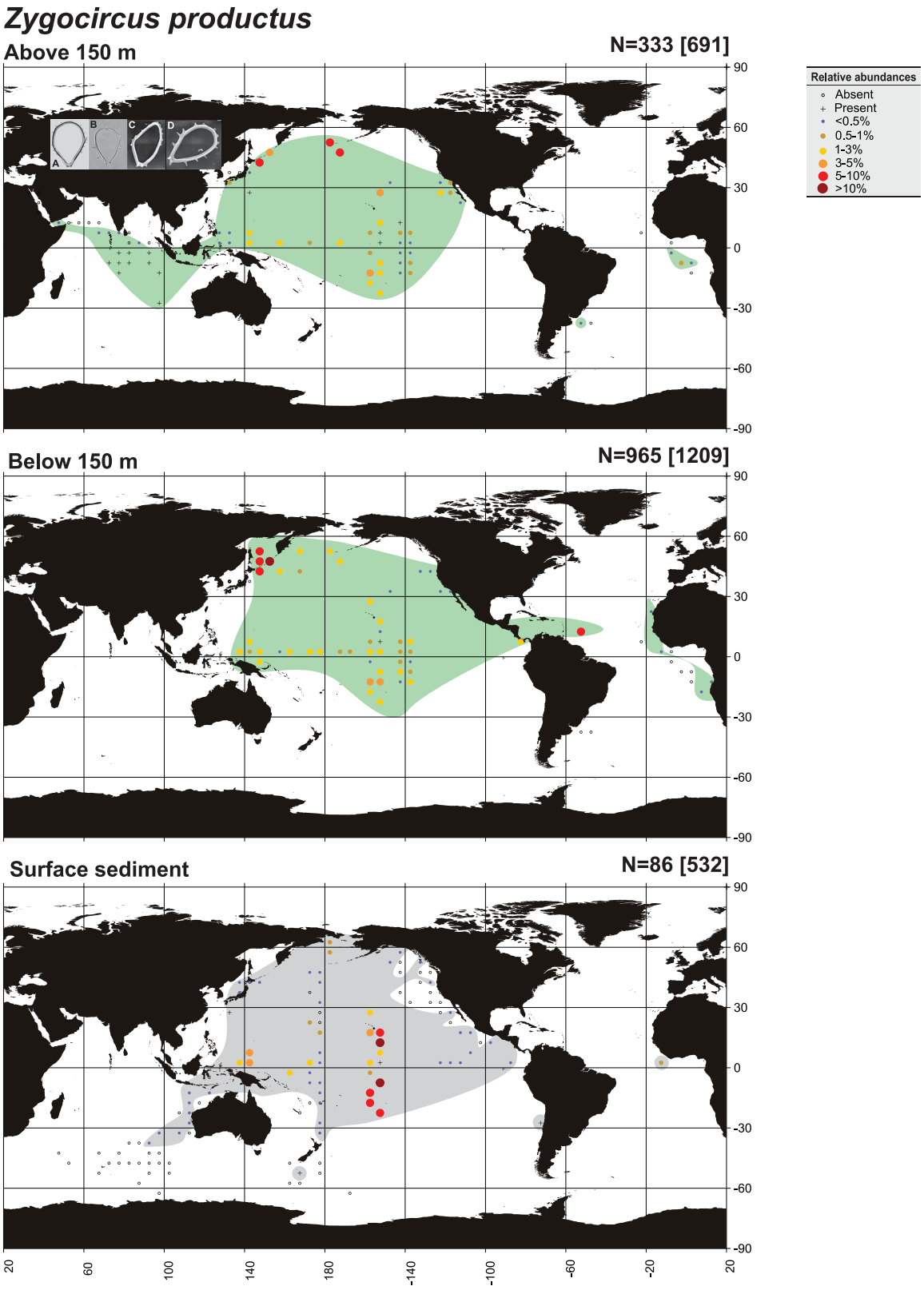


Figure 101. Geographic distribution of *Zygocircus productus*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (above 150 m and below 150 m; plankton and sediment trap materials) and surface sediment materials. Sources of species illustrations: A, Boltovskoy and Riedel (1987); B, Original; C, Original; D, Original.

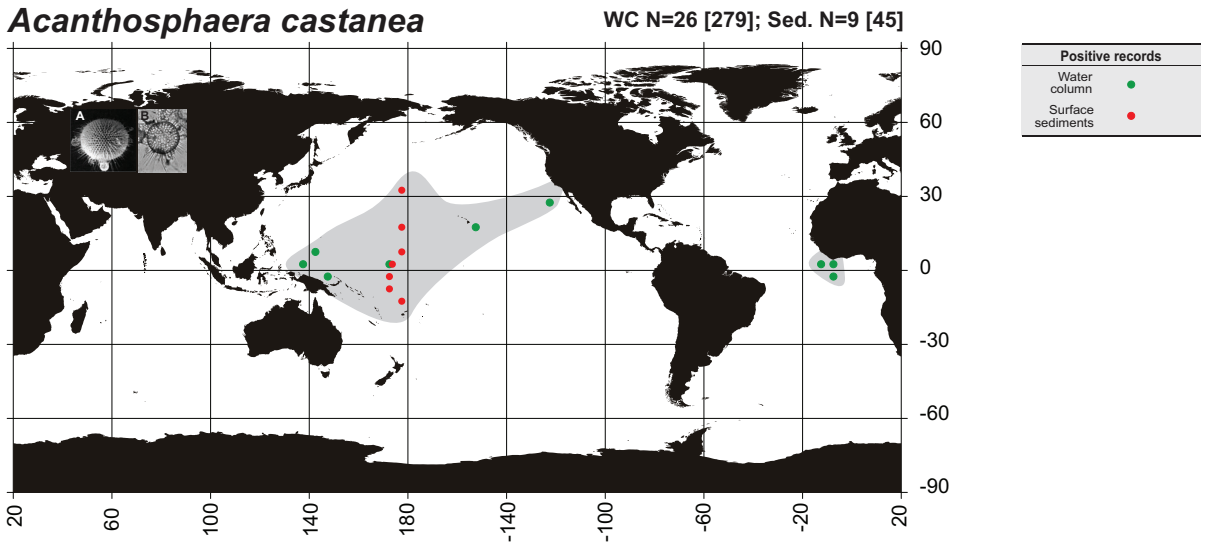


Figure 102. Geographic distribution of *Acanthosphaera castanea*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Takahashi (1991); B, Original.

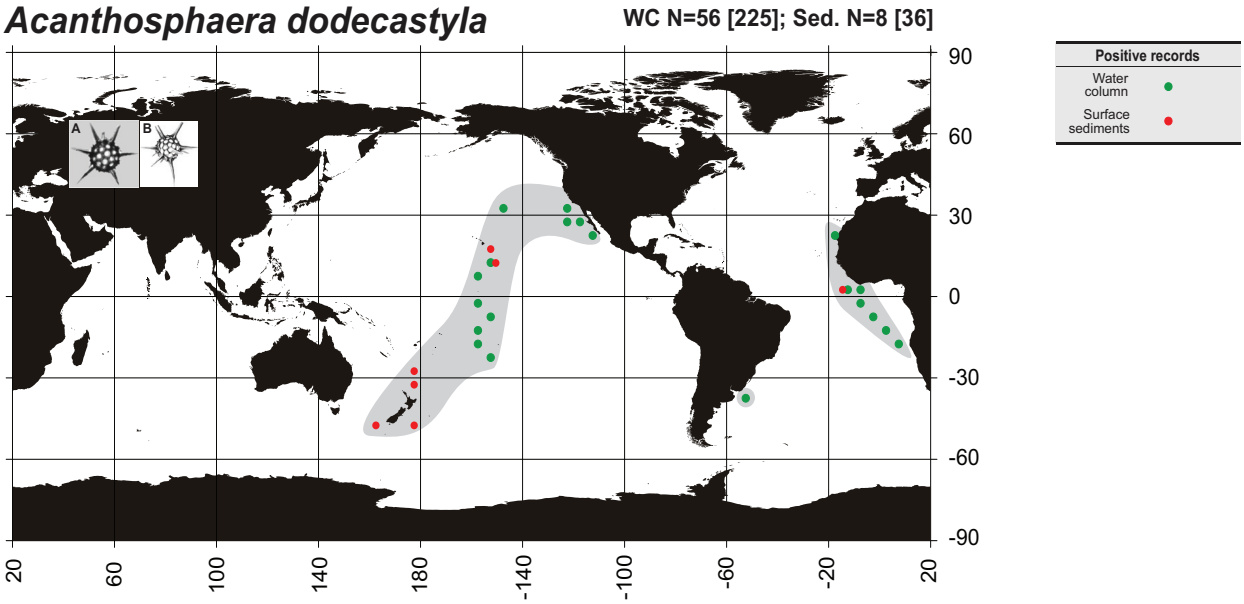


Figure 103. Geographic distribution of *Acanthosphaera dodecastyla*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Boltovskoy (1999); B, Popofsky (1913).

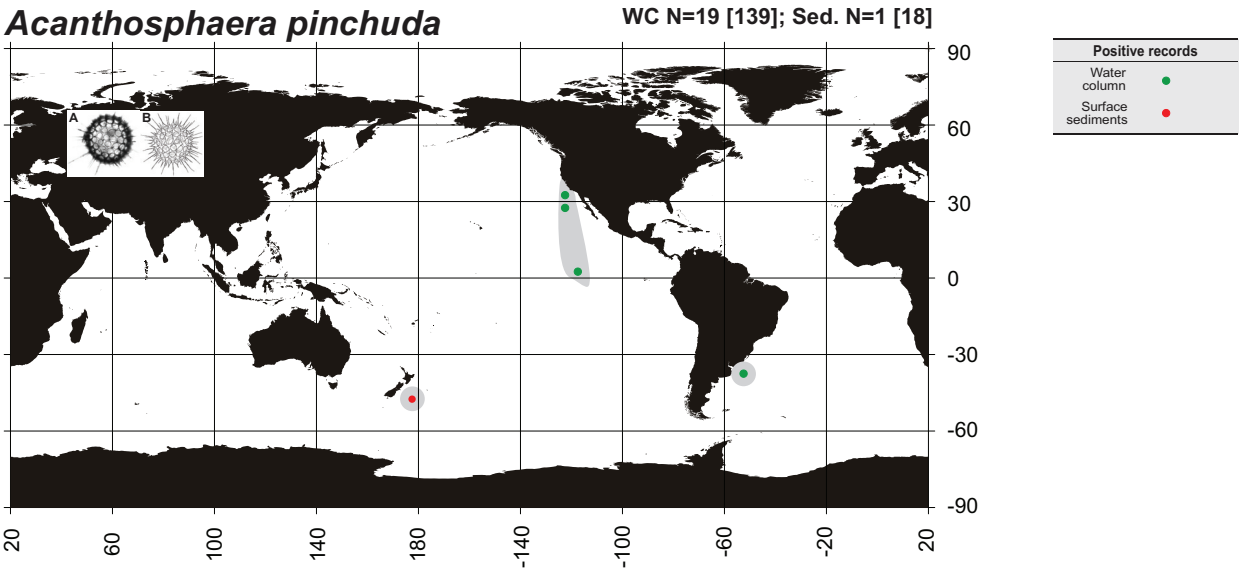


Figure 104. Geographic distribution of *Acanthosphaera pinchuda*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Boltovskoy and Riedel (1980); B, Boltovskoy and Riedel (1980).

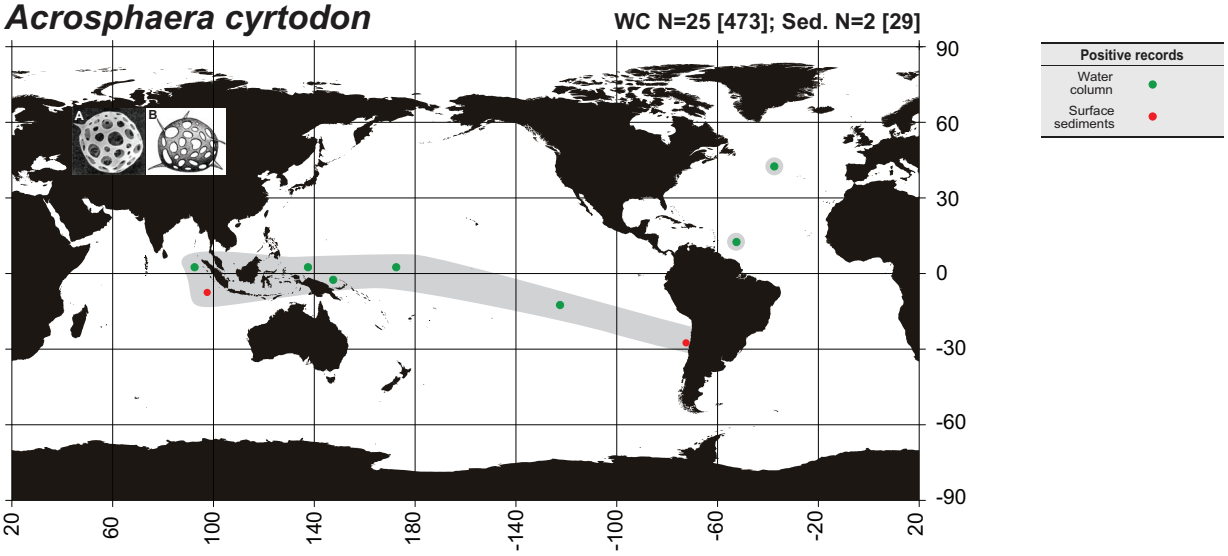


Figure 105. Geographic distribution of *Acrosphaera cyrtodon*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Takahashi (1991); B, Strelkov and Reshetnjak (1971).

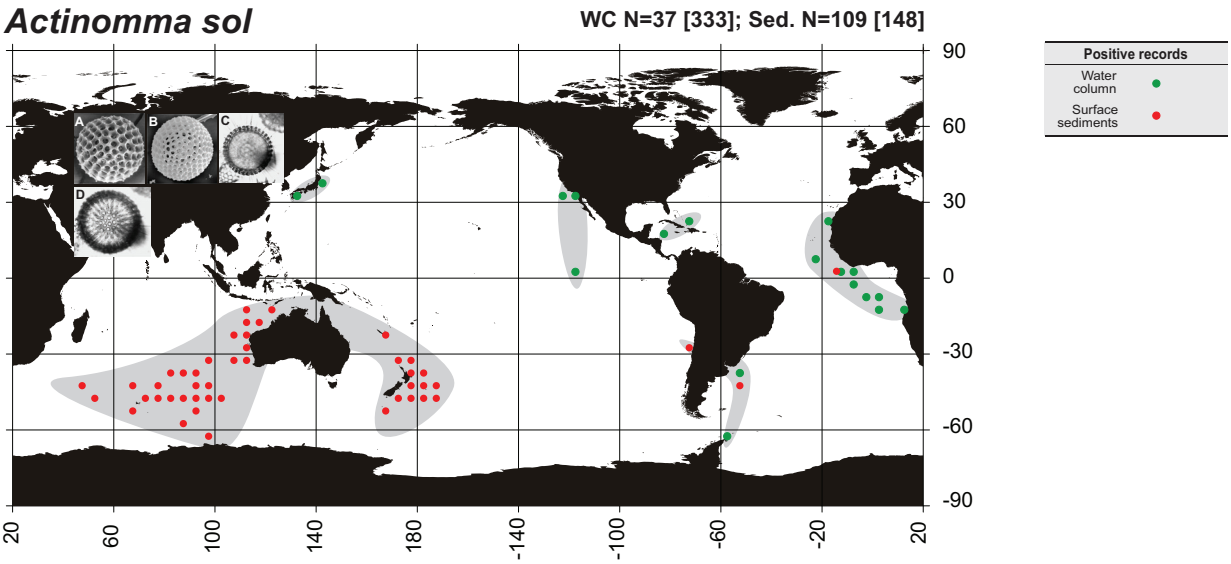


Figure 106. Geographic distribution of *Actinomma sol*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Original; B, Original; C, Original; D, Original.

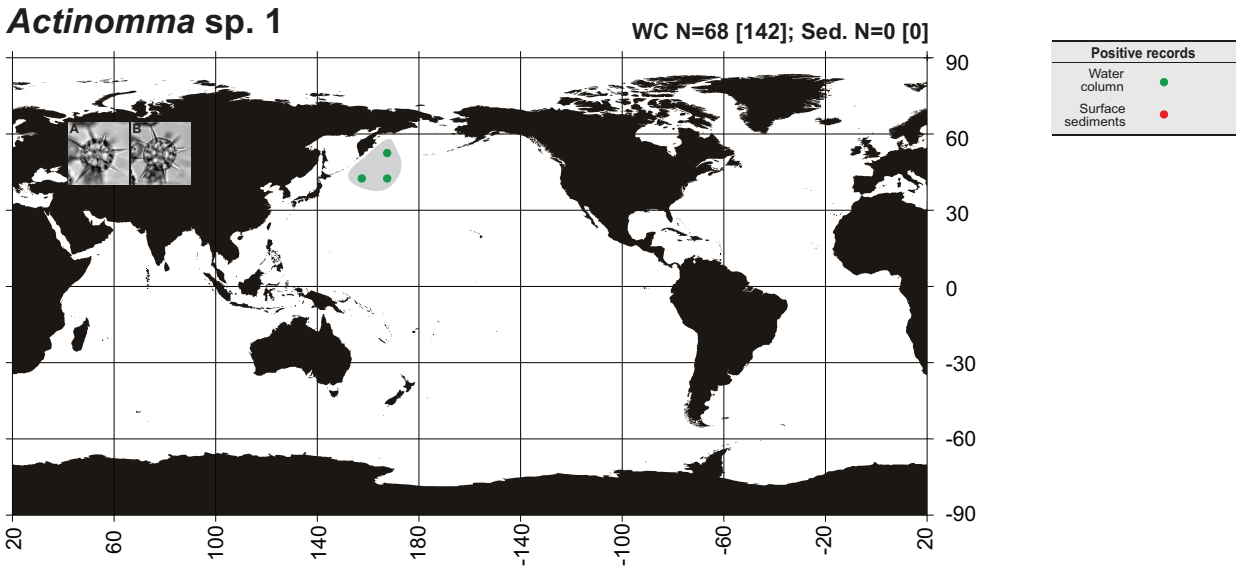


Figure 107. Geographic distribution of *Actinomma* sp. 1. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Okazaki et al. (2005); B, Okazaki et al. (2005).

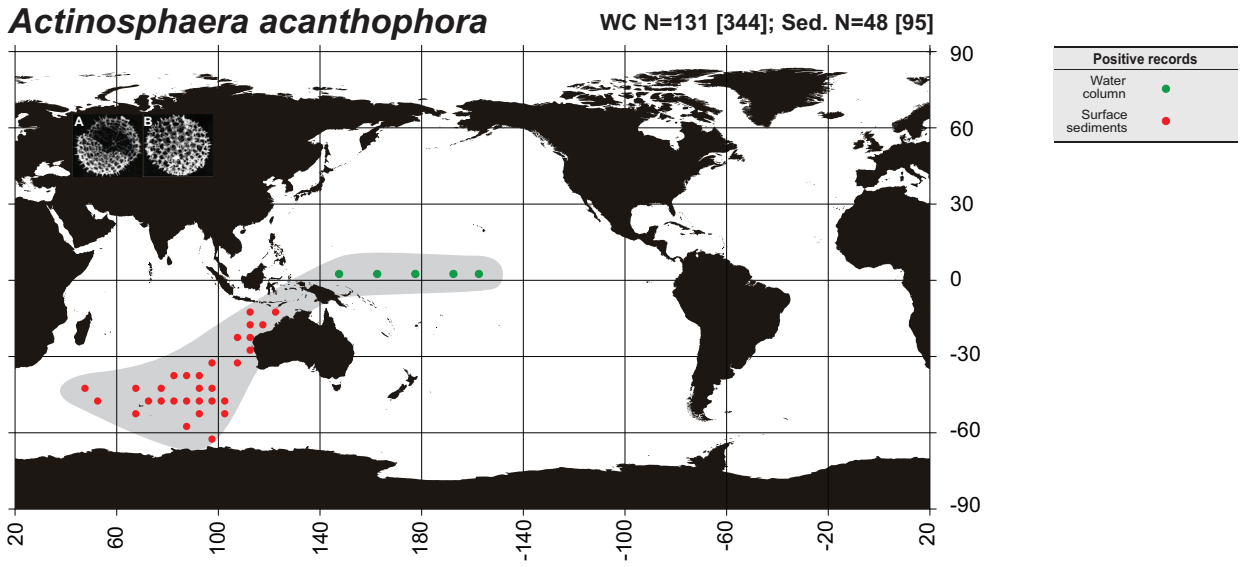


Figure 108. Geographic distribution of *Actinosphaera acanthophora*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Takahashi (1991); B, Takahashi (1991).

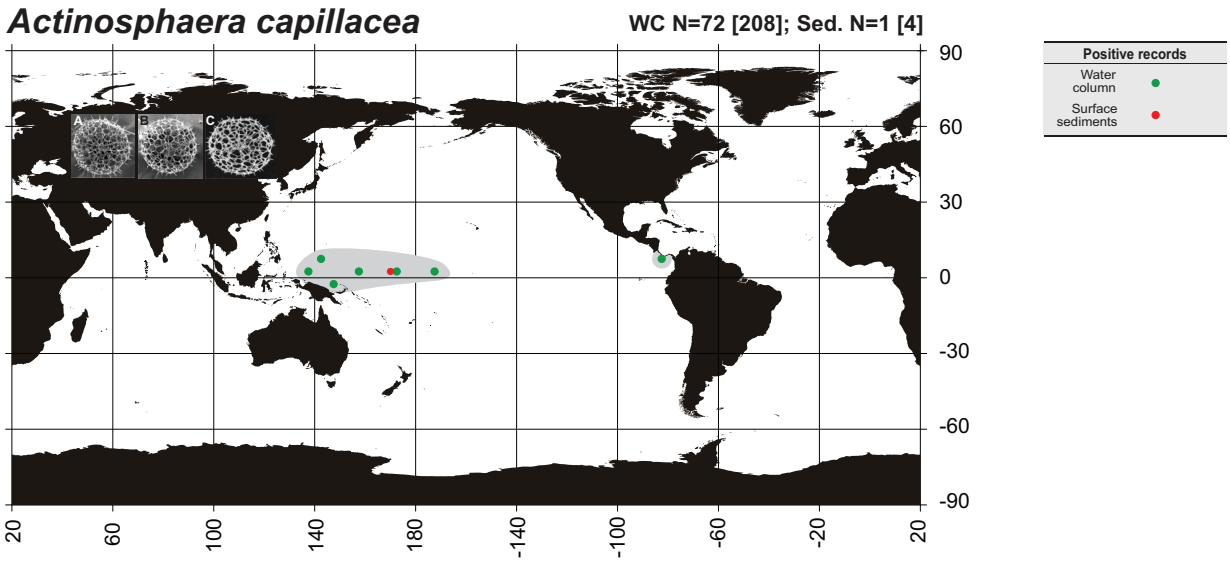


Figure 109. Geographic distribution of *Actinosphaera capillacea*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Matsuoka (2009); B, Matsuoka (2009); C, Takahashi (1991).

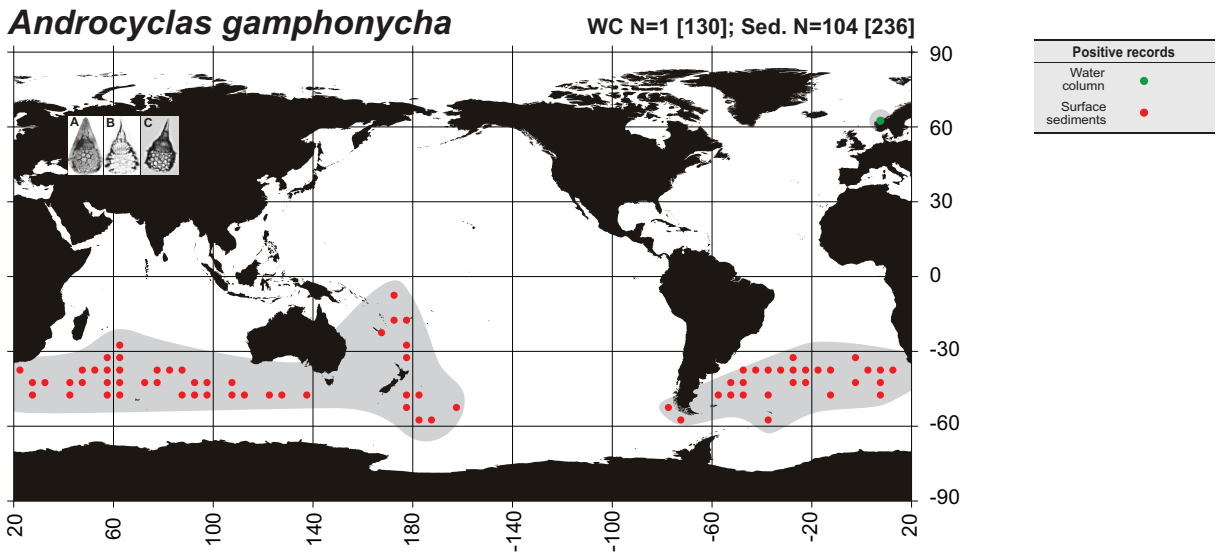


Figure 110. Geographic distribution of *Androcyclas gamphonycha*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Bjørklund (1976); B, Bjørklund (1976); C, Original.

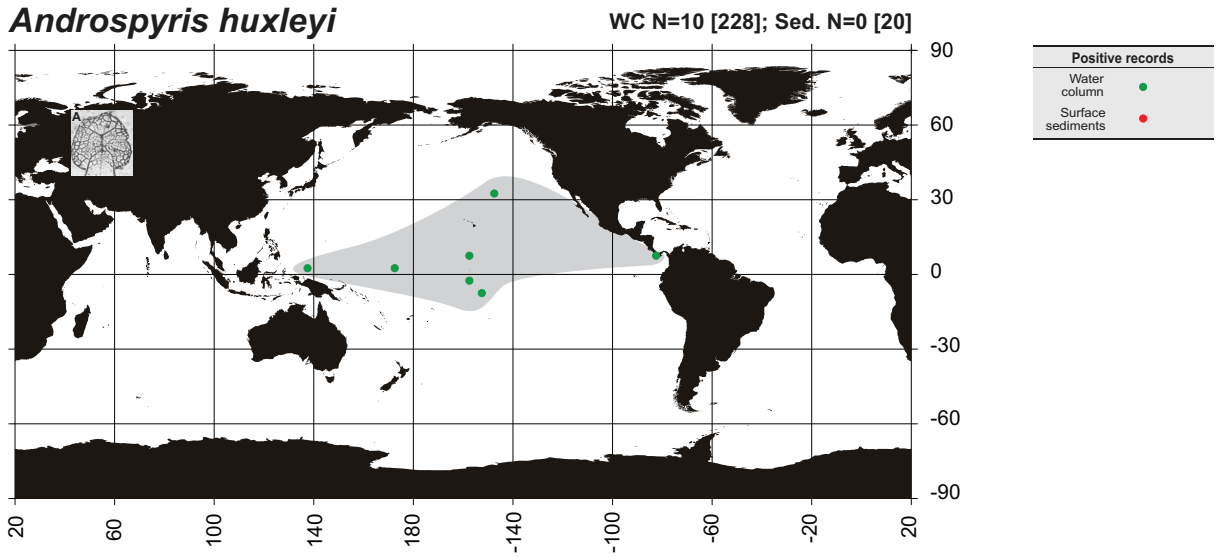


Figure 111. Geographic distribution of *Androspyris huxleyi*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Takahashi (1991).

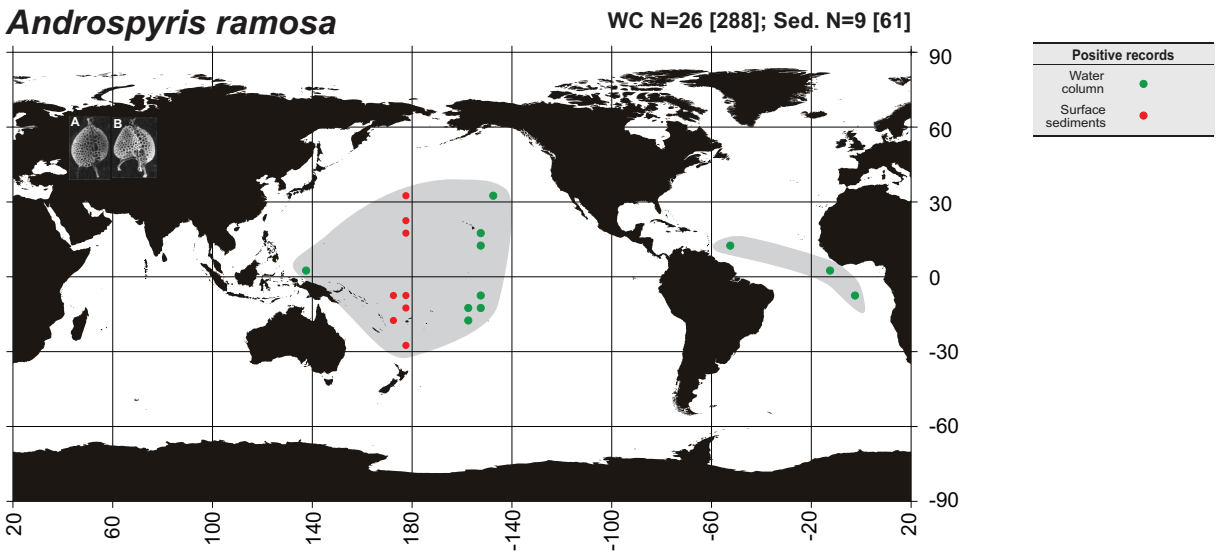


Figure 112. Geographic distribution of *Androspyris ramosa*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Takahashi (1991); B, Takahashi (1991).

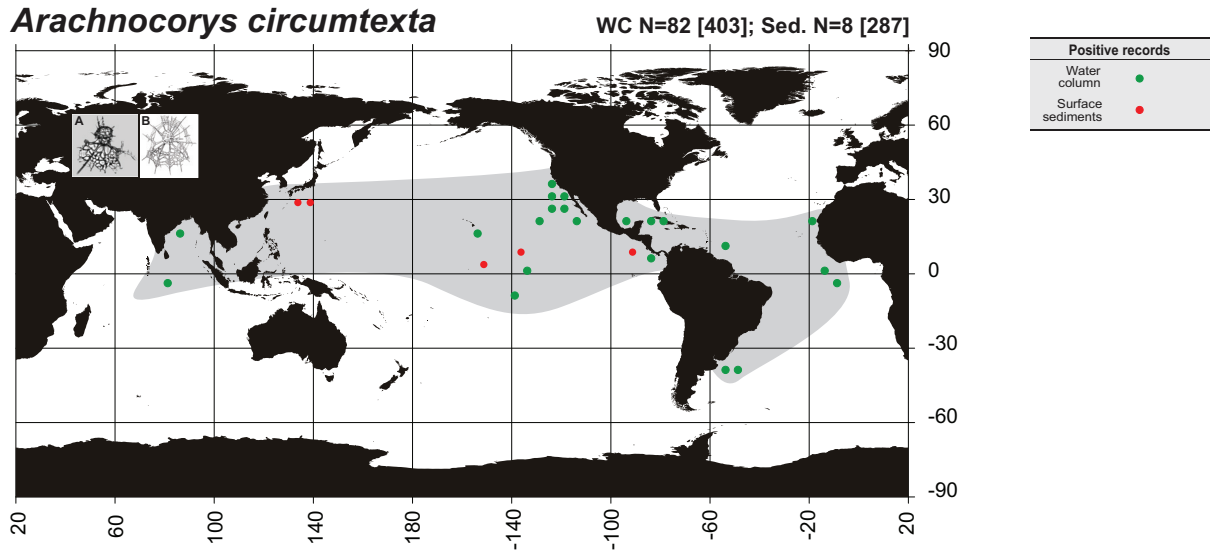


Figure 113. Geographic distribution of *Arachnocorys circumtexta*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Boltovskoy and Riedel (1980); B, Petrushevskaya (1971).

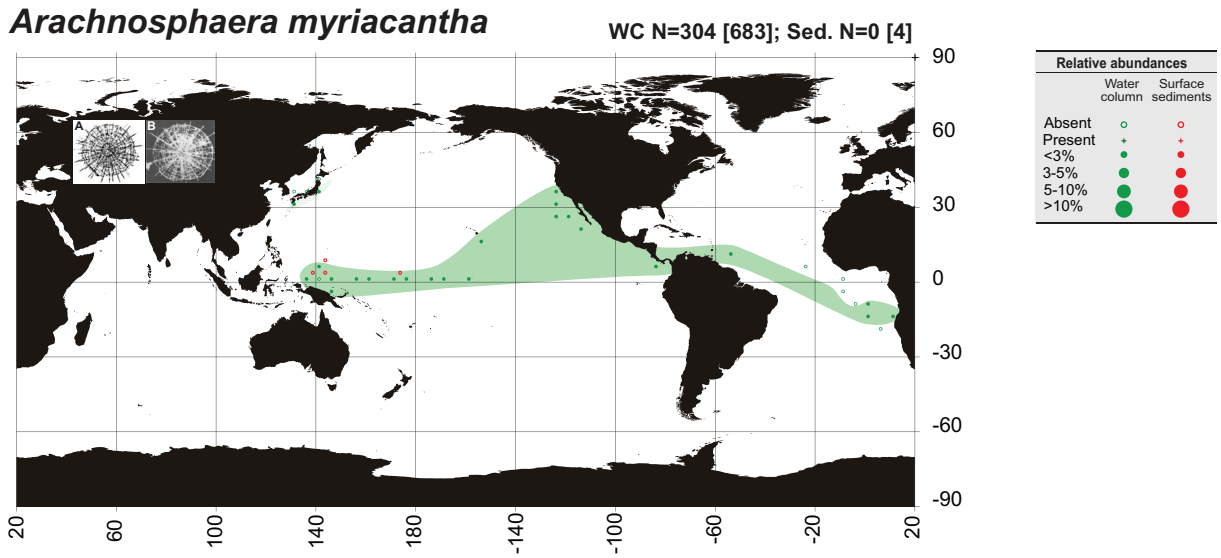


Figure 114. Geographic distribution of *Arachnosphaera myriacantha*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Boltovskoy (1999); B, Takahashi (1991).

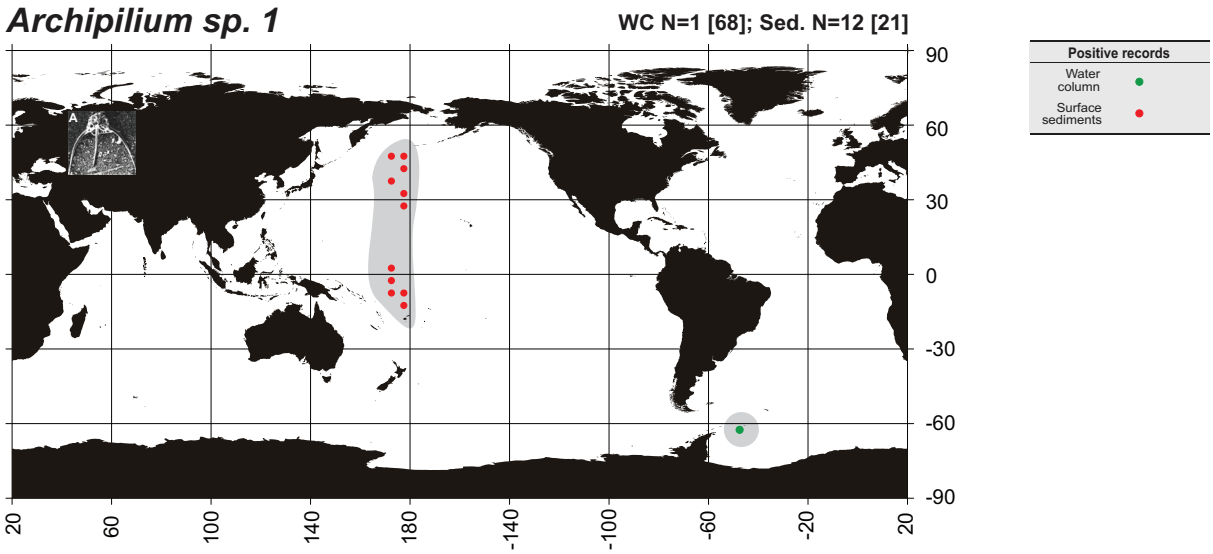


Figure 115. Geographic distribution of *Archipilium* sp. 1. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Takahashi (1991).

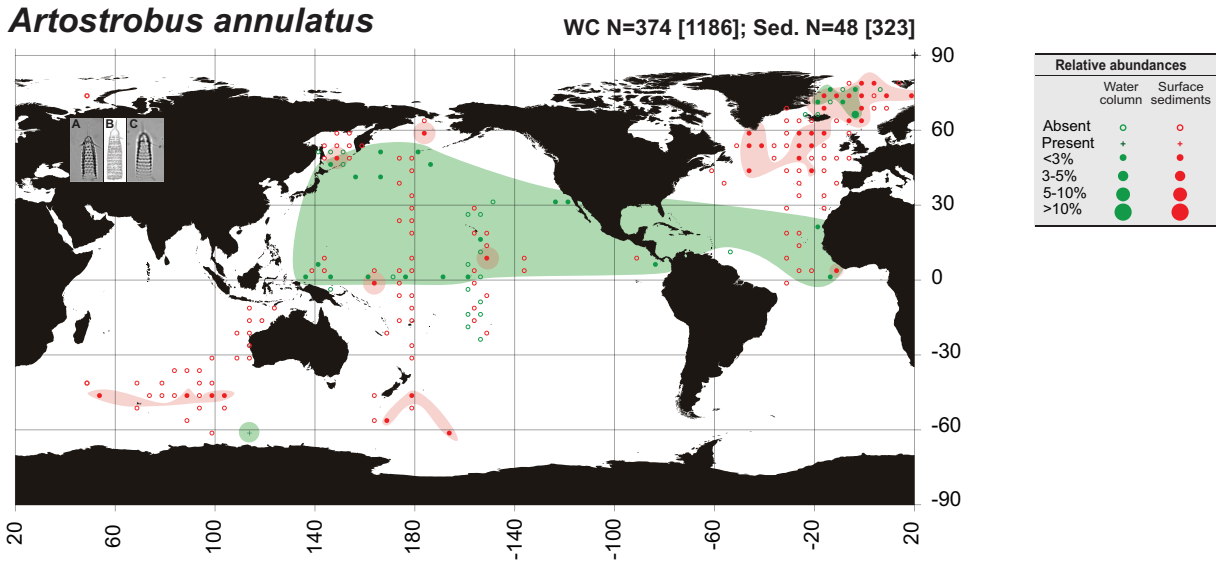


Figure 116. Geographic distribution of *Artostrobus annulatus*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Original; B, Riedel (1958); C, Original.

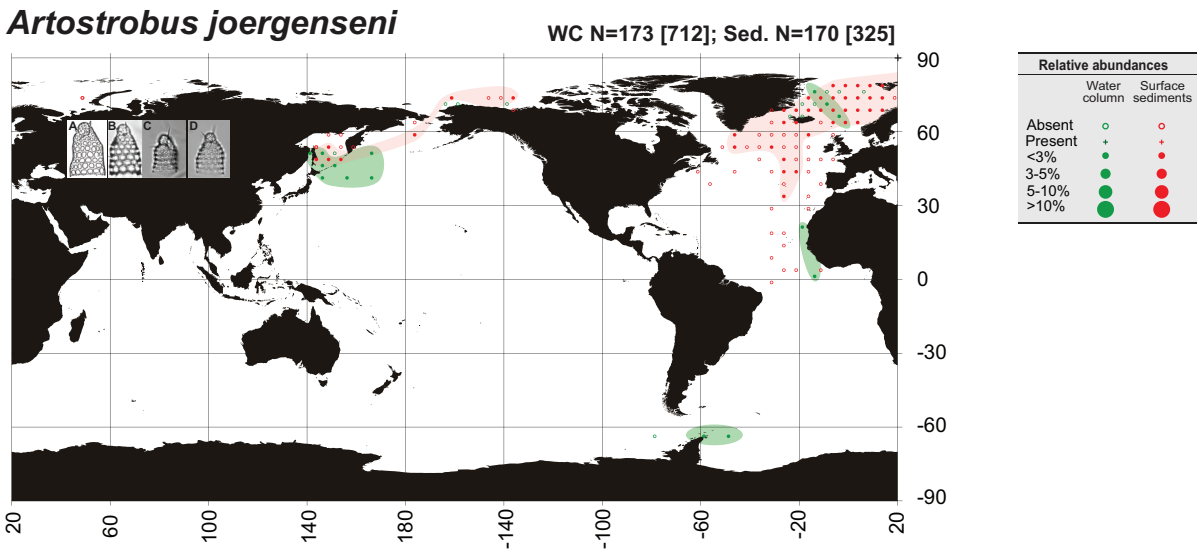


Figure 117. Geographic distribution of *Artostrobus joergenseni*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Petrushevskaya (1971); B, Original; C, Original; D, Original.

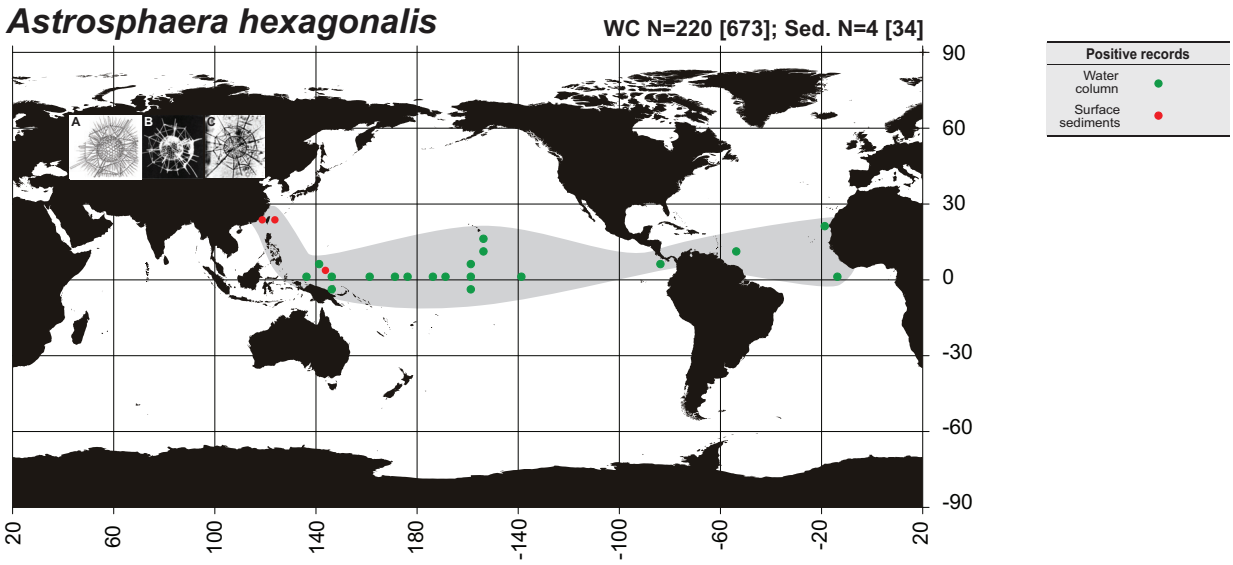


Figure 118. Geographic distribution of *Astrosphaera hexagonalis*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Haeckel (1887); B, Takahashi (1991); C, Takahashi (1991).

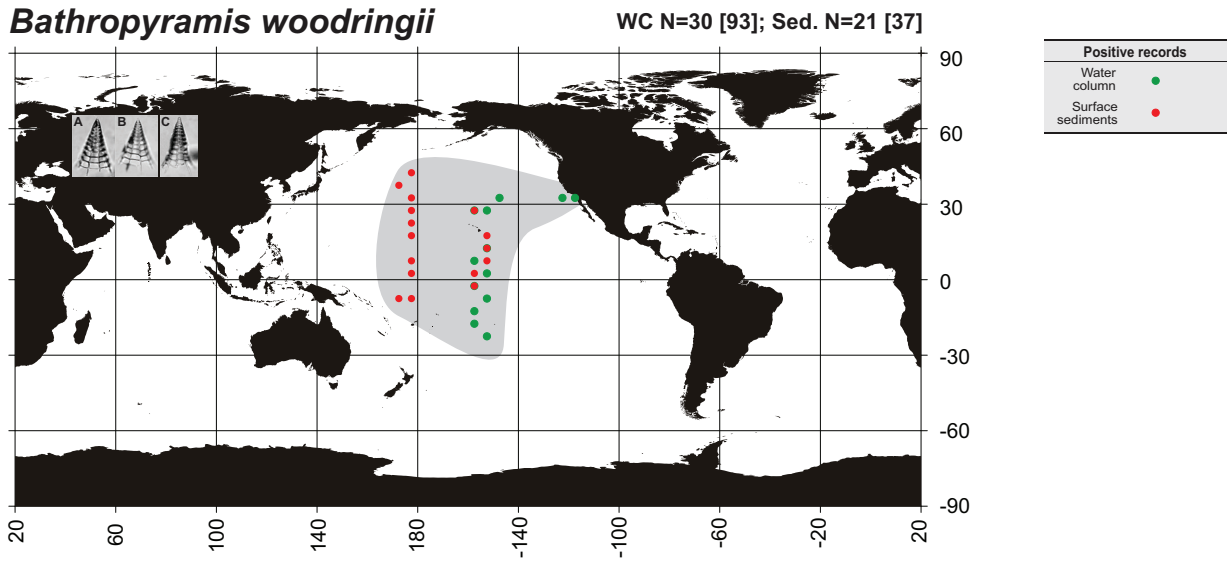


Figure 119. Geographic distribution of *Bathropyramis woodringii*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Original; B, Original; C, Original.

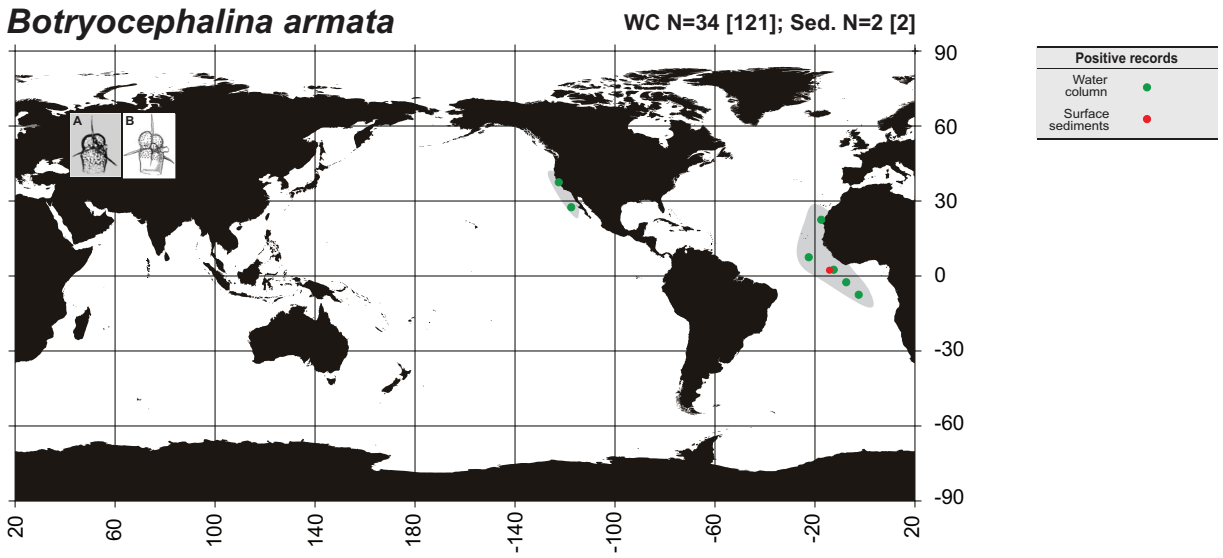


Figure 120. Geographic distribution of *Botryocephalina armata*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Boltovskoy and Riedel (1987); B, Petrushevskaya (1965).

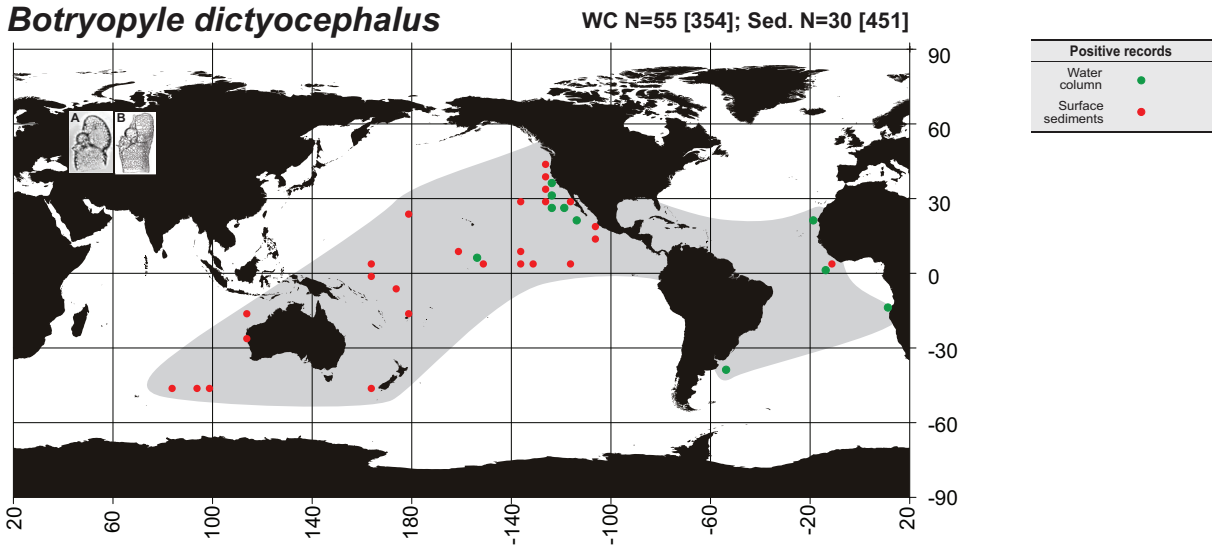


Figure 121. Geographic distribution of *Botryopyle dictyocephalus*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Boltovskoy and Riedel (1987); B, Petrushevskaya (1965).

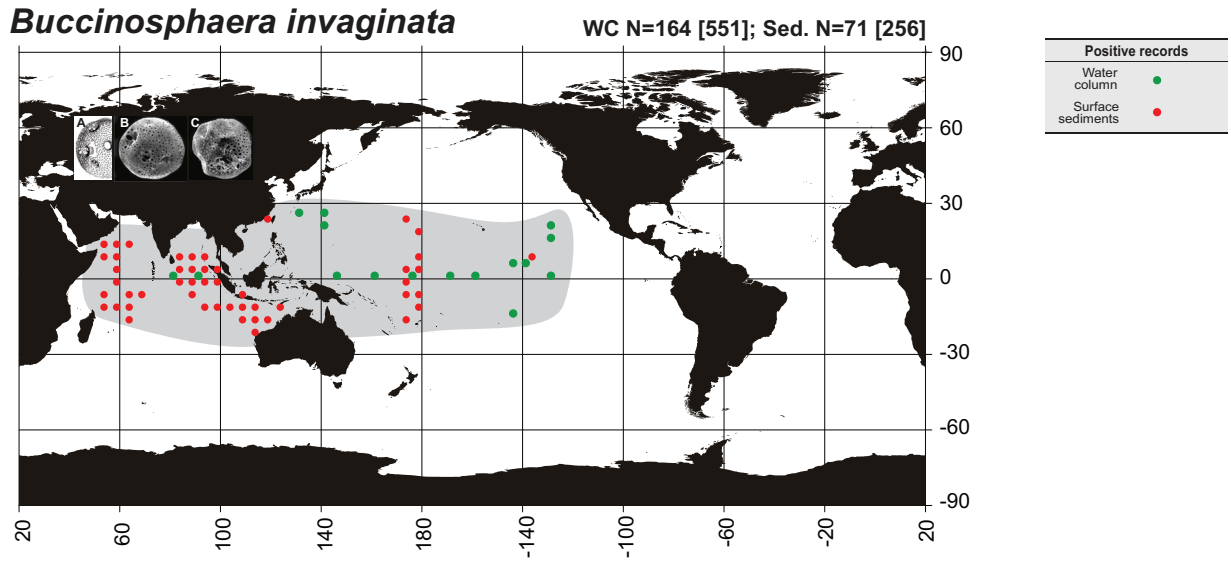


Figure 122. Geographic distribution of *Buccinosphaera invaginata*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Haeckel (1887); B, Paverd (1995); C, Paverd (1995).

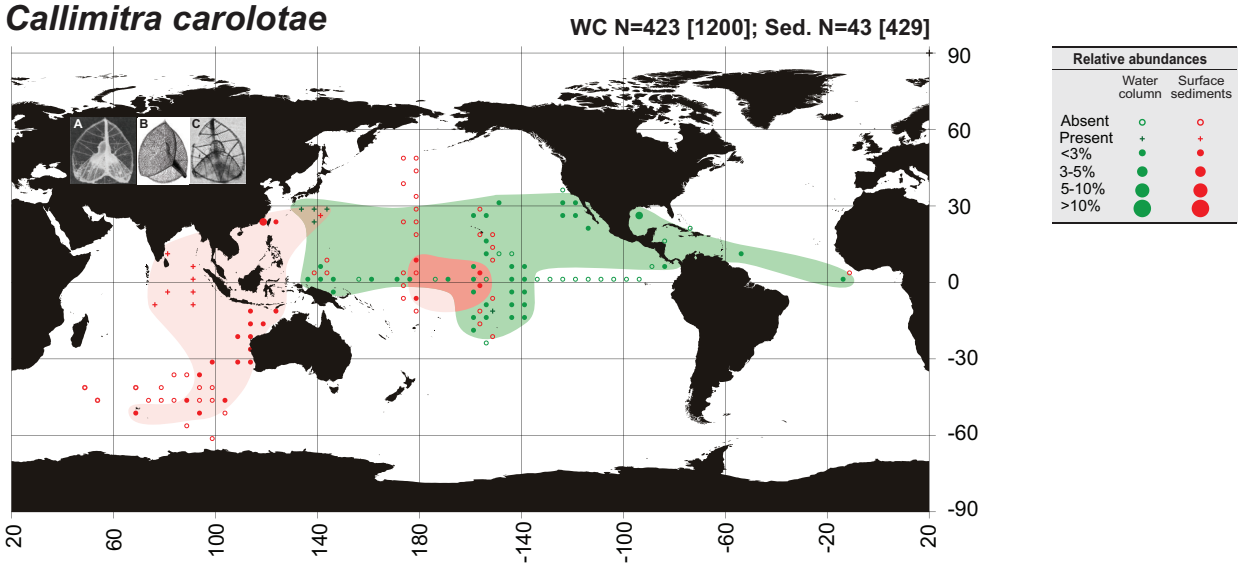


Figure 123. Geographic distribution of *Callimitra carolotae*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Takahashi (1991); B, Haeckel (1887); C, Boltovskoy (1999).

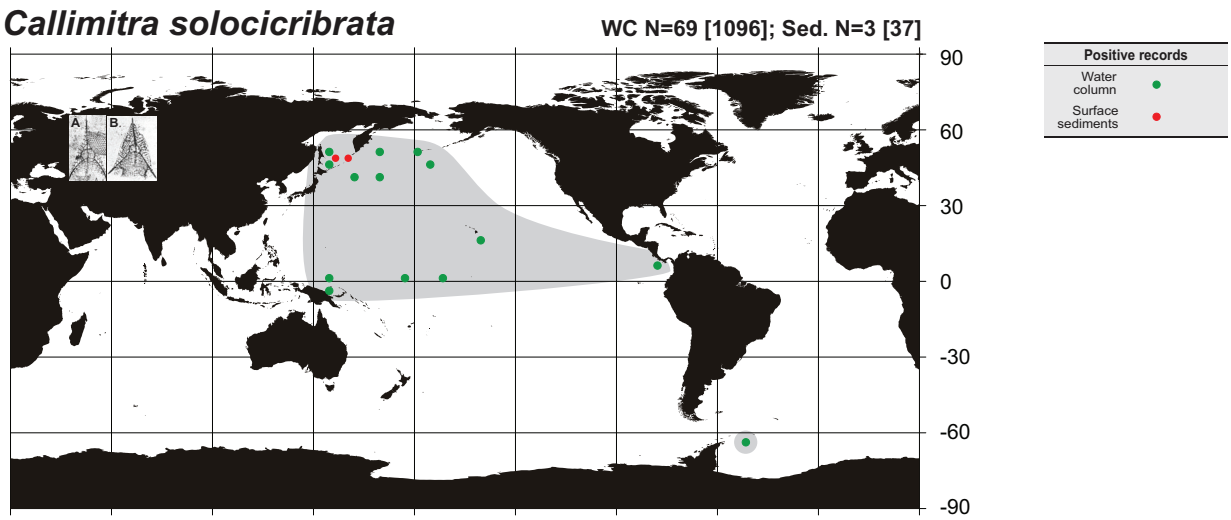


Figure 124. Geographic distribution of *Callimitra solocicribrata*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Takahashi (1991); B, Takahashi (1991).

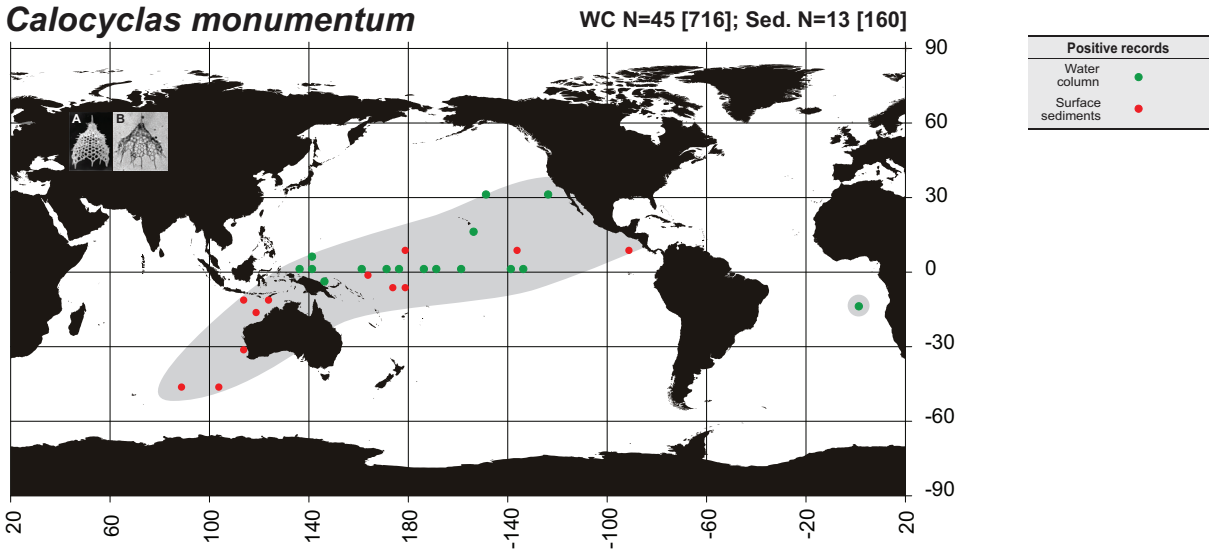


Figure 125. Geographic distribution of *Calocyclas monumentum*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Original; B, Takahashi (1991).

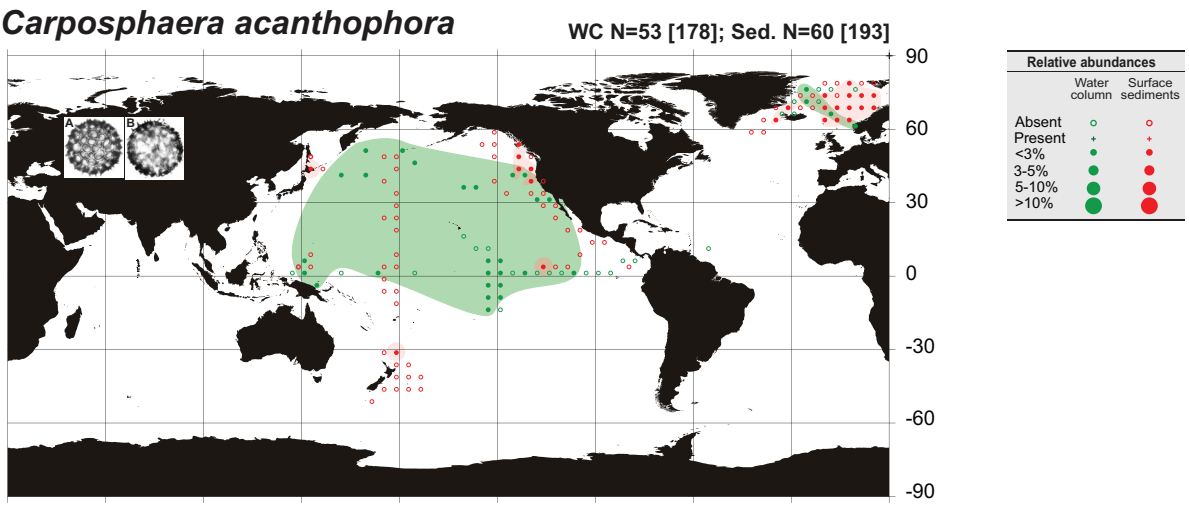


Figure 126. Geographic distribution of *Carposphaera acanthophora*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Benson (1966); B, Benson (1966).

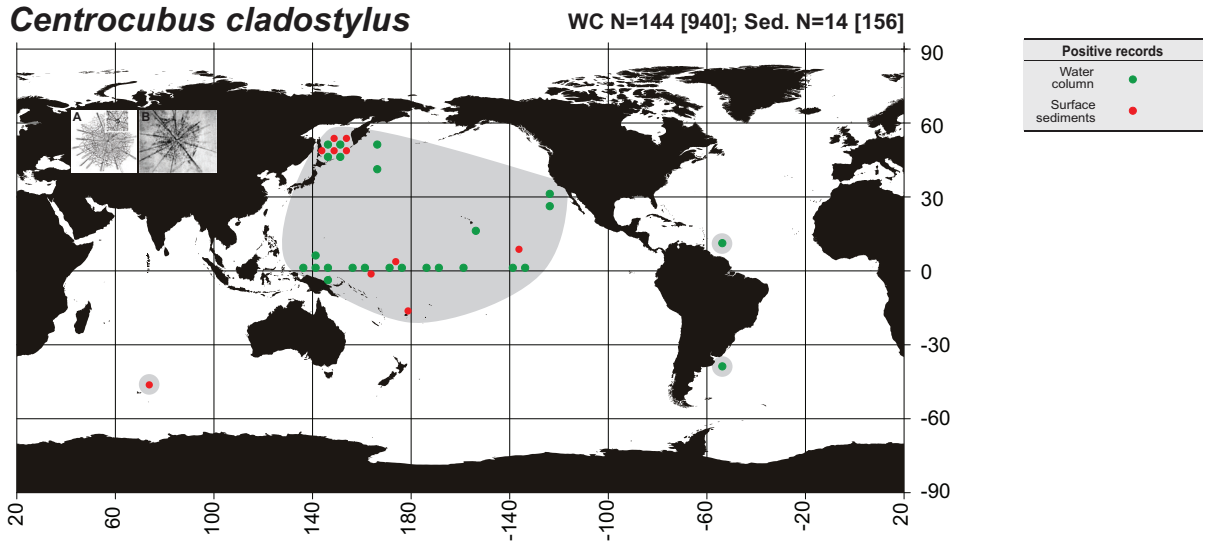


Figure 127. Geographic distribution of *Centrocubus cladostylus*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Haeckel (1887); B, Boltovskoy and Riedel (1987).

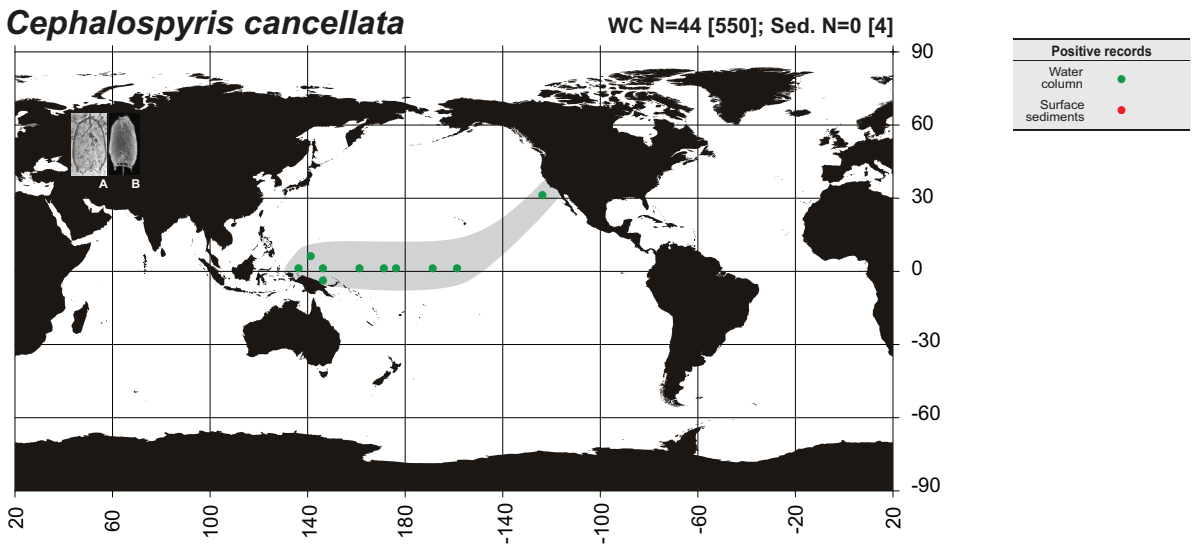


Figure 128. Geographic distribution of *Cephalospyris cancellata*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Takahashi (1991); B, Paverd (1995).

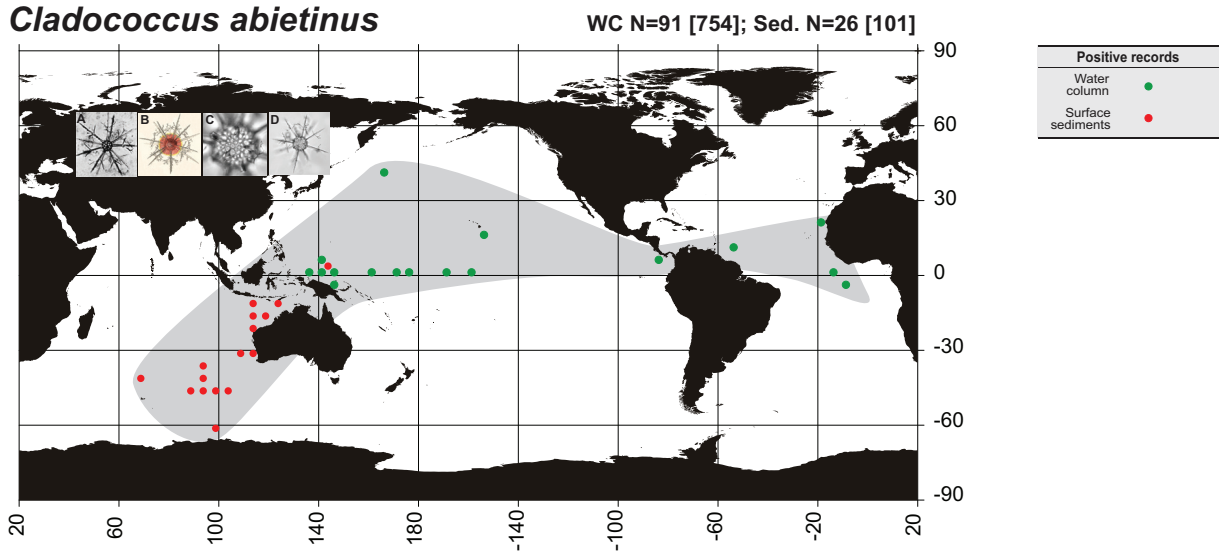


Figure 129. Geographic distribution of *Cladococcus abietinus*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Takahashi (1991); B, Haeckel (1887); C, Original; D, Original.

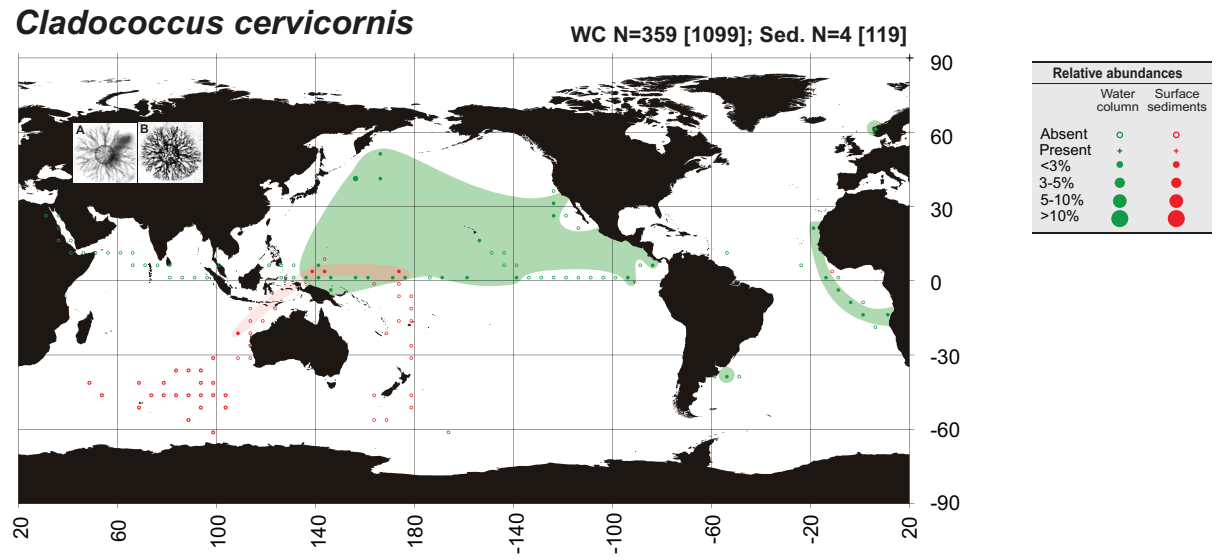


Figure 130. Geographic distribution of *Cladococcus cervicornis*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Original; B, Takahashi (1991).

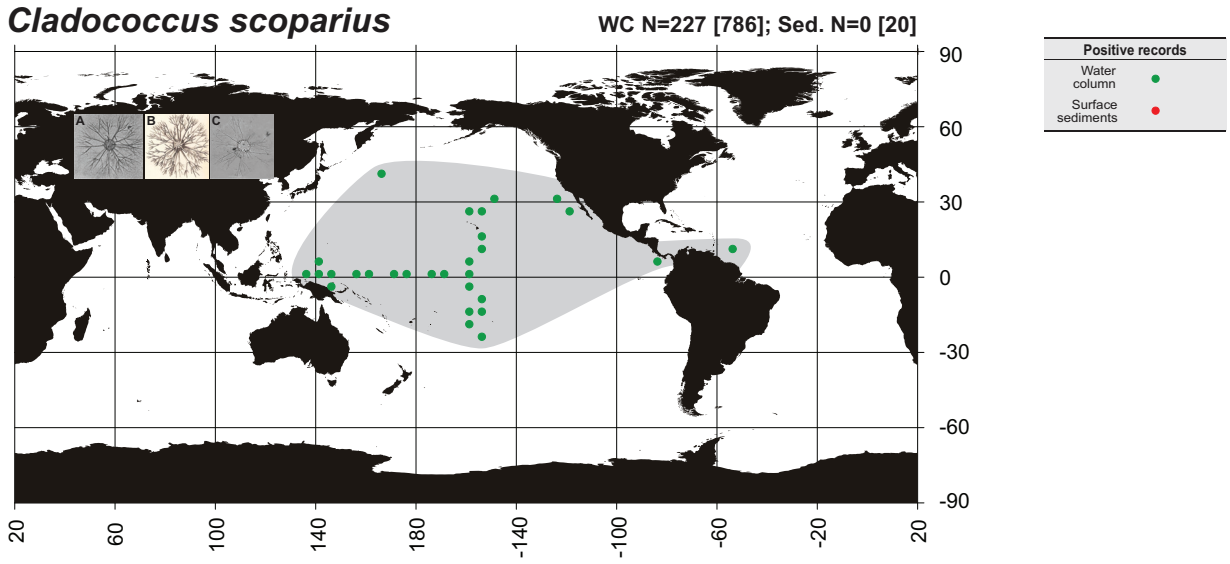


Figure 131. Geographic distribution of *Cladococcus scoparius*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Takahashi (1991); B, Haeckel (1887); C, Original.

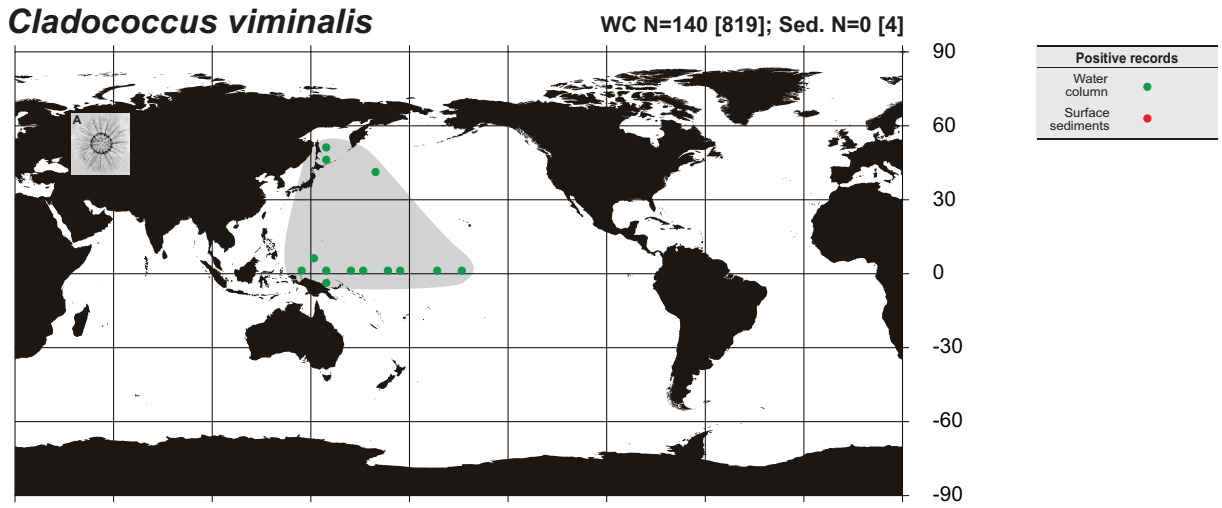


Figure 132. Geographic distribution of *Cladococcus viminalis*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Bjørklund (1976).

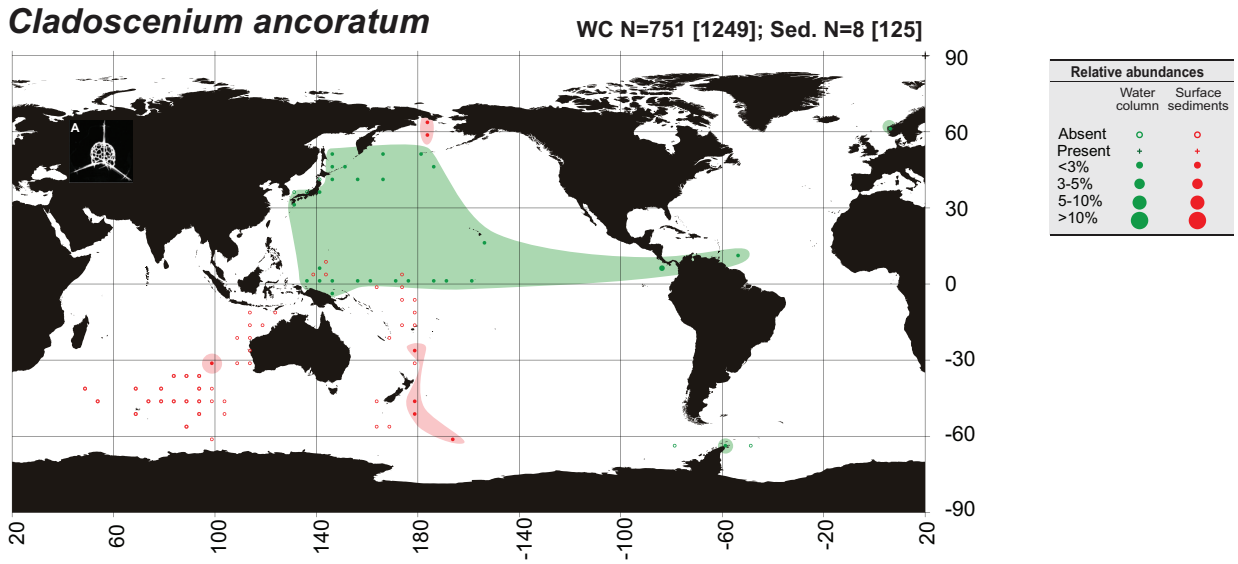


Figure 133. Geographic distribution of *Cladoscenium ancoratum*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Takahashi (1991).

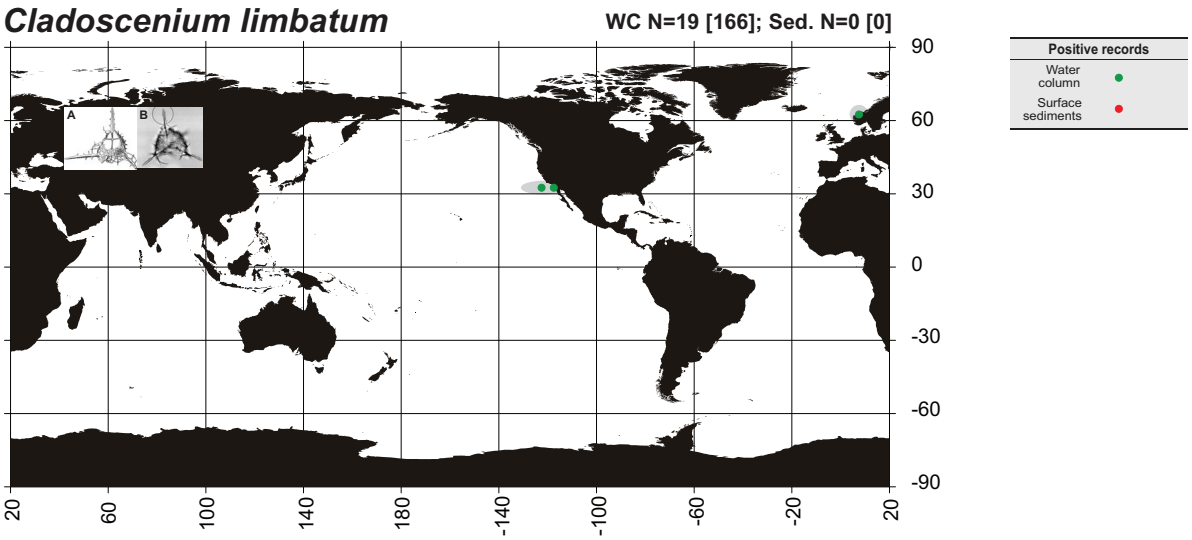


Figure 134. Geographic distribution of *Cladoscenium limbatum*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Jorgensen (1905); B, Radiolaria.org (photo K. Bjørklund).

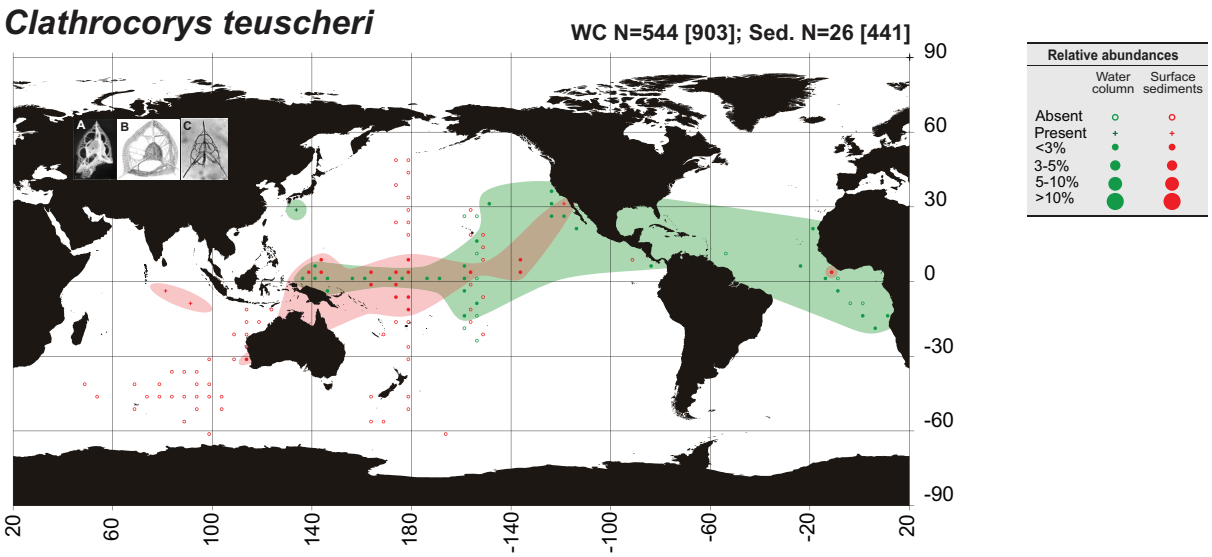


Figure 135. Geographic distribution of *Clathrocorys teuscheri*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Takahashi (1991); B, Boltovskoy (1999); C, Haeckel (1887).

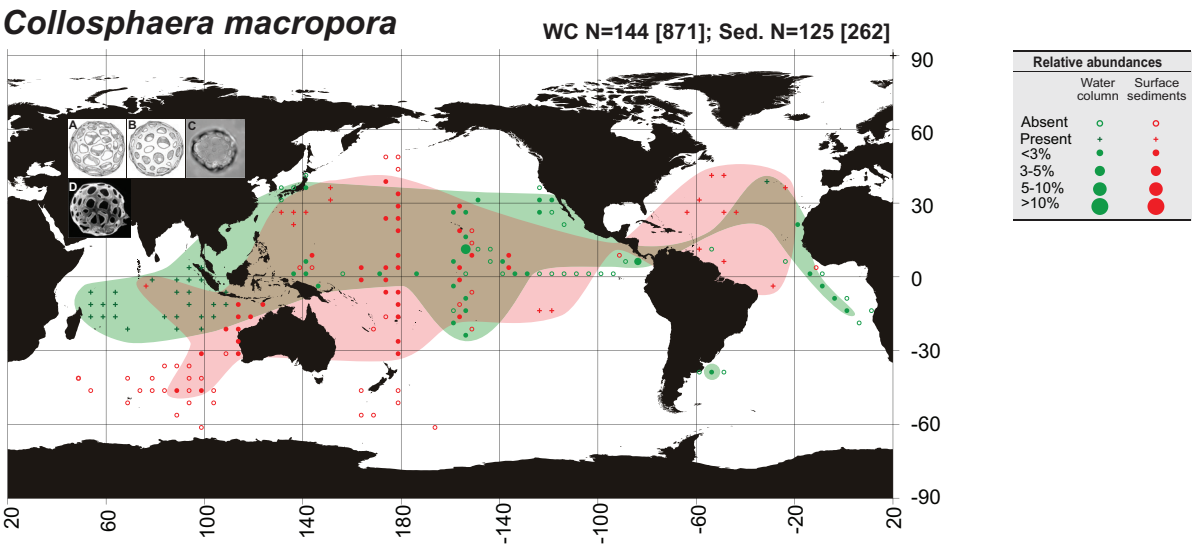


Figure 136. Geographic distribution of *Collosphaera macropora*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Dumitrica (1973); B, Dumitrica (1973); C, Original; D, Paverd (1995).

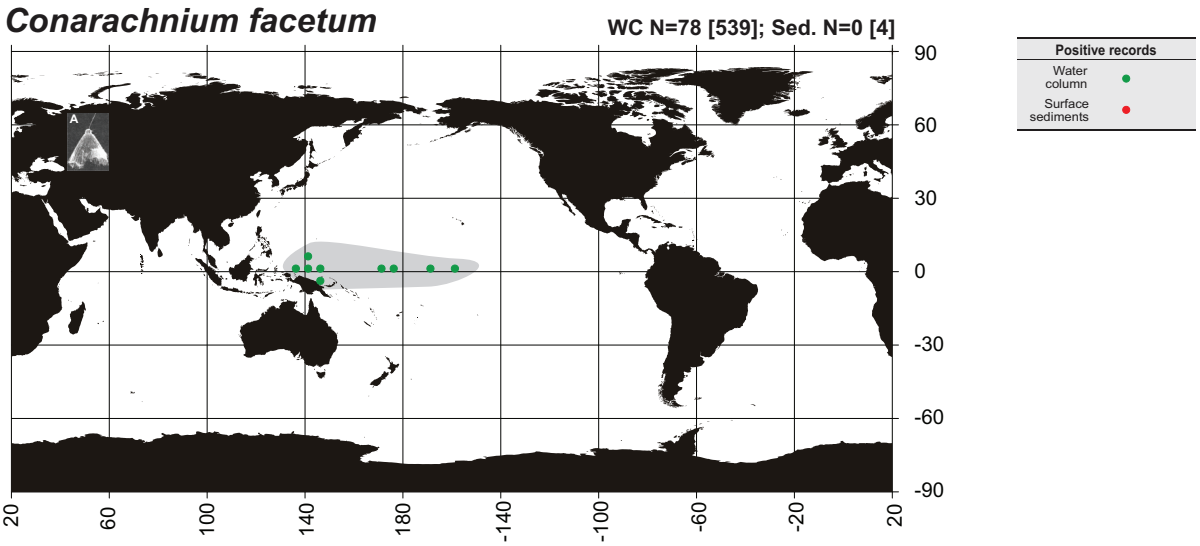


Figure 137. Geographic distribution of *Conarachnium facetum*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Takahashi (1991).

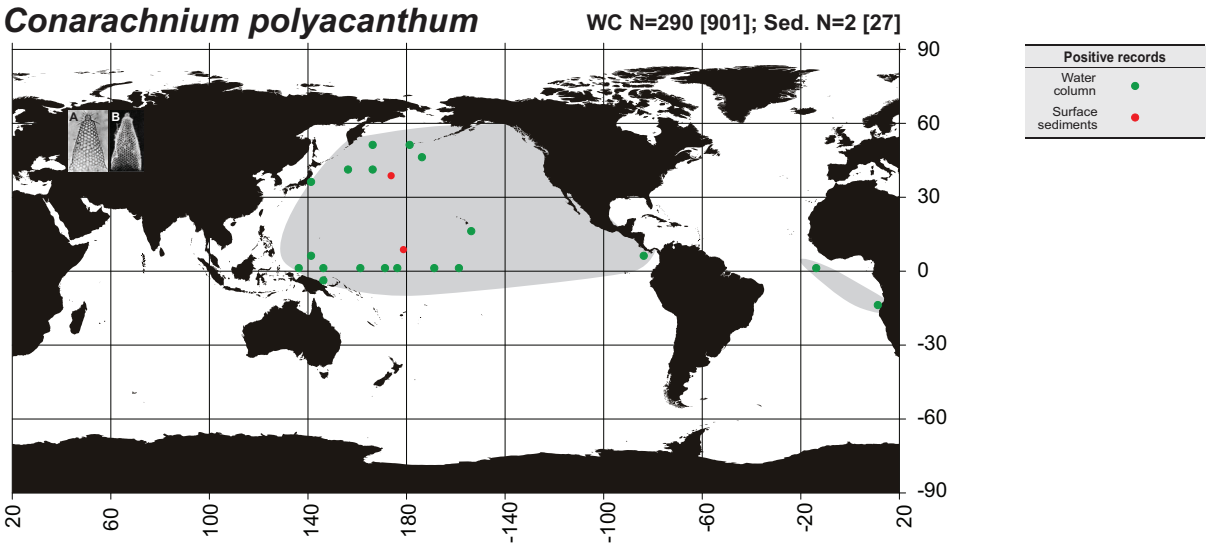


Figure 138. Geographic distribution of *Conarachnium polyacanthum*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Takahashi (1991); B, Takahashi (1991).

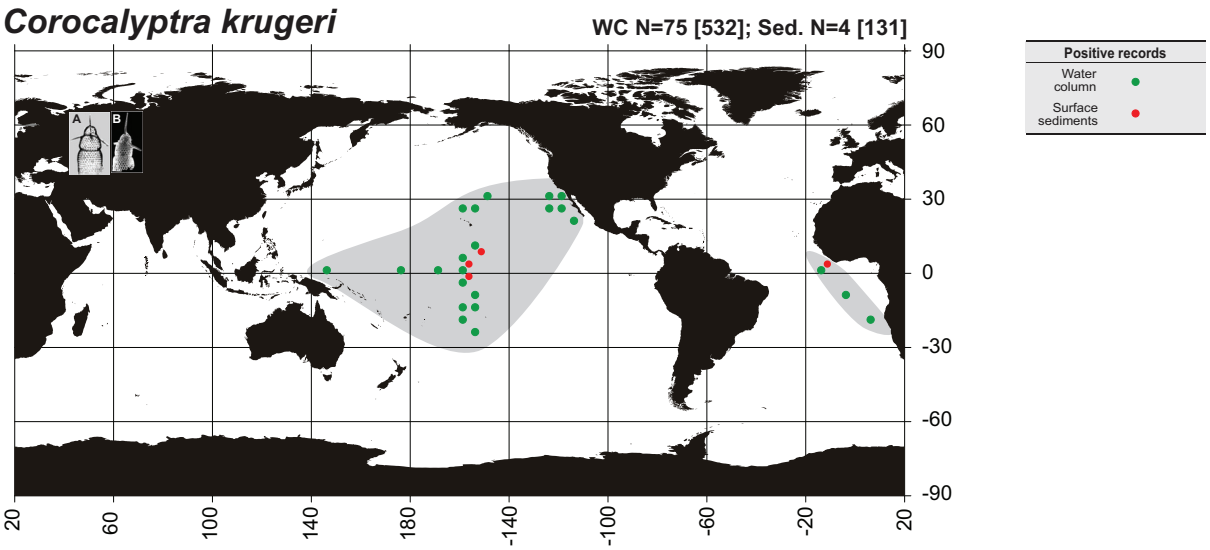


Figure 139. Geographic distribution of *Corocalyptra krugeri*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Boltovskoy (1999); B, Paverd (1995).

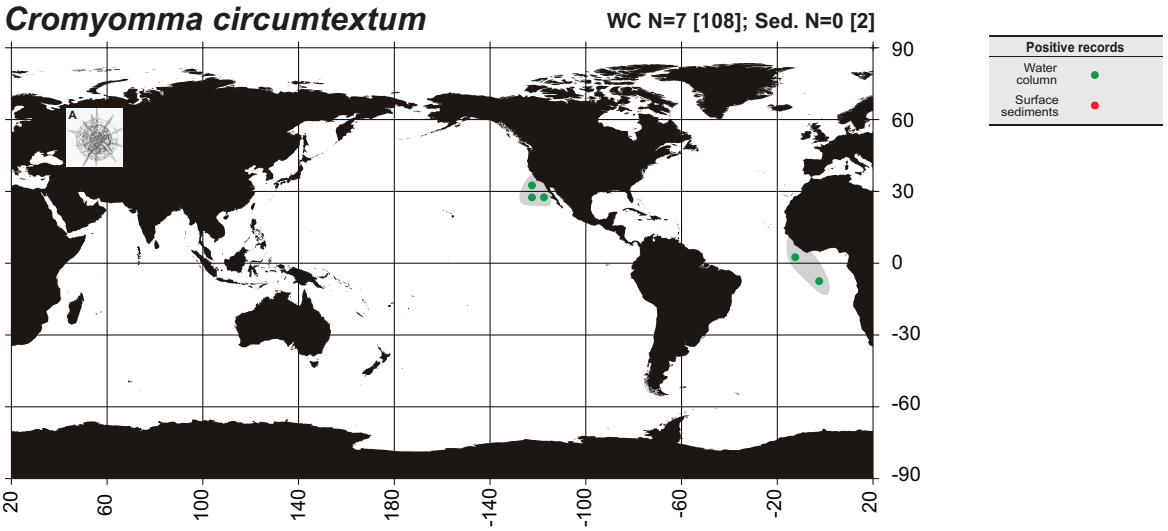


Figure 140. Geographic distribution of *Cromyomma circumtextum*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Haeckel (1887).

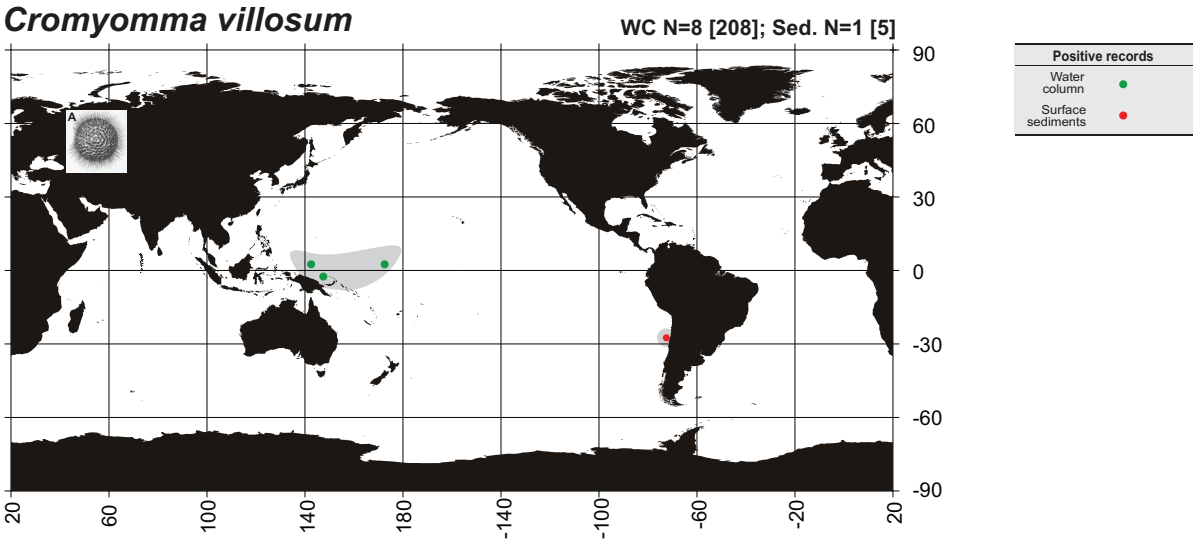


Figure 141. Geographic distribution of *Cromyomma villosum*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Haeckel (1887).

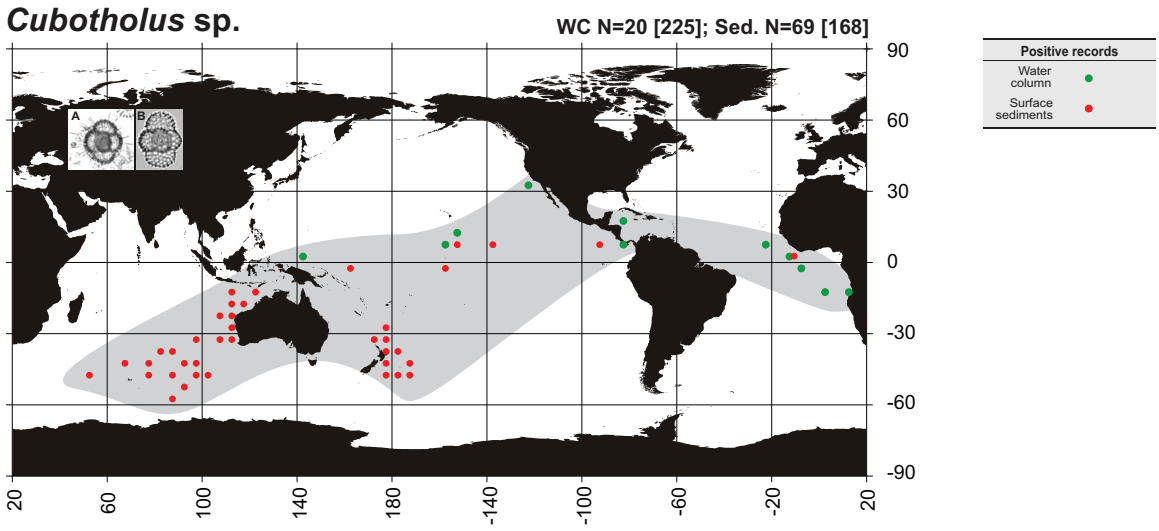


Figure 142. Geographic distribution of *Cubotholus* sp. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Original; B, Hollis and Neal (2005).

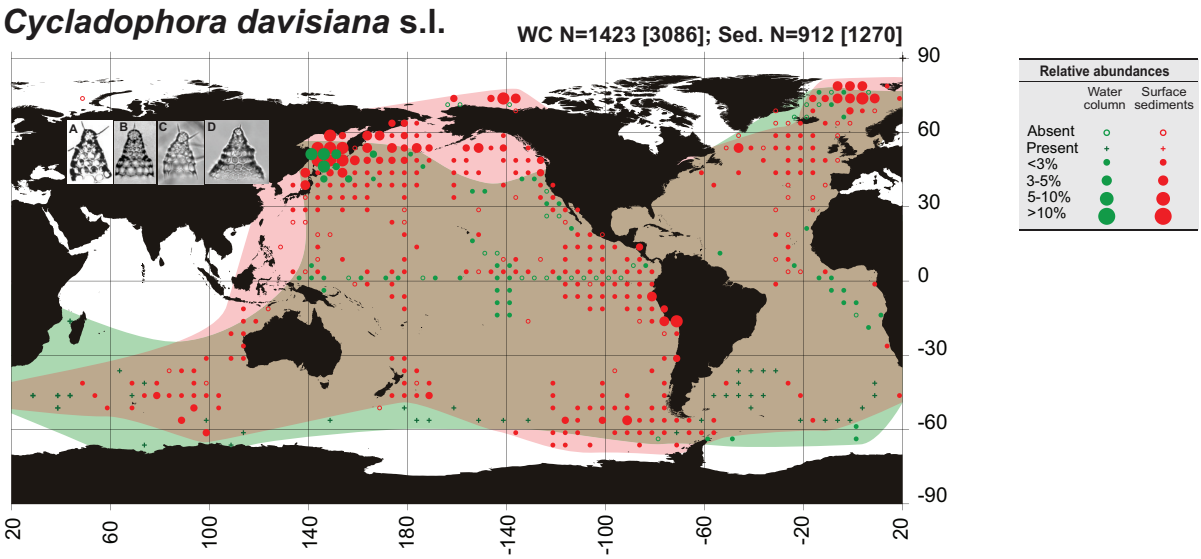


Figure 143. Geographic distribution of *Cycladophora davisiana*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Boltovskoy (1999); B, Bjørklund and Kruglikova (2003); C, Original; D, Original.

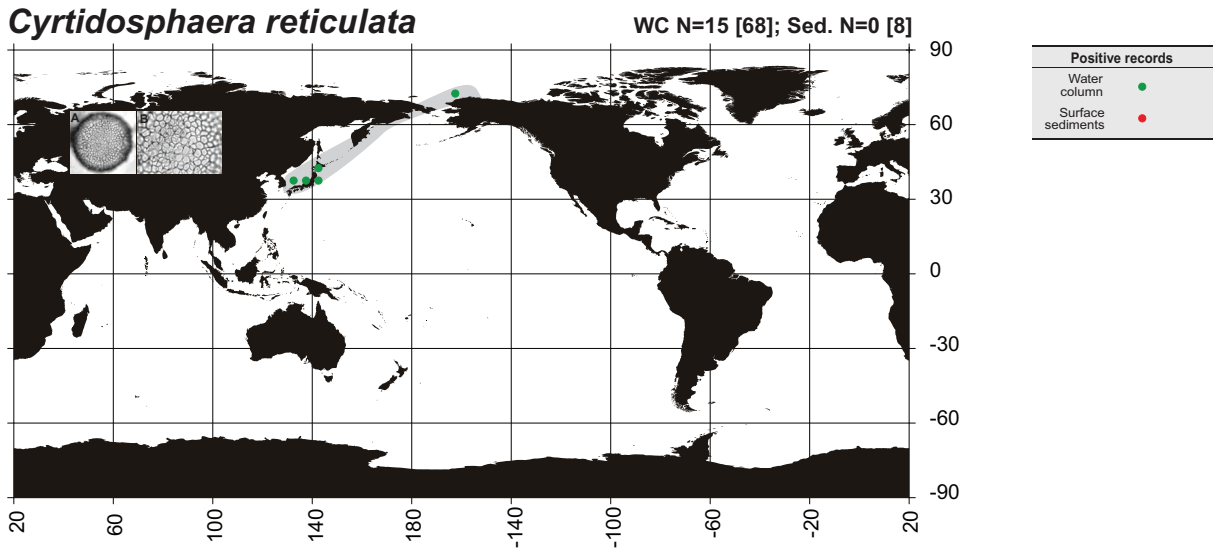


Figure 144. Geographic distribution of *Cyrtidosphaera reticulata*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Itaki (2009); B, Itaki (2009).

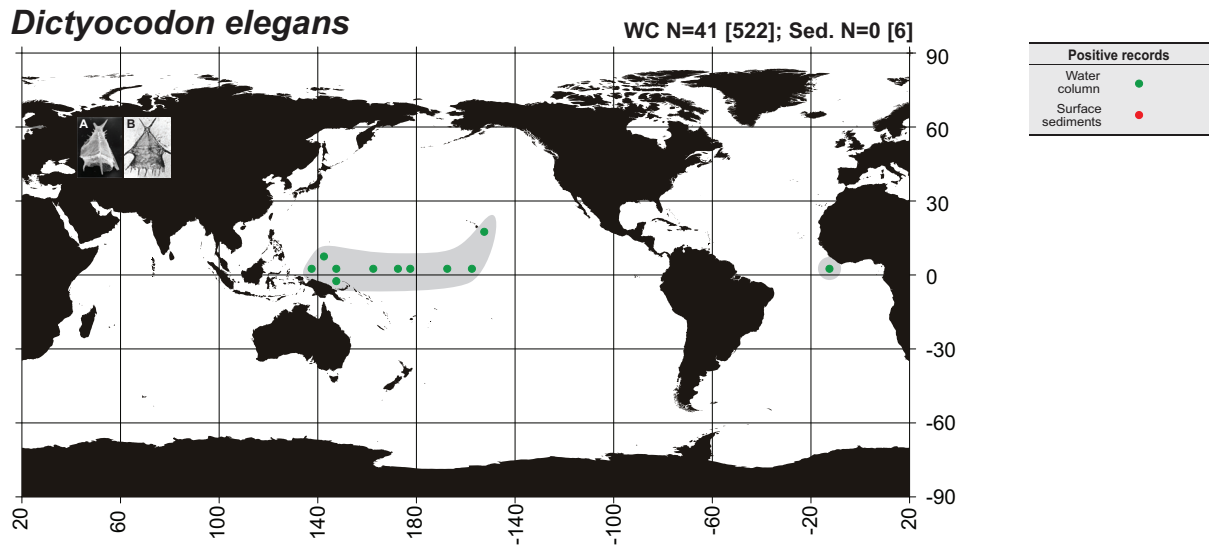


Figure 145. Geographic distribution of *Dictyocodon elegans*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Original; B, Takahashi (1991).

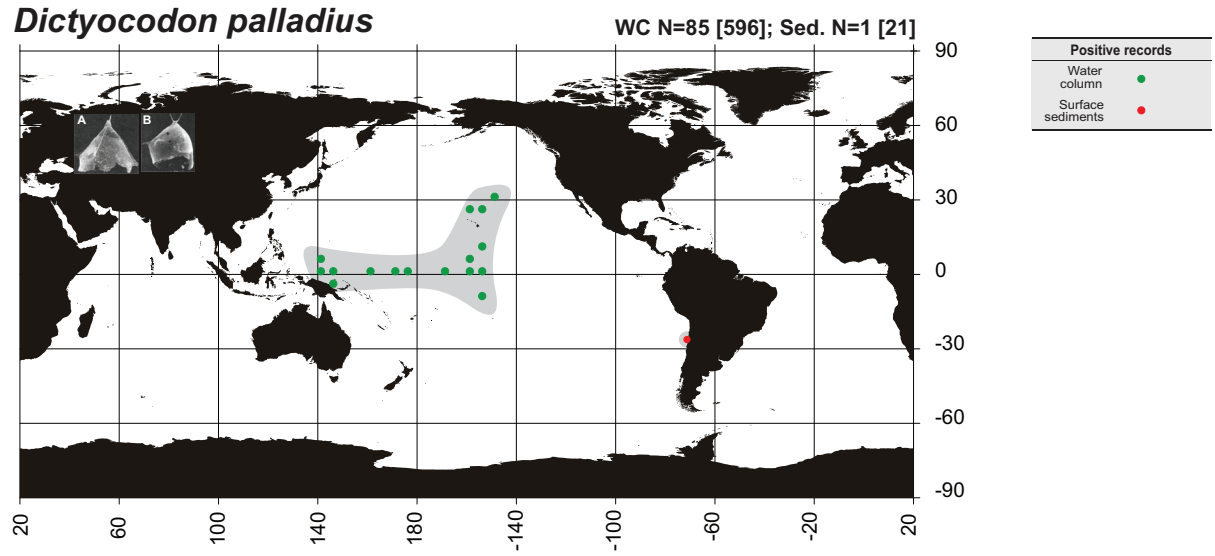


Figure 146. Geographic distribution of *Dictyocodon palladius*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Takahashi (1991); B, Takahashi (1991).

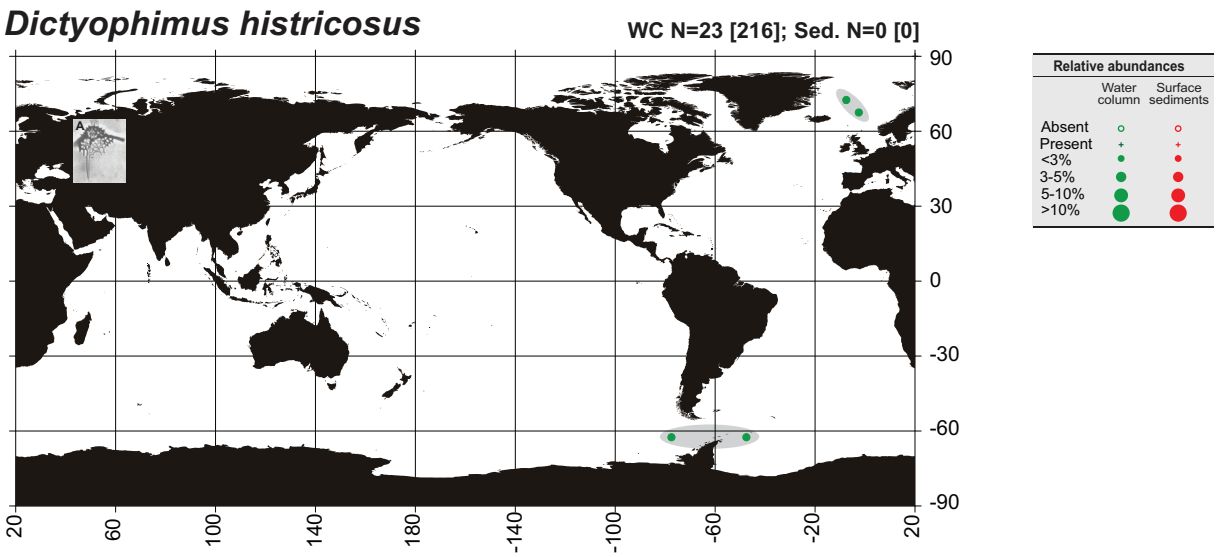


Figure 147. Geographic distribution of *Dictyophimus histricosus*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Schröder-Ritzrau (1995).

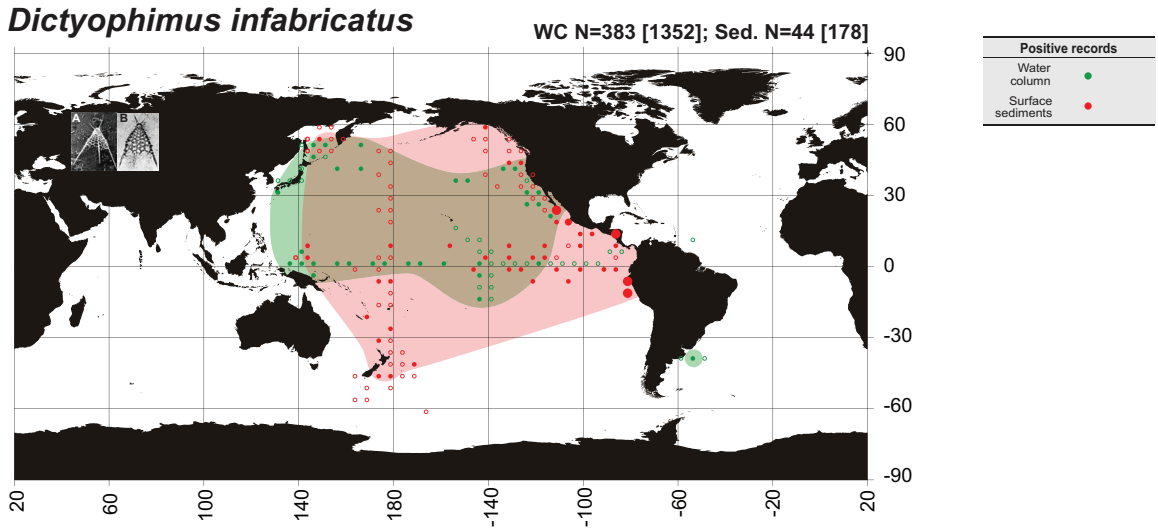


Figure 148. Geographic distribution of *Dictyophimus infabricatus*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Takahashi (1991); B, Takahashi (1991).

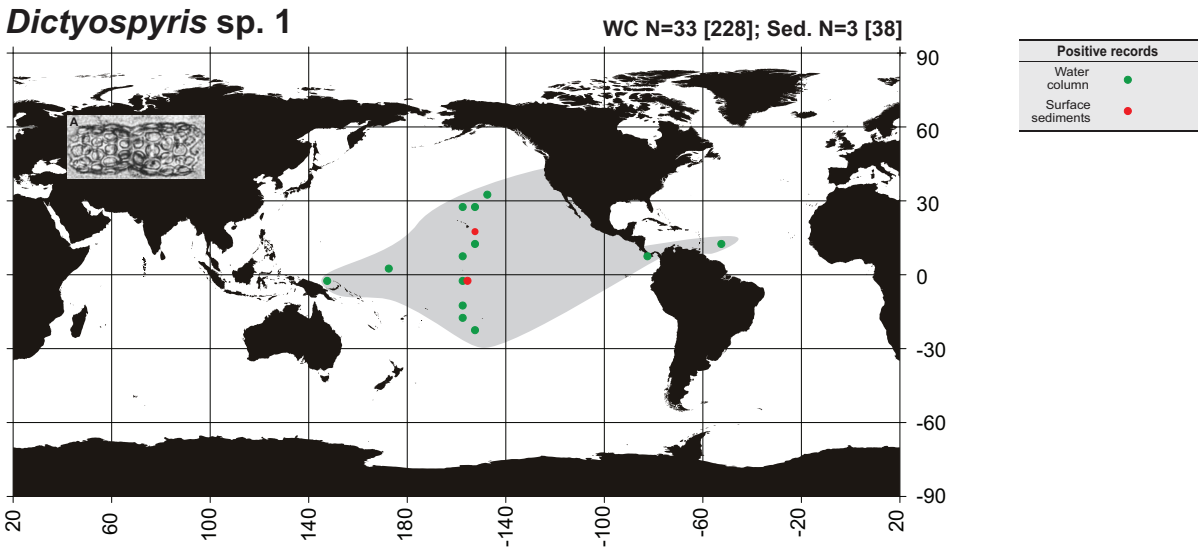


Figure 149. Geographic distribution of *Dictyospyris* sp. 1. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Takahashi (1991).

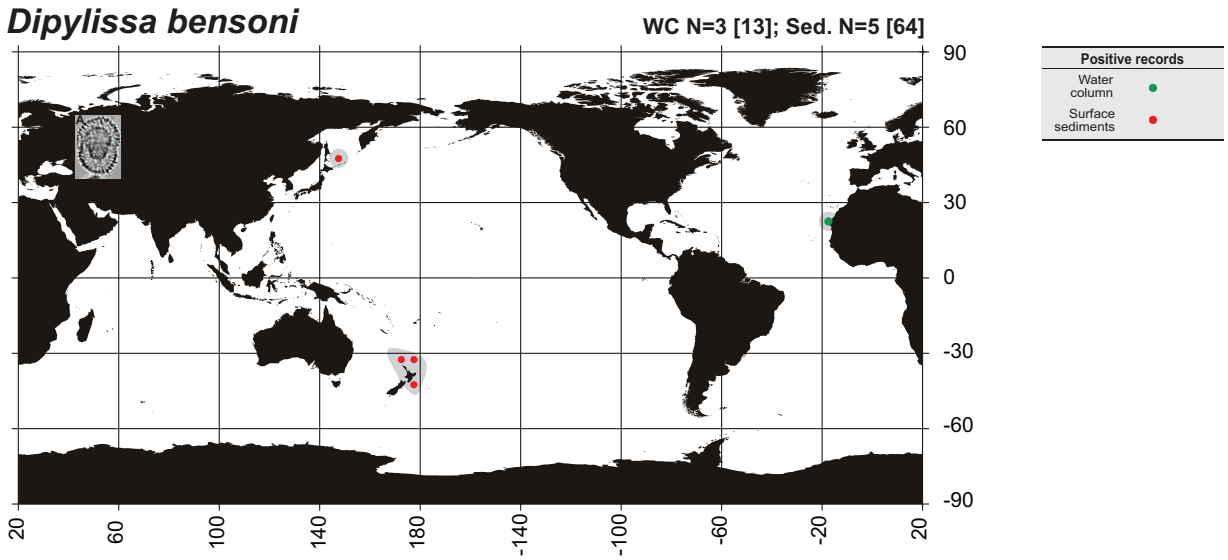


Figure 150. Geographic distribution of *Dipylissa bensoni*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Hollis and Neal (2005).

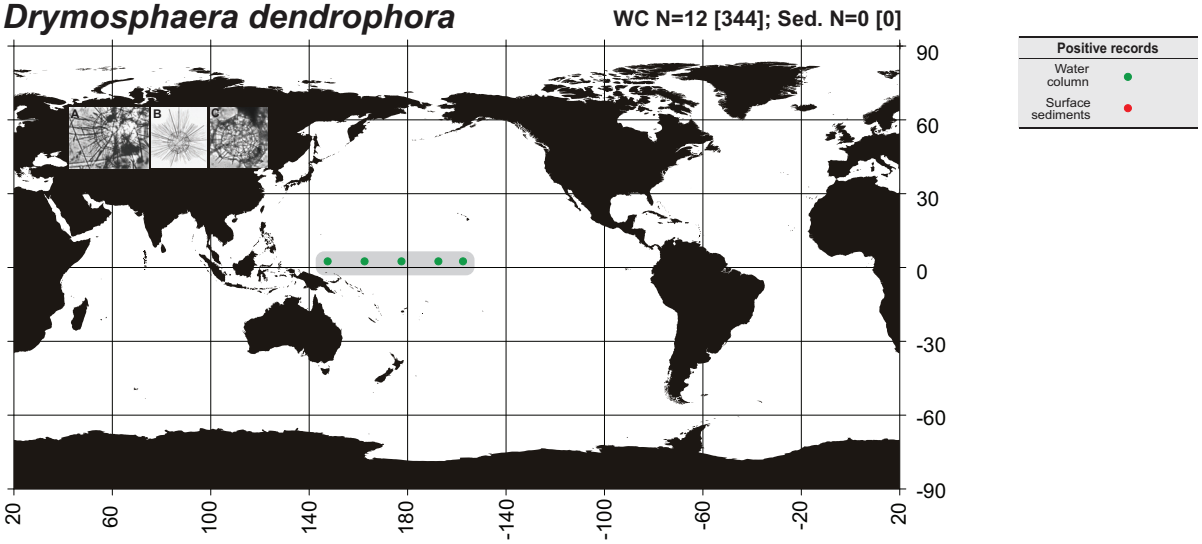


Figure 151. Geographic distribution of *Drymosphaera dendrophora*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Takahashi (1991); B, Haeckel (1887); C, Original.

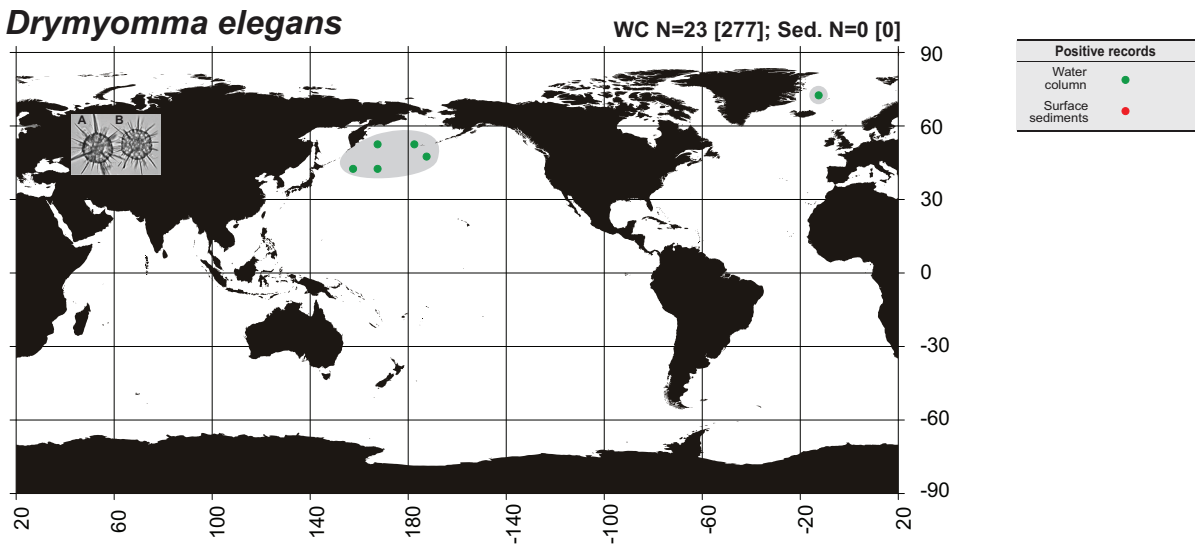


Figure 152. Geographic distribution of *Drymyomma elegans*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Radiolaria.org (photo K. Bjørklund).

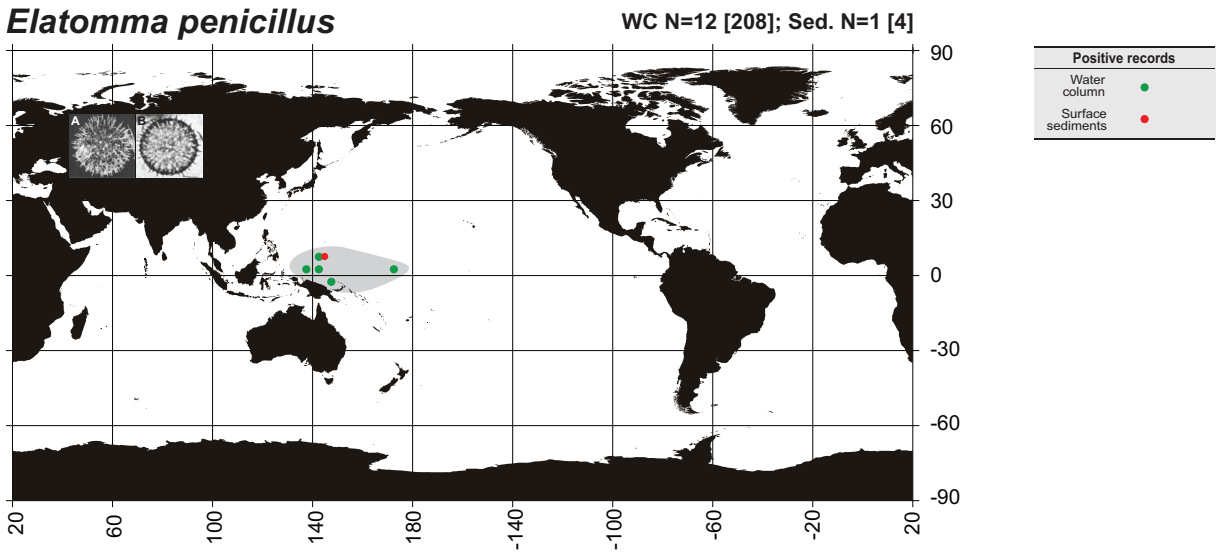


Figure 153. Geographic distribution of *Elatomma penicillus*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Takahashi (1991); B, Takahashi (1991).

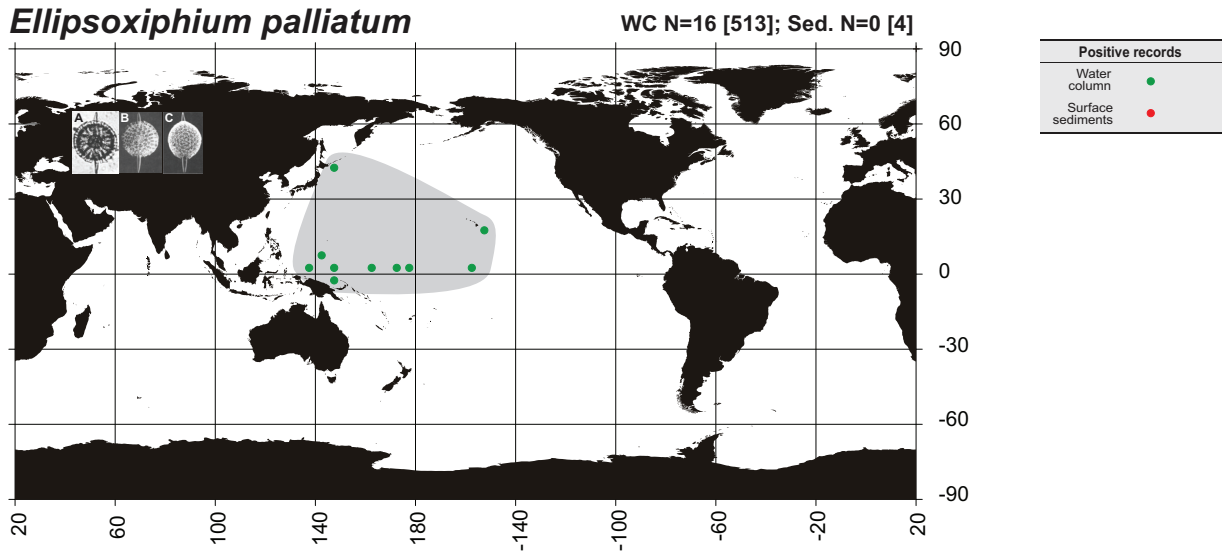


Figure 154. Geographic distribution of *Ellipsoxiphium palliatum*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Takahashi (1991); B, Takahashi (1991); C, Takahashi (1991).

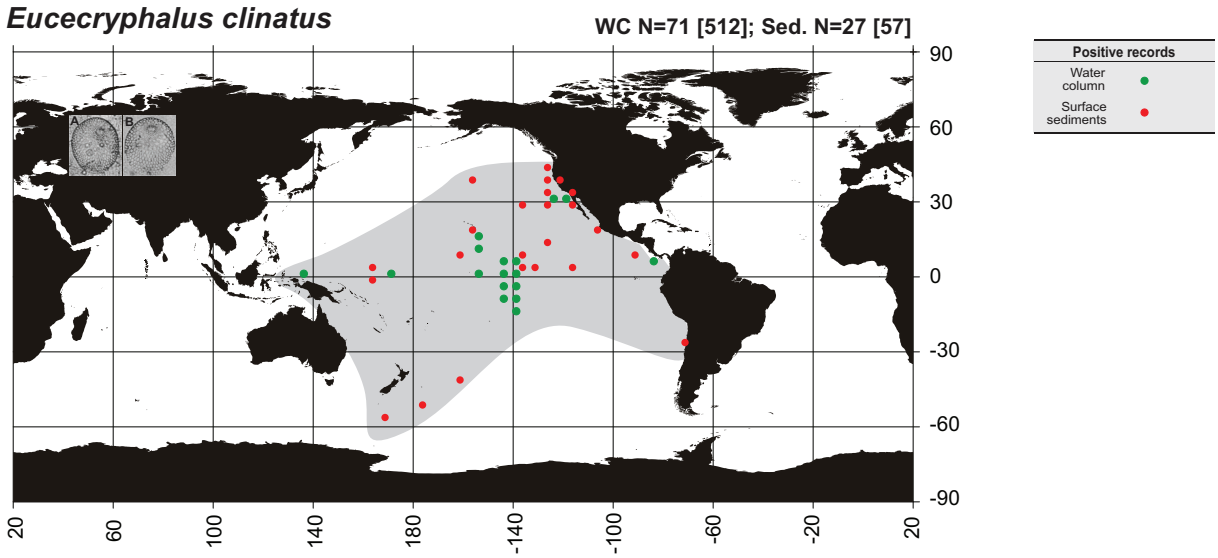


Figure 155. Geographic distribution of *Eucecryphalus clinatus*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Takahashi (1991); B, Takahashi (1991).

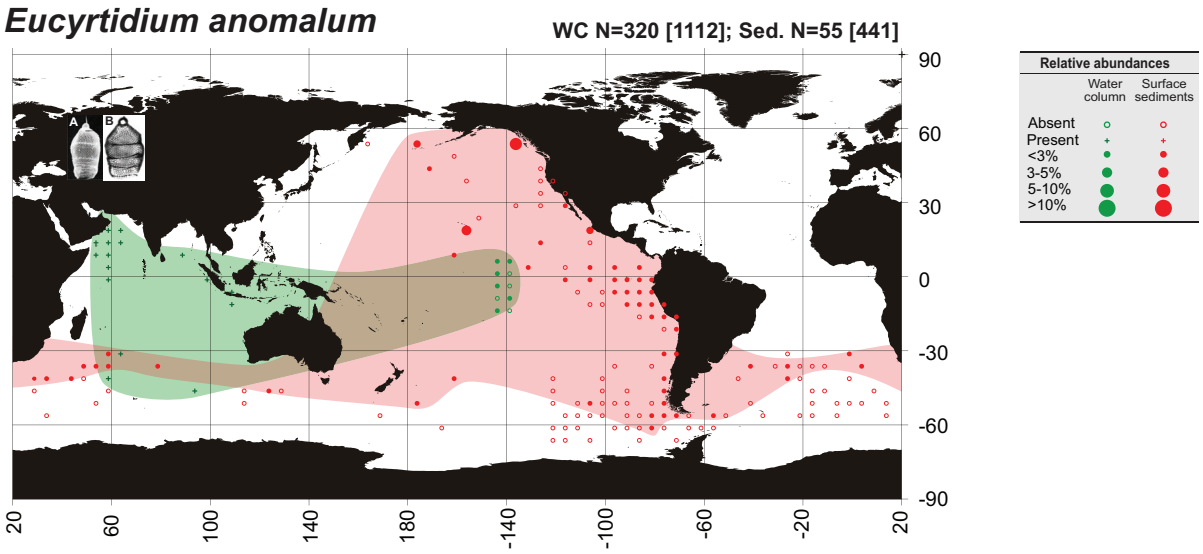


Figure 156. Geographic distribution of *Eucyrtidium anomalum*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Takahashi (1991); B, Boltovskoy (1999).

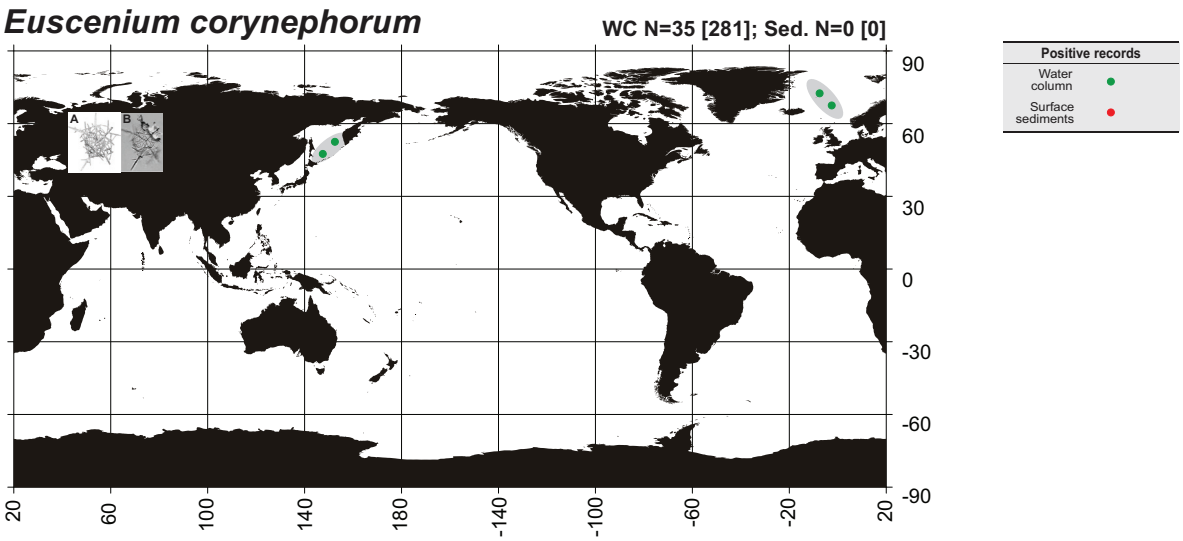


Figure 157. Geographic distribution of *Euscenium corynephorum*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Jorgensen (1905); B, Radiolaria.org (photo K. Bjørklund).

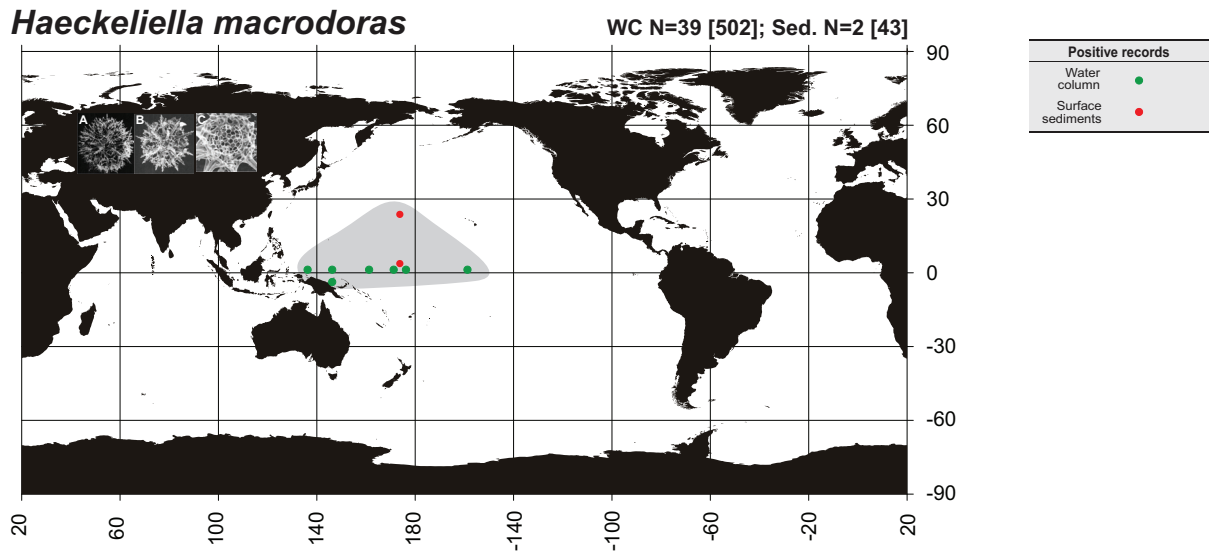


Figure 158. Geographic distribution of *Haeckeliella macrodoras*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Takahashi (1991); B, Takahashi (1991); C, Takahashi (1991).

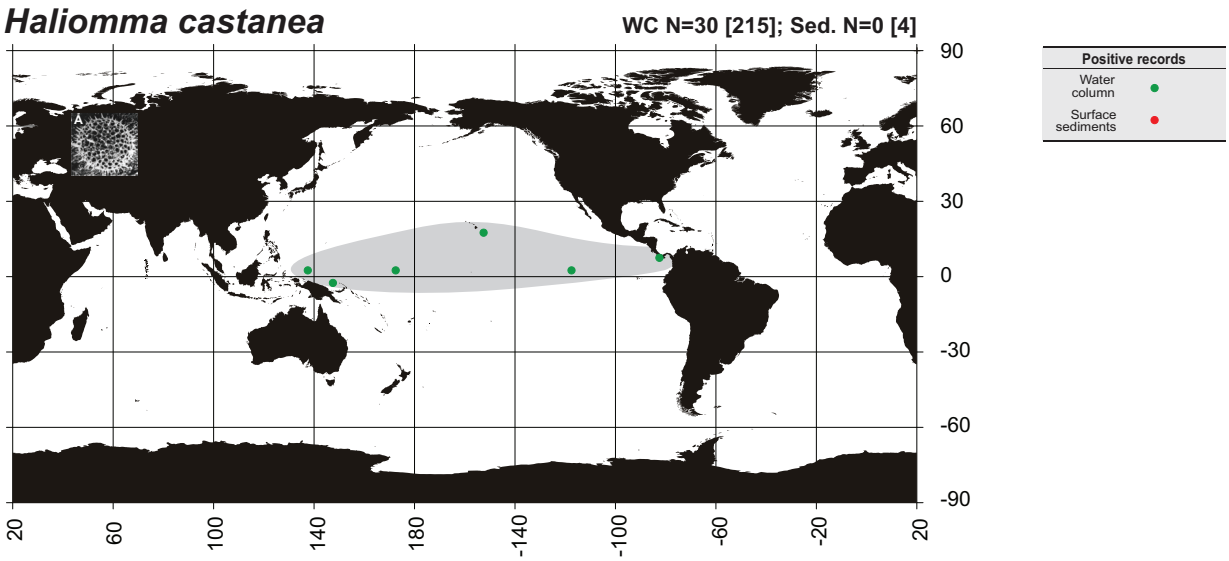


Figure 159. Geographic distribution of *Haliomma castanea*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Takahashi (1991).

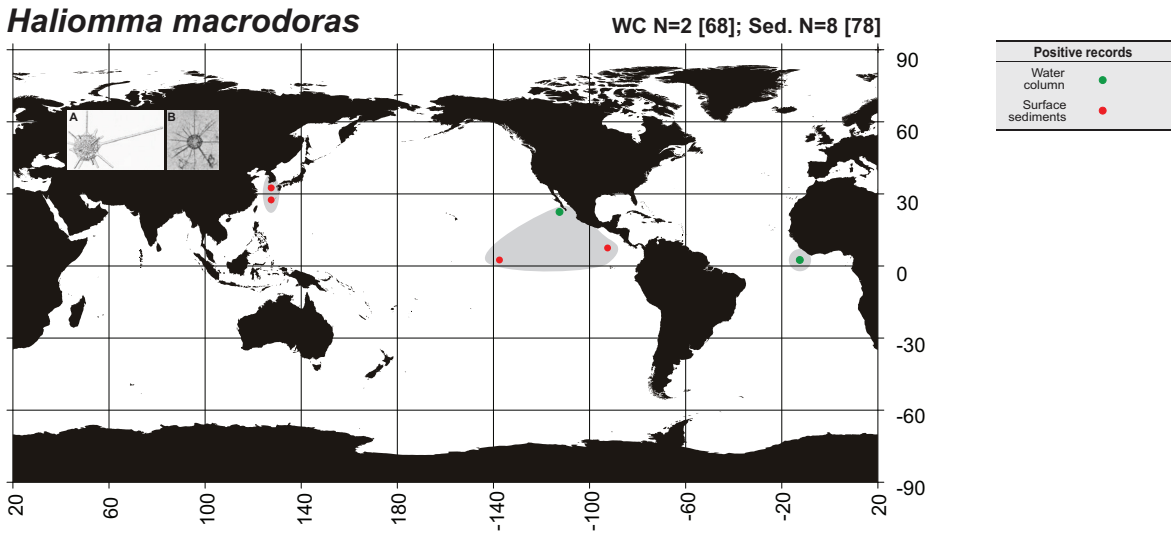


Figure 160. Geographic distribution of *Haliomma macrodoras*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Haeckel (1887); B, Boltovskoy and Riedel (1987).

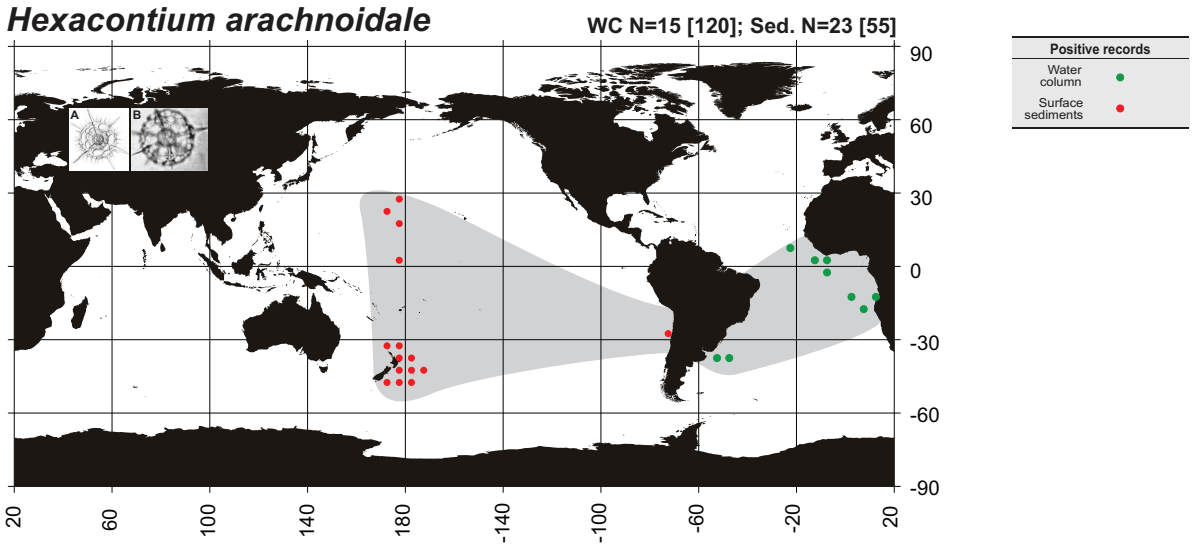


Figure 161. Geographic distribution of *Hexacontium arachnoidale*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Hollande and Enjumet (1960); B, Boltovskoy and Riedel (1987).

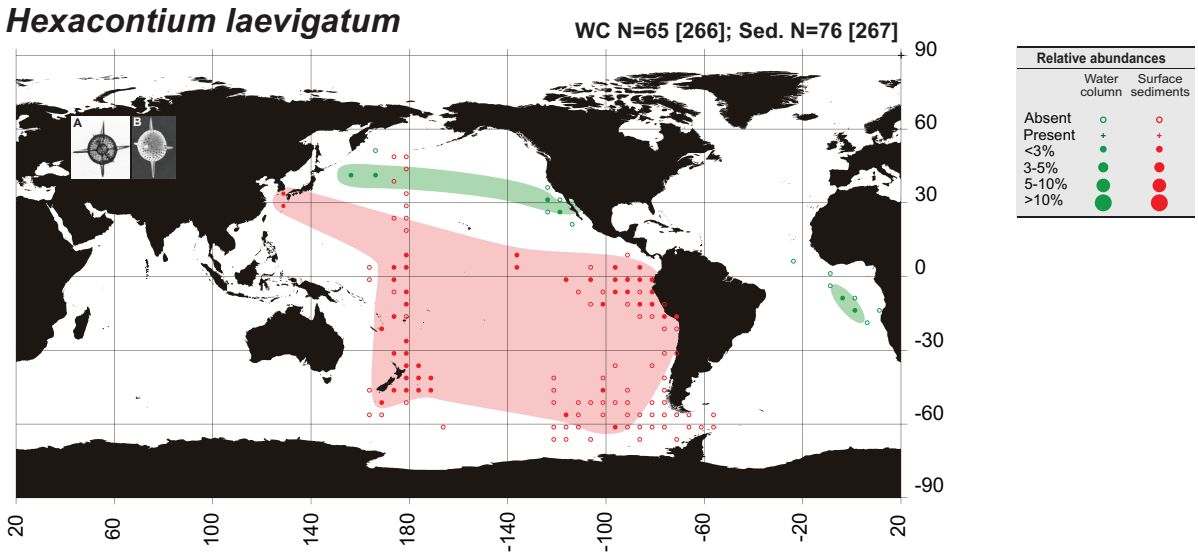


Figure 162. Geographic distribution of *Hexacontium laevigatum*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Benson (1966); B, Paverd (1995).

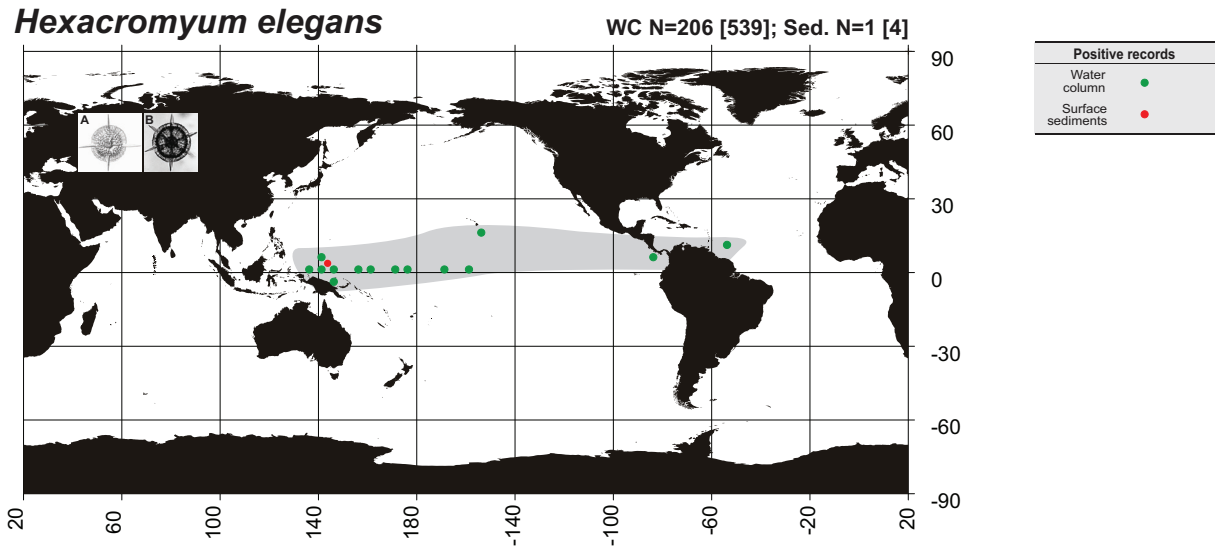


Figure 163. Geographic distribution of *Hexacromyum elegans*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Haeckel (1887); B, Takahashi (1991).

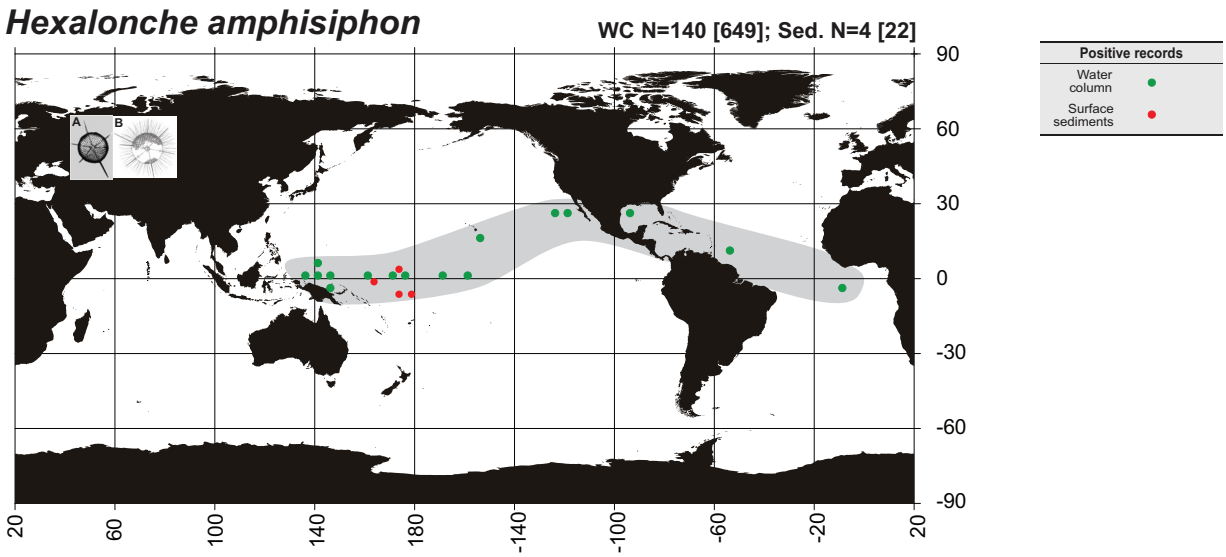


Figure 164. Geographic distribution of *Hexalonche amphisiphon*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Boltovskoy (1999); B, Hollande and Enjumet (1960).

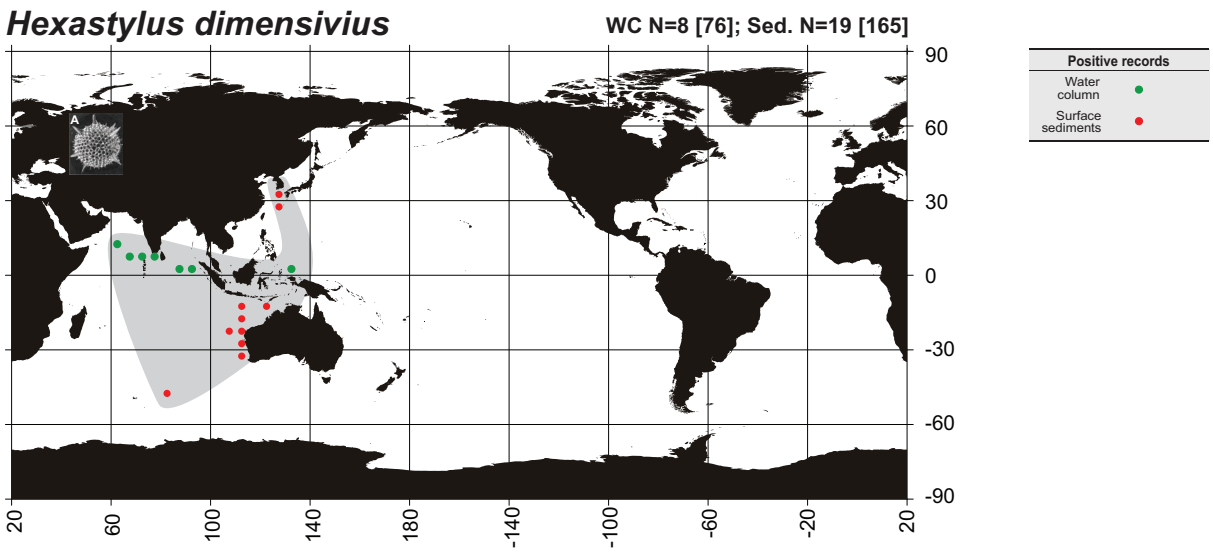


Figure 165. Geographic distribution of *Hexastylus dimensivius*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Paverd (1995).

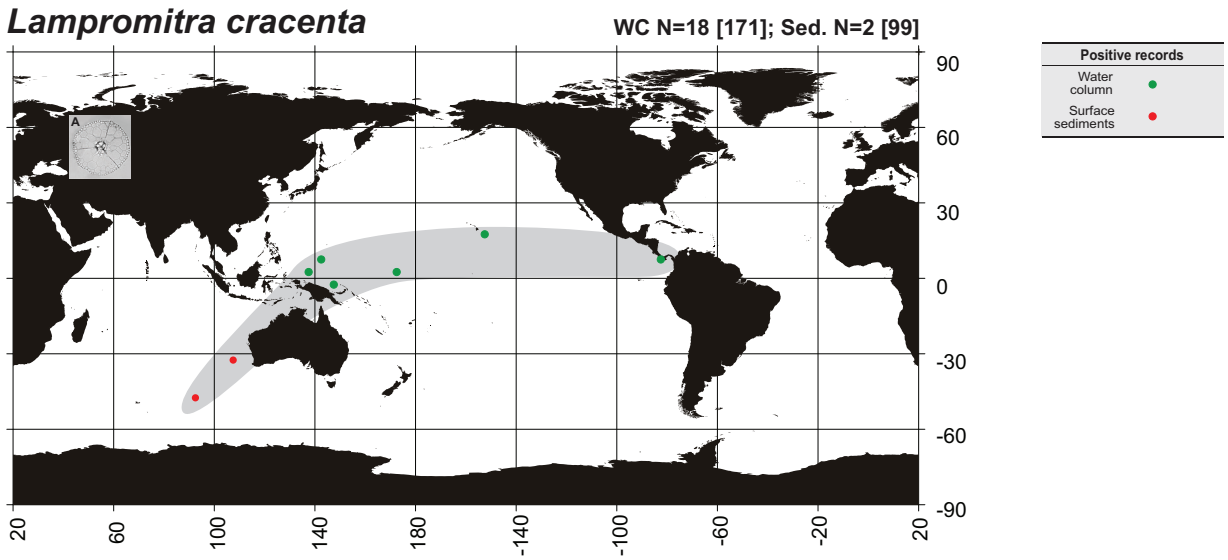


Figure 166. Geographic distribution of *Lampromitra cracenta*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Original.

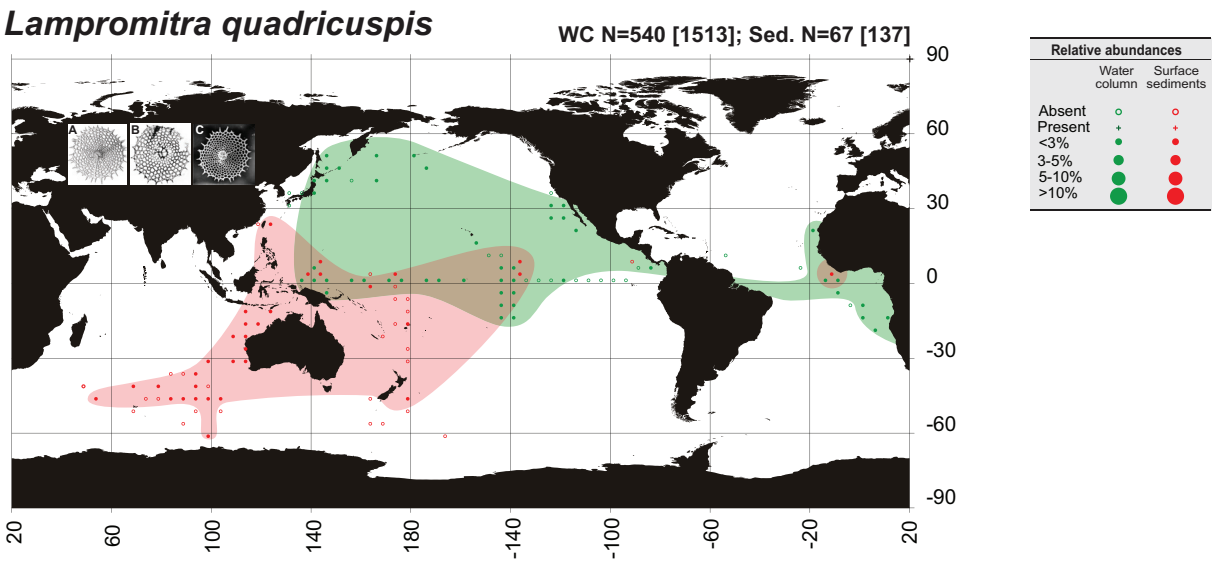


Figure 167. Geographic distribution of *Lampromitra quadricuspis*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Haeckel (1887); B, Boltovskoy (1999); C, Original.

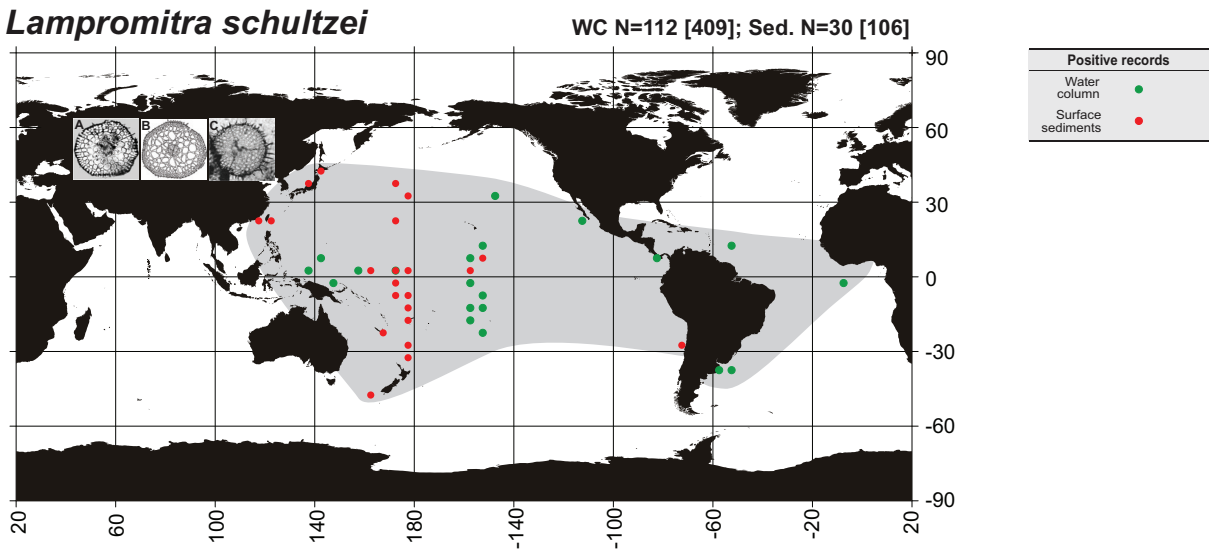


Figure 168. Geographic distribution of *Lampromitra schultzei*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Boltovskoy (1999); B, Boltovskoy (1999); C, Takahashi (1991).

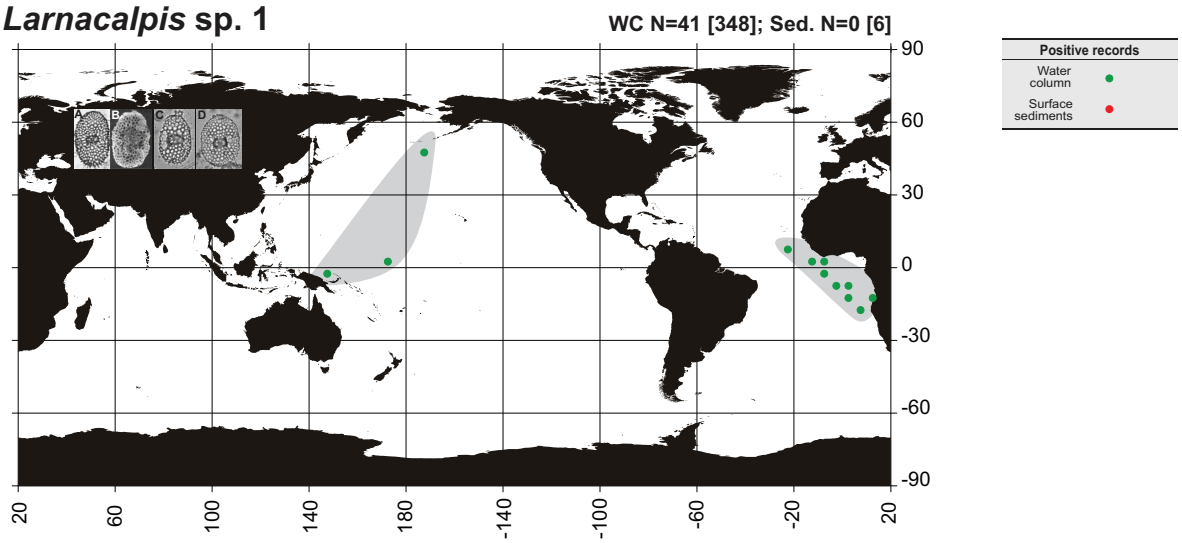


Figure 169. Geographic distribution of *Larnacalpis* sp. 1. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Takahashi (1991); B, Takahashi (1991); C, Original; D, Original.

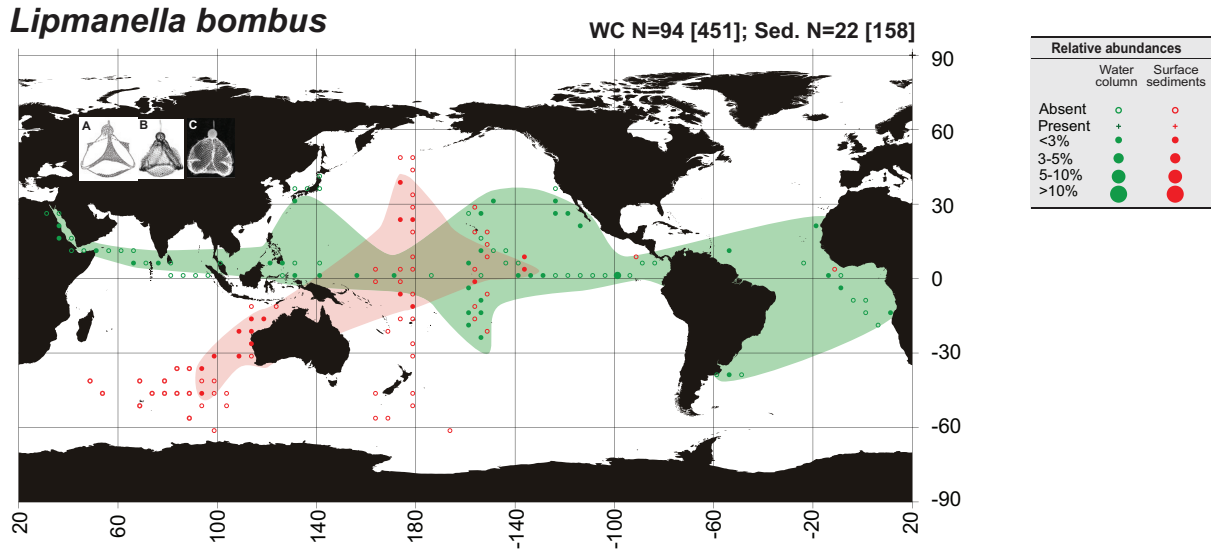


Figure 170. Geographic distribution of *Lipmanella bombus*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Petrushevskaya (1971); B, Boltovskoy (1999); C, Takahashi (1991).

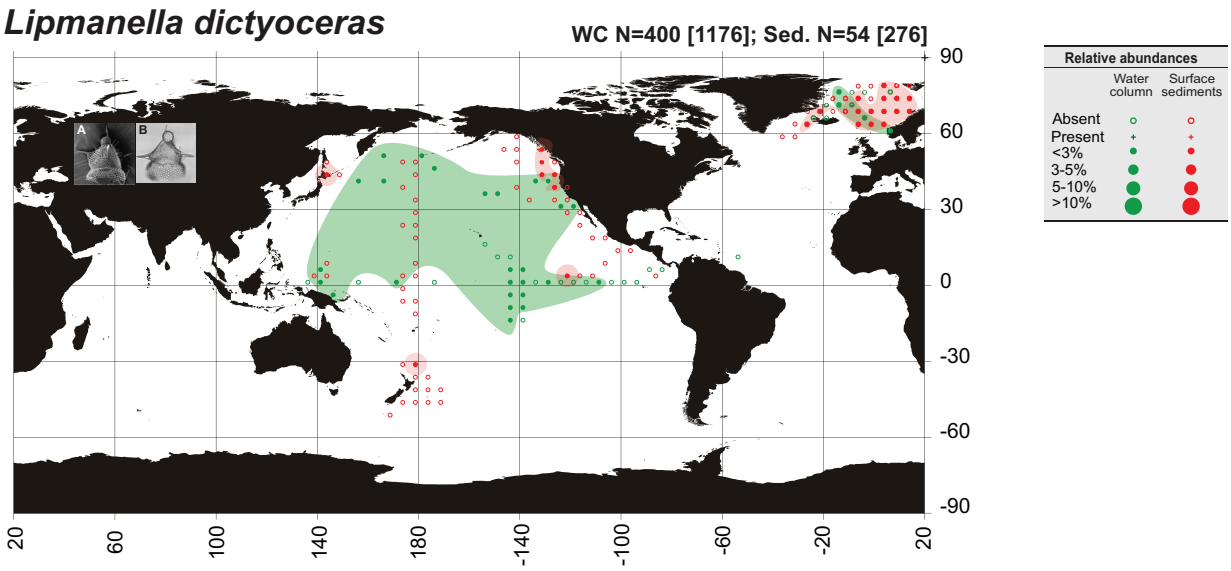


Figure 171. Geographic distribution of *Lipmanella dictyoceras*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Matsuoka (2009); B, Original.

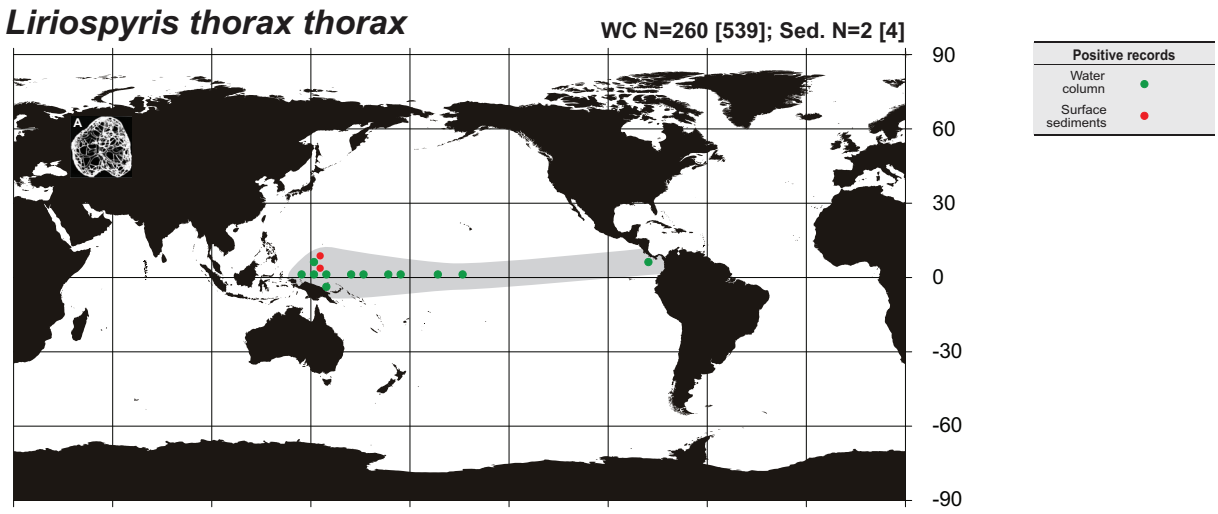


Figure 172. Geographic distribution of *Liriospyris thorax thorax*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Takahashi (1991).

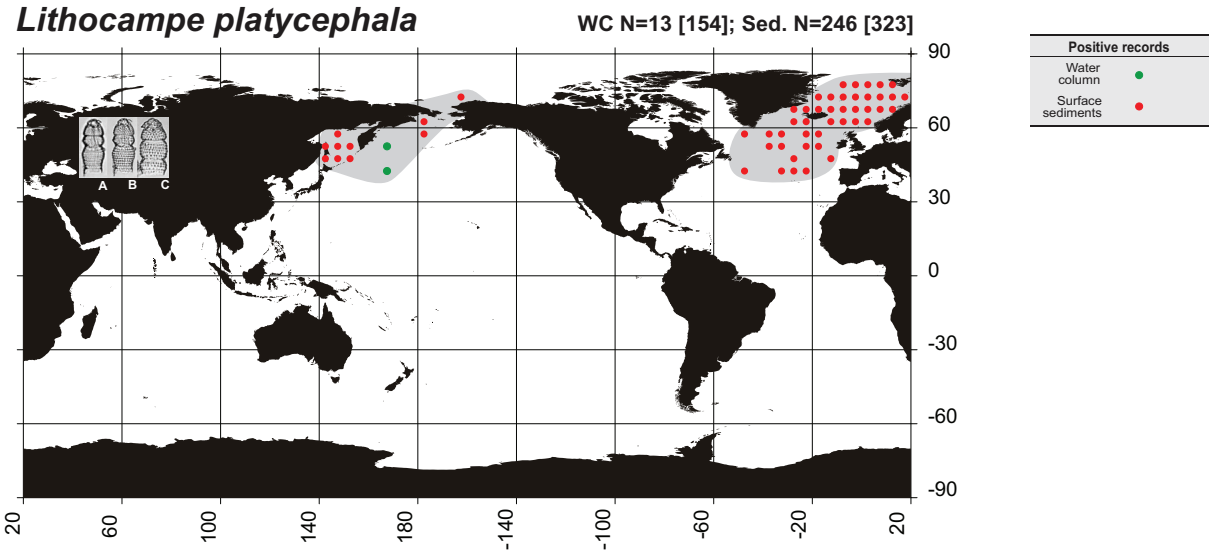


Figure 173. Geographic distribution of *Lithocampe platycephala*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Cortese et al. (2003); B, Cortese et al. (2003); C, Cortese et al. (2003).

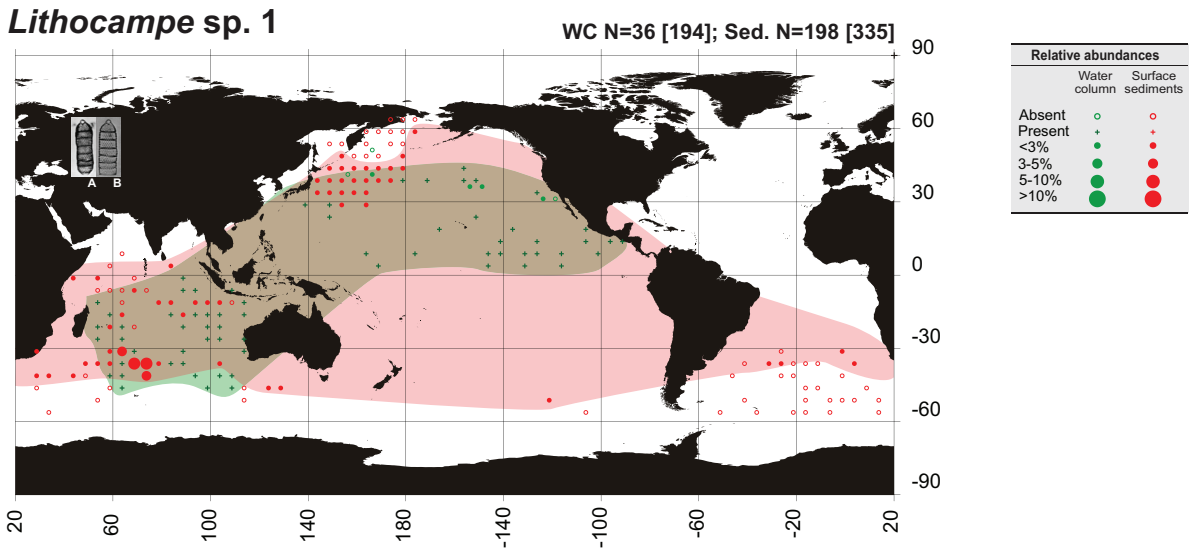


Figure 174. Geographic distribution of *Lithocampe* sp. 1. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Nigrini (1967); B, Nigrini (1967).

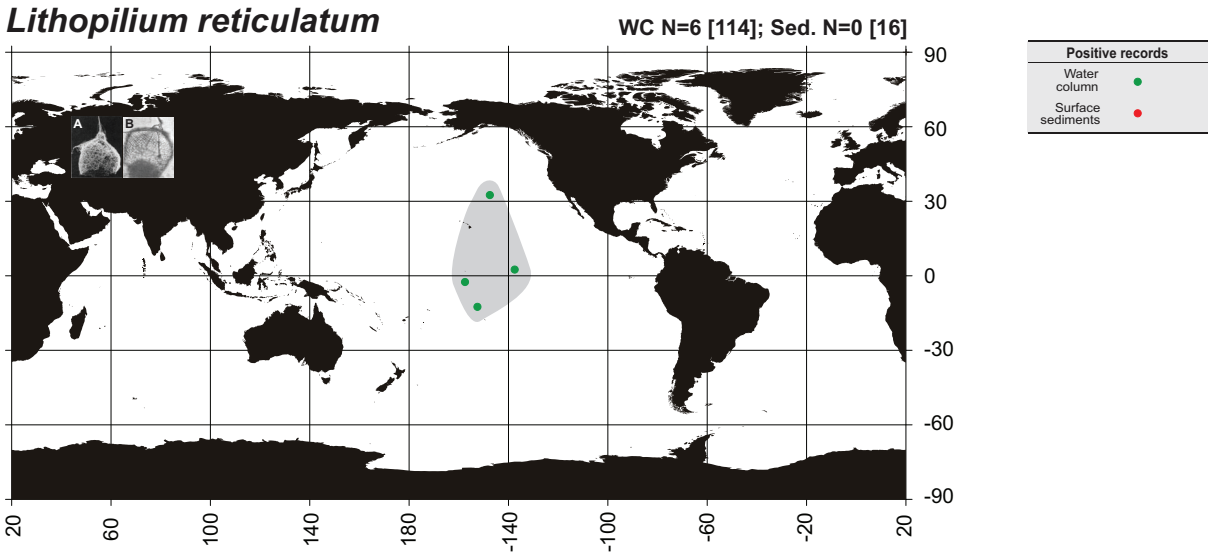


Figure 175. Geographic distribution of *Lithopilium reticulatum*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Takahashi (1991); B, Boltovskoy and Jankilevich (1985).

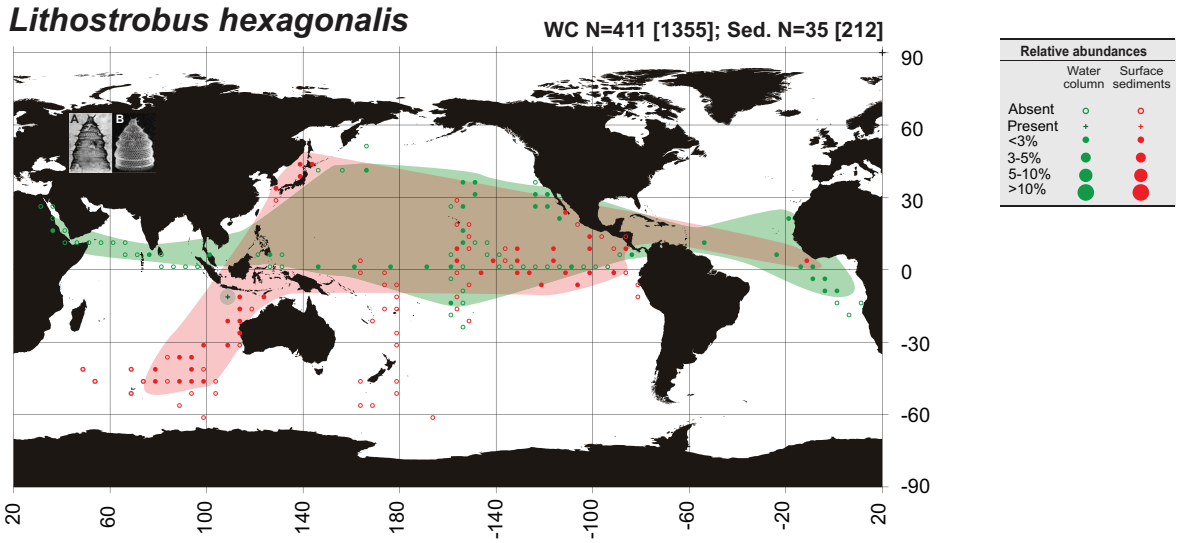


Figure 176. Geographic distribution of *Lithostrobus hexagonalis*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Takahashi (1991); B, Takahashi (1991).

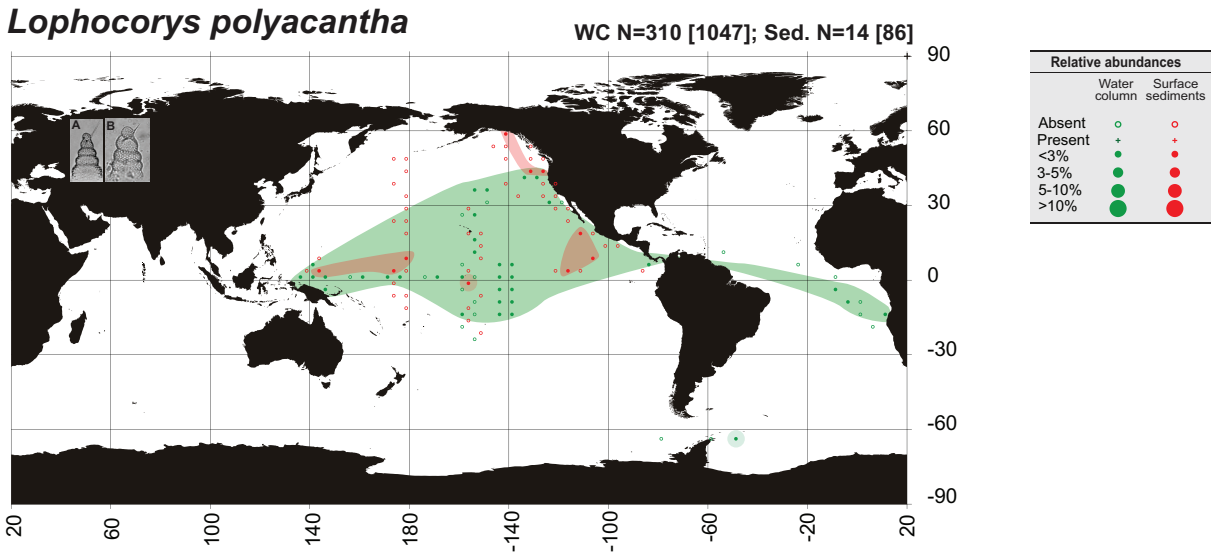


Figure 177. Geographic distribution of *Lophocorys polyacantha*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Welling (1997); B, Original.

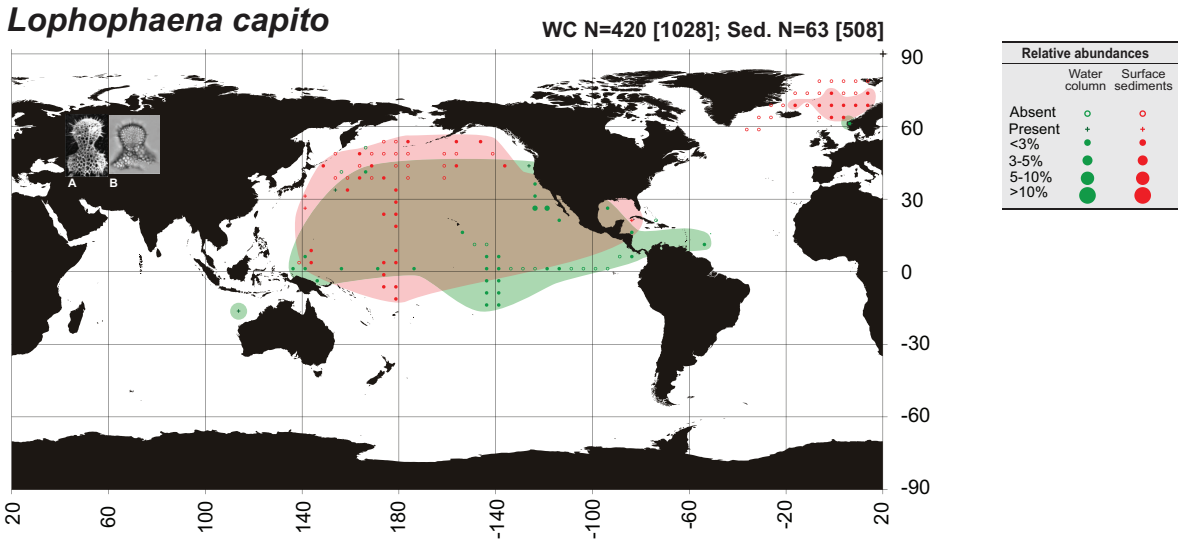


Figure 178. Geographic distribution of *Lophophaena capito*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Takahashi (1991); B, Original.

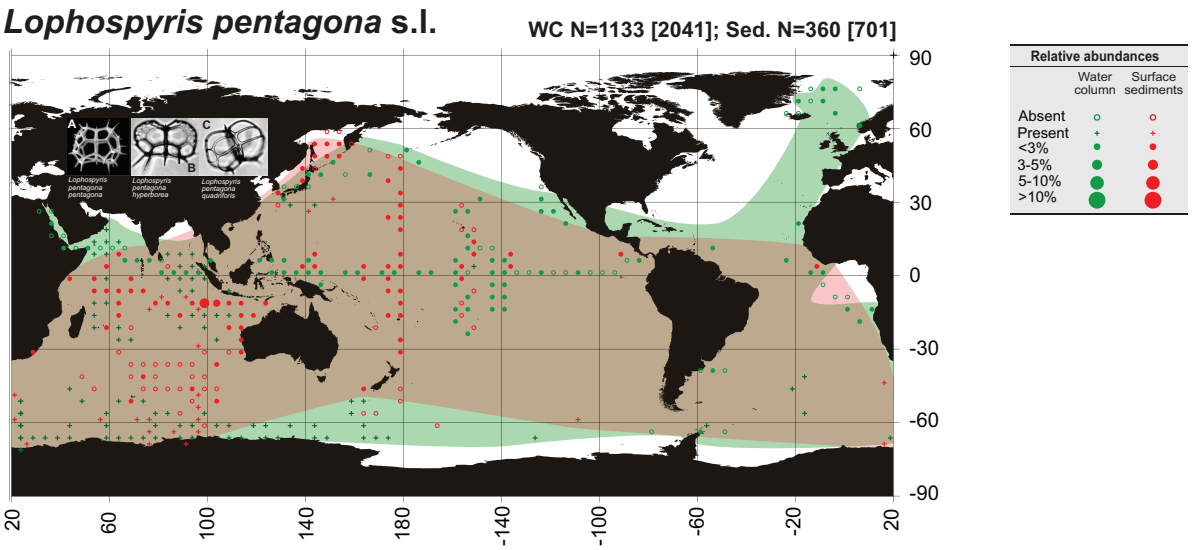


Figure 179. Geographic distribution of *Lophospyris pentagona* s.l. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Original; B, Goll (1976); C, Goll (1976).

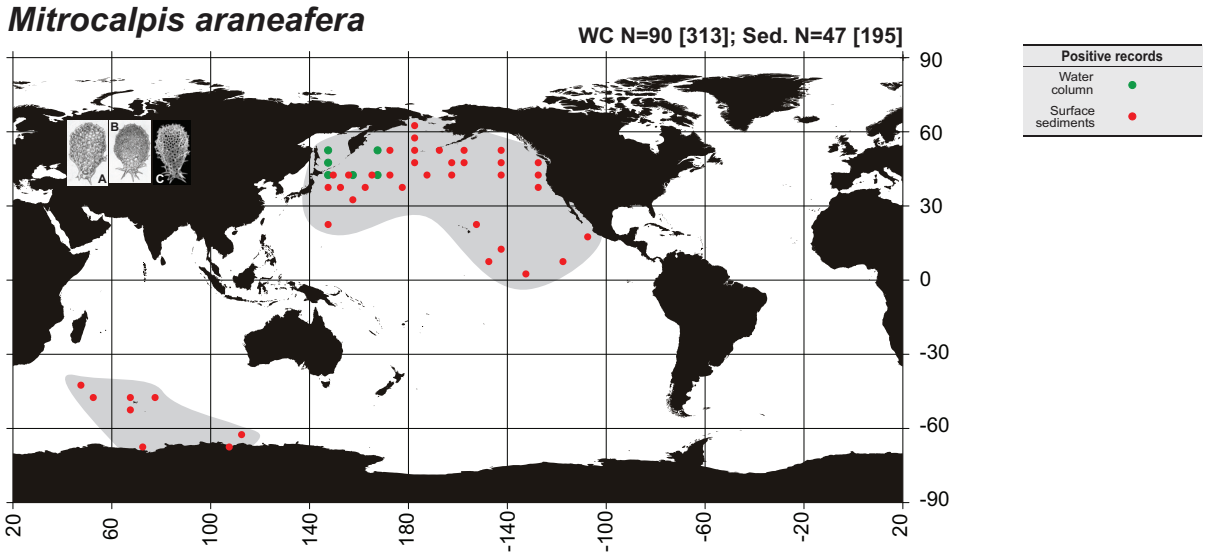


Figure 180. Geographic distribution of *Mitrocalpis araneafera*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Riedel (1958); B, Riedel (1958); C, Original.

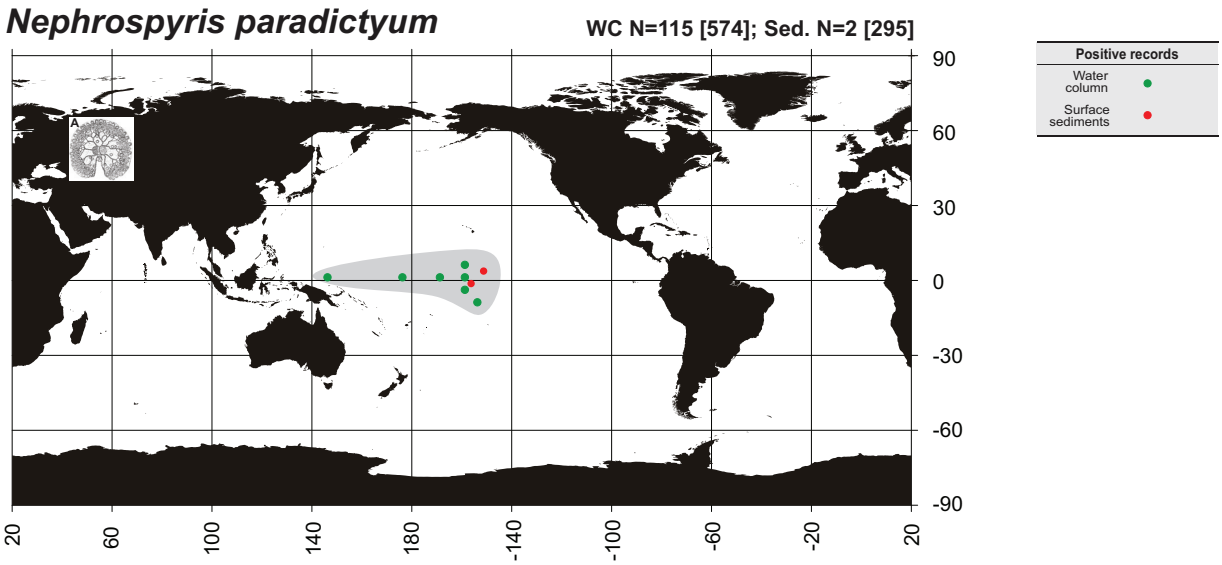


Figure 181. Geographic distribution of *Nephrospyris paradictyum*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Petrushevskaya (1971).

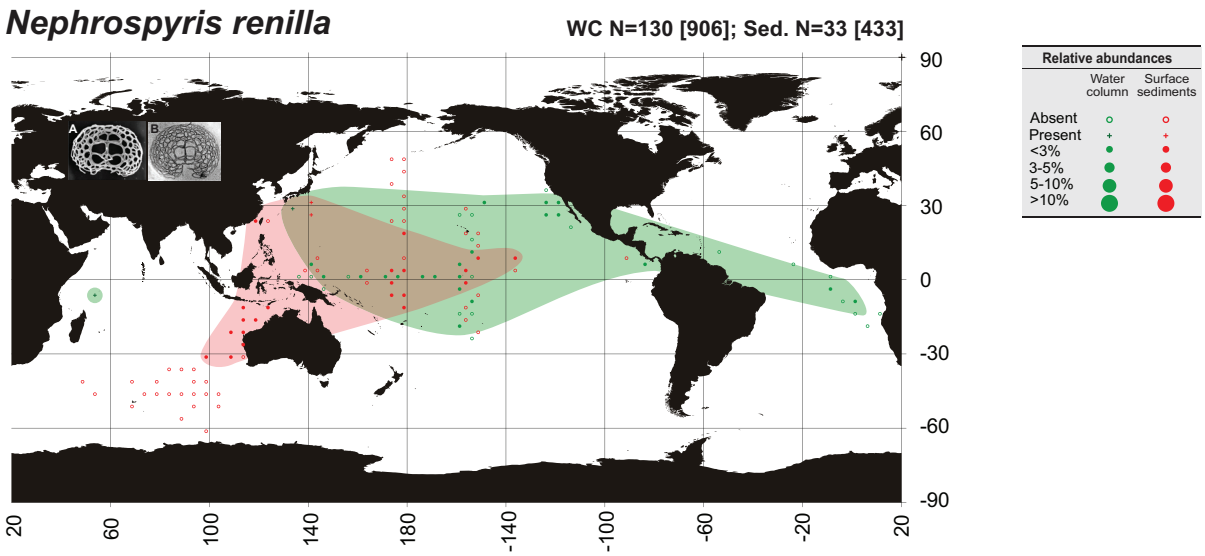


Figure 182. Geographic distribution of *Nephrospyris renilla*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Original; B, Takahashi (1991).

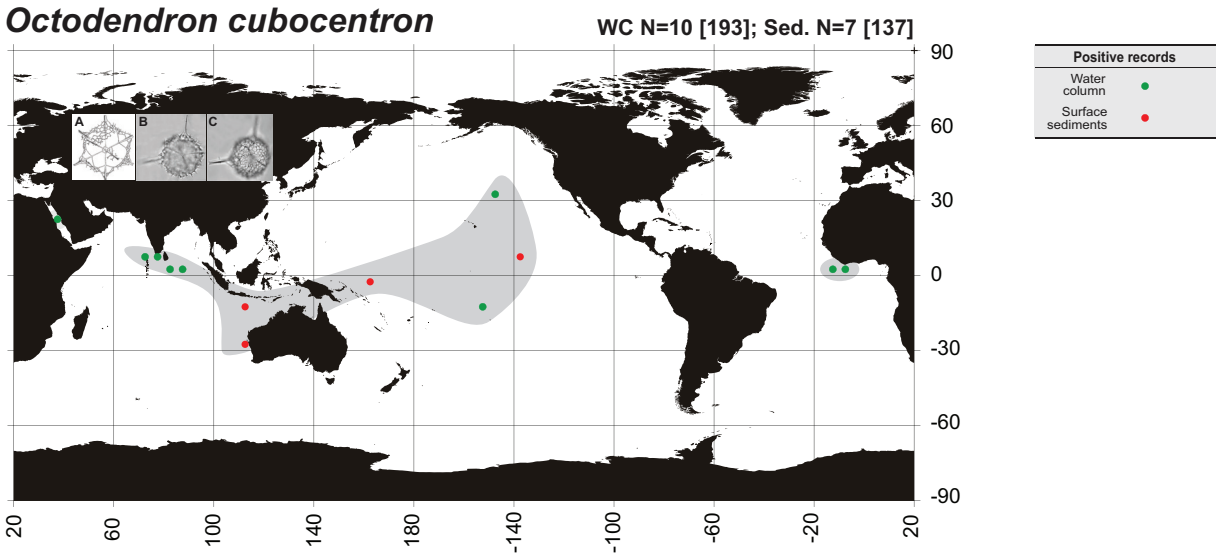


Figure 183. Geographic distribution of *Octodendron cubocentron*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Haeckel (1887); B, Original; C, Original.

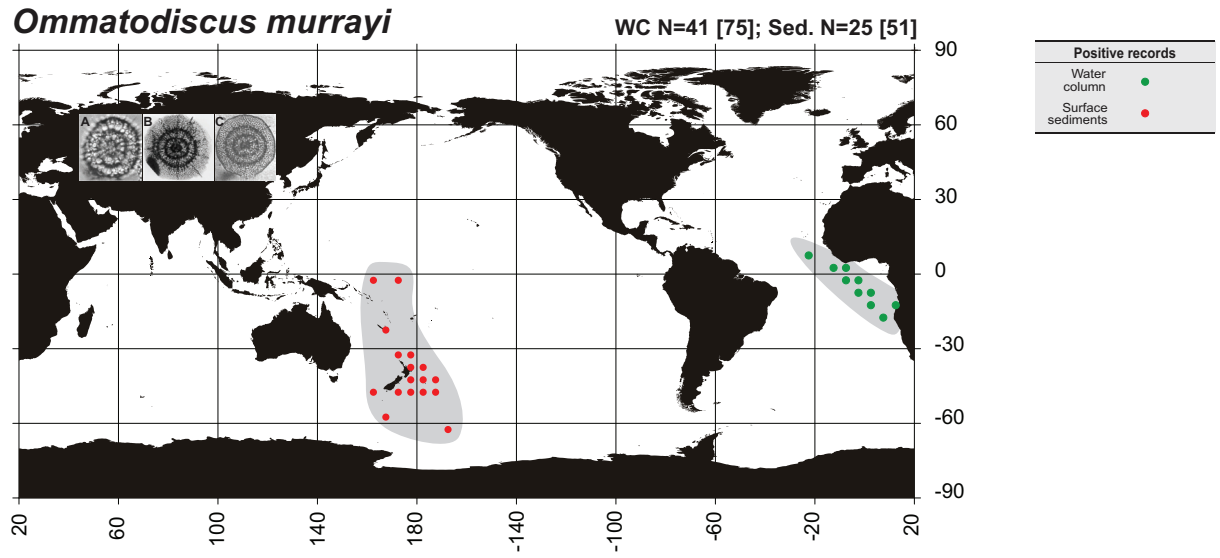


Figure 184. Geographic distribution of *Ommatodiscus murrayi*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Boltovskoy (1987); B, Benson (1966); C, Takahashi and Honjo (1981).

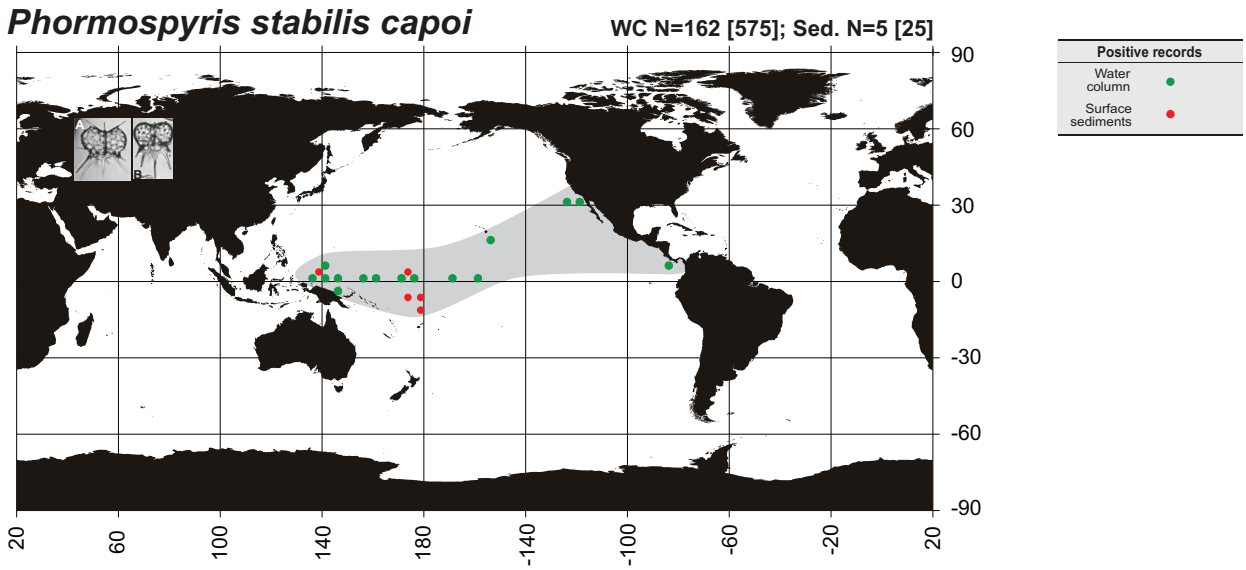


Figure 185. Geographic distribution of *Phormospyris stabilis capoi*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Goll (1976); B, Goll (1976).

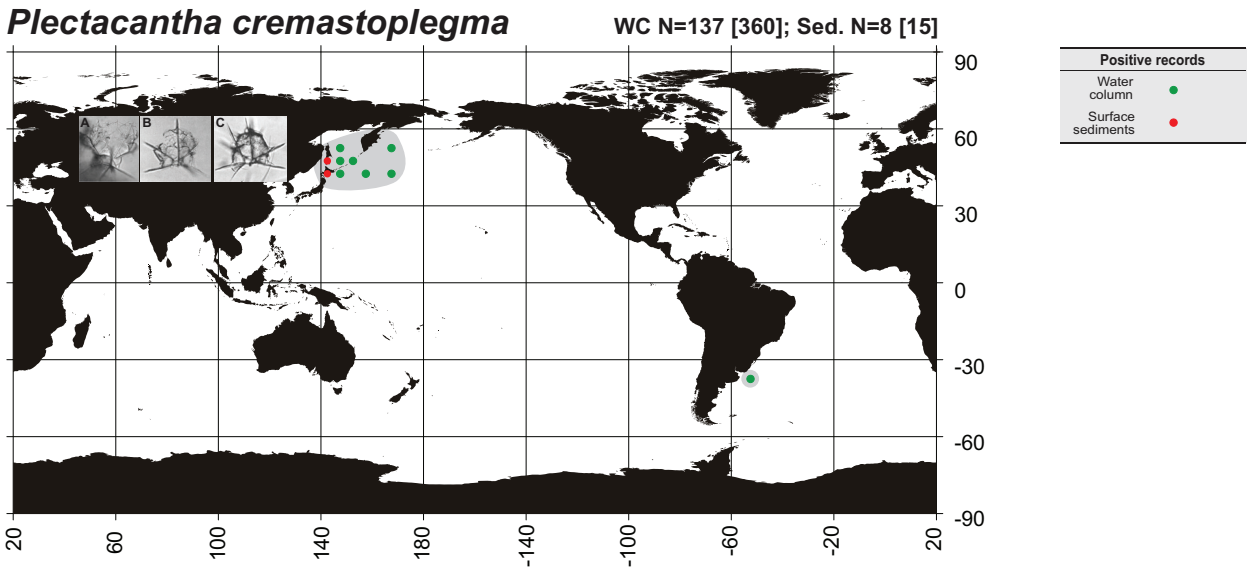


Figure 186. Geographic distribution of *Plectacantha cremastoplegma*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Original; B, Nigrini (1968); C, Nigrini (1968).

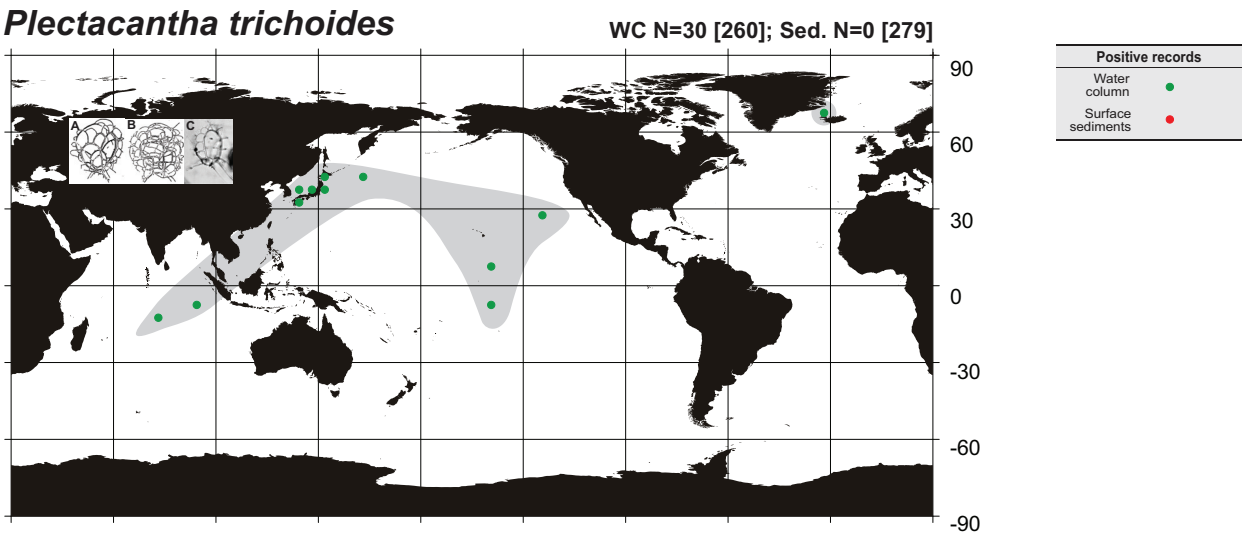


Figure 187. Geographic distribution of *Plectacantha trichoides*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Petrushevskaya (1971); B, Petrushevskaya (1971); C, Original.

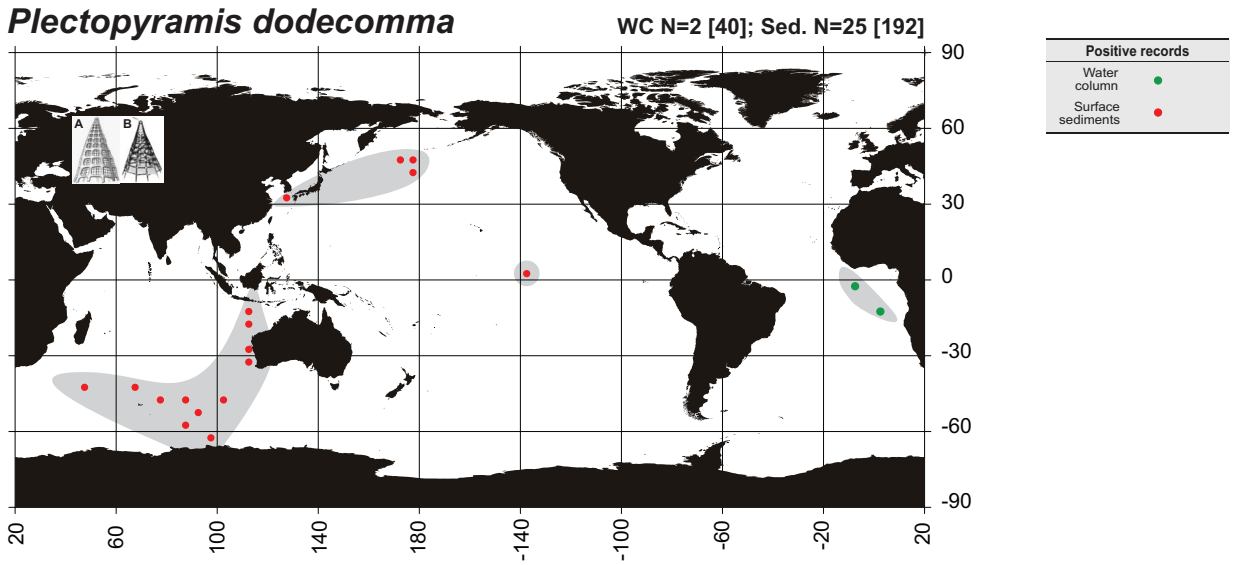


Figure 188. Geographic distribution of *Plectopyramis dodecomma*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Haeckel (1887); B, Benson (1966).

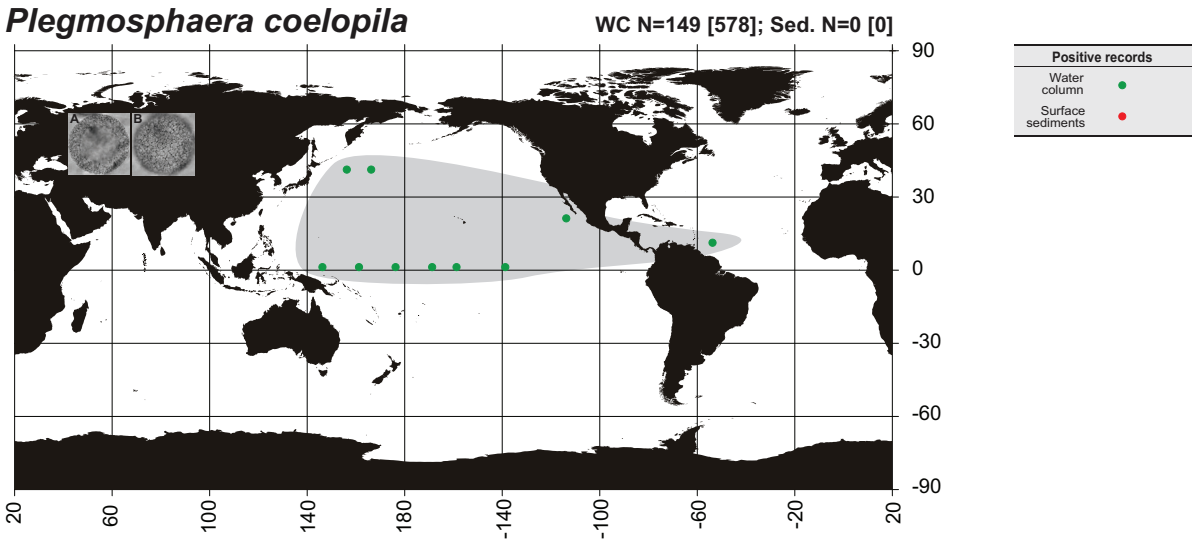


Figure 189. Geographic distribution of *Plegmosphaera coelopila*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Okazaki et al. (2005); B, Okazaki et al. (2005).

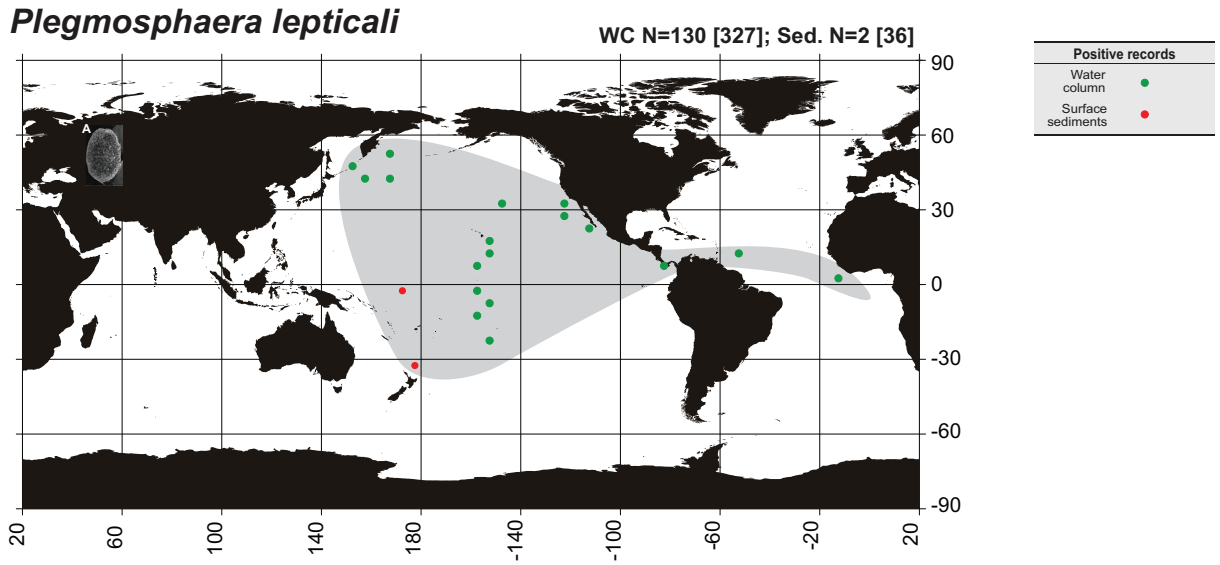


Figure 190. Geographic distribution of *Plegmosphaera lepticali*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Matsuoka (2009).

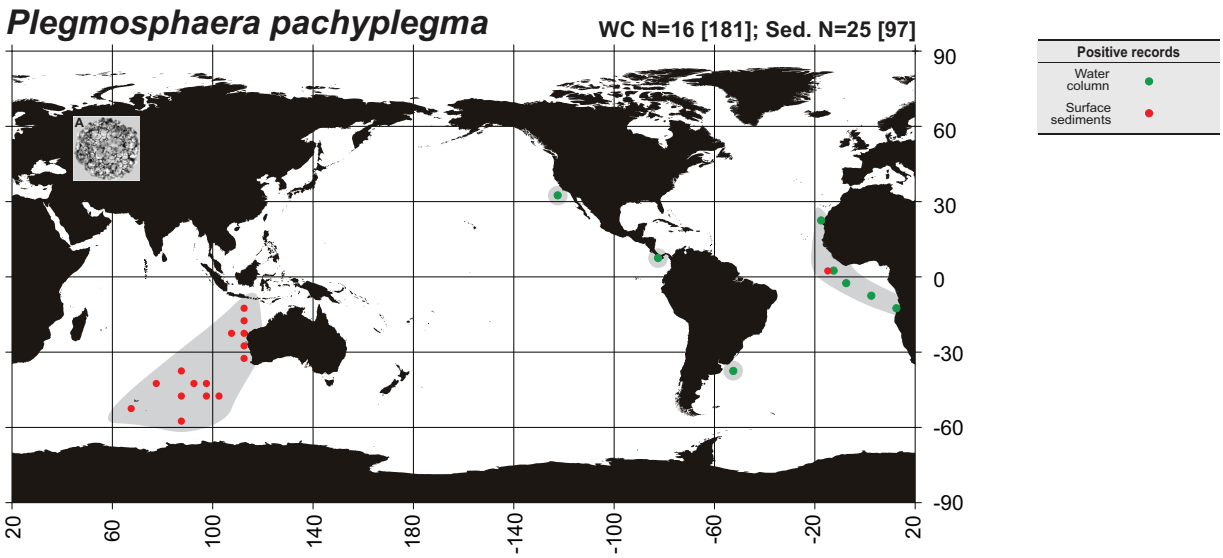


Figure 191. Geographic distribution of *Plegmosphaera pachyplegma*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Boltovskoy (1999).

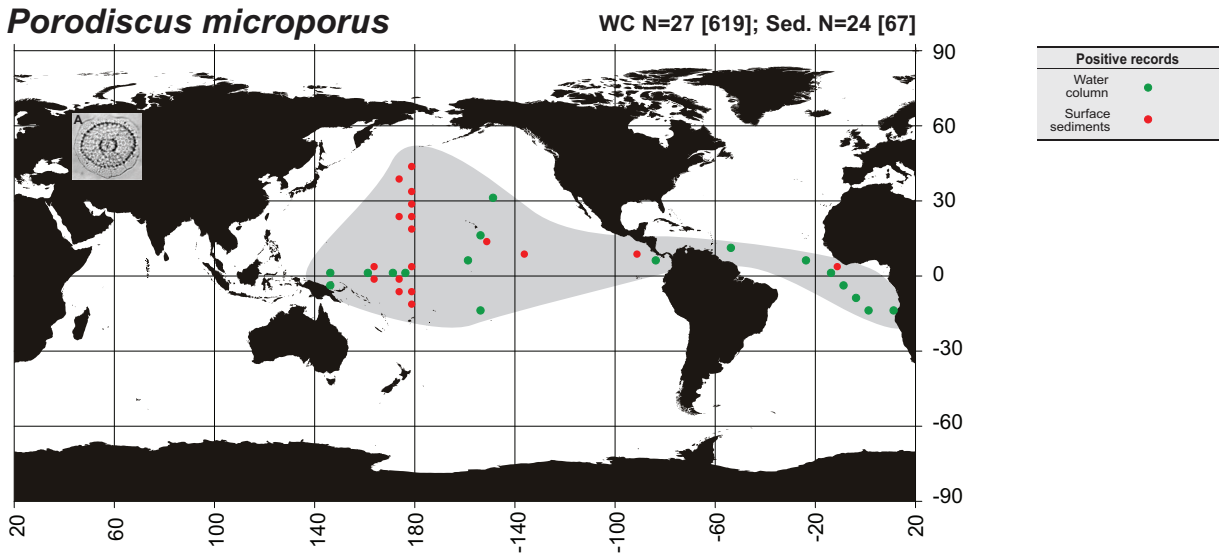


Figure 192. Geographic distribution of *Porodiscus microporus*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Boltovskoy (1987).

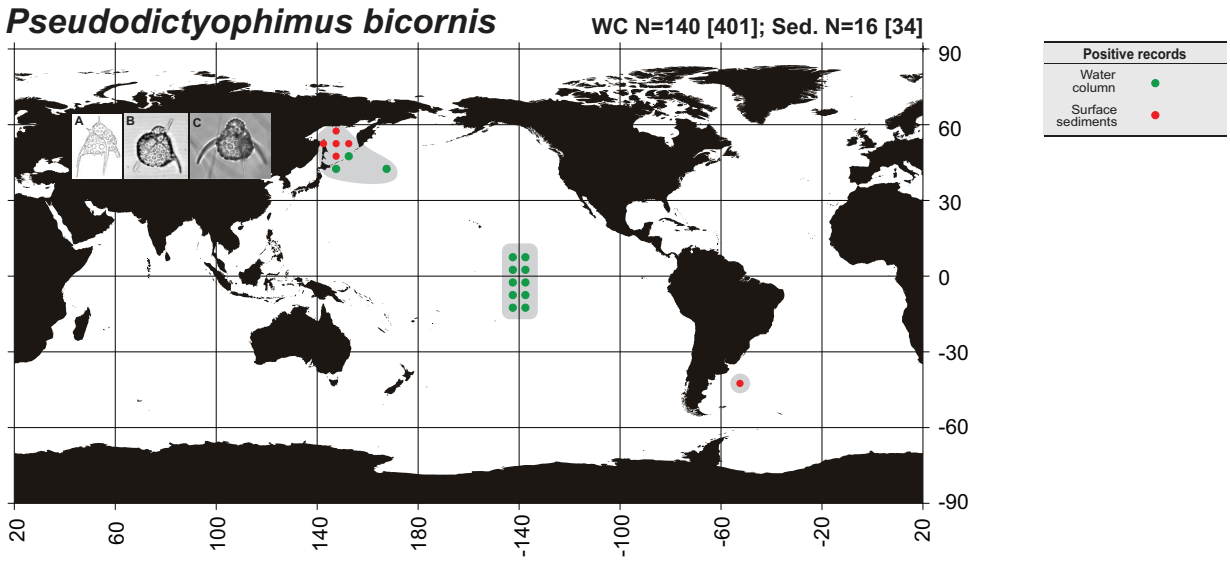


Figure 193. Geographic distribution of *Pseudodictyophimus bicornis*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Petrushevskaya (1971); B, Original; C, Original.

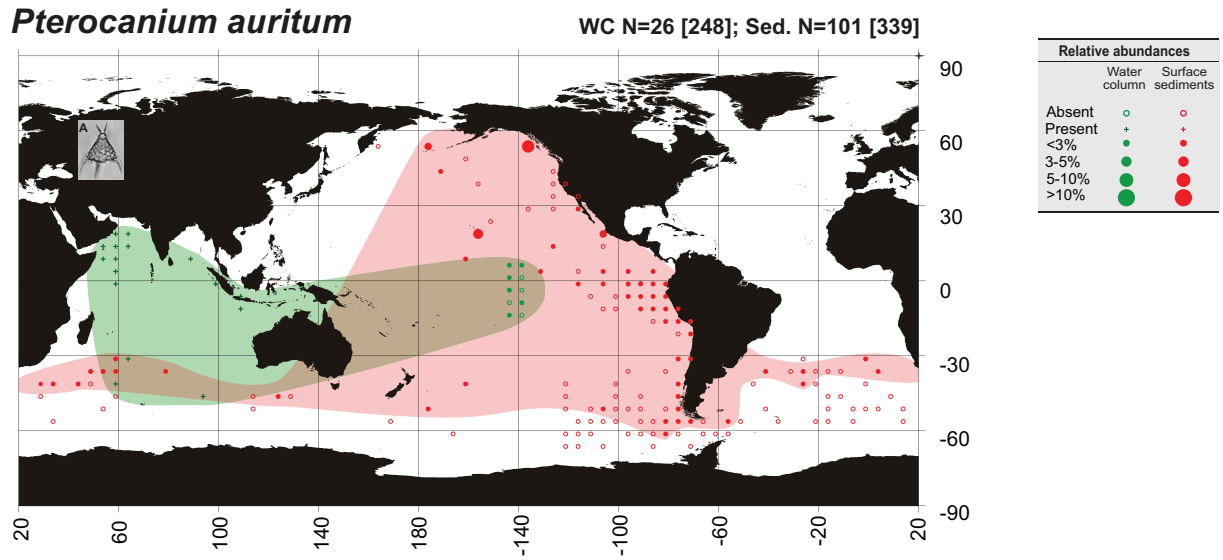


Figure 194. Geographic distribution of *Pterocanium auritum*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Welling (1997).

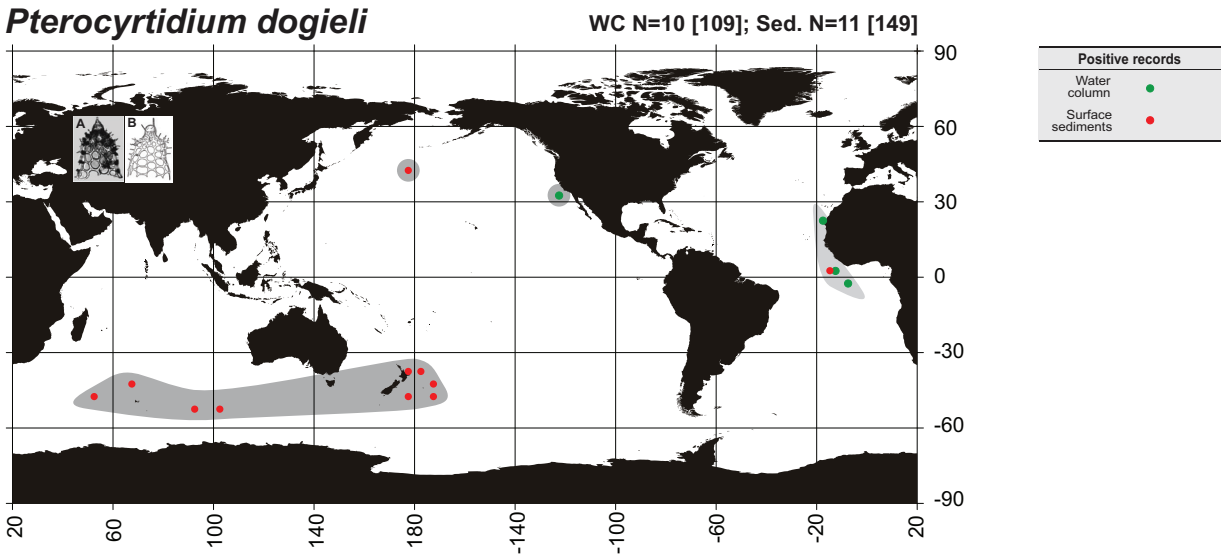


Figure 195. Geographic distribution of *Pterocyrtidium dogieli*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Boltovskoy (1999); B, Petrushevskaya (1971).

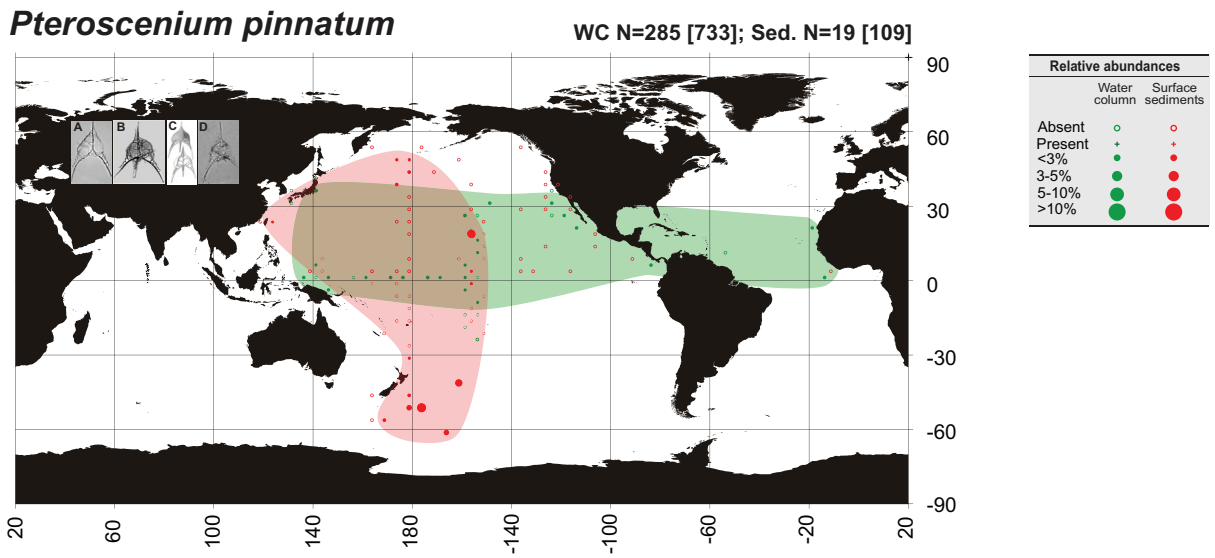


Figure 196. Geographic distribution of *Pteroscenium pinnatum*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Itaki (2009); B, Boltovskoy (1999); C, Haeckel (1987); D, Original.

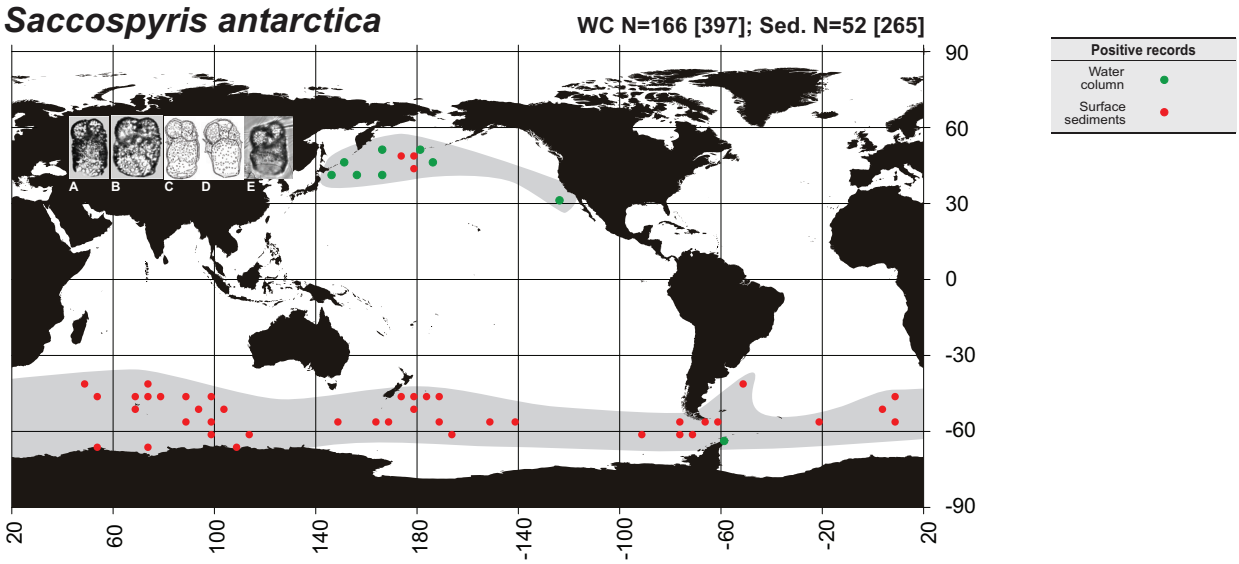


Figure 197. Geographic distribution of *Saccospyris antarctica*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Boltovskoy and Riedel (1987); B, Boltovskoy (1999); C, Petrushevskaya (1965); D, Petrushevskaya (1965); E, Original.

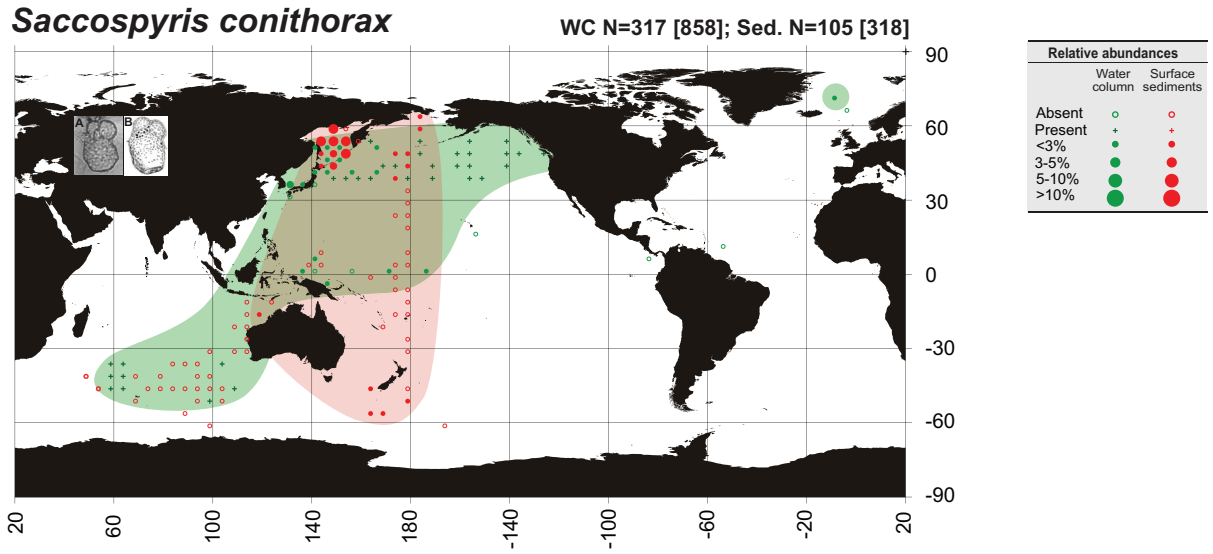


Figure 198. Geographic distribution of *Saccospyris conithorax*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Okazaki et al. (2004); B, Petrushevskaya (1967).

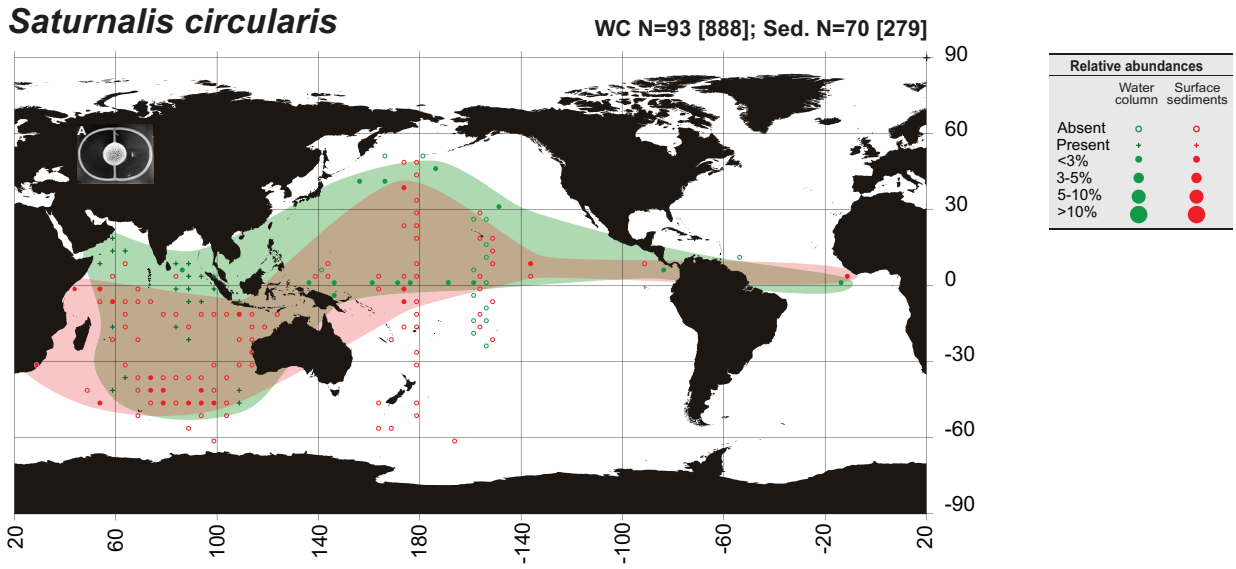


Figure 199. Geographic distribution of *Saturnalis circularis*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Original.

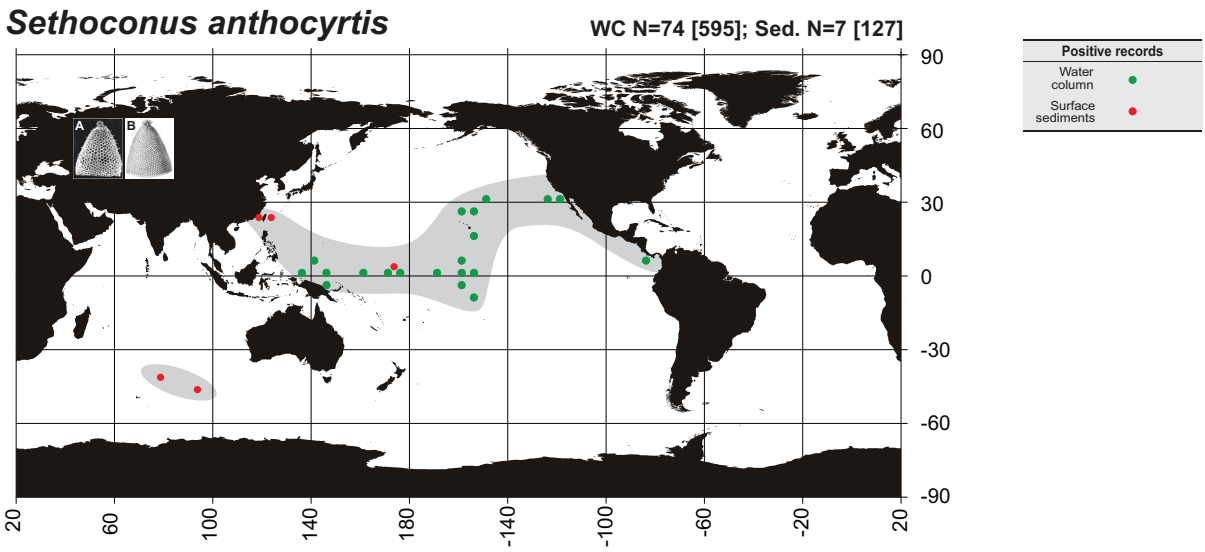


Figure 200. Geographic distribution of *Sethoconus anthocyrtis*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Paverd (1995); B, Haeckel (1887).

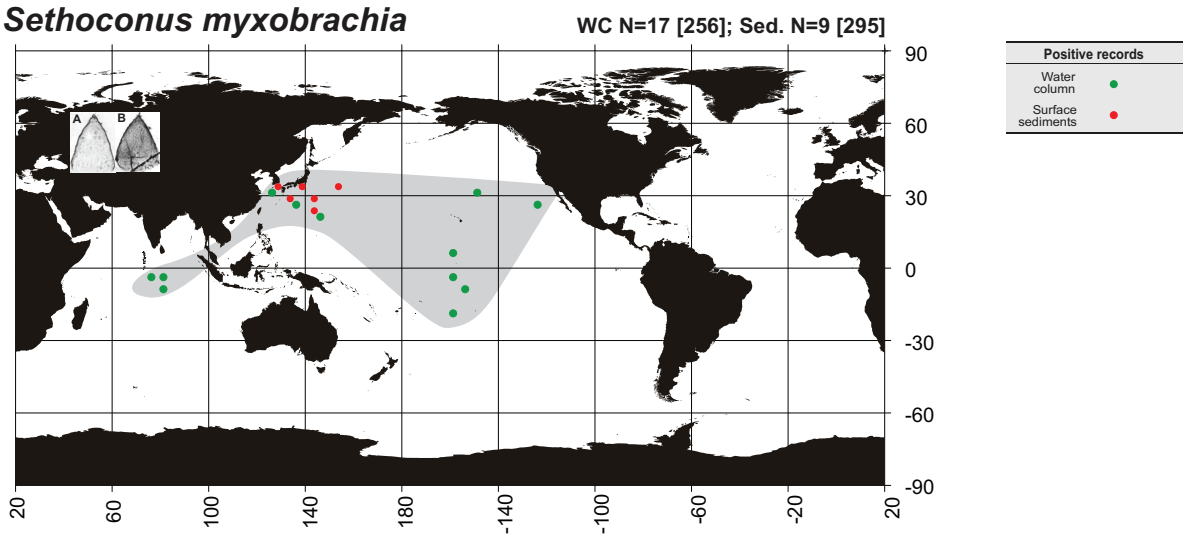


Figure 201. Geographic distribution of *Sethoconus myxobrachia*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Takahashi (1991); B, Takahashi (1991).

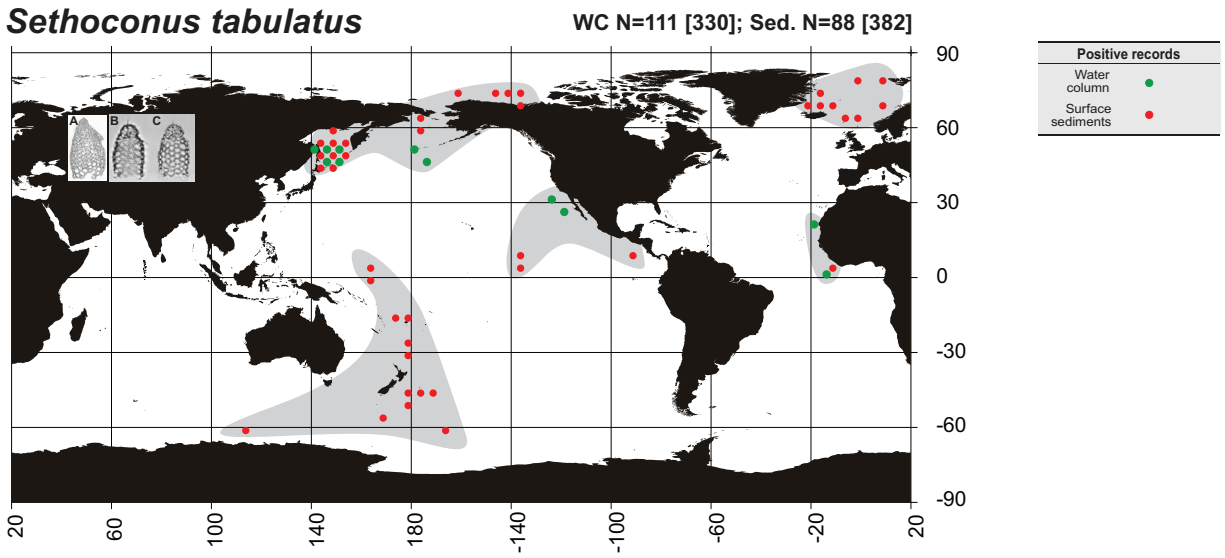


Figure 202. Geographic distribution of *Sethoconus tabulatus*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Riedel (1958); B, Original; C, Original.

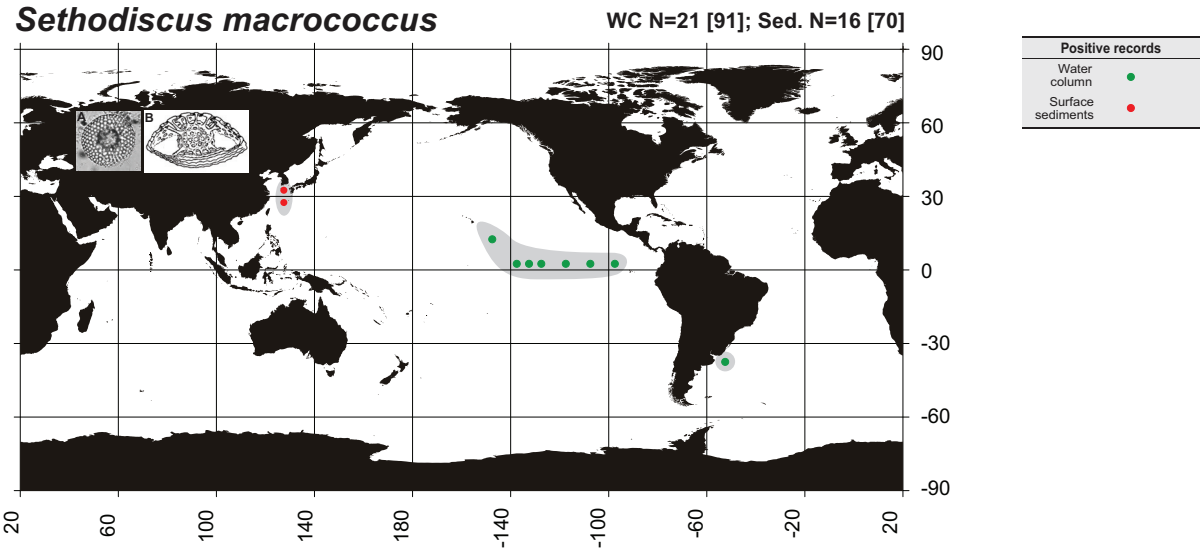


Figure 203. Geographic distribution of *Sethodiscus macrococcus*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Original; B, Boltovskoy (1999).

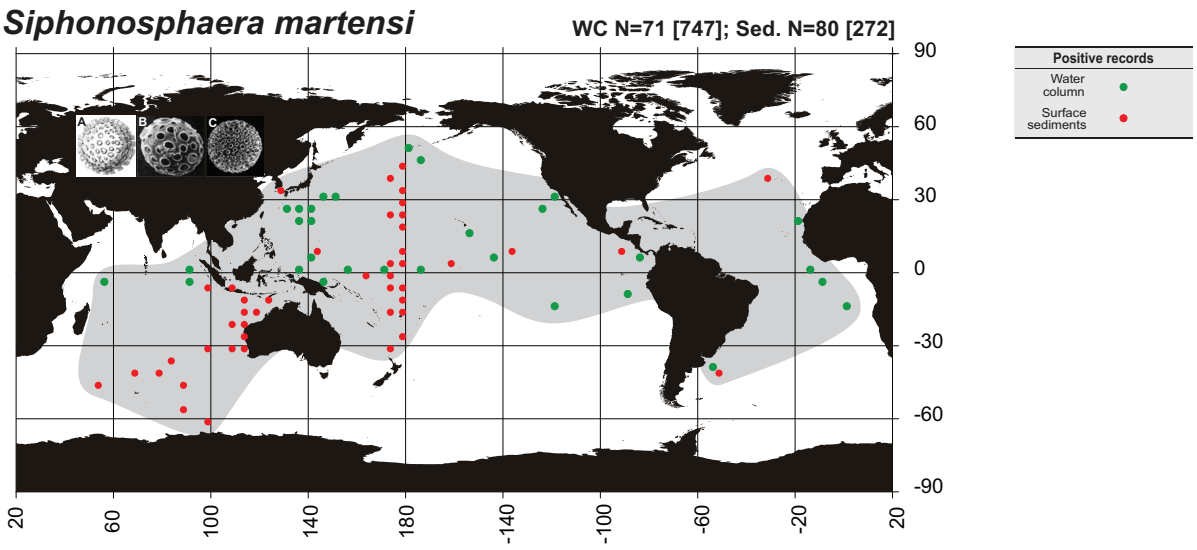


Figure 204. Geographic distribution of *Siphonosphaera martensi*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Haeckel (1887); B, Takahashi (1991); C, Paverd (1995).

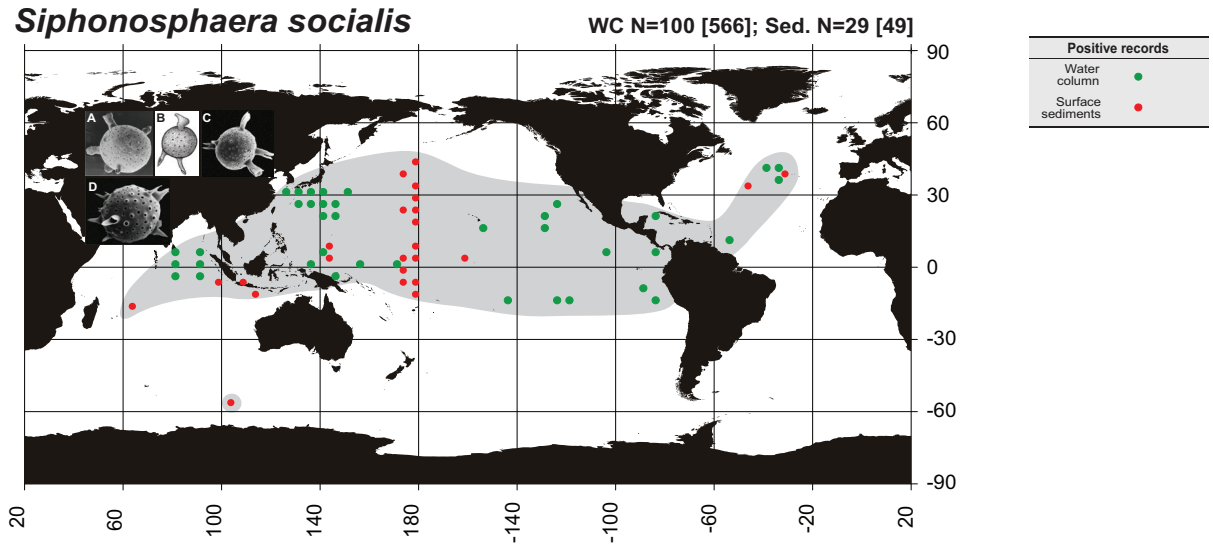


Figure 205. Geographic distribution of *Siphonosphaera socialis*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Original; B, Strelkov and Reshetnjak (1971); C, Takahashi (1991); D, Takahashi (1991).

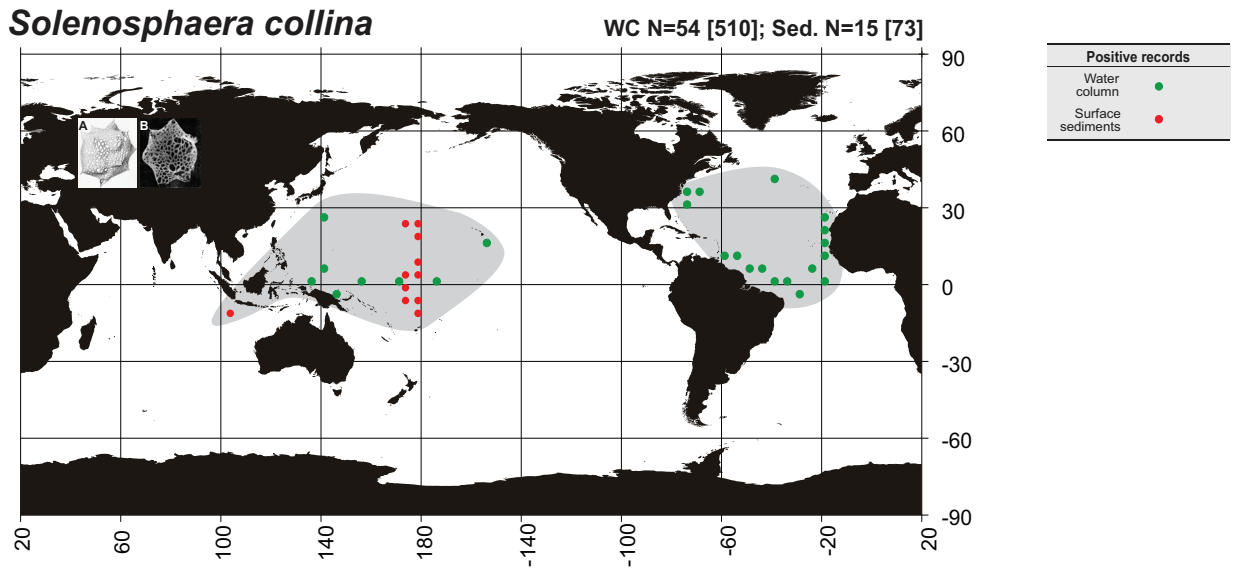


Figure 206. Geographic distribution of *Solenosphaera collina*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Haeckel (1887); B, Takahashi (1991).

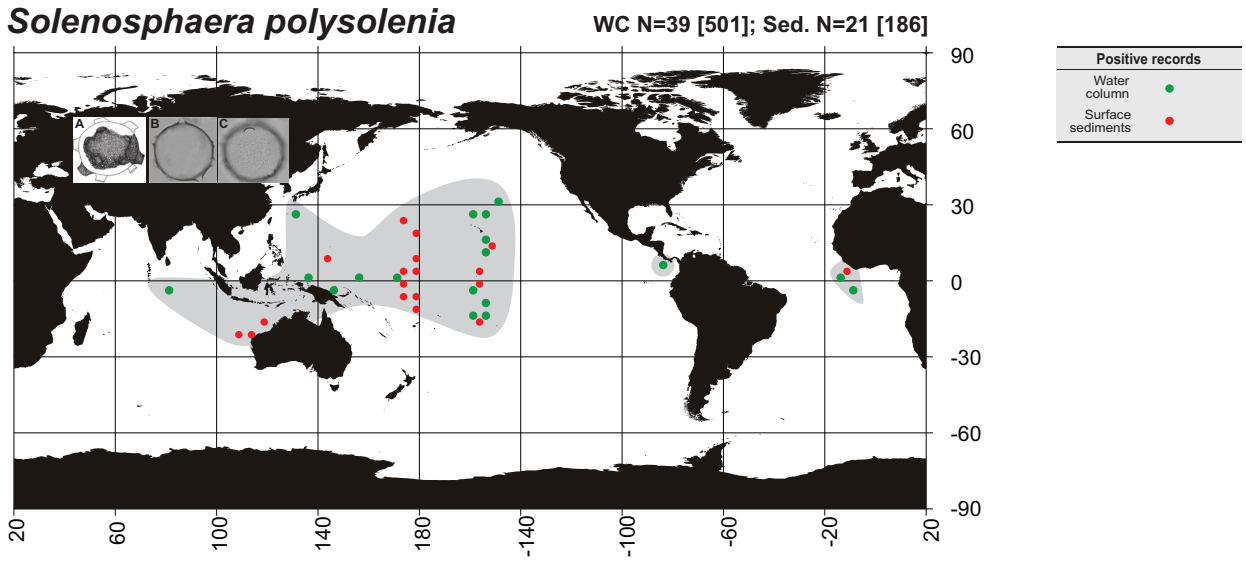


Figure 207. Geographic distribution of *Solenosphaera polysolenia*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Strelkov and Reshetnjak (1971); B, Okazaki et al. (2005); C, Okazaki et al. (2005).

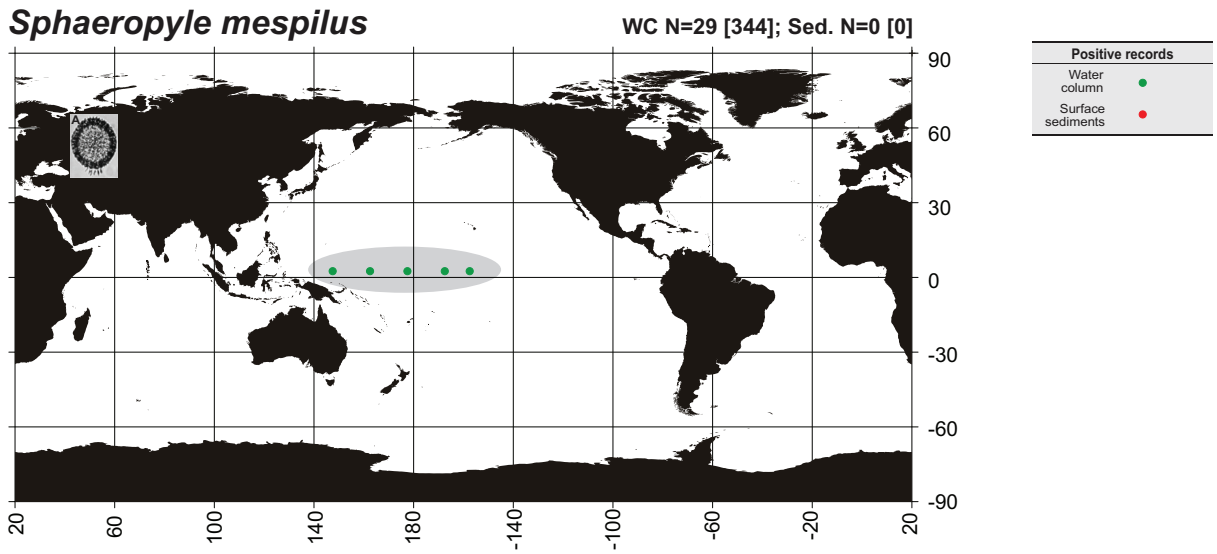


Figure 208. Geographic distribution of *Sphaeropyle mespilus*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Takahashi (1991).

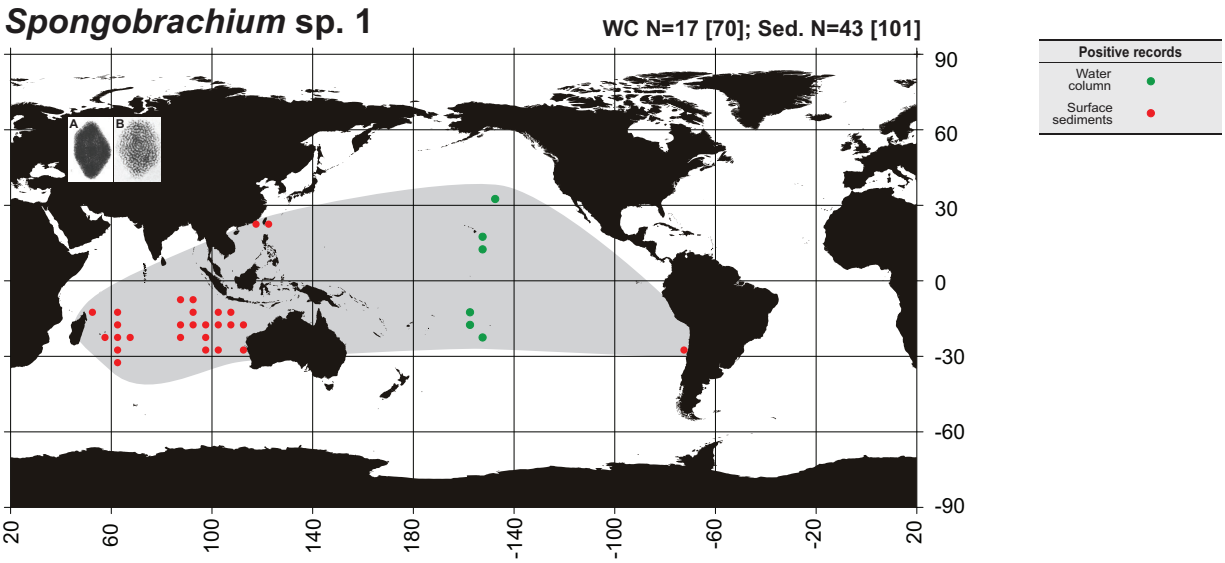


Figure 209. Geographic distribution of *Spongobrachium* sp. 1. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Renz (1974); B, Original.

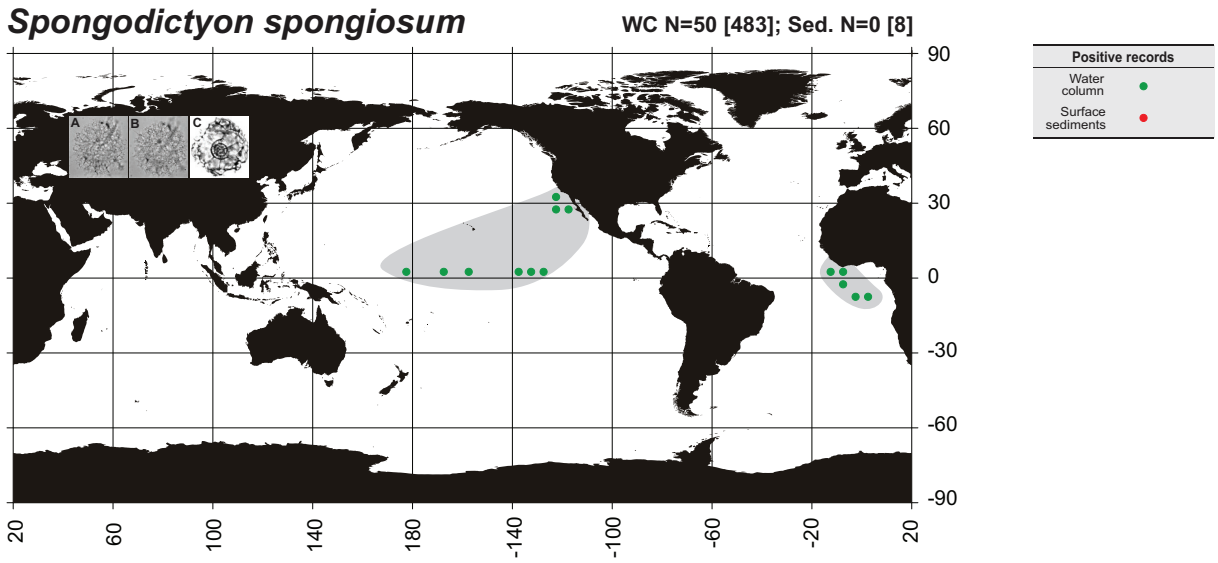


Figure 210. Geographic distribution of *Spongodictyon spongiosum*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Boltovskoy (1999); B, Original; C, Original.

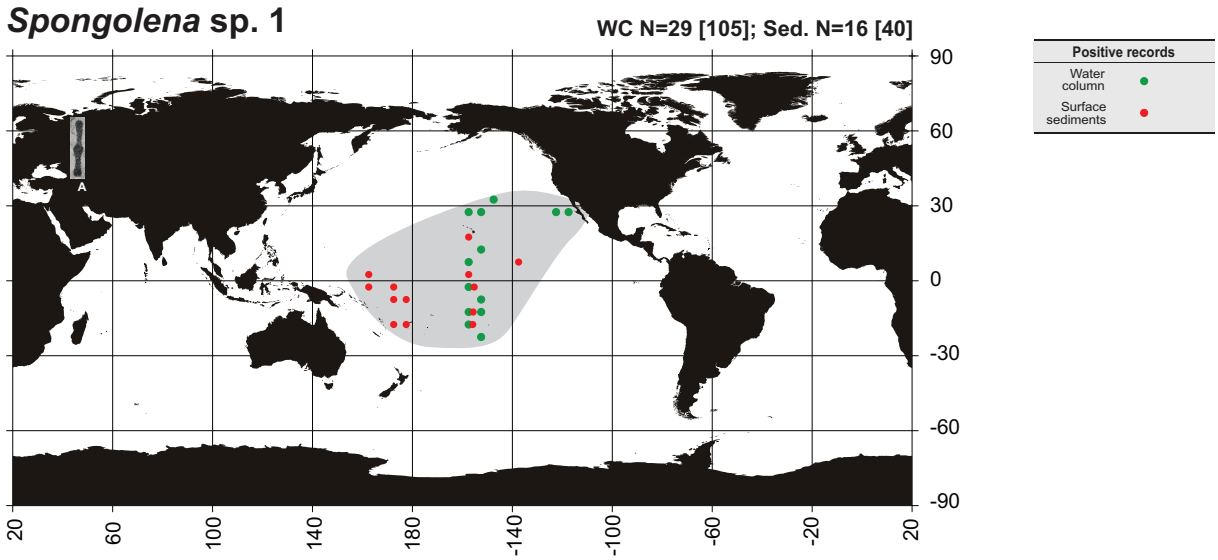


Figure 211. Geographic distribution of *Spongolena* sp. 1. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Boltovskoy and Riedel (1987).

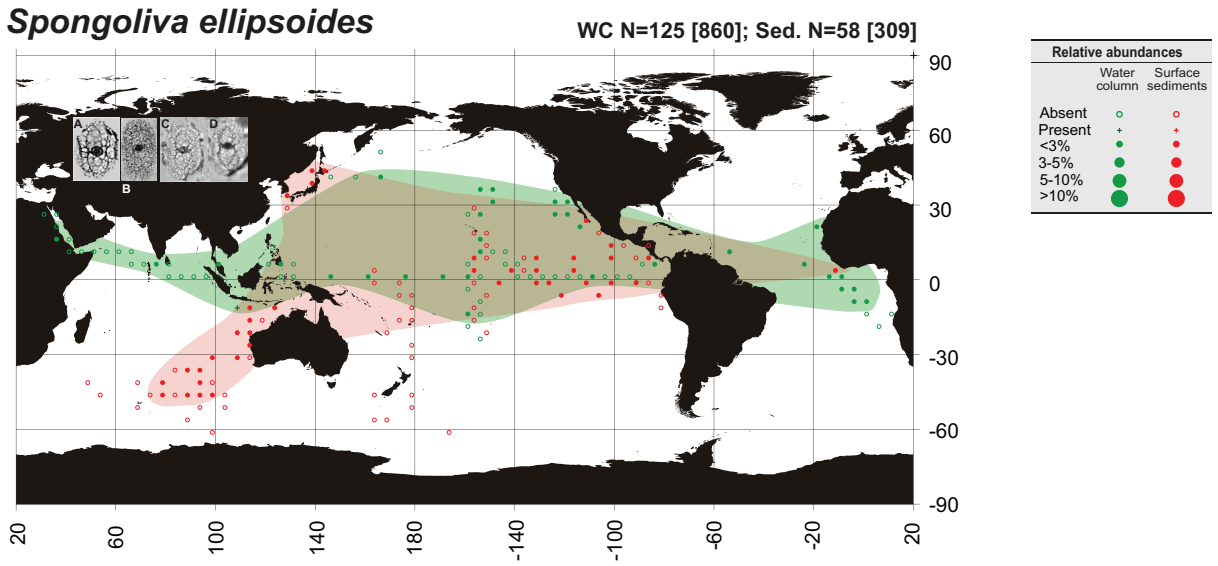


Figure 212. Geographic distribution of *Spongoliva ellipsoides*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Boltovskoy (1999); B, Takahashi (1991); C, Original; D, Original.

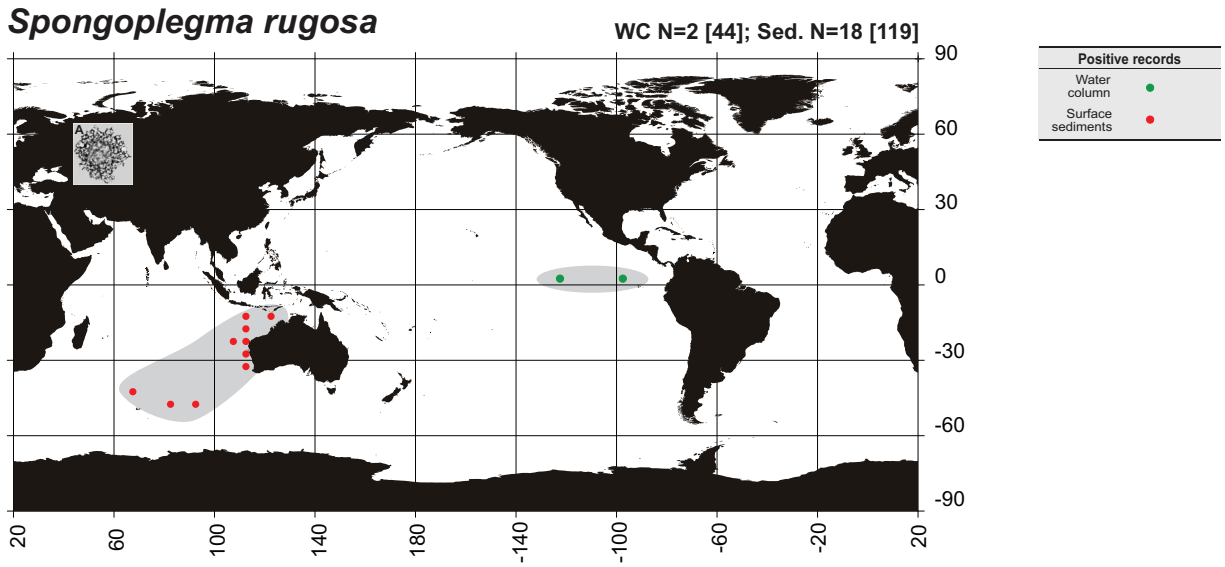


Figure 213. Geographic distribution of *Spongoplegma rugosa*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Boltovskoy (1999).

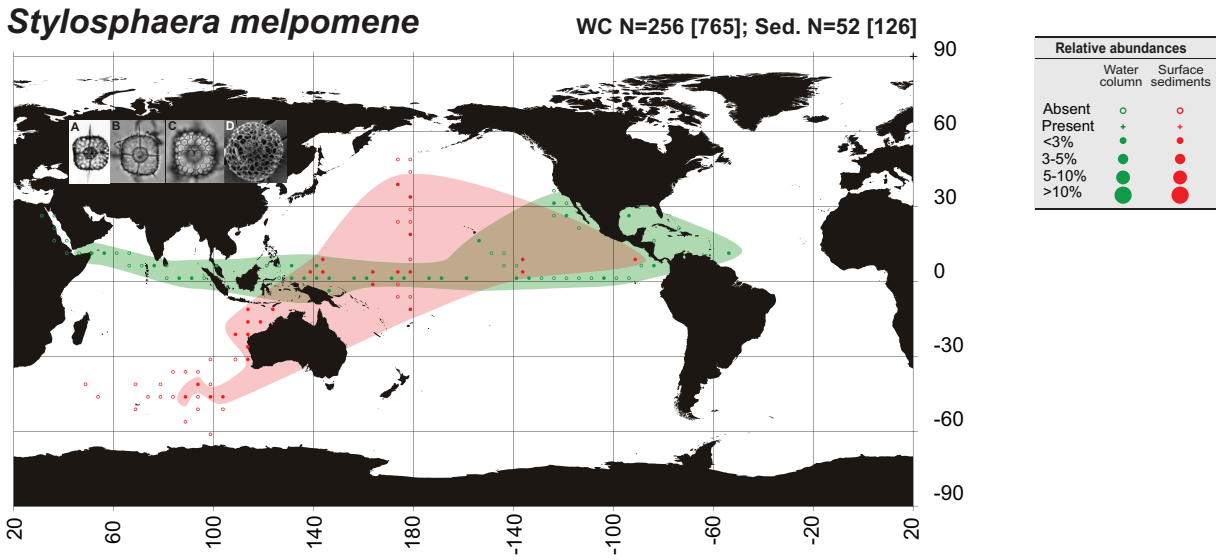


Figure 214. Geographic distribution of *Stylosphaera melpomene*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Benson (1966); B, Original; C, Original; D, Matsuoka (2009).

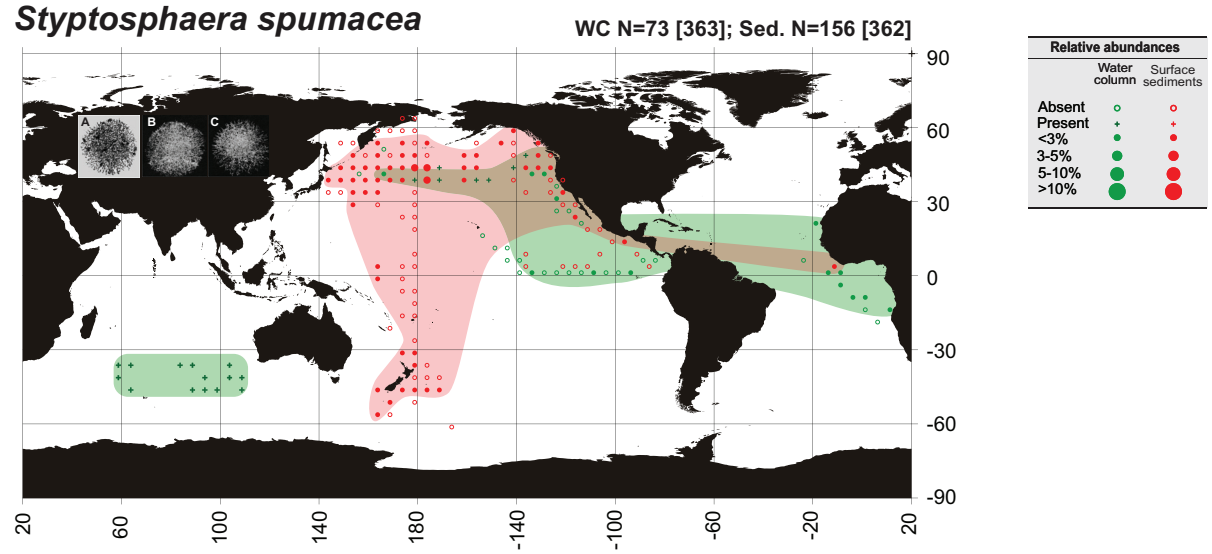


Figure 215. Geographic distribution of *Styptosphaera spumacea*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Boltovskoy (1999); B, Swanberg et al. (1990).

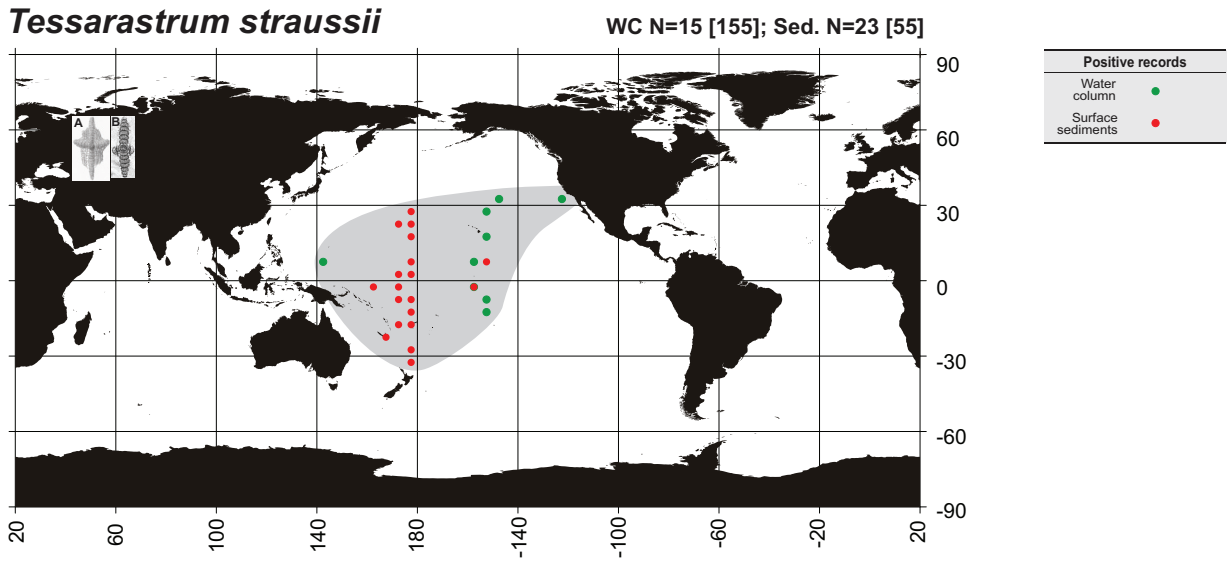


Figure 216. Geographic distribution of *Tessarastrum straussii*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Haeckel (1887); B, Takahashi (1991).

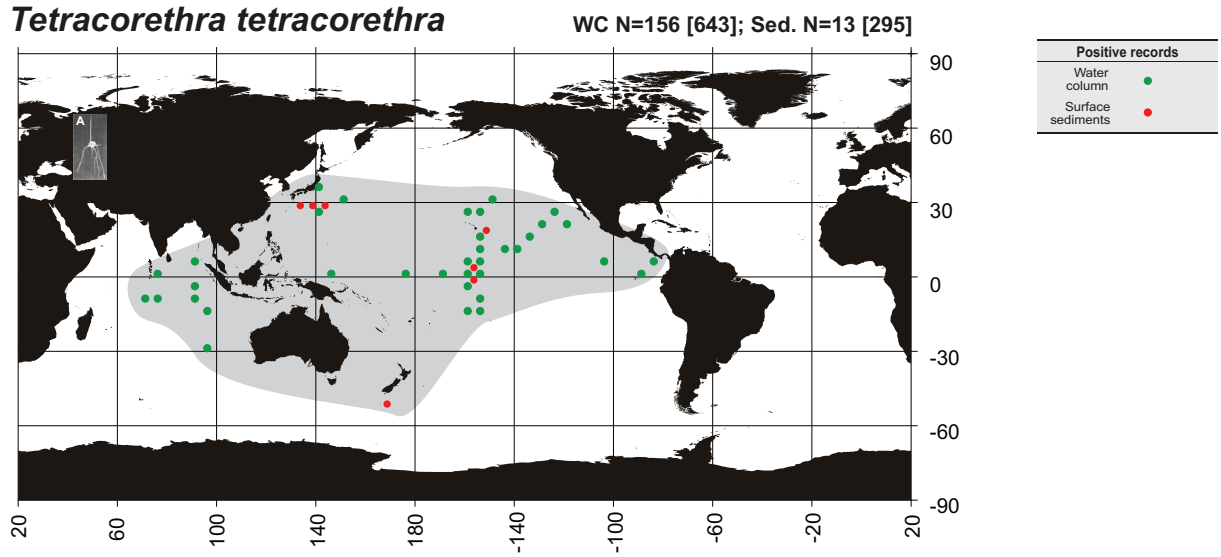


Figure 217. Geographic distribution of *Tetracorethra tetracorethra*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Takahashi (1991).

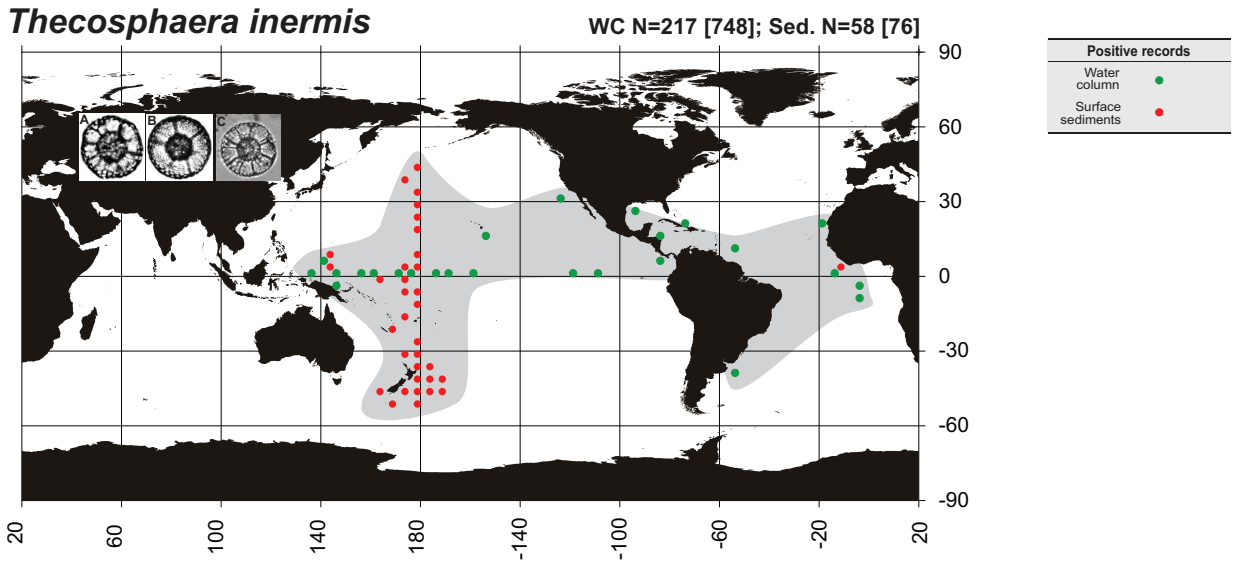


Figure 218. Geographic distribution of *Thecosphaera inermis*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Boltovskoy (1999); B, Boltovskoy (1999); C, Original.

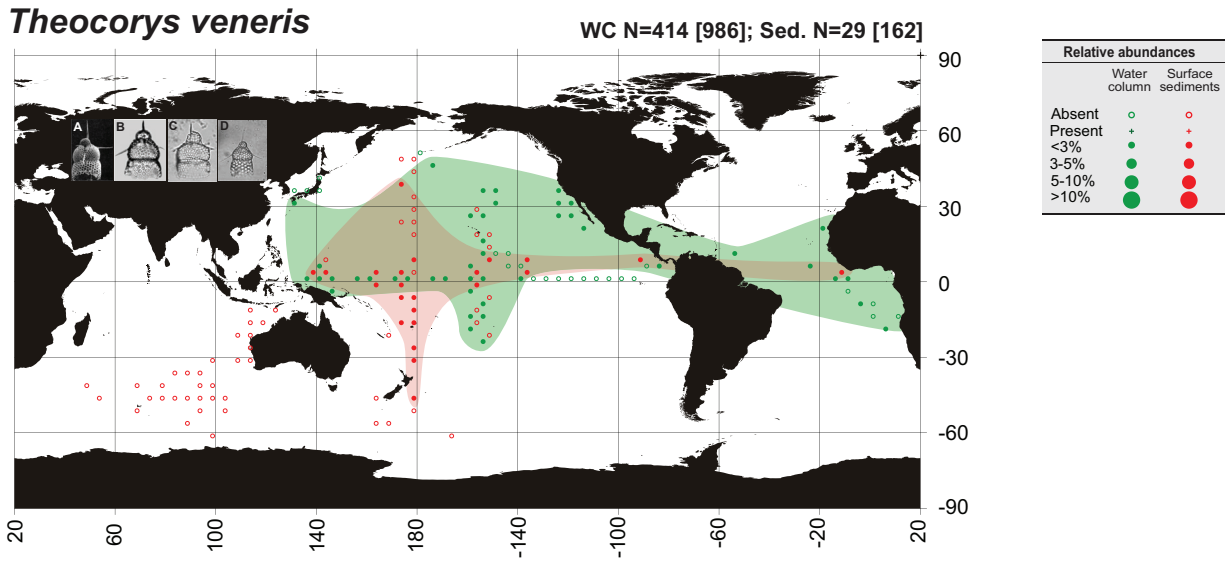


Figure 219. Geographic distribution of *Theocorys veneris*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Takahashi (1991); B, Boltovskoy (1999); C, Original; D, Original.

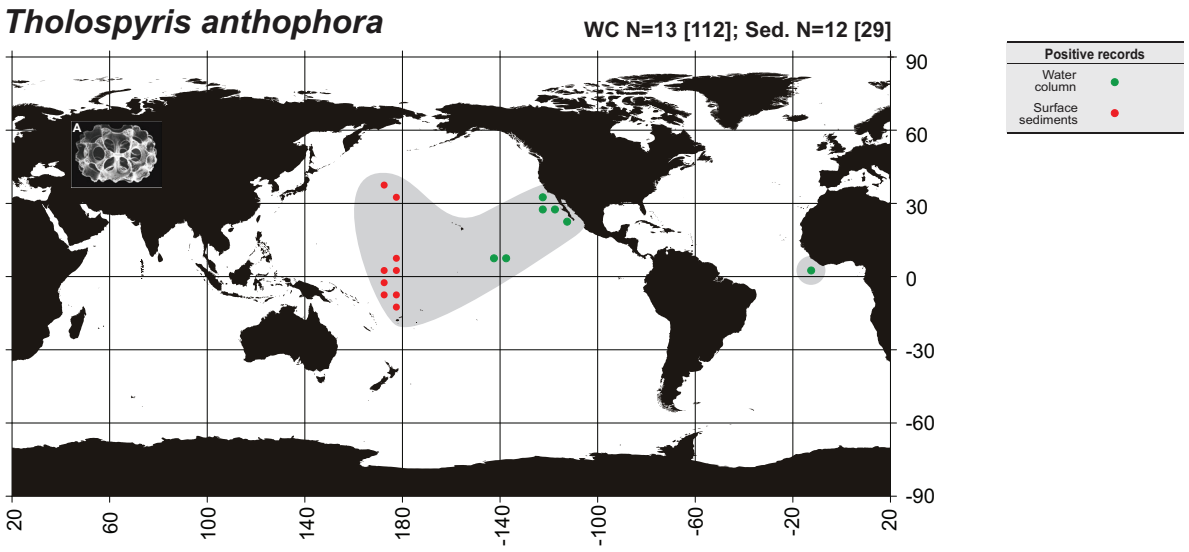


Figure 220. Geographic distribution of *Tholospyris anthophora*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Goll (1972).

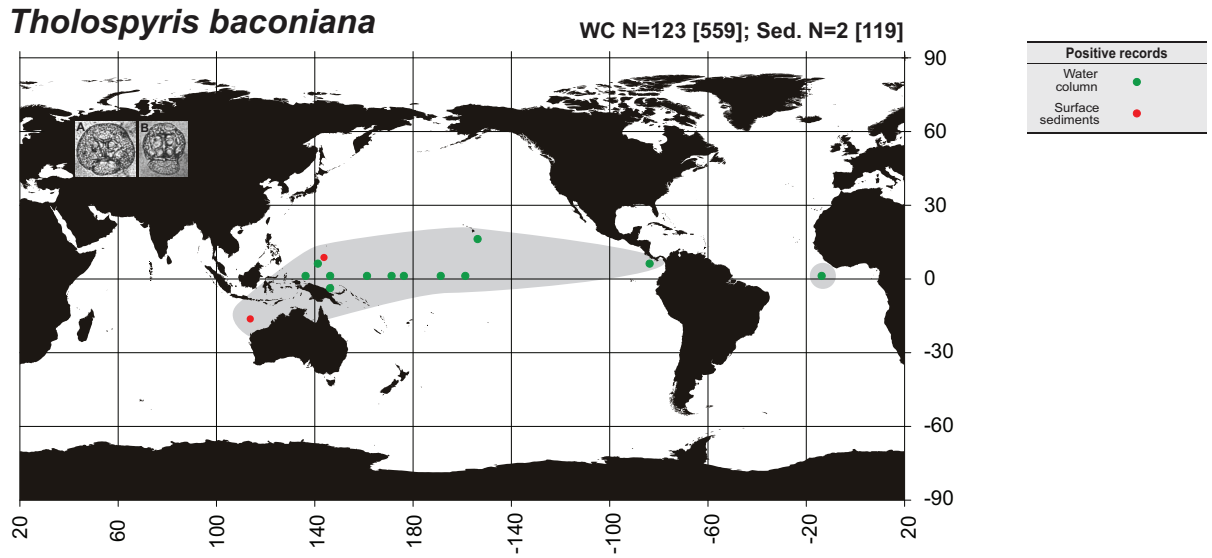


Figure 221. Geographic distribution of *Tholospyris baconiana*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Takahashi (1991); B, Takahashi (1991).

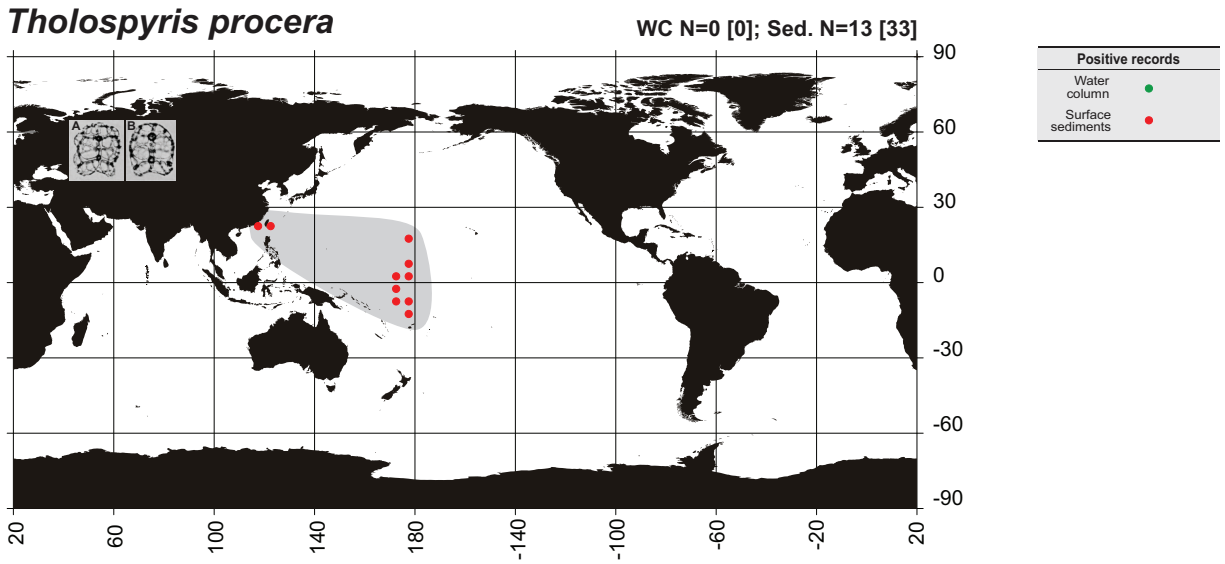


Figure 222. Geographic distribution of *Tholospyris procera*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Nigrini and Moore (1979); B, Nigrini and Moore (1979).

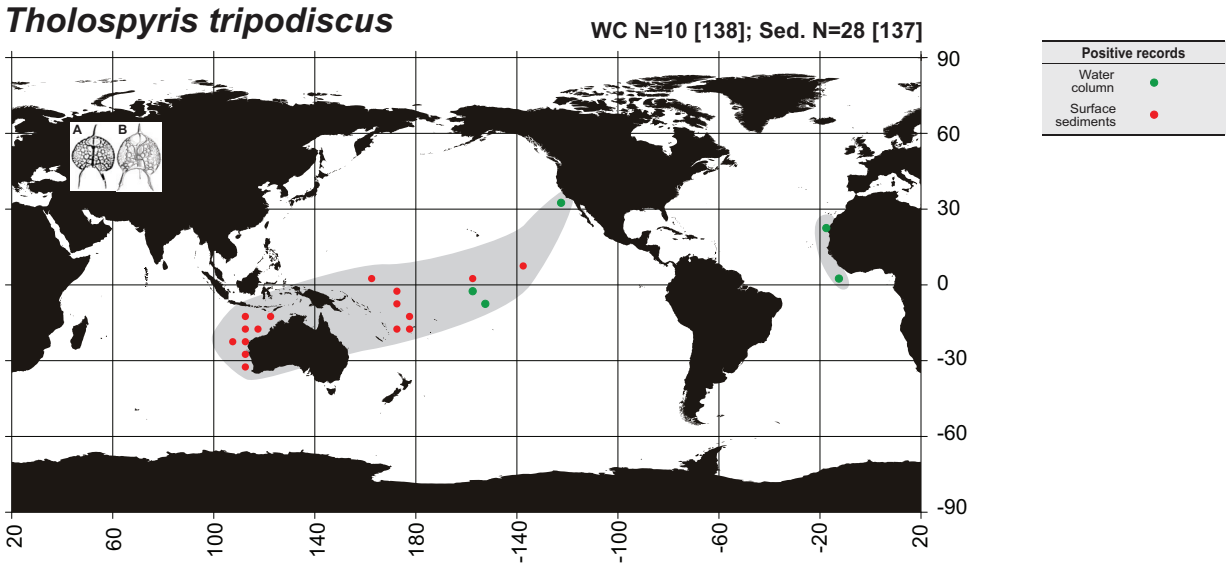


Figure 223. Geographic distribution of *Tholospyris tripodiscus*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Boltovskoy (1999); B, Haeckel (1887).

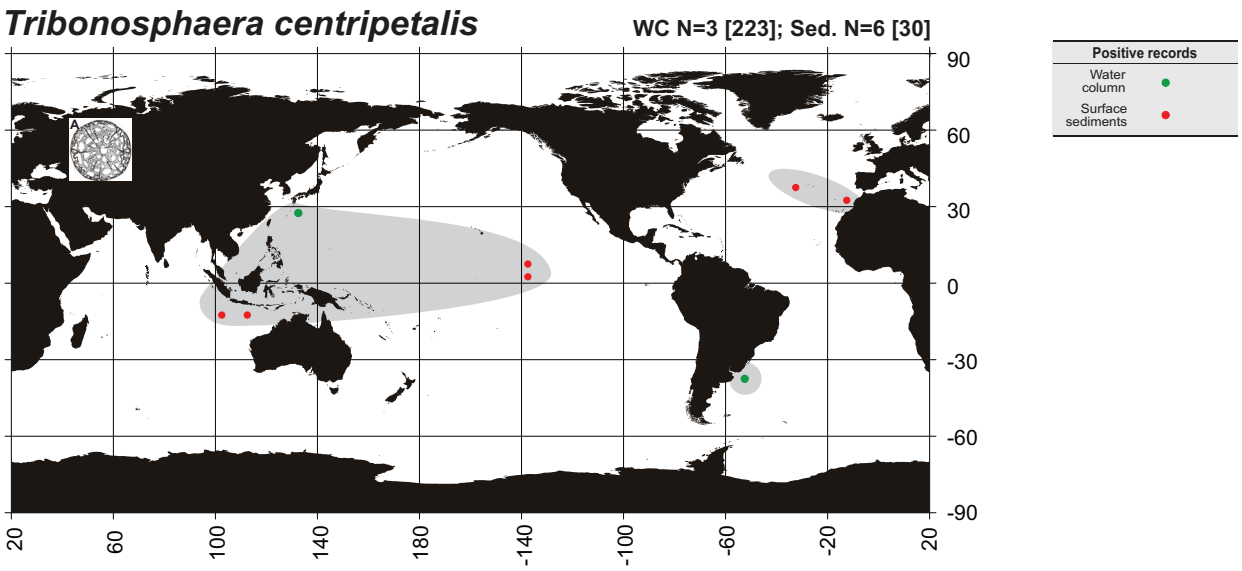


Figure 224. Geographic distribution of *Tribonosphaera centripetalis*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Boltovskoy (1999).

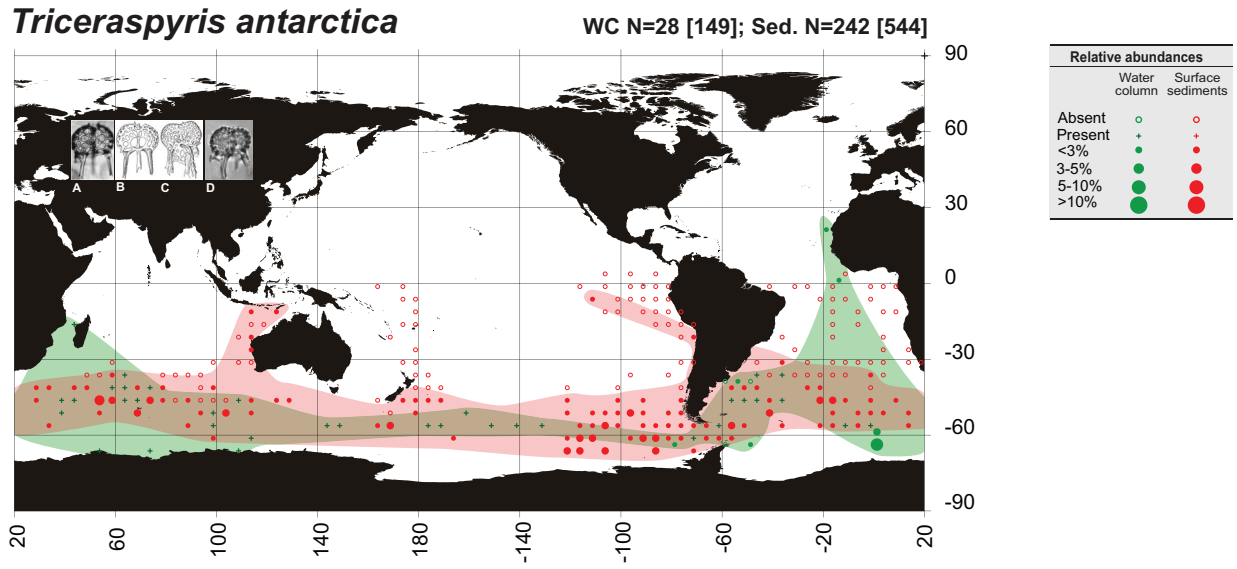


Figure 225. Geographic distribution of *Triceraspyris antarctica*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Goll (1976); B, Petrushevskaya (1967); C, Petrushevskaya (1967); D, Original.

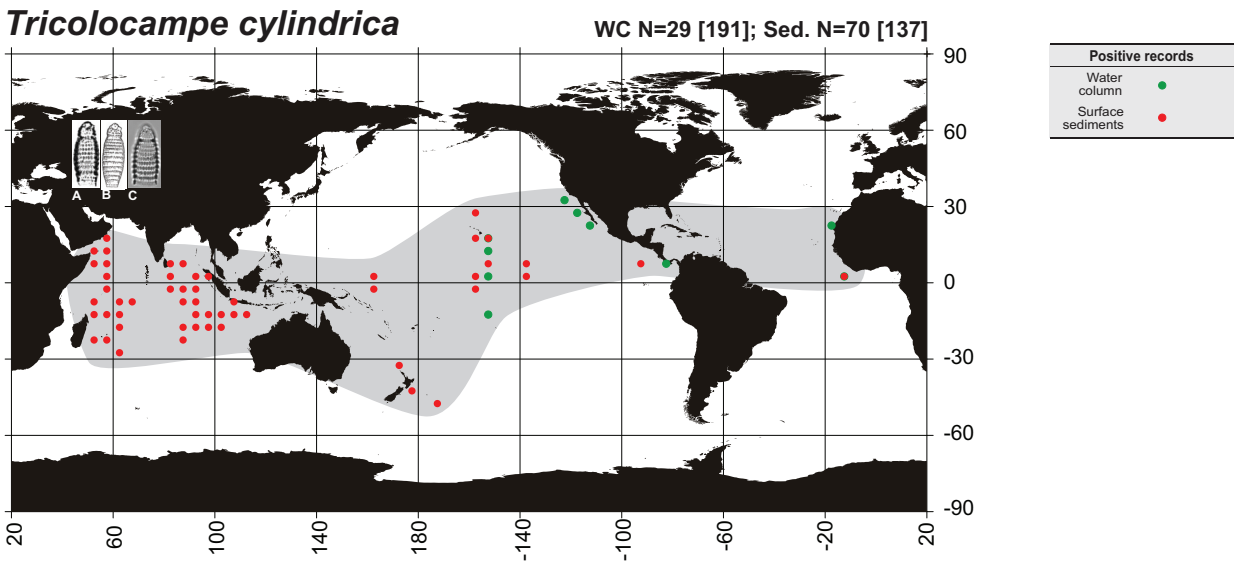


Figure 226. Geographic distribution of *Tricolocampe cylindrica*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Boltovskoy (1999); B, Petrushevskaya (1967); C, Original.

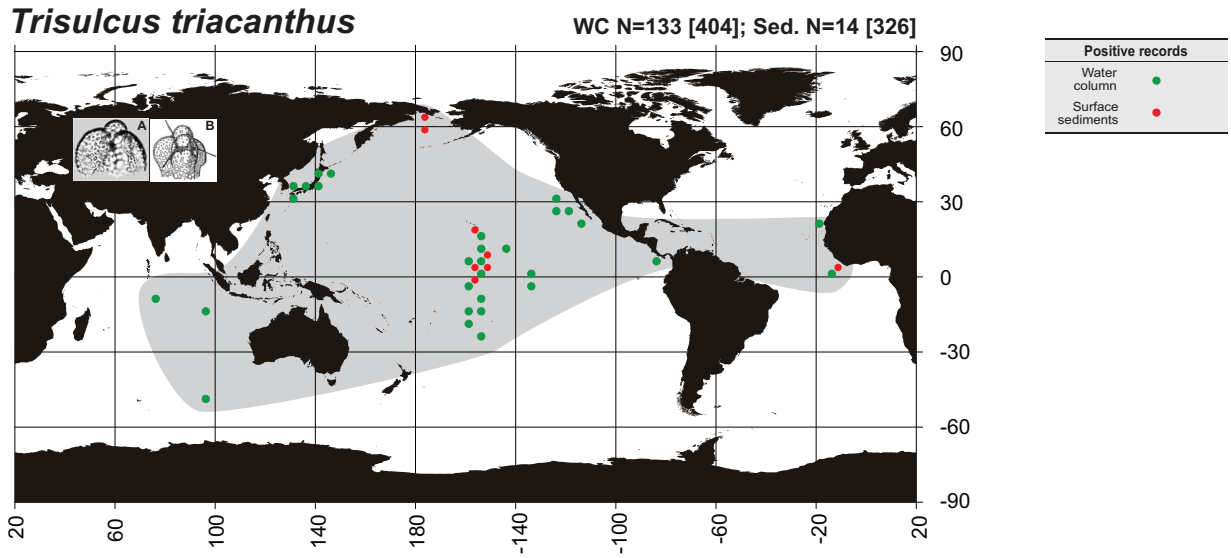


Figure 227. Geographic distribution of *Trisulcus triacanthus*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Boltovskoy (1999); B, Petrushevskaya (1971).

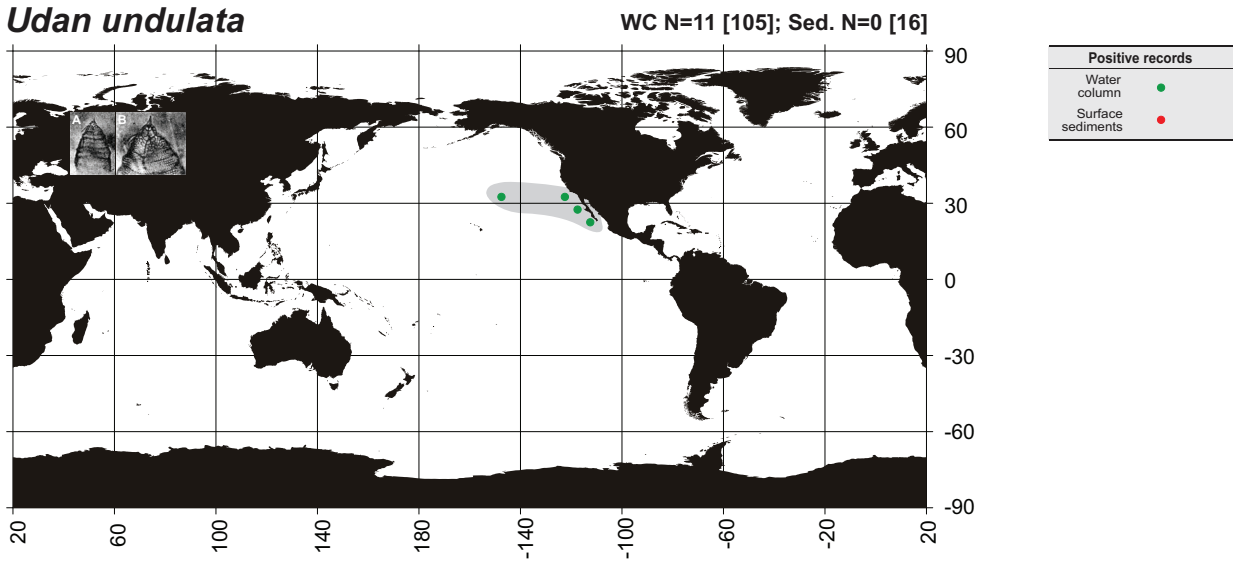


Figure 228. Geographic distribution of *Udan undulata*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Renz (1976); B, Renz (1976).

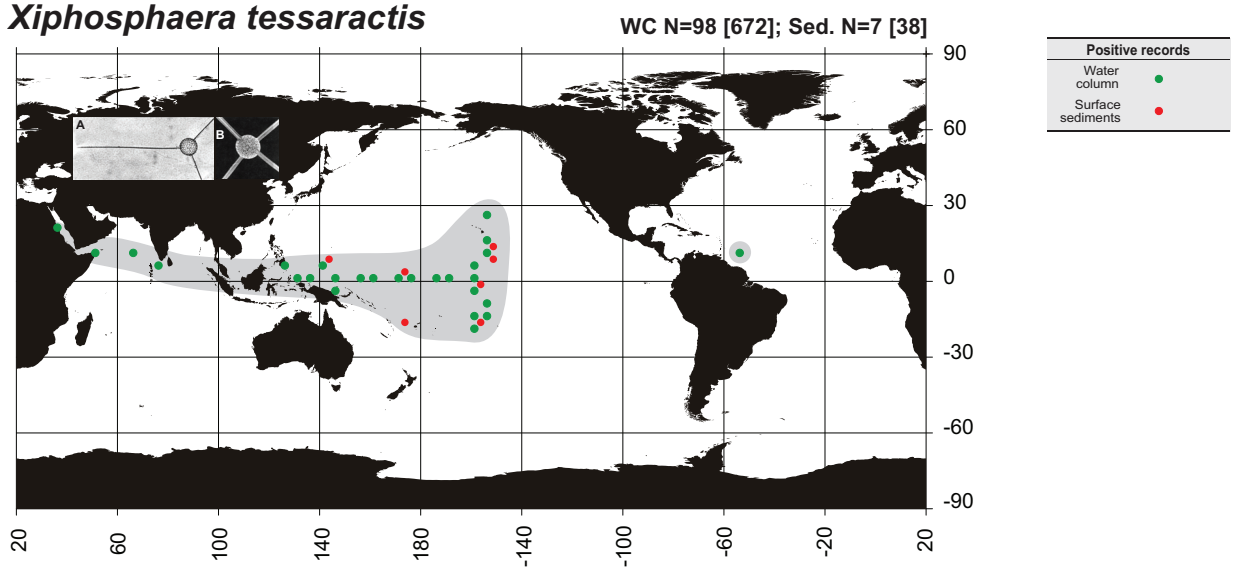


Figure 229. Geographic distribution of *Xiphosphaera tessaractis*. N: total number of positive records [total number of samples where the species was presumably sought], for water-column (WC) and surface sediment (Sed.) materials. Sources of species illustrations: A, Takahashi (1991); B, Takahashi (1991).

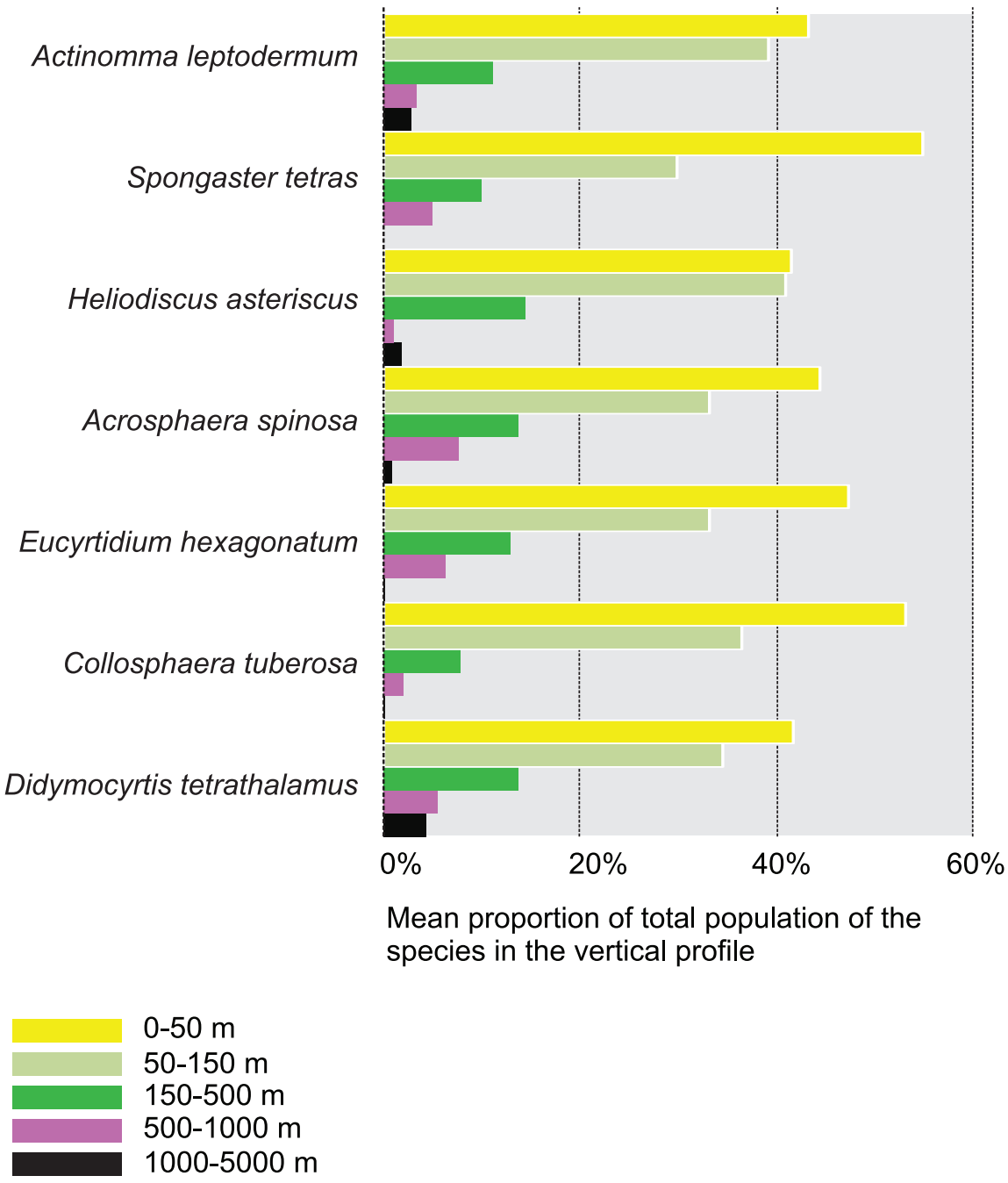


Figure 230. Vertical abundance profiles of species peaking in the upper 50 m.

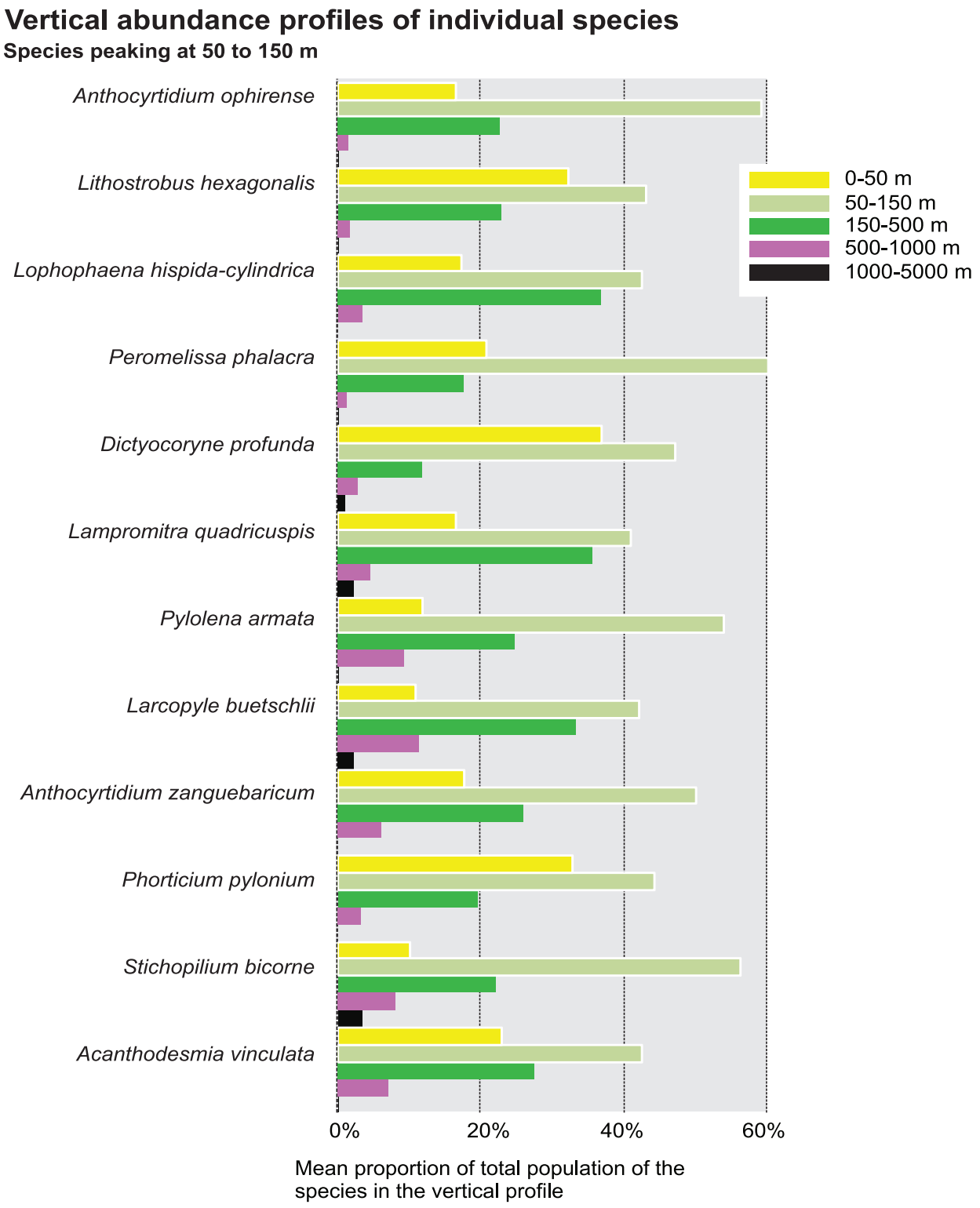


Figure 231. Vertical abundance profiles of species peaking at 50 to 150 m.

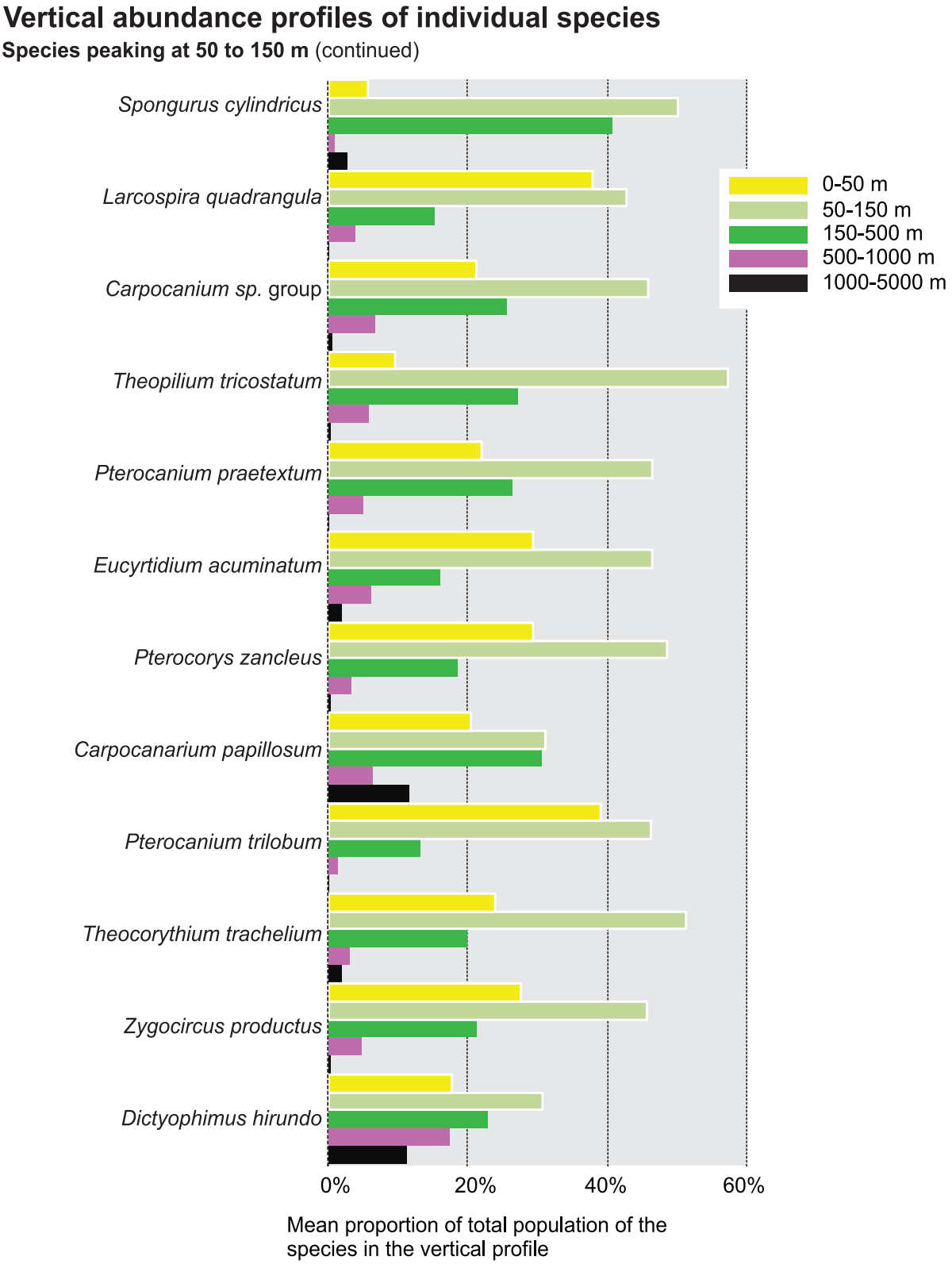


Figure 232. Vertical abundance profiles of species peaking at 50 to 150 m (continued).

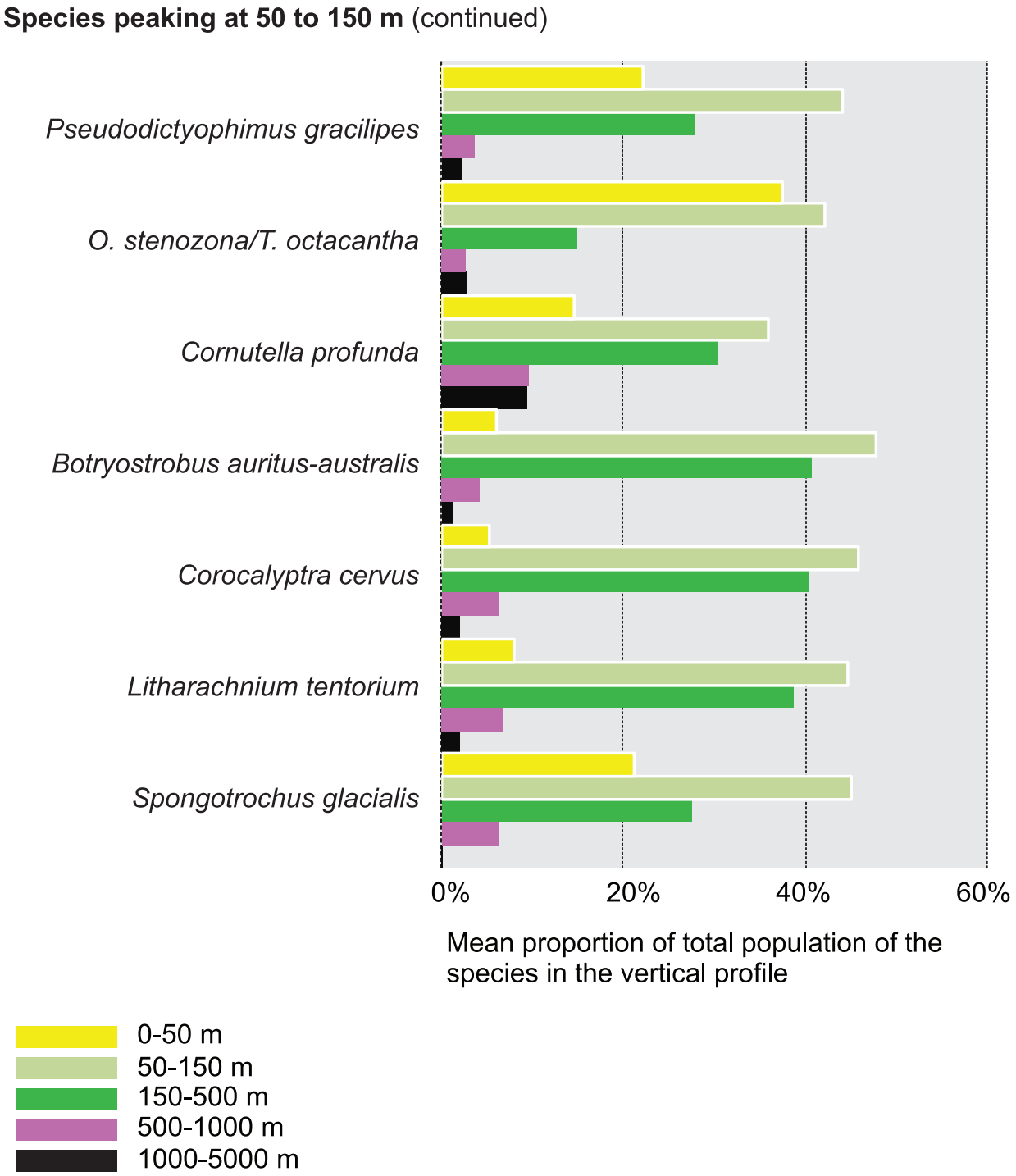


Figure 233. Vertical abundance profiles of individual species. Species peaking at 50 to 150 m.

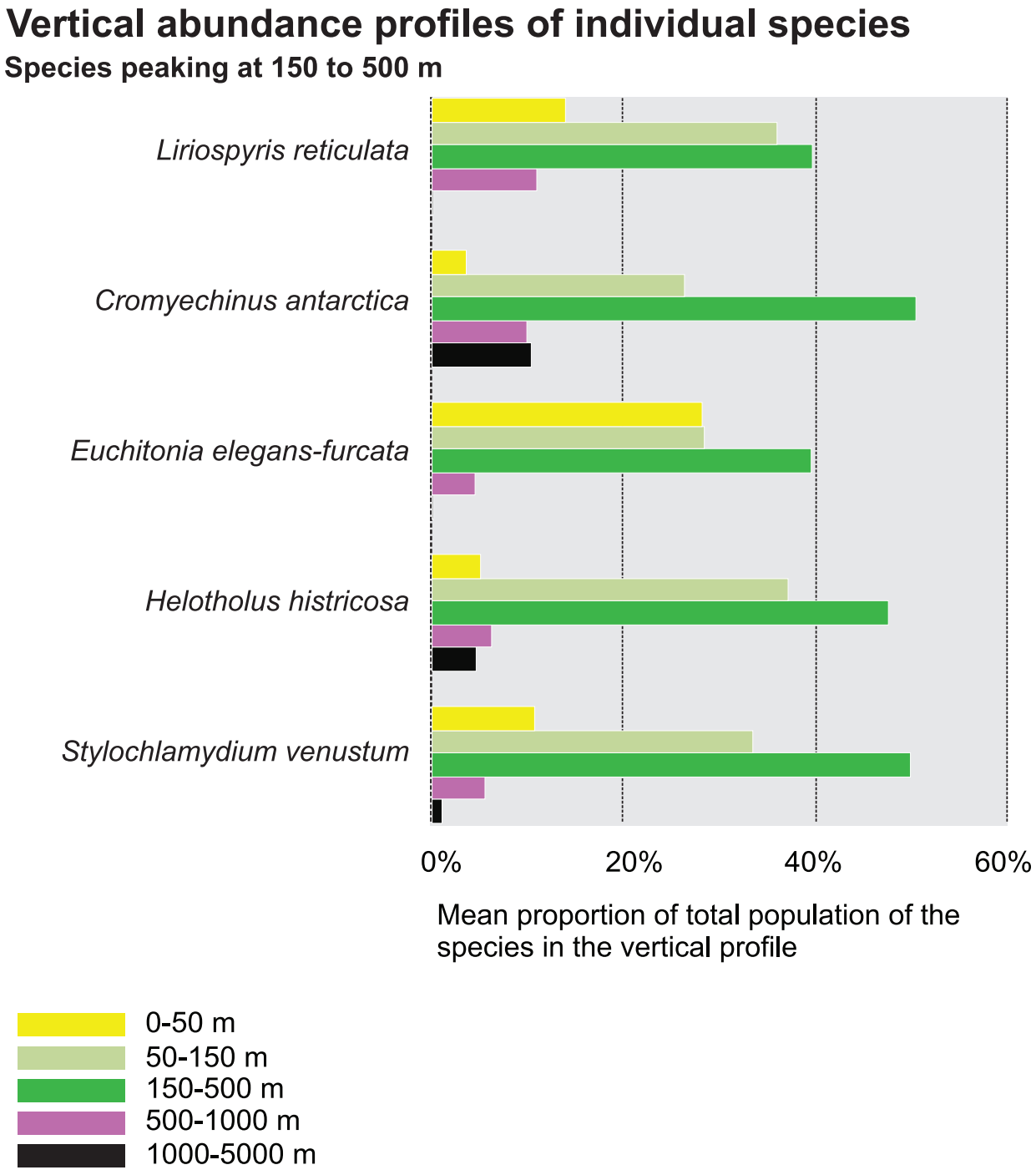
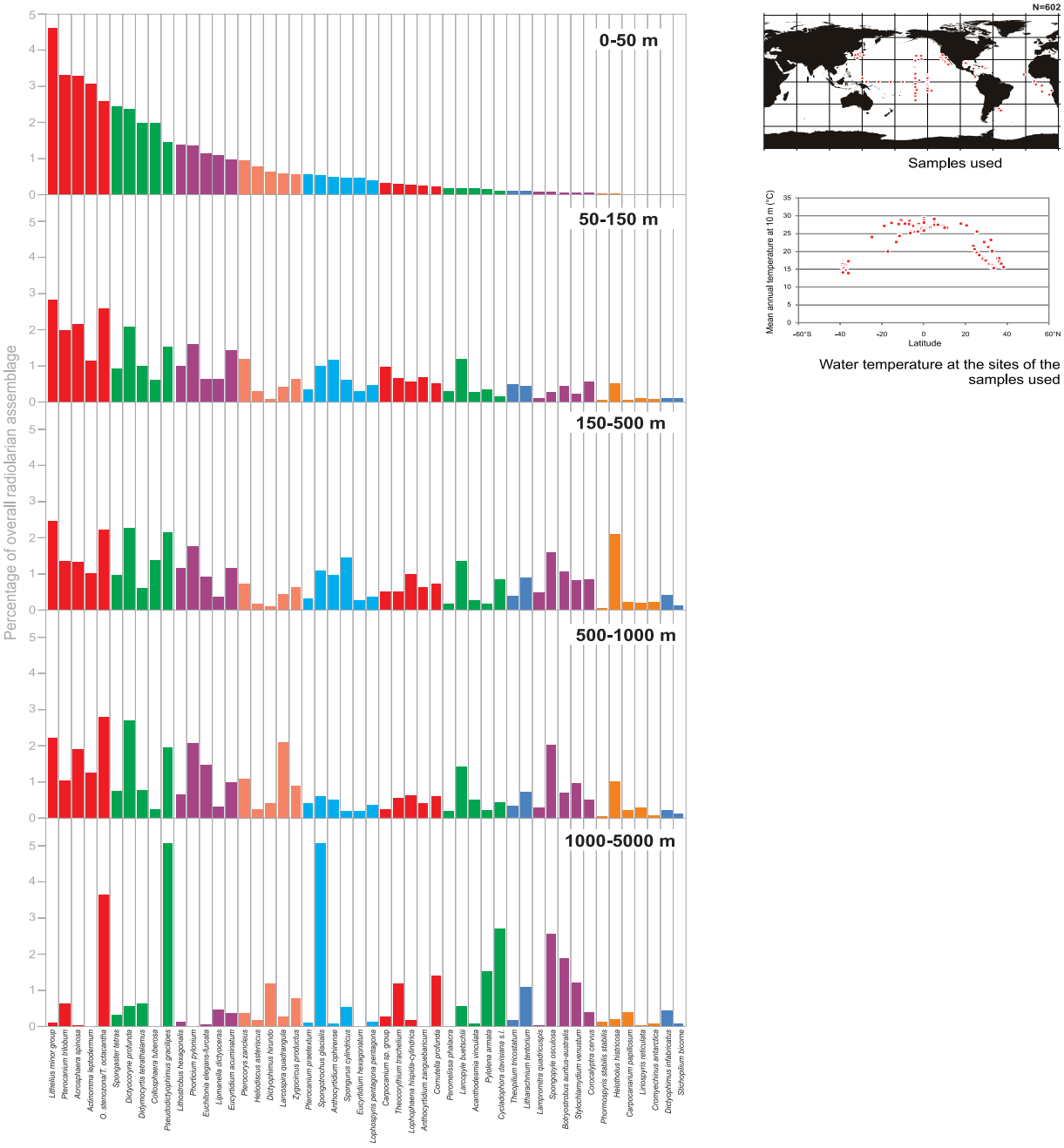


Figure 234. Vertical abundance profiles of species peaking at 150-500 m.

Dominant species at different depths

Tropics and subtropics (mean annual temperature at 10 m >12°C)



Samples used

Water temperature at the sites of the samples used

Figure 235. Dominant species at different depths intervals in the tropics and subtropics (mean annual temperature al 10 m >12°C).

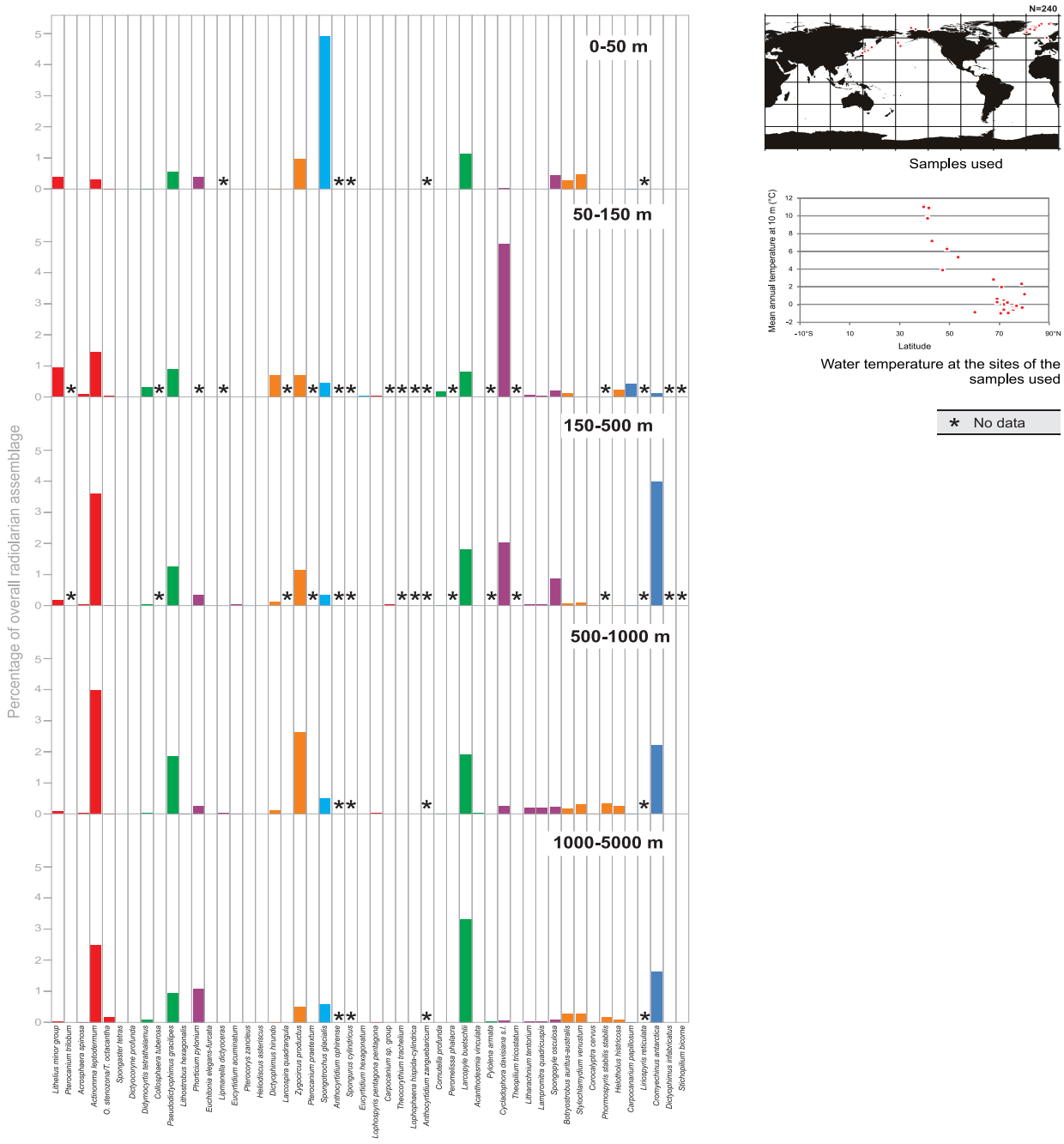


Figure 236. Dominant species at different depths intervals in temperate and cold areas, northern hemisphere only (mean annual temperature al 10 m <12°C).

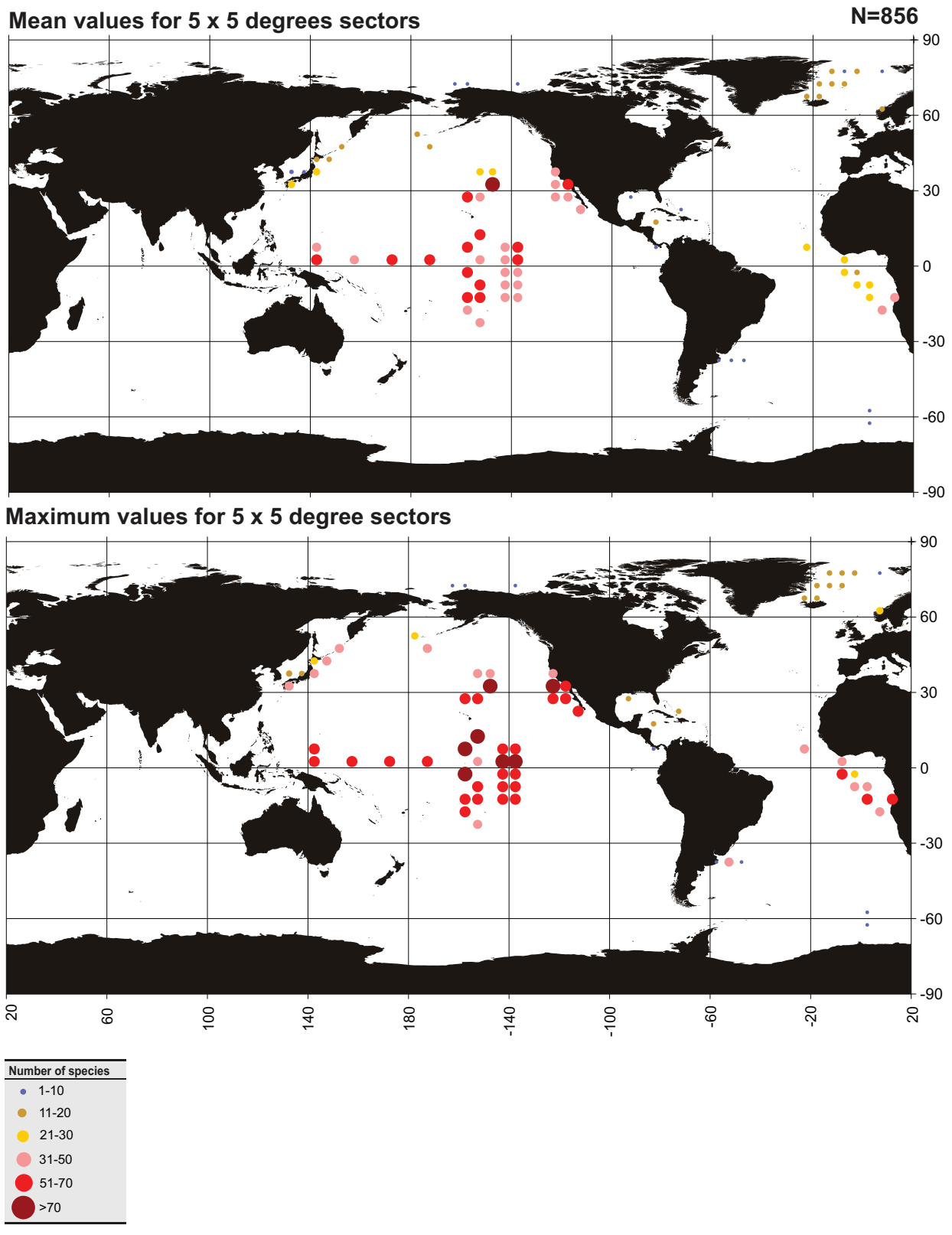


Figure 237. Mean and maximum numbers of species in plankton samples (all depths included; data are pooled in 5 x 5 degree bins). N: number of samples used.

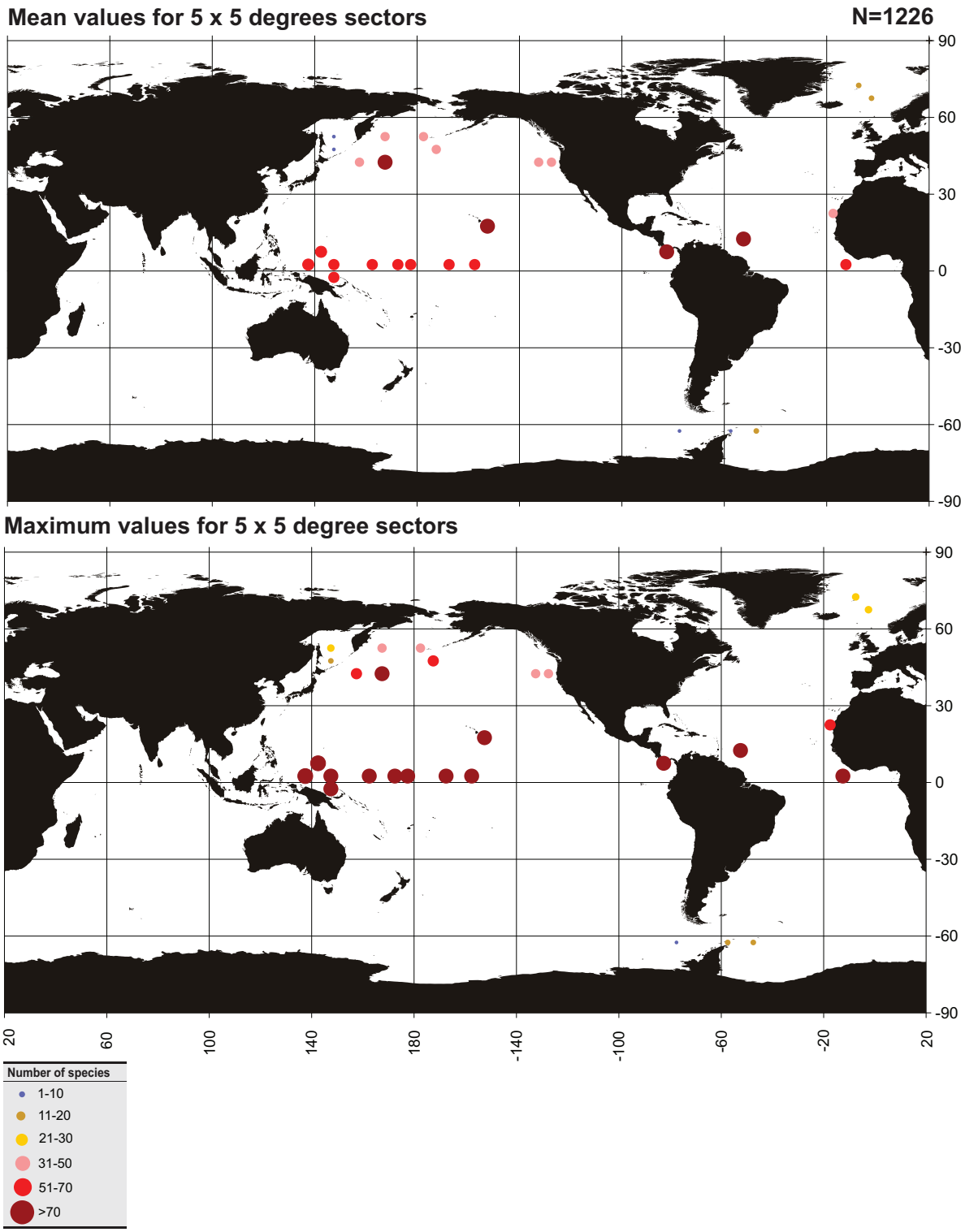


Figure 238. Mean and maximum numbers of species in sediment trap samples (each cup is a discrete sample; all depths included; data are pooled in 5 x 5 degree bins). N: number of samples used.

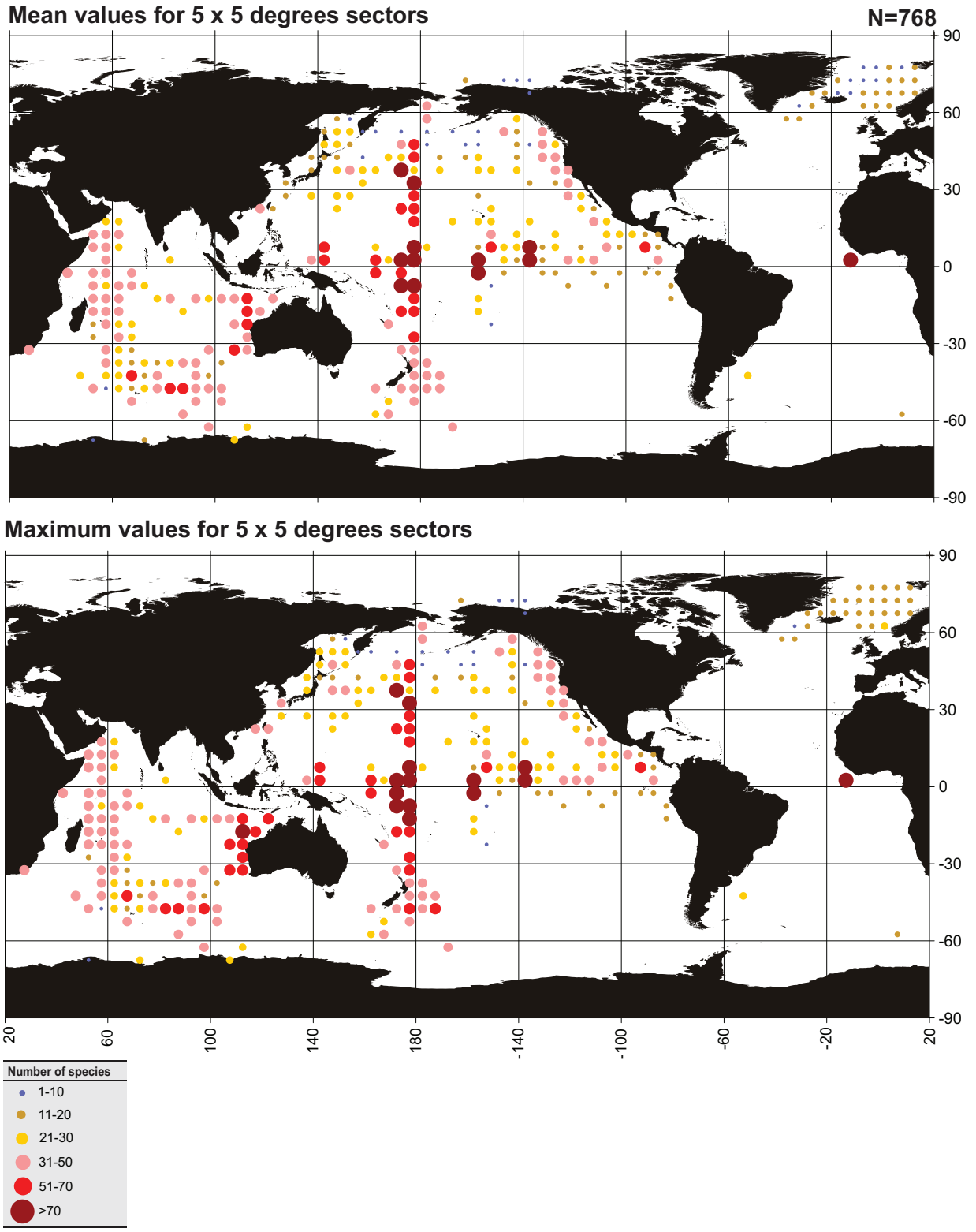


Figure 239. Mean and maximum numbers of species in surface sediment samples (data are pooled in 5 x 5 degree bins). N: number of samples used.

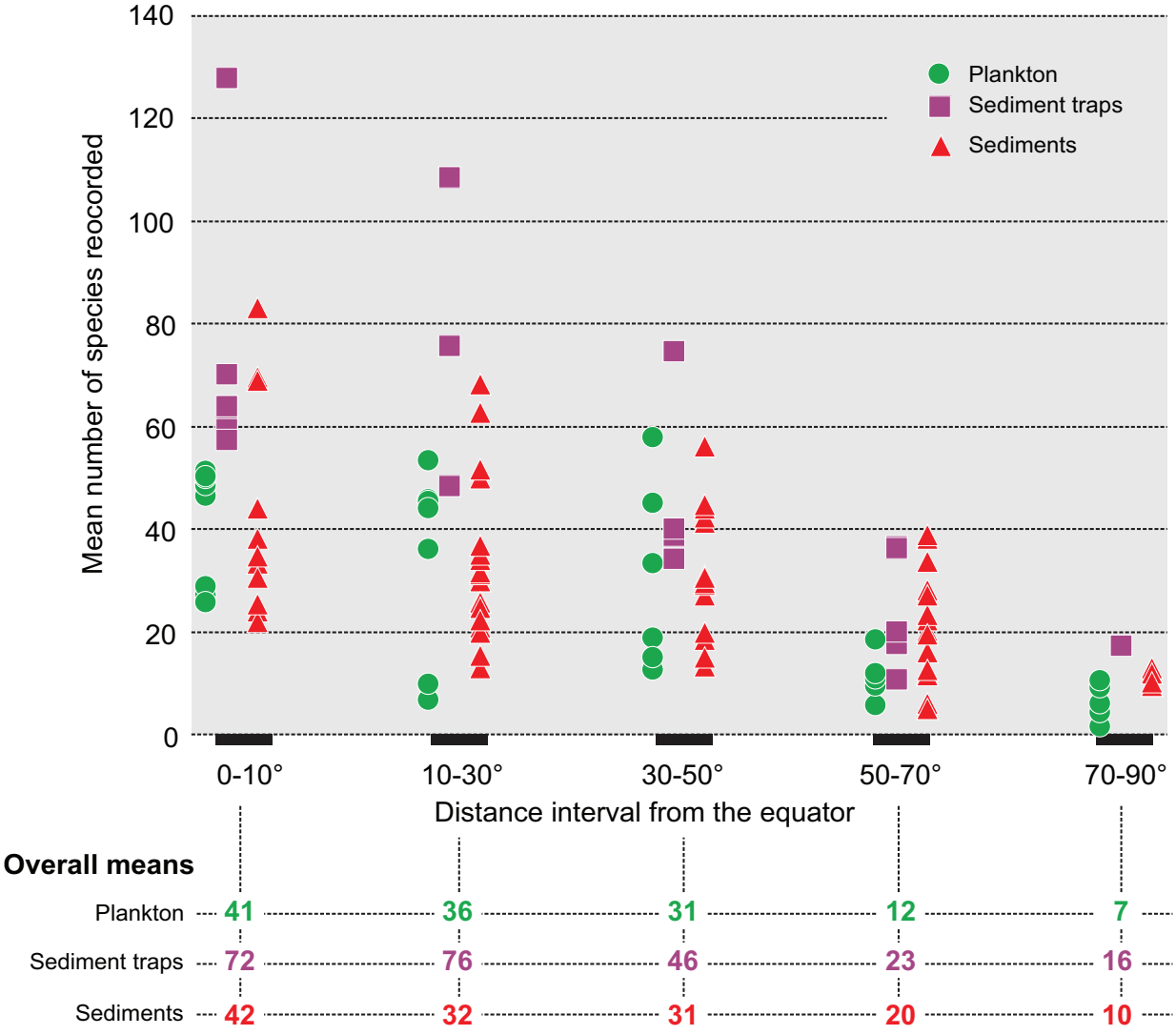


Figure 240. Comparative figures of numbers of species identified in plankton, sediment trap, and surface sediment samples as a function of latitude (averaged data for 20 x 20 degree sectors).

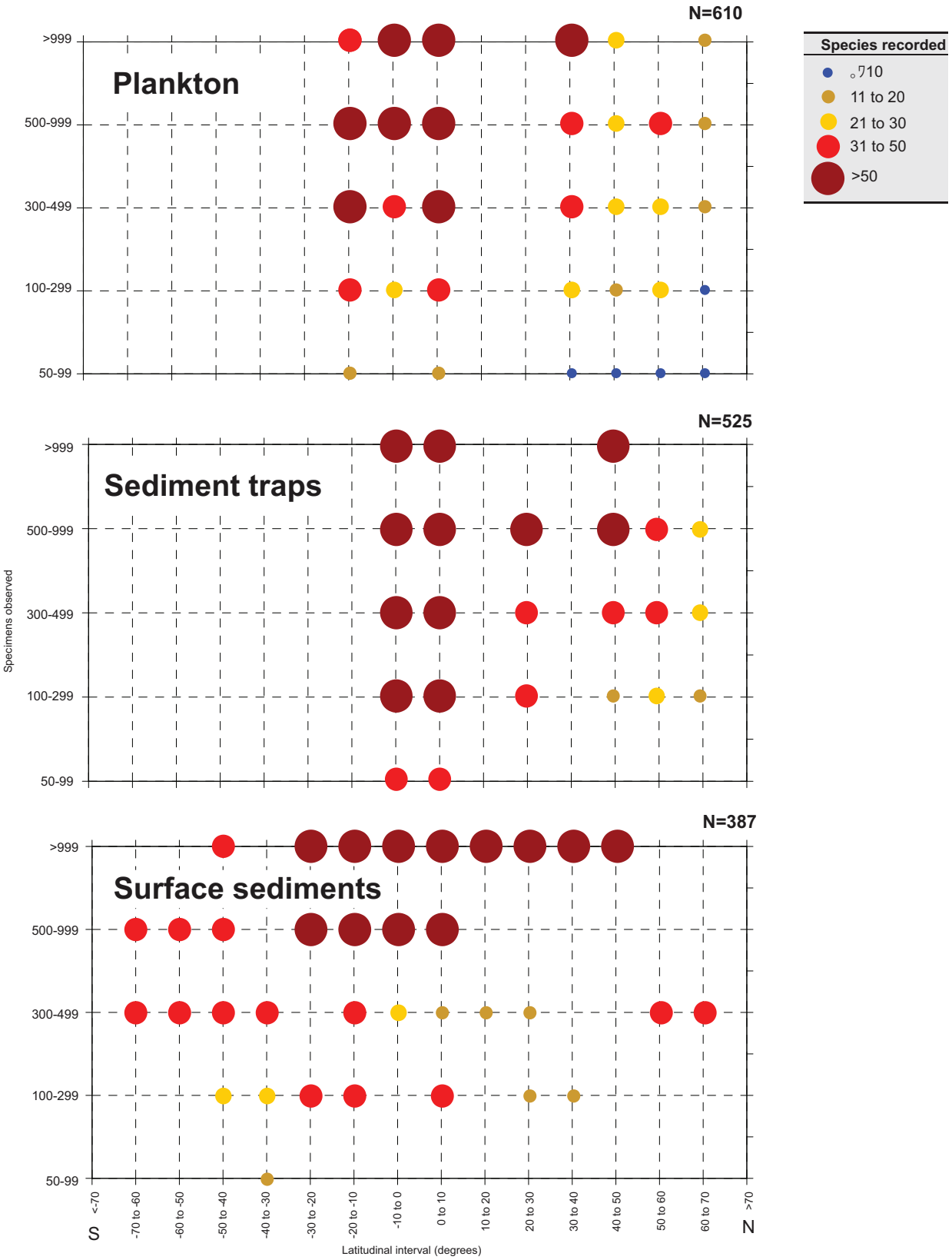


Figure 241. Number of species identified as a function of the number of specimens scanned at different latitudinal intervals. N: number of samples used.

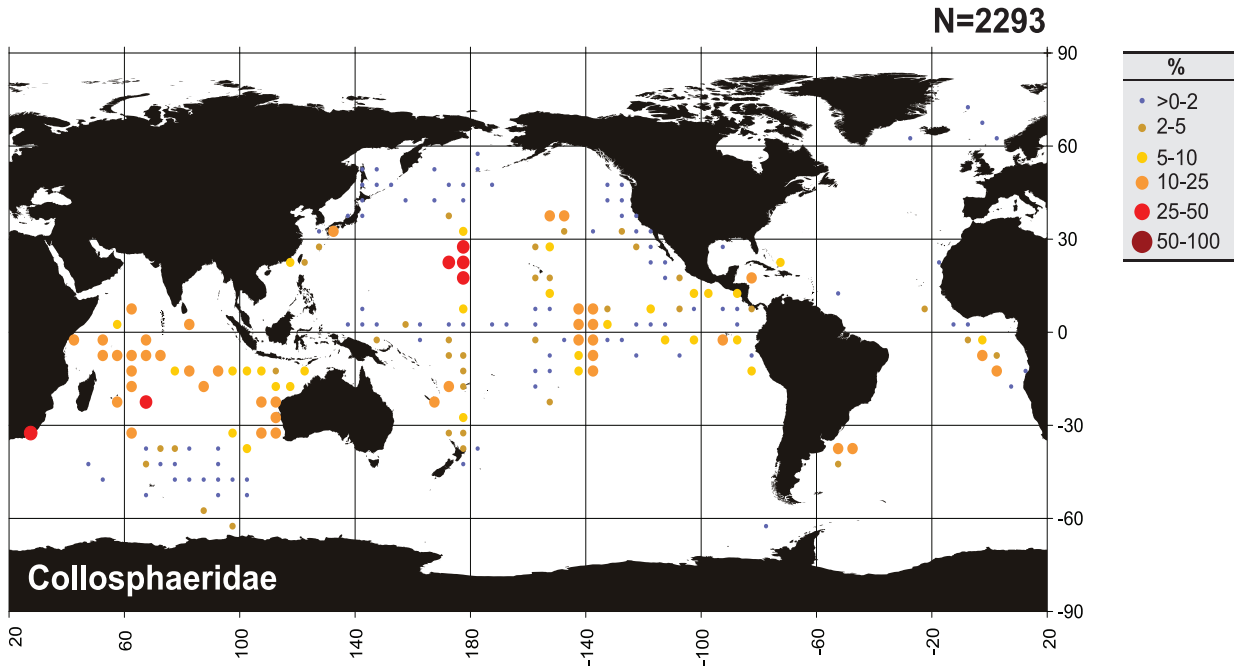


Figure 242. Geographic distribution of Collosphaeridae (Spumellaria). N: number of samples used.

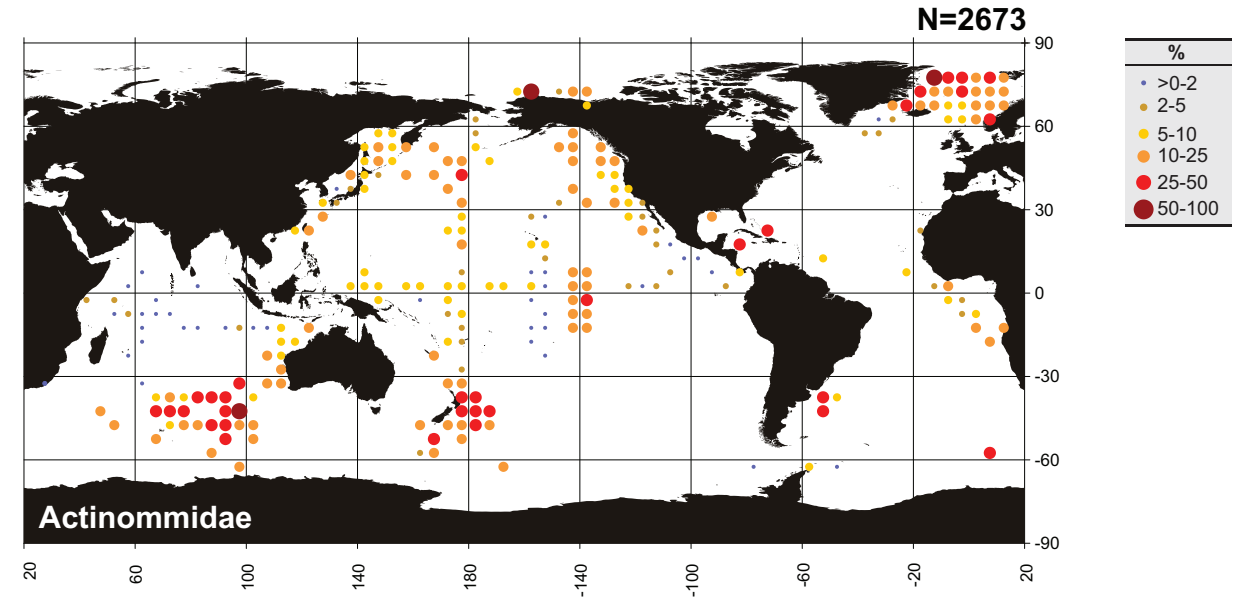


Figure 243. Geographic distribution of Actinommidae (Spumellaria). N: number of samples used.

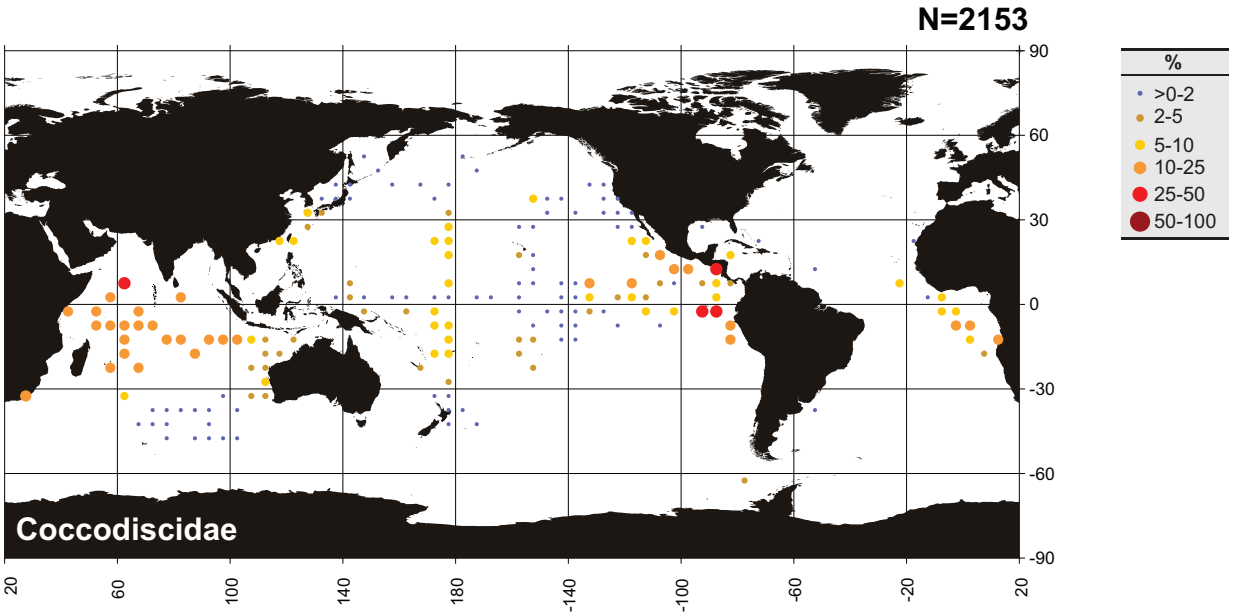


Figure 244. Geographic distribution of Coccodiscidae (Spumellaria). N: number of samples used.

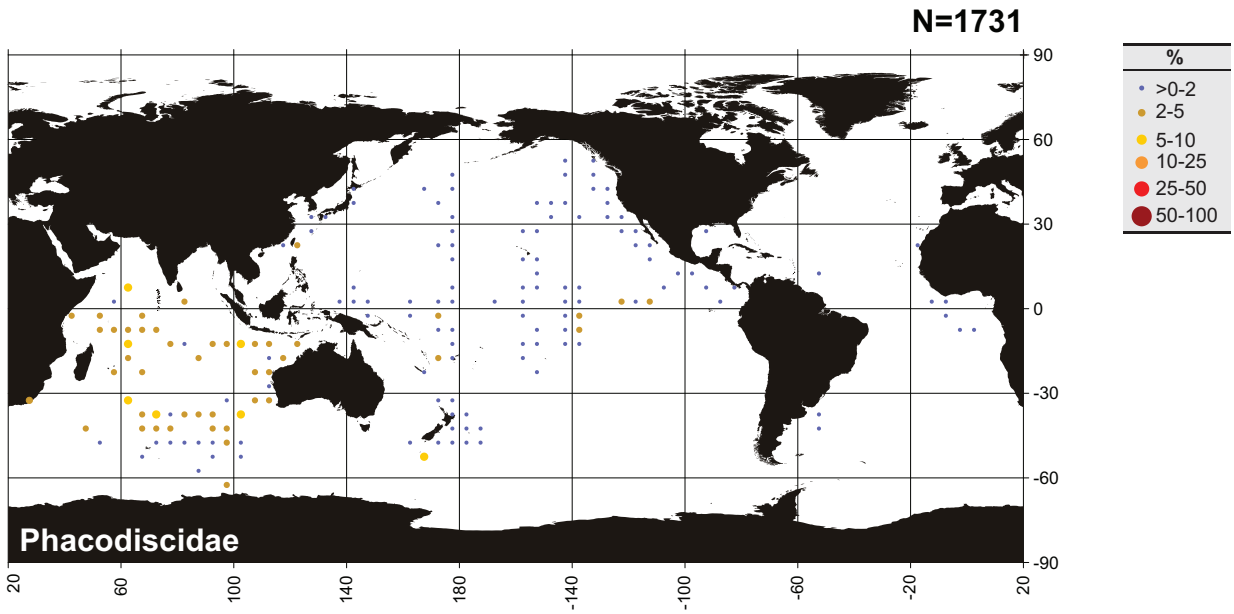


Figure 245. Geographic distribution of Phacodiscidae (Spumellaria). N: number of samples used.

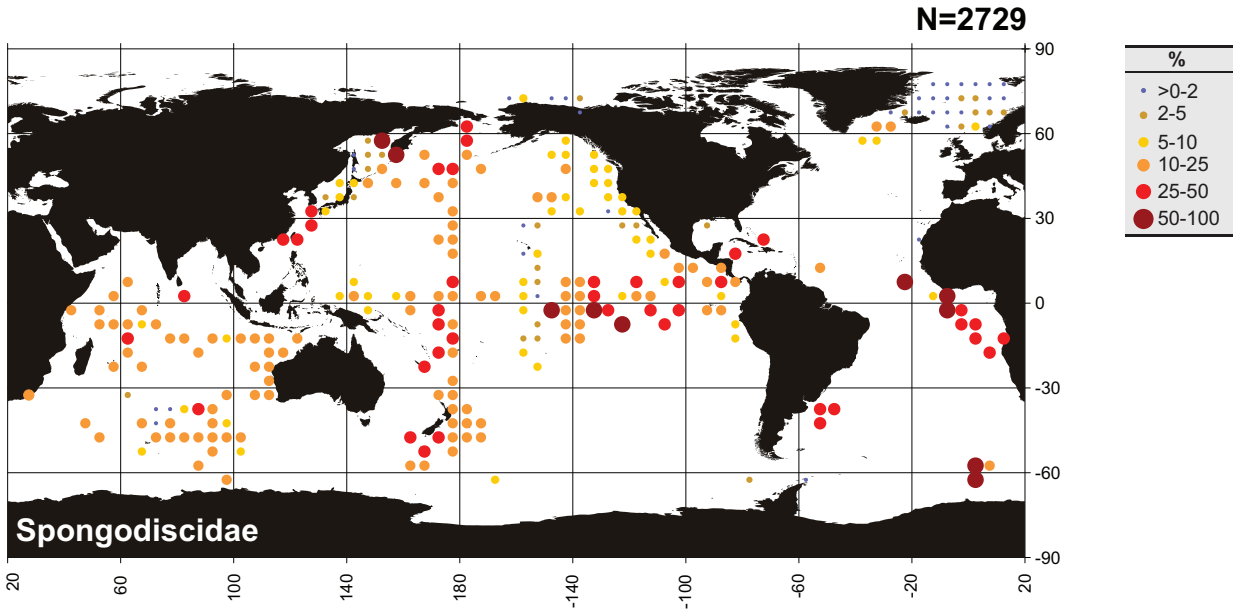


Figure 246. Geographic distribution of Spongodiscidae (Spumellaria). N: number of samples used.

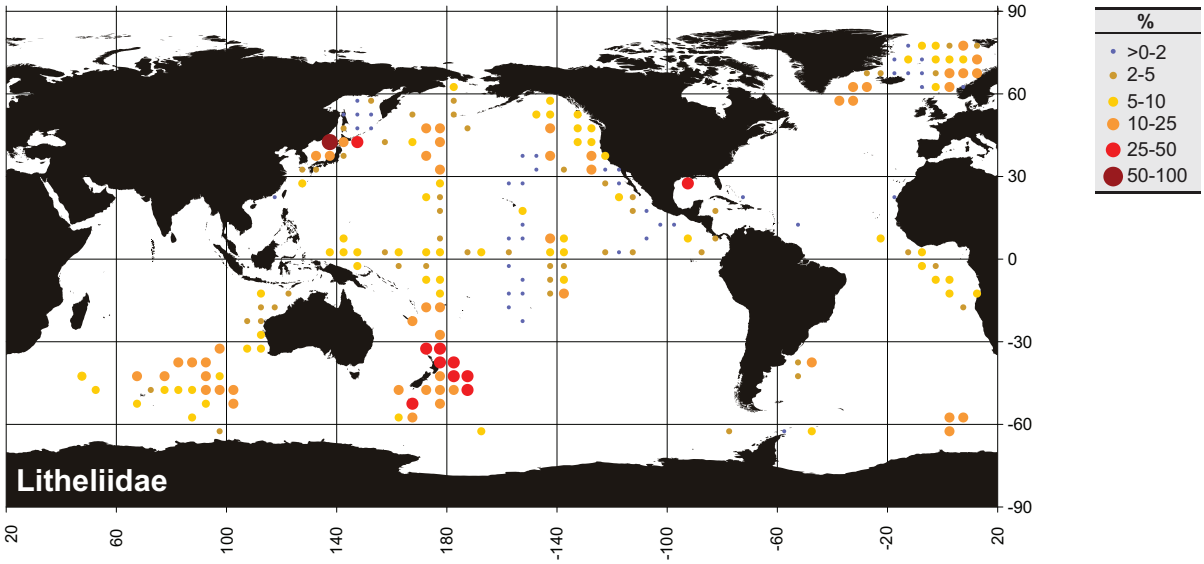


Figure 247. Geographic distribution of Litheliidae (Spumellaria). N: number of samples used.

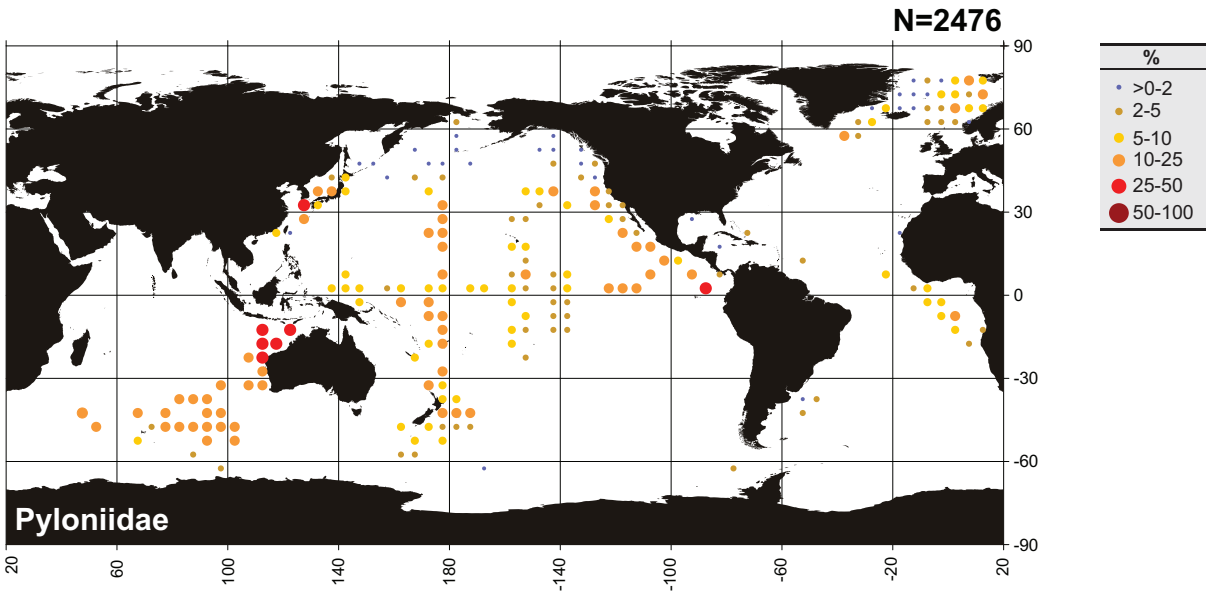


Figure 248. Geographic distribution of Pyloniidae (Spumellaria). N: number of samples used.

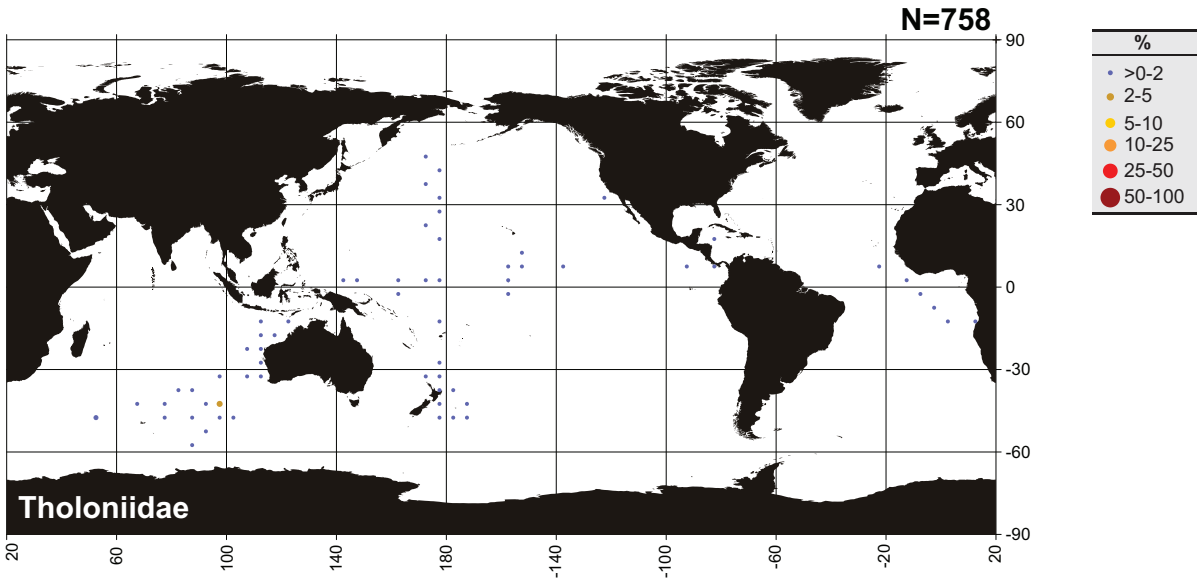


Figure 249. Geographic distribution of Tholoniidae (Spumellaria). N: number of samples used.

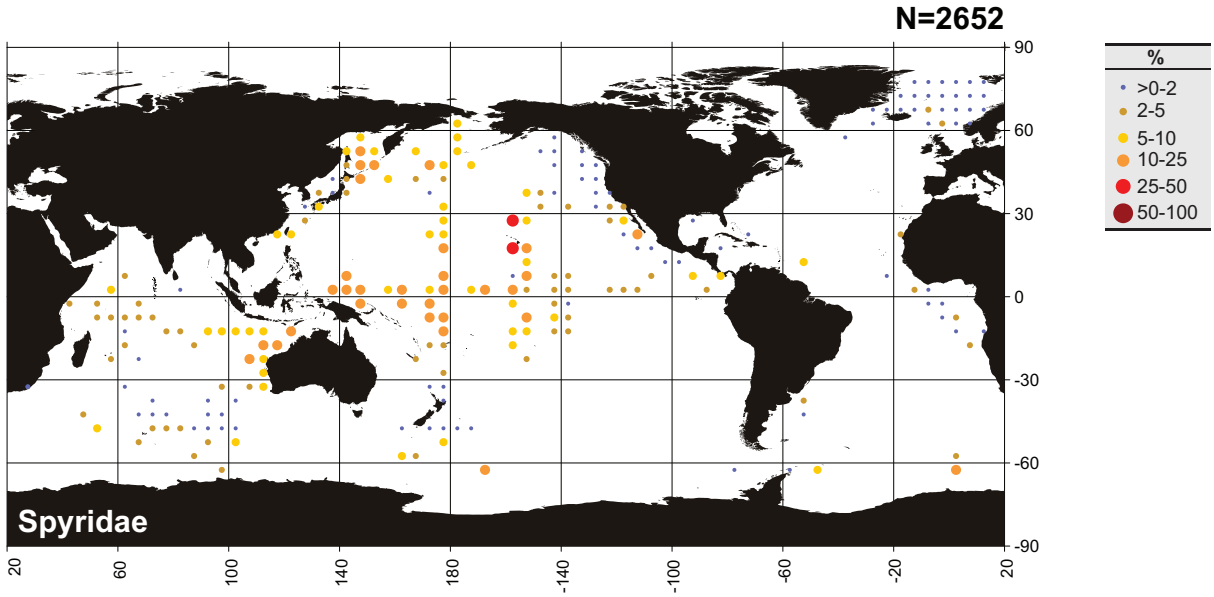


Figure 250. Geographic distribution of Spyridae (Nassellaria). N: number of samples used.

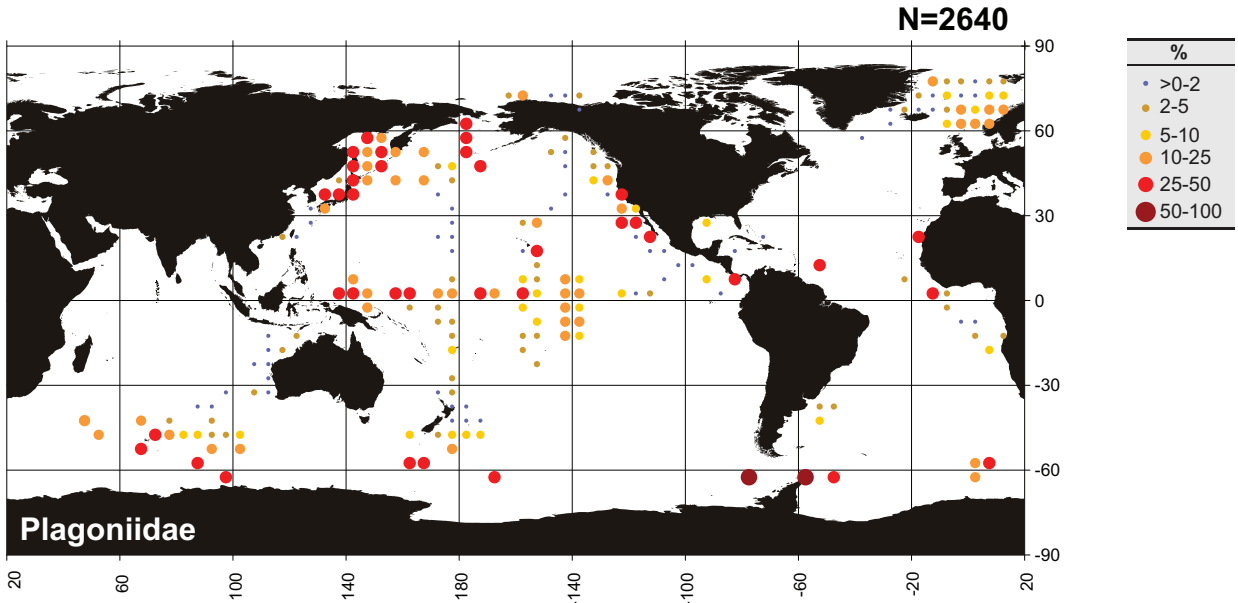


Figure 251. Geographic distribution of Plagoniidae (Nassellaria). N: number of samples used.

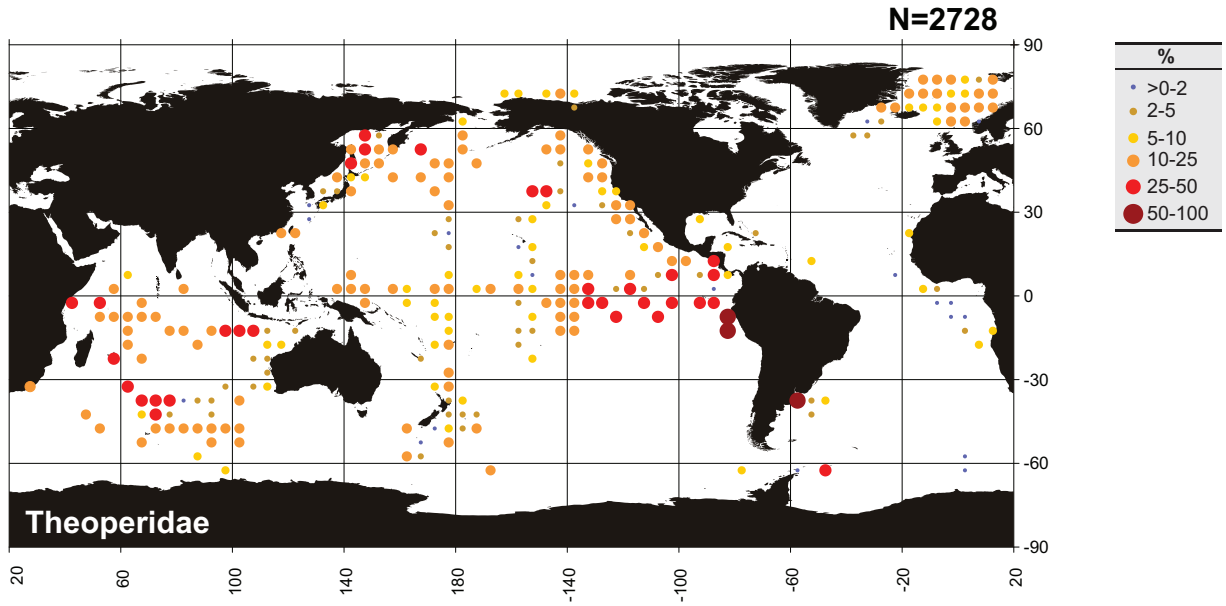


Figure 252. Geographic distribution of Theoperidae (Nassellaria). N: number of samples used.

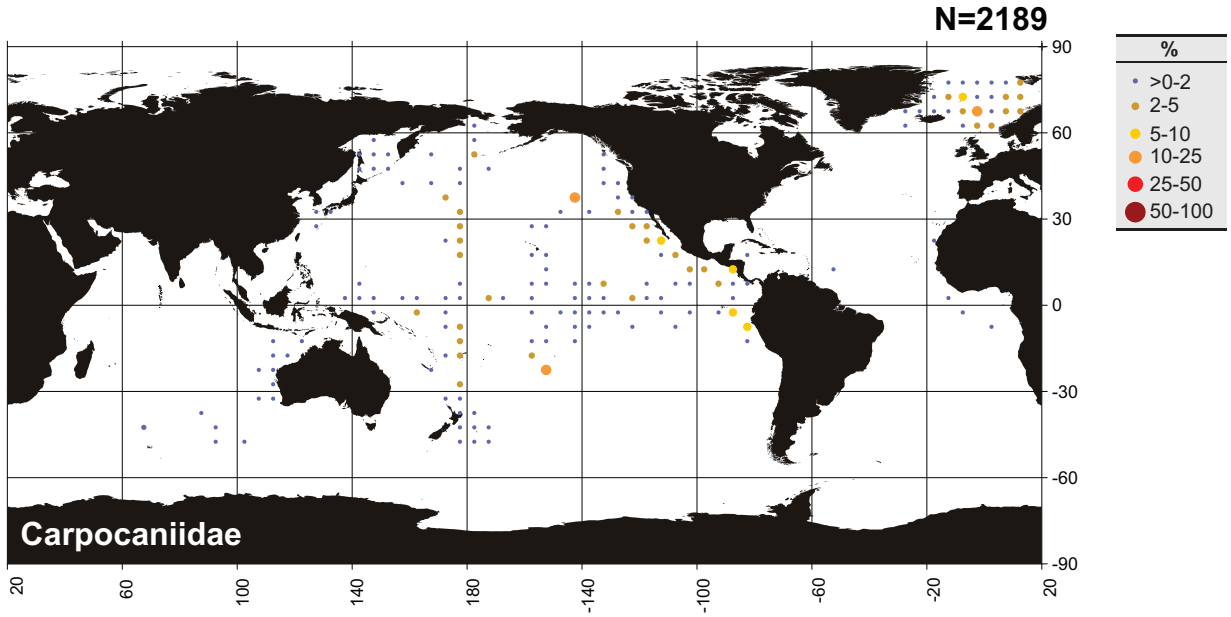


Figure 253. Geographic distribution of Carpocaniidae (Nassellaria). N: number of samples used.

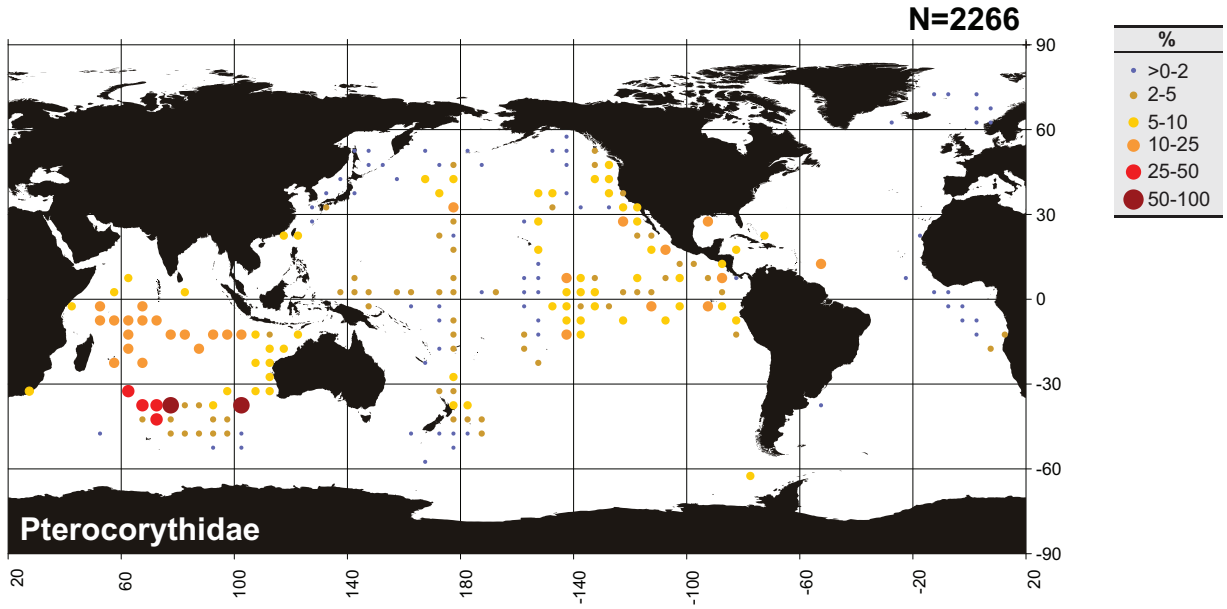


Figure 254. Geographic distribution of Pterocorythidae (Nassellaria). N: number of samples used.

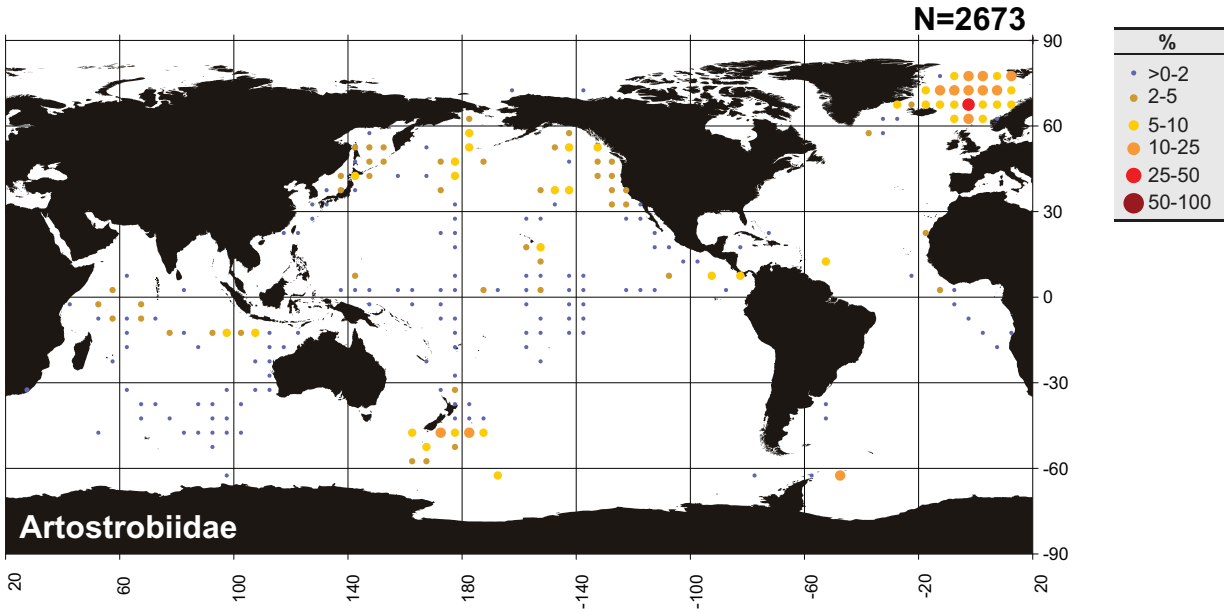


Figure 255. Geographic distribution of Artostrobiidae (Nassellaria). N: number of samples used.

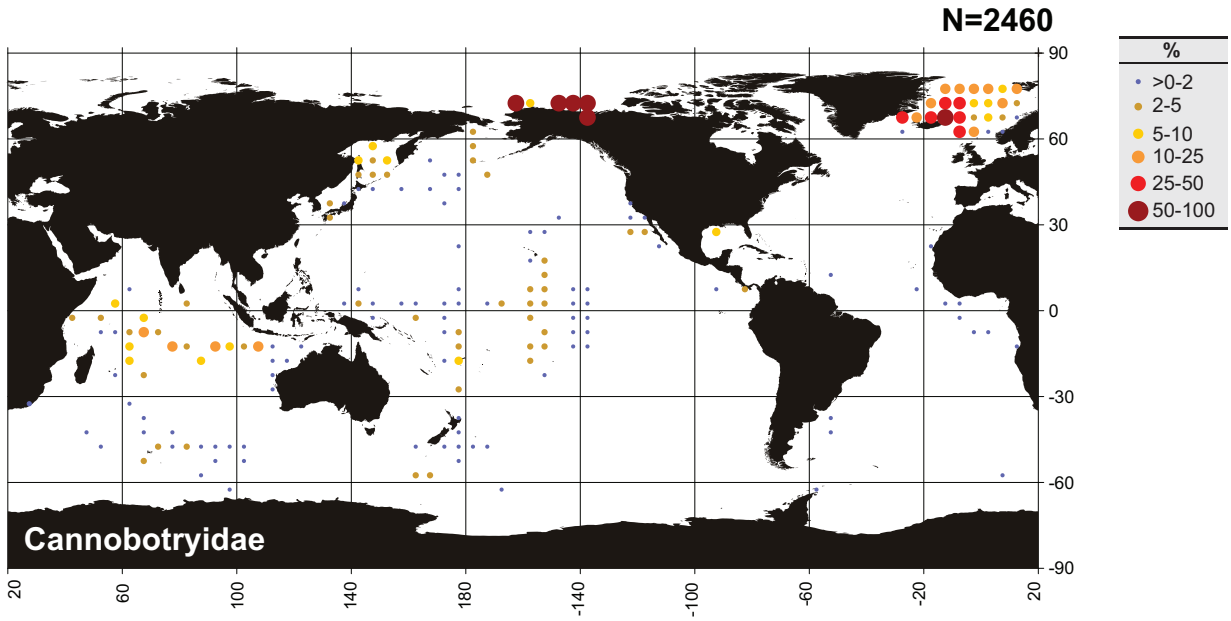


Figure 256. Geographic distribution of Cannobotryidae (Nassellaria). N: number of samples used.

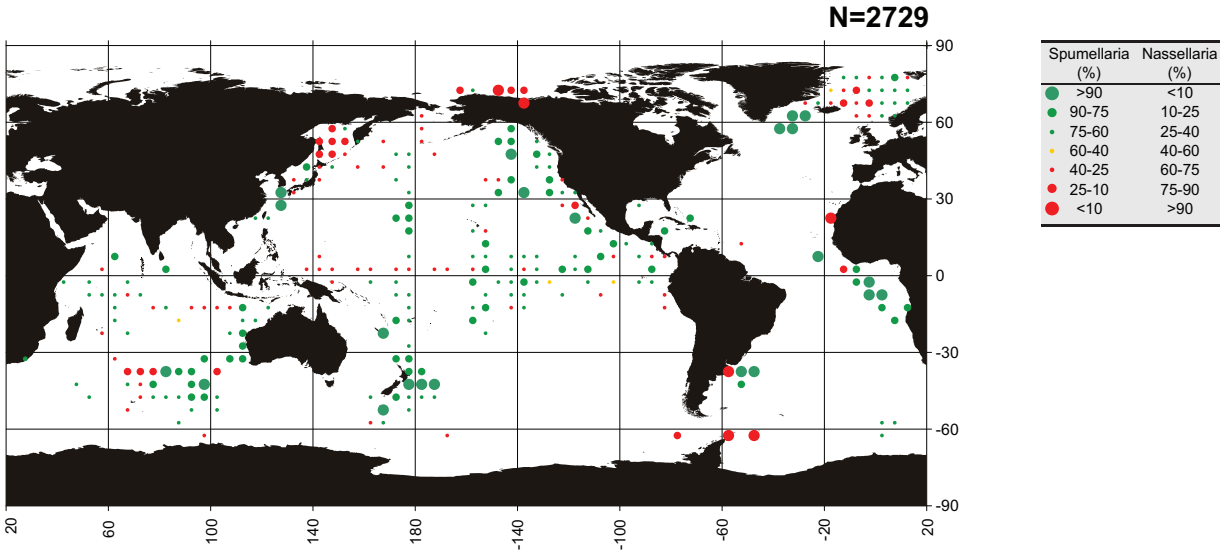


Figure 257. Proportions of Spumellaria vs. Nassellaria. N: number of samples used.

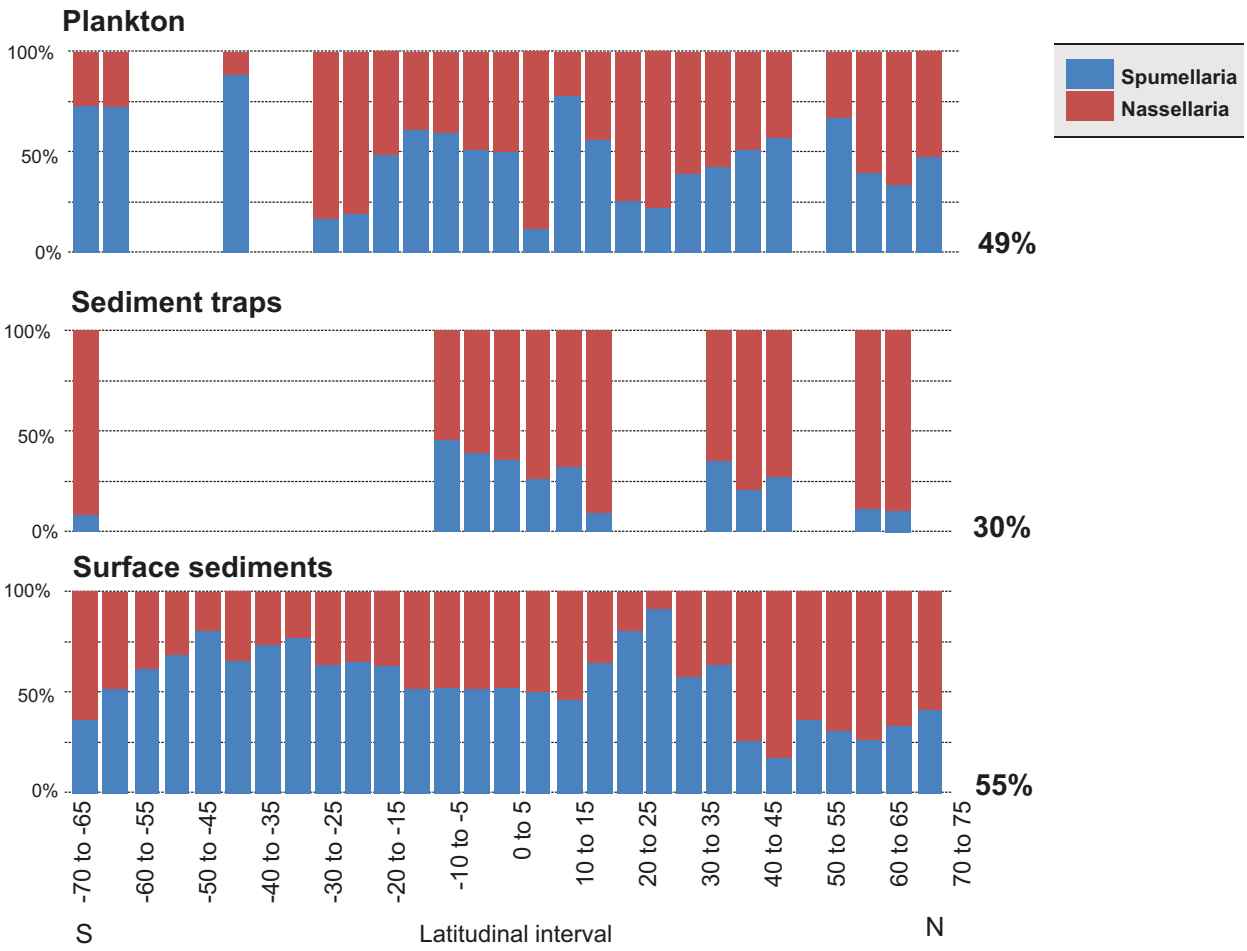


Figure 258. Proportions of Spumellaria vs. Nassellaria as a function of latitude for plankton, sediment trap, and surface sediment materials (averaged data for the latitude intervals indicated).

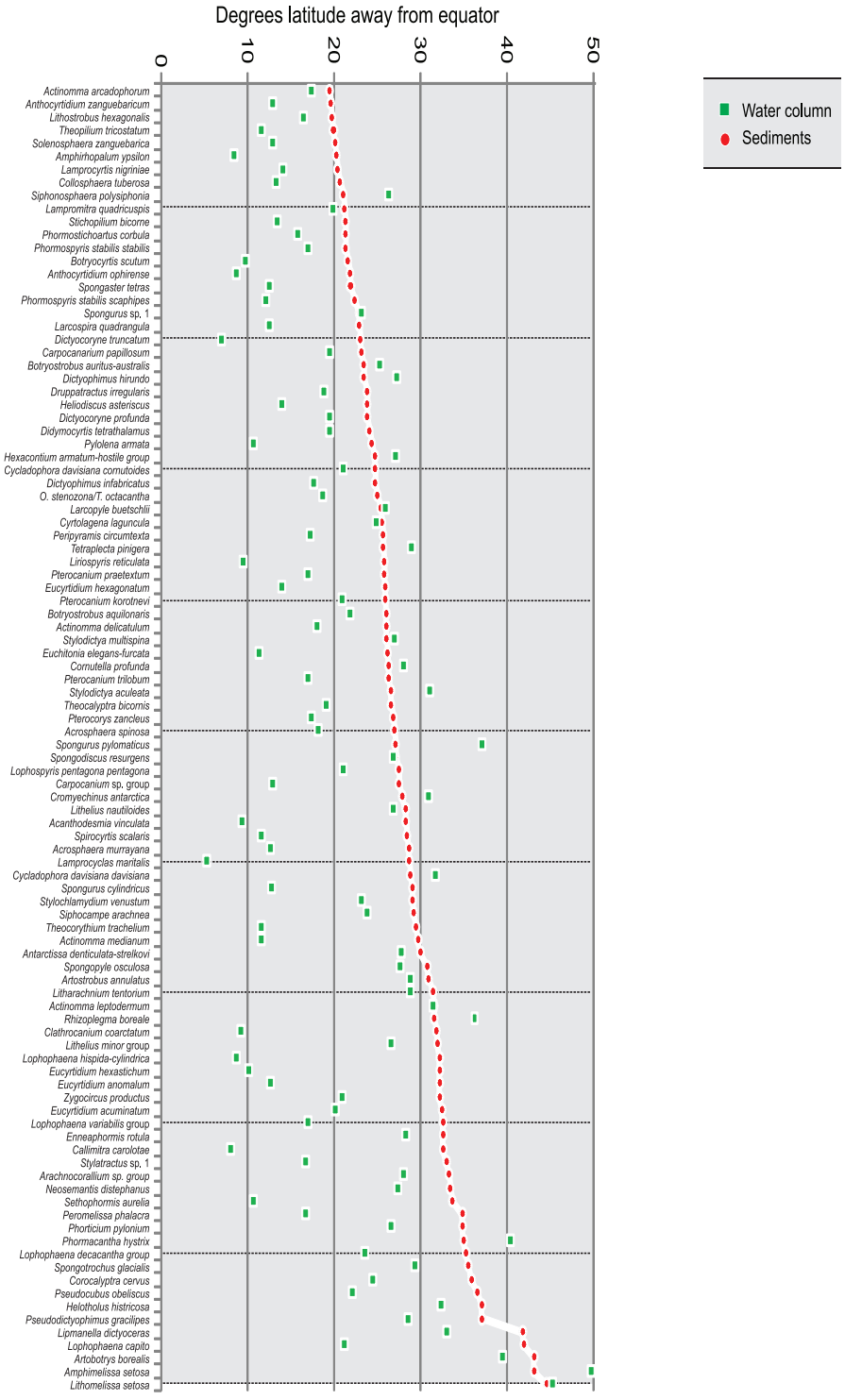


Figure 259. Comparison of specific occurrences of the 100 most abundant species in water column and in sediment samples. For each species the average latitude (absolute values) of all the samples where the species was present is shown. Because the mean latitude of sedimentary samples is 1.32 times that of all plankton samples, their index was divided by this figure.

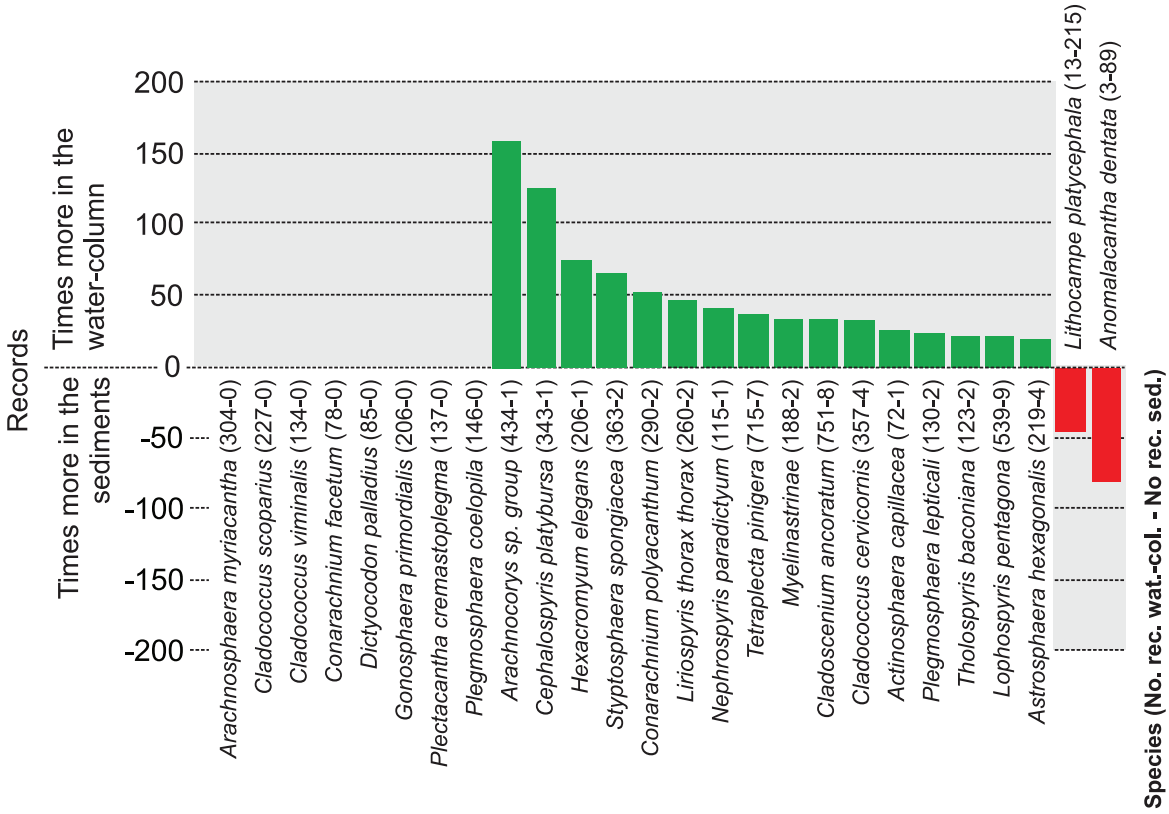


Figure 260. Comparison of specific occurrences of selected species in water column and in sediment samples, as indicated by the ratio between the number of times a given species was recorded in the water-column vs. the number of times it was recorded in the sediments. Numbers in parentheses after each species name denote numbers of samples where it was recorded in water column materials (first figure) and in sedimentary materials (second figure). For columns graphed, the total number of occurrences in the water column and in the sediments were corrected for total number of water column and sediment samples in the database.

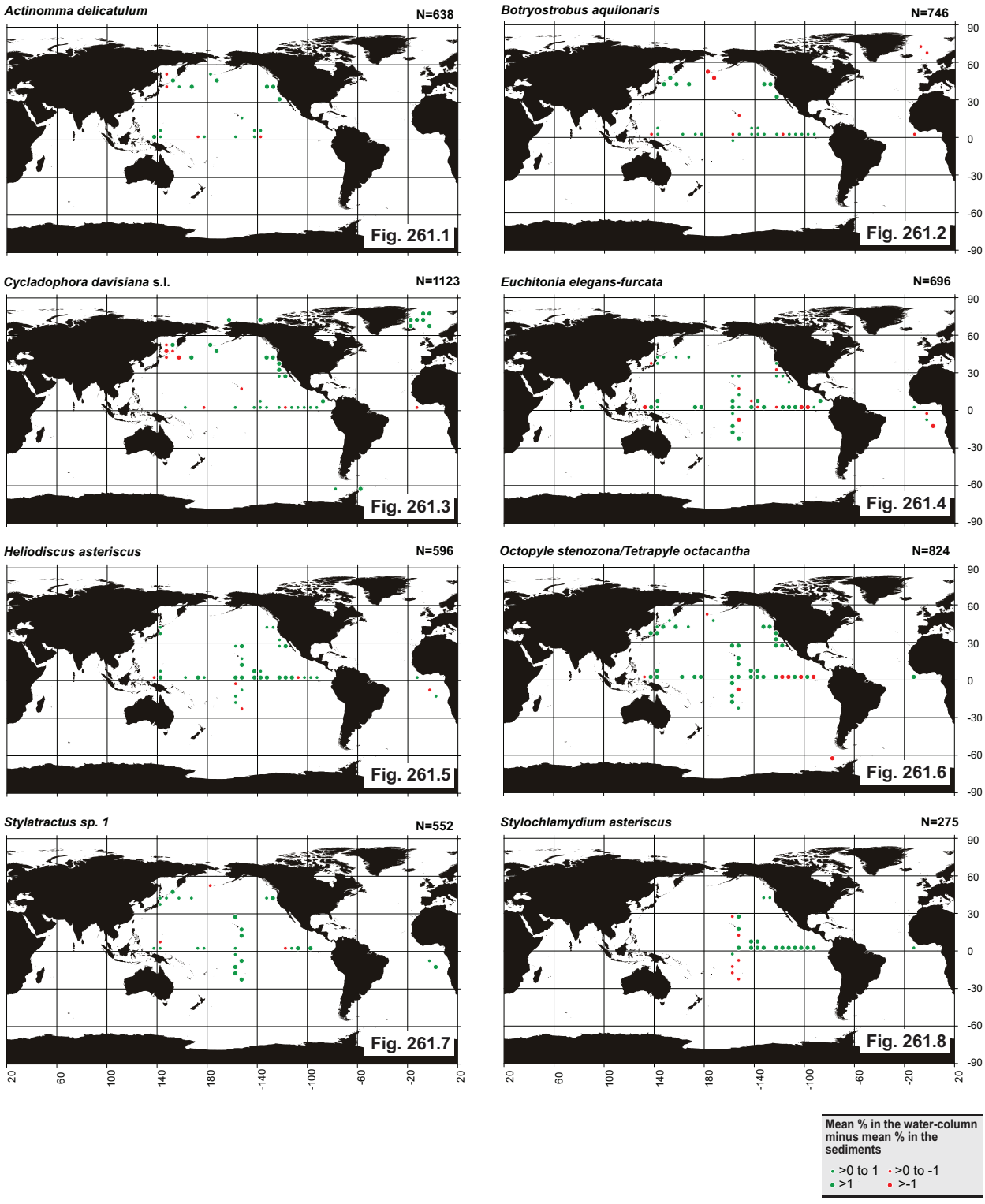


Figure 261. Comparison of mean species percentages in the water-column and the sediments. Species with enhanced presence in water-column samples. Data pooled in 5 x 5 degree Marsden squares and averaged for water column (plankton and sediment traps) and sedimentary materials separately. For those Marsden squares where data for both the water-column and the sediments were available mean proportions in the sediments were substracted from the mean proportions in the water-column. N values indicate total numbers of original data points involved in each comparison. Graphs are restricted to species where a strong bias toward the water-column is apparent.

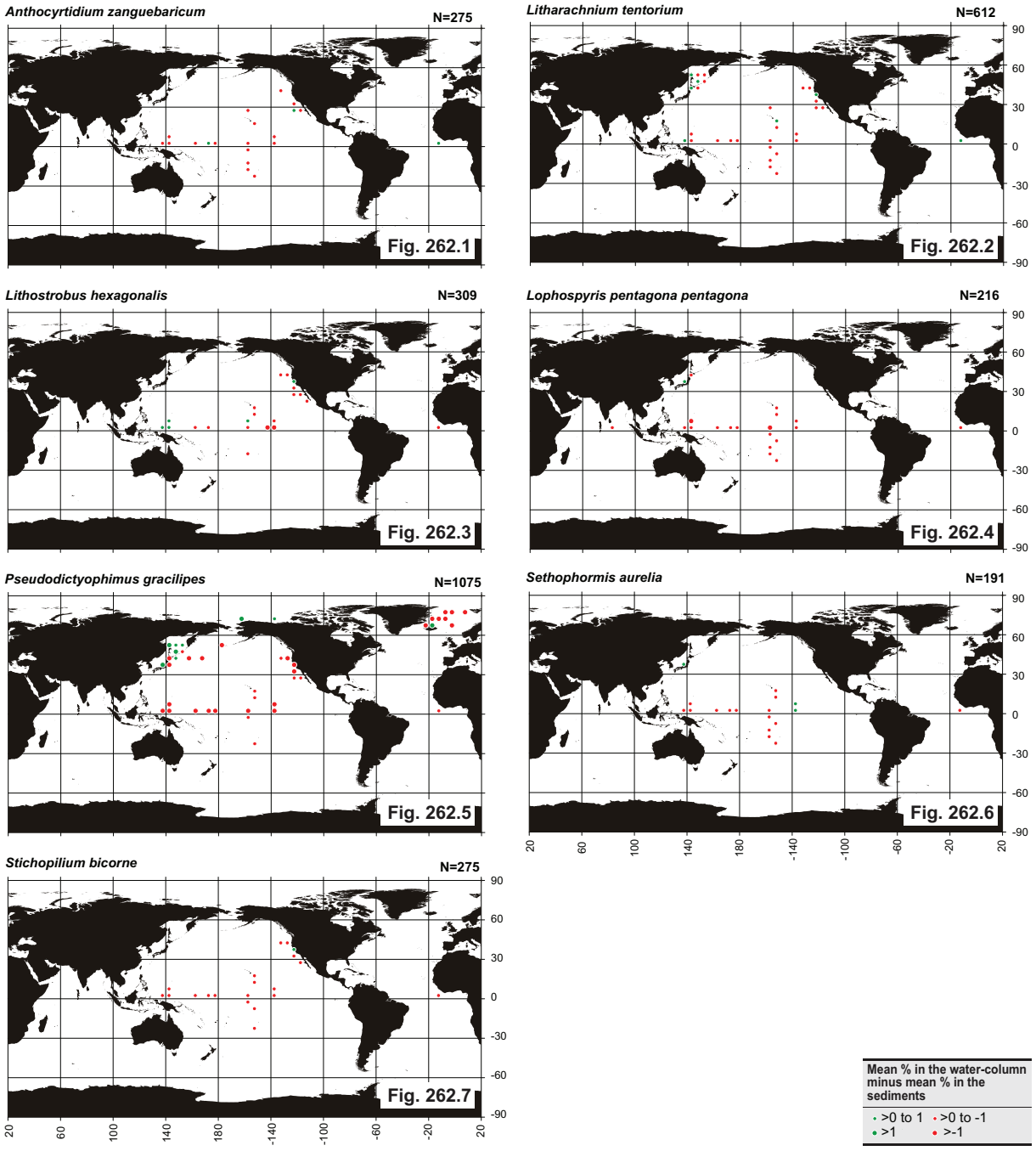


Figure 262. Comparison of mean species percentages in the water-column and the sediments. Species with enhanced presence in surface sediment samples. Data pooled in 5 x 5 degree Marsden squares and averaged for water column (plankton and sediment traps) and sedimentary materials separately. For those Marsden squares where data for both the water-column and the sediments were available mean proportions in the sediments were substracted from the mean proportions in the water-column. N values indicate total numbers of original data points involved in each comparison. Graphs are restricted to species where a strong bias toward the sediments is apparent.

APPENDIX 1.

Sources used for compiling the present database and details of the information extracted from each.

Source	Materials	Type of data	Number of samples
Abelmann (1992)	Sediment trap	Shells/m^2/day, spp. %	55
Abelmann and Gowing (1997)	Plankton	Shells/m^3, counts only, no ID	33
Alder et al. (Unpublished)	Plankton	Shells/m^3, counts only, no ID	232
Alperín (1987)	Sediments	Spp. %	1
Bernstein et al. (1990)	Sediment trap	Shells/m^2/day, counts only, no ID	42
Bjørklund (1972)	Plankton	Shells/m^3, spp. %	130
Bjørklund and Kruglikova (2003)	Sediments	Shells/g dry sed., counts only, no ID	229
Boltovskoy (1987)	Sediments	Spp. %	18
Boltovskoy (1992)	Sediments	Shells/g dry sed., spp. %	6
Boltovskoy and Jankilevich (1985)	Plankton	Spp. % (approx.)	44
Boltovskoy and Riedel (1980)	Plankton	Spp. % (approx.)	47
Boltovskoy and Riedel (1987)	Plankton	Shells/m^3, spp. %	48
Boltovskoy et al. (1993a)	Sediment trap	Shells/m^2/day, spp. %	20
Boltovskoy et al. (1993b)	Sediments	Spp. %	2
Boltovskoy et al. (1996a)	Plankton	Spp. %	40
Boltovskoy et al. (1996b)	Sediment trap	Shells/m^2/day, spp. %	13
Boltovskoy et al. (2003)	Plankton	Shells/m^3, spp. %	4
Casey (1971)	Sediments	Binary (pres./absence)	30
Chang et al. (2003)	Sediments	Spp. %	70
Cheng and Yeh (1989)	Sediments	Binary (pres./absence)	12
CLIMAP. (1997)	Sediments	Spp. %	67
Coco (1982)	Sediments	Spp. %	1
Cortese et al. (2003)	Sediments	Shells/g dry sed., spp. %	160
Dworetzky and Morley (1987)	Plankton	Shells/m^3, spp. %	15
Goll and Bjørklund (1971)	Sediments	Shells/g dry sed., counts only, no ID	334
Goll and Bjørklund (1974)	Sediments	Shells/g dry sed., counts only, no ID	452
Gowing (1993)	Sediment trap	Shells/m^2/day, counts only, no ID	57
Gowing (1986)	Sediment trap	Shells/m^2/day, counts only, no ID	13
Gowing and Coale (1989)	Sediment trap	Shells/m^2/day, counts only, no ID	20
Gupta (1996) *	Sediments	Shells/g dry sed., spp. %	42
Gupta et al. (2002)	Sediment trap	Shells/m^2/day, spp. %	50
Haslett (2003)	Sediments	Spp. %	40
Hays (1965) **	Sediments	Binary (pres./absence)	92
Hollis and Neil (2005)	Sediments	Shells/g dry sed., spp. %	31
Ishitani and Takahashi (2007)	Plankton	Shells/m^3, spp. %	56
Itaki (2003)	Plankton & sediments	Spp. %	37
Itaki et al. (2003b)	Plankton	Shells/m^3, spp. %	1
Itaki et al. (2003a)	Plankton & sediments	Shells/m^3, spp. %	20
Itaki et al. (2008)	Sediments	Spp. %	15
Johnson and Nigrini (1980)	Sediments	Binary (pres./absence)	47
Johnson and Nigrini (1982)	Sediments	Binary (pres./absence)	74

Source	Materials	Type of data	Number of samples
Kamikuri et al. (2008)	Sediments	Spp. %	21
Kling (1979)	Plankton	Shells/m^3, spp. %	16
Kling and Boltovskoy (1995)	Plankton	Shells/m^3, spp. %	36
Kruglikova (1966)	Sediments	Shells/g dry sed., counts only, no ID	124
Lange et al. (2000)	Sediment trap	Shells/m^2/day, counts only, no ID	89
Ling and McPherson (1973)	Sediments	Spp. %	10
Matul (Several papers) ***	Sediments	Spp. %	84
McMillen and Casey (1978)	Plankton	Shells/m^C, spp. %	22
Molina-Cruz (1978)	Sediments	Spp. %	121
Molina-Cruz and Bernal-Ramírez (1996)	Sediments	Spp. %	30
Morley (1977)	Sediments	Spp. %	57
Morley (1980)	Sediments	Spp. %	34
Morley and Stepien (1985)	Plankton	Shells/m^3, spp. %	14
Motoyama et al. (2005)	Sediment trap	Shells/m^2/day, counts only, no ID	49
Nigrini (1968)	Sediments	Spp. % (approx.)	26
Nigrini (1970)	Sediments	Binary (pres./absence)	68
Nigrini (1967)	Sediments	Spp. %	32
Nimmergut (2002)	Plankton & sediments	Shells/m^3, spp. %	153
Okazaki et al. (2004)	Plankton	Shells/m^3, spp. %	11
Okazaki et al. (2003	Sediment trap	Shells/m^2/day, spp. %	160
Okazaki et al. (2005)	Sediment trap	Shells/m^2/day, spp. %	142
Okazaki. et al. (2008)	Sediment trap	Shells/m^2/day, spp. %	331
Paverd (1995)	Plankton	Spp. %	76
Petrushevskaya (1971)	Plankton & sediments	Binary (pres./absence)	466
Pisias et al. (1997)	Sediments	Spp. %	170
Renz (1976)	Plankton & sediments	Shells/m^3, spp. %	73
Riedel (1958)	Sediments	Binary (pres./absence)	6
Robertson (1975)	Sediments	Spp. %	66
Rogers and De Deckker (2007)	Sediments	Spp. %	95
Romero et al. (2001)	Sediment trap	Shells/m^2/day, counts only, no ID	96
Sachs (1973)	Sediments	Spp. %	44
Schröder-Ritzrau (1995)	Sediment trap	Shells/m^2/day, spp. %	161
Strelkov and Reshetnjak (1971)	Plankton & sediments	Binary (pres./absence)	200
Swanberg (1979)	Plankton [Scuba diving]	Binary (pres./absence)	126
Swanberg and Eide (1992)	Plankton	Spp. %	18
Takahashi (1987)	Sediment trap	Shells/m^2/day, counts only, no ID	47
Takahashi (1991)	Sediment trap	Shells/m^2/day, spp. %	13
Takahashi and Yamashita (2004)	Sediment traps & sediments	Shells/g dry sed., spp. %	162
Tanaka and Takahashi (2008)	Plankton	Shells/m^3, spp. %	15
Tanaka et al. ****	Plankton	Shells/m^3, spp. %	24
Tanaka and Takahashi *****	Sediment trap	Spp. %	117
Uliana (1997)	Sediment trap	Shells/m^2/day, counts only, no ID	19
Wang et al. (2006)	Sediments	Spp. %	8
Welling (1990)	Sediment traps & sediments	Spp. %	101

Source	Materials	Type of data	Number of samples
Welling (1997)	Plankton	Shells/m^3, spp. %	248
Yamashita et al. (2002)	Plankton	Shells/m^3, spp. %	37
Zapata and Olivares (2005)	Sediments	Binary (pres./absence)	1

* Species identified to genera, data used at family level only.

** Values given in this work are proportions of identified specimens only (rather than proportions of all polycystines), for which reason they were used as presence-absence data.

*** Data provided by the author, based on Matul (1989, 1990a, b, 1999).

**** Data provided by S. Tanaka, K. Takahashi and A. Yamaguchi, A., based on results of the project "Comparison of 0-3000 m radiolarian vertical distributions between the Bering Sea and the central subarctic Pacific in June 2003 and July 2004".

***** Data provided by S. Tanaka and K. Takahashi, based on results of the project " Ten year-long temporal flux changes of radiolarians reflecting the environmental conditions in the Bering Sea and the central subarctic Pacific, 1990-2000".

APPENDIX 2.

Polycystine species retained in the database used for this work listed in alphabetical order. For each each entry the following information is given: species name, authority, family (in parentheses), up to 3 references illlustrating the species concept used ("Ref."), other names used variously for this species in the literature surveyed ("Syn."), and remarks ("Rem.").

Acanthodesmia vinculata (Müller) (Spyridae). Ref.: Petrushevskaya (1971); Nigrini and Moore (1979) (as *Giraffospyris angulata*); Boltovskoy (1999). Syn.: *Giraffospyris angulata*.

Acanthodesmia zonaria (Haeckel) (Spyridae). Ref.: Haeckel (1887).

Acanthosphaera actinota (Haeckel) (Actinommidae). Ref.: Boltovskoy and Riedel (1980); Boltovskoy (1999). Syn.: *Acanthosphaera corloca*, *Acanthosphaera tunis*, *Acanthosphaera tenuissima*.

Acanthosphaera castanea Haeckel (Actinommidae). Ref.: Takahashi (1991); Boltovskoy (1999) (as *Heliaster hexagonium*). Syn.: *Heliaster hexagonium*.

Acanthosphaera dodecastyla Mast (Actinommidae). Ref.: Boltovskoy (1999). Syn.: *Hexastylus triaxonius*.

Acanthosphaera pinchuda Boltovskoy and Riedel (Actinommidae). Ref.: Boltovskoy (1999).

Acrobotrys sp. group (Cannobotryidae). . Syn.: *Acrobotrys* sp. A, *Acrobotrys* sp. B, *Acrobotrys* sp. C, *Acrobotrys chelinobotrys*, *Acrobotrys teralans*, *Acrobotrys tessarolobon*, *Neobotrys quadrituberosa*. Rem.: Heterogeneous grouping, most probably includes 3-4 different species.

Acrosphaera cyrtodon (Haeckel) (Collosphaeridae). Ref.: Strelkov and Reshetnkak (1971); Takahashi (1991).

Acrosphaera murrayana (Haeckel) (Collosphaeridae). Ref.: Strelkov and Reshetnkak (1971); Nigrini and Moore (1979); Swanberg (1979). Syn.: *Choenicosphaera murrayana*, *Collosphaera murrayana*, *Polysolenia murrayana*.

Acrosphaera spinosa (Haeckel) (Collosphaeridae). Ref.: Boltovskoy (1999). Syn.: *Acrosphaera arktios*, *Polysolenia spinosa*, *Polysolenia lappacea*, *Polysolenia flammabunda*. Rem.: Differences in the species limits between authors do not allow consistent separation of morphotypes. Probably includes several forms or subspecies.

Actinomma antarcticum (Haeckel) (Actinommidae). Ref.: Riedel (1958) (as *Diploplegma banzare*); Nigrini (1967); Petrushevskaya (1967) (as *Diploplegma* (?) *aquatica*). Syn.: *Diploplegma banzare*, *Diploplegma aquatica*.

Actinomma arcadophorum Haeckel (Actinommidae). Ref.: Nigrini and Moore (1979).

Actinomma capillaceum Haeckel (Actinommidae). Ref.: Takahashi (1991).

Actinomma delicatulum (Dogel and Reshetnjak) (Actinommidae). Ref.: Welling (1997); Okazaki et al. (2004). Syn.: *Actinomma popofskii*, *Echinomma delicatum*, *Echinomma popofskii*, *Haliometta miocenica*.

Actinomma leptodermum (Jørgensen) (Actinommidae). Ref.: Nigrini and Moore (1979); Boltovskoy (1999). Syn.: *Actinomma boreale*, *Actinomma leptoderma leptoderma*, *Actinomma leptoderma longispina*, *Actinomma hastatum*, *Actinomma haysi*, *Echinomma leptodermum*. Rem.: Poorly defined morphotype, probably includes several species, including the juvenile or partially dissolved 3-shelled stages of *Cromyechinus antarctica*. Cortese and Bjørklund (1998a, b) reviewed the morphology and taxonomy of the boreal representatives of this taxon.

Actinomma medianum Nigrini (Actinommidae). Ref.: Nigrini and Moore (1979). Rem.: Separation between this morphotype and *Atinomma antarcticum* and *Actinomma arcadophorum* may be questionable in some surveys.

Actinomma sol Cleve (Actinommidae). Ref.: Hollande and Enjumet (1960); Boltovskoy and Riedel (1980); Boltovskoy (1999). Syn.: *Thecosphaera radians*, *Thecosphaera entactinata*.

Actinomma sp. 1 (Actinommidae). Ref.: Okazaki et al. (2005a) (as *Actinomma* spp.).

Actinosphaera acanthophora (Popofsky) (Actinommidae). Ref.: Takahashi (1991).

Actinosphaera capillacea (Haeckel) (Actinommidae). Ref.: Takahashi (1991).

Actinosphaera tenella (Haeckel) (Actinommidae). Ref.: Takahashi (1991).

Amphimelissa setosa (Cleve) (Cannobotryidae). Ref.: Swanberg and Bjørklund (1987); Schröder-Ritzrau (1995); Cortese et al. (2003).

Amphirhopalum ypsilon Haeckel (Spongodiscidae). Ref.: Nigrini and Moore (1979); Boltovskoy (1999). Syn.: *Amphirhopalum* cf. *Tessarastrum straussii*, *Trigonastrum* sp., *Amphirhopalum virchowii*, *Amphimenium* sp. A, *Perichlamydium wirchowii*.

Androcyclas gamphonycha (Jørgensen) (Pterocoryidae). Ref.: Hays (1965); Nigrini and Moore (1979); Bjørklund (1976).

Androspyris huxleyi (Haeckel) (Spyridae). Ref.: Takahashi (1991). Syn.: *Lamprospyris hookeri*.

Androspyris ramosa (Haeckel) (Spyridae). Ref.: Takahashi (1991); Boltovskoy (1999) (as *Tholospyris ramosa*). Syn.: *Tholospyris fornicata*, *Tholospyris ramosa*, *Tripospyris cortiniscus*, *Tripospyris palmipes*, *Tripospyris semantis*.

Androspyris reticulodisca Takahashi (Spyridae). Ref.: Takahashi (1991).

Anomalacantha dentata Mast (Actinommidae). Ref.: Nigrini (1970) (as *Heteracantha dentata*). Syn.: *Astrosphaera* sp., *Heteracantha dentata*.

Antarctissa denticulata-strelkovi (Plagoniidae). Ref.: Petrushevskaya (1967) (as *Antarctissa denticulata* and *Antarctissa strelkovi*). Rem.: Includes the morphotypes identified as *Antarctissa denticulata*, *Antarctissa strelkovi*, and *Antarctissa cylindrica*. These forms have very often been lumped in radiolarian surveys, which precludes their separation herewith.

Anthocyrtidium ophirense (Ehrenberg) (Pterocoryidae). Ref.: Nigrini and Moore (1979); Boltovskoy (1999). Syn.: *Anthocyrtidium* cf. *ophirensis*, *Anthocyrtidium cineraria*, *Anthocyrtidium euryclathrum*.

Anthocyrtidium zanguebaricum (Ehrenberg) (Pterocoryidae). Ref.: Nigrini and Moore (1979); Boltovskoy (1999).

Arachnocorallium sp. group (Plagoniidae). . Rem.: An artificial grouping of several (5-10?) mostly unisegmented plagoniids. These morphotypes have been mentioned in the literature under a wide variety of names (e.g., *Arachnocorallium calvata*, *Arachnocorallium* spp., *Arachnocorys pentacantha*, *Dimelissa apis*, *Dimelissa thoracites*, *Lithomelissa thoracites*, *Lophophaena* spp., *Peridium longispinum*, *Peridium spinipes*, *Peromelissa phalacra*, *Phormacantha* spp., *Psilomelissa calvata*, etc.).

Arachnocorys circumtexta Haeckel (Plagoniidae). Ref.: Petrushevskaya (1971).

Arachnocorys sp. group (Plagoniidae). . Rem.: Morphotypes designated as *Arachnocorys pentacantha* , *Arachnocorys umbellifera*, *Cladoscenium tricolpium*. Probably includes 3-4 different poorly resolved species, although in some restricted areas these morphotypes are adequately delimited (e.g., *Arachnocorys umbellifera* and *Cladoscenium tricolpium* in the Nordic Seas).

Arachnosphaera myriacantha Haeckel (Actinommidae). Ref.: Haeckel (1862); Takahashi (1991).

Arachnosphaera sp. 1 (Actinommidae). Ref.: Takahashi (1991).

Archipilium sp. 1 (Theoperidae). Ref.: Takahashi (1991) (as *Archipilium macroporus*? and *Archipilium* sp. aff. *Archipilium orthopterum*). Syn.: *Sethopilium macropus*.

Artobotrys borealis (Cleve) (Carpocaniidae). Ref.: Takahashi (1991); Schröder-Ritzrau (1995). Syn.: *Artobotrys boreale*.

Artostrobus annulatus (Bailey) (Artostrobiidae). Ref.: Riedel (1958); Petrushevskaya (1967); Bjørklund (1976).

Artostrobus Jørgenseni Petrushevskaya (Artostrobiidae). Ref.: Petrushevskaya (1971); Bjørklund and Kruglikova (2003). Syn.: *Eucecryphalus histricosus*.

Astrosphaera hexagonalis Haeckel (Actinommidae). Ref.: Takahashi (1991).

Bathropyramis woodringii (Campbell and Clark) (Theoperidae). Ref.: Kling (1973). Syn.: *Cinclopyramis infundibulum*.

Botryocephalina armata Petrushevskaya (Cannobotryidae). Ref.: Petrushevskaya (1965). Rem.: Probably synonymous with *Saccospyris conithorax*.

Botryocyrtis scutum (Harting) (Cannobotryidae). Ref.: Nigrini (1967); Nigrini and Moore (1979); Boltovskoy (1999).

Botryopyle dictyocephalus Haeckel (Cannobotryidae). Ref.: Petrushevskaya (1965); Boltovskoy (1999). Syn.: *Acrobotrissa cribrosa*, *Botryopyle cribrosa*.

Botryostrobus aquilonaris (Bailey) (Artostrobiidae). Ref.: Nigrini and Moore (1979). Syn.: *Artostrobium miralestense*, *Artostrobium tumidulum*, *Siphocampe aquilonaris*, *Siphocampe erucosa*.

Botryostrobus auritus-australis (Ehrenberg) (Artostrobiidae). Ref.: Boltovskoy and Vrba (1989); Boltovskoy (1999). Syn.: *Artostrobium auritum* group, *Artostrobium eupora*, *Botryostrobus auritus*, *Botryostrobus bramlettei*, *Botryostrobus seriatus*, *Lithamphora furcaspiculata*, *Lithostrobus (?) seriatus*, *Lithostrobus (?) seriatus*, *Lithostrobus lithobotrys*, *Lithostrobus botryocyrtis*, *Spirocyrtis subscalaris*, *Spirocyrtis*? *platycephala* group, *Stichocorys seriata*, *Stichocorys seriatus*. Rem.: Differences in the species limits between authors do not allow consistent separation of morphotypes. Probably includes several forms, species or subspecies (e.g., *Stichocorys seriata* may be a different organism)

Buccinosphaera invaginata Haeckel (Collosphaeridae). Ref.: Strelkov and Reshetnjak (1971); Nigrini (1971).

Callimitra carolotae Haeckel (Plagoniidae). Ref.: Haeckel (1887); Petrushevskaya (1971); Boltovskoy (1999). Syn.: *Callimitra annae*, *Callimitra emmae*.

Callimitra solocicribrata Takahashi (Plagoniidae). Ref.: Takahashi (1991).

Calocyclas monumentum Haeckel (Theoperidae). Ref.: Takahashi (1991) (as *Clathrocyclas monumentum* and *Clathrocyclas cassiopejae*). Syn.: *Clathrocyclas cassiopeiae*, *Clathrocyclas monumentum*.

Carpocanarium papillosum (Ehrenberg) (Theoperidae). Ref.: Petrushevskaya (1967) (as *Dictyocephalus* (?) *papillosus*). Syn.: *Dictyocephalus papillosus*, *Tricolocapsa papillosa*, *Tricolocapsa papillosa mediterranea*.

Carpocanium sp. group (Carpocaniidae). Ref.: Nigrini and Moore (1979) (as *Carpocanistrum* spp. and *Carpocanistrum* sp. A); Boltovskoy (1999). Syn.: *Carpocanarium* sp., *Carpocanistrum acutidentatum*, *Carpocanistrum cephalum*, *Carpocanistrum evacuatum*, *Carpocanistrum favosum*, *Carpocanistrum flosculum*, *Carpocanistrum* sp. A, *Carpocanistrum* sp. B, *Carpocanium blastogenicum*, *Carpocanium calycoides*, *Carpocanium gemmula*, *Carpocanium obliqua*, *Carpocanium obliquum*, *Carpocanium palmipes*, *Carpocanopsis obovata*. Rem.: Differences in the species limits between authors do not allow consistent separation of morphotypes. Probably includes several forms, species or subspecies

Carposphaera acanthophora (Popofsky) (Actinommidae). Ref.: Benson (1966); Boltovskoy and Riedel (1980). Syn.: *Actinosphaera* sp., *Lonchosphaera* sp. C, *Cenosphaera coronata*, *Haliomma erinaceum*.

Carposphaera capillacea Haeckel (Actinommidae). Ref.: Takahashi (1991).

Cenosphaera cristata Haeckel (Actinommidae). Ref.: Riedel (1958) (as *Cenosphaera cristata*?). Syn.: *Carposphaera acanthorphora*, *Carposphaera* sp. aff. *Carposphaera acanthorphora*, *Cenosphaera compacta*. Rem.: Limits between this species and *Cenosphaera elysia*, *Cenosphaera hirsuta* and *Cenosphaera* spp. are often imprecise. Assignements in this work are therefore conditional.

Cenosphaera elysia Haeckel (Actinommidae). Ref.: Boltovskoy and Riedel (1980). Syn.: *Carposphaera melitomma*, *Cenosphaera favosa*, *Cenosphaera riedeli*, *Cenosphaera* spp., *Cenosphaera vesparia*. Rem.: Limits between this species and *Cenosphaera cristata*, *Cenosphaera hirsuta* and *Cenosphaera* spp. are often imprecise. Assignements in this work are therefore conditional.

Cenosphaera hirsuta Ehrenberg (Actinommidae). Ref.: Boltovskoy and Riedel (1980). Rem.: Limits between this species and *Cenosphaera cristata*, *Cenosphaera elysia* and *Cenosphaera* spp. are often imprecise. Assignements in this work are therefore conditional.

Cenosphaera spp. (Actinommidae). . Rem.: Heterogeneous group of various single-shelled actinommids without main spines provisionally inluded in this genus.

Centrobotrys thermophila Petrushevskaya (Cannobotryidae). Ref.: Petrushevskaya (1965).

Centrocubus cladostylus Haeckel (Actinommidae). Ref.: Haeckel (1887); Takahashi (1991) (as *Centrocubus cladostylus* and *Centrocubus octostylus*); Boltovskoy (1999). Syn.: *Centrocubus octostylus*, *Octodendron pinetum*.

Cephalospyris cancellata Haeckel (Spyridae). Ref.: Takahashi (1991).

Cephalospyris platybursa (Haeckel) (Spyridae). Ref.: Takahashi (1991) (as *Cantharospyris platybursa*). Syn.: *Cantharospyris platybursa*, *Platybursa clathrobursa*.

Ceratocyrtis sinuosa (Popofsky) (Plagoniidae). Ref.: Petrushevskaya (1971).

Ceratospyris borealis Bailey (Spyridae). Ref.: Kamikuri et al. (2008). Syn.: *Tristylospyris* sp..

Cladococcus abietinus Haeckel (Actinommidae). Ref.: Takahashi and Honjo (1981).

Cladococcus bifurcus Haeckel (Actinommidae). Ref.: Boltovskoy and Riedel (1980).

Cladococcus cervicornis Haeckel (Actinommidae). Ref.: Boltovskoy and Riedel (1980); Takahashi (1991). Syn.: *Cladococcus arborescens*, *Cladococcus viminalis*.

Cladococcus megaceros Hollande and Enjumet (Actinommidae). Ref.: Hollande and Enjumet (1960); Boltovskoy and Riedel (1980); Boltovskoy (1999).

Cladococcus scoparius Haeckel (Actinommidae). Ref.: Takahashi and Honjo (1981); Boltovskoy and Riedel (1987).

Cladococcus viminalis Haeckel (Actinommidae). Ref.: Takahashi (1991).

Cladococcus sp. 1 (Actinommidae). Ref.: Boltovskoy and Riedel (1980) (as *Cladococcus* sp.).

Cladoscenium ancoratum Haeckel (Plagoniidae). Ref.: Takahashi (1991). Syn.: *Cladoscenium tricolpium*.

Cladoscenium limbatum Jørgensen (Plagoniidae). Ref.: Jørgensen (1905); Nigrini (1968) (as *Plectacantha cremastoplegma*). Syn.: *Plectacantha cremastoplegma*.

Clathrocanium coarctatum Ehrenberg (Plagoniidae). Ref.: Welling (1997). Syn.: *Clathrocanium coronatum*, *Clathrocanium diadema*, *Clathrocanium ornatum*, *Clathrocanium reginae*, *Clathrocorys* sp., *Pteropilium reticulatum*.

Clathrocorys teuscheri Haeckel (Plagoniidae). Ref.: Boltovskoy (1999). Syn.: *Clathrocorys giltschii*, *Clathrocorys murrayi*.

Clathrocyclas sp. 1 (Theoperidae). Ref.: Takahashi (1991).

Clathromitra pentacantha Haeckel (Plagoniidae). Ref.: Petrushevskaya (1971).

Clathromitra pterophormis Haeckel (Plagoniidae). Ref.: Takahashi (1991).

Clathrosphaera arachnoides Haeckel (Collosphaeridae). Ref.: Takahashi (1991).

Collosphaera huxleyi Muller (Collosphaeridae). Ref.: Strelkov and Reshetnkak (1971); Swanberg (1979); Boltovskoy (1999). Syn.: *Collosphaera confossa*. Rem.: Living colonies have been shown to host skeletons identifyable as *Collosphaera huxleyi* and as *Collosphaera tuberosa* (Bjørklund, 1981), thus casting doubts on the separation between these morphotypes

Collosphaera macropora Popofsky (Collosphaeridae). Ref.: Boltovskoy and Riedel (1980); Boltovskoy (1999). Syn.: *Collosphaera glebulenta*, *Collosphaera polygona*.

Collosphaera tuberosa Haeckel (Collosphaeridae). Ref.: Strelkov and Reshetnkak (1971); Boltovskoy (1999). Rem.: Living colonies have been shown to host skeletons identifyable as *Collosphaera huxleyi* and as *Collosphaera tuberosa* (Bjørklund, 1981), thus casting doubts on the separation between these morphotypes

Conarachnium facetum (Haeckel) (Theoperidae). Ref.: Takahashi (1991).

Conarachnium polyacanthum (Popofsky) (Theoperidae). Ref.: Takahashi (1991). Syn.: *Conarachnium polyacantha*.

Conarachnium sp. 1 (Theoperidae). Ref.: Tanaka and Takahashi (2008).

Conicavus tipiopsis Takahashi (Theoperidae). Ref.: Takahashi (1991).

Cornutella profunda Ehrenberg (Theoperidae). Ref.: Boltovskoy (1999).

Corocalyptra cervus (Ehrenberg) (Theoperidae). Ref.: Benson (1966). Syn.: *Clathrocyclas danaes*, *Corocalyptra craspedota*, *Eucecryphalus aberrans*, *Eucecryphalus cervus*, *Eucecryphalus craspedota*, *Eucecryphalus elizabethae*, *Eucecryphalus europae*, *Eucecryphalus gegenbauri*, *Eucecryphalus gegenbauri*/cervus group, *Theocalyptra gegenbauri*. Rem.: Heterogeneous group, probably includes several species.

Corocalyptra krugeri Popofsky (Theoperidae). Ref.: Popofsky (1913); Boltovskoy (1999). Syn.: *Corocalyptra killmari*, *Dictyophimus (?) killmari*.

Cromyechinus antarctica (Dreyer) (Actinommidae). Ref.: Petrushevskaya (1967). Syn.: *Actinomma boreale*, *Actinomma imperfecta*, *Cromyechinus antarcticum*, *Cromyechinus borealis*, *Cromyechinus icosacanthus*, *Prunopyle antarctica*, *Prunopyle buspinigerum*, *Sphaeropyle langii*, *Sphaeropyle robusta*. Rem.: Probably includes several species, including the adult 4-shelled stages of *Actinomma leptodermum*. Specimens from the Nordic seas identified as *Actinomma boreale* are probably not conspecific with *Cromyechinus antarctica*..

Cromyechinus sp. 1 (Actinommidae). Ref.: Takahashi (1991) (as Cromyechinus ? sp.).

Cromyomma circumtextum Haeckel (Artostrobiidae). Ref.: Haeckel (1887); Boltovskoy (1999).

Cromyomma villosum Haeckel (Actinommidae). Ref.: Takahashi (1991).

Cromyomma sp. 1 (Actinommidae). Ref.: Boltovskoy (1987) (as Cromyomma sp.).

Cubotholus sp. (Tholoniidae). Ref.: Boltovskoy (1999). Syn.: *Amphitholus acanthometra*, *Amphitholus tricolonium*, *Cubotholus octoceras*, *Cubotholus regularis*, *Cubotholus rhombicus*, *Cubotholus* sp. aff. *C. octoceras*, *Tholoma metallasson*.

Cycladophora davisiana davisiana (Ehrenberg) (Theoperidae). Ref.: Takahashi (1991) (as *Theocalyptra davisiana davisiana*). Syn.: *Cycladophora davisiana*, *Cycladophora davisiana davisiana*, *Diplocyclas sp A.*, *Theocalyptra davisiana*, *Theocalyptra davisiana davisiana*. Rem.: Separation between the subspecies of *Cycladophora davisiana* is uncertain.

Cycladophora davisiana (Ehrenberg) cornutoides (Theoperidae). Ref.: Takahashi (1991) (as Theocalyptra davisiana cornutoides). Syn.: *Cycladophora cornuta*, *Cycladophora cornutoides*, *Cycladophora davisiana*, *Cycladophora davisiana semeloides*, *Cycladophora davisiana var. Semeloides*, *Theocalyptra davisiana*, *Theocalyptra davisiana cornutoides*. Rem.: Separation between the subspecies of *Cycladophora davisiana* is uncertain.

Cyclampterium neatum Sanfilippo and Riedel (Theoperidae). Ref.: Renz (1976).

Cyrtidosphaera reticulata Haeckel (Actinommidae). Ref.: Haeckel (1862); Itaki et al. (2003a).

Cyrtolagena laguncula Haeckel (Theoperidae). Ref.: Petrushevskaya (1971); Boltovskoy (1999) (as *Cyrtopera laguncula*). Syn.: *Cyrtocapsa* sp., *Cyrtolagena cuspidata*, *Cyrtopera laguncula*, *Cyrtopera aglaolampa*, *Stichoformis cornutella*, *Stichopera pectinata*, *Stichophormis* cf. *cornutella*.

Dictyocodon elegans (Haeckel) (Theoperidae). Ref.: Haeckel (1887) (as *Artopilium elegans*); Takahashi (1991).

Dictyocodon palladius Haeckel (Theoperidae). Ref.: Haeckel (1887); Takahashi (1991). Syn.: *Tripocyrtis pteides*.

Dictyocoryne profunda Ehrenberg (Spongodiscidae). Ref.: Nigrini and Moore (1979); Boltovskoy (1999). Syn.: *Dictyocoryne abyssorum*, *Dictyocoryne euclidis*, *Dictyocoryne euclidis*/profunda group, *Euchitonia koellikeri*, *Euchitonia mulleri*, *Euchitonia triangulum*, *Hymeniastrium euclidis*, *Hymeniastrum koellikeri*. Rem.: In some surveys separation between this species and *Dictyocoryne truncatum* is dubious.

Dictyocoryne truncatum (Ehrenberg) (Spongodiscidae). Ref.: Nigrini and Moore (1979); Boltovskoy (1999). Syn.: *Hymeniastrum* sp. A, *Hymeniastrum* sp. C, *Hymeniastrum* sp. E, *Rhopalastrum profundum*. Rem.: In some surveys separation between this species and *Dictyocoryne profunda* is dubious.

Dictyophimus hirundo (Haeckel) (Theoperidae). Ref.: Nigrini and Moore (1979); Boltovskoy (1999). Syn.: *Dictyophimus hirundo*/crisiae, *Dictyophimus crisiae*, *Dictyophimus crisiae*/hirundo, *Dictyophiumus clevei*, *Pterocorys hirundo*. Rem.: In some surveys the limits of this species are uncertain.

Dictyophimus histricosus Jørgensen (Theoperidae). Ref.: Schröder-Ritzrau (1995).

Dictyophimus infabricatus Nigrini (Theoperidae). Ref.: Nigrini and Moore (1979). Syn.: *Dictyophimus crisiae*, *Dictyophimus* sp. aff. *D. infabricatus*.

Dictyophimus mawsoni Riedel (Theoperidae). Ref.: Riedel (1958). Rem.: Probably an extinct species.

Dictyophimus sp. 1 (Theoperidae). Ref.: Takahashi (1991) (as *Dictyophimus* sp. A).

Dictyospyris sp. 1 (Spyridae). Ref.: Renz (1976) (as *Lophospyris* sp.); Takahashi (1991) (as *Dictyospyris* sp. group). Syn.: *Lophospyris* sp..

Didymocyrtis tetrathalamus (Haeckel) (Coccodiscidae). Ref.: Nigrini and Moore (1979); Boltovskoy (1999). Syn.: ?Didimocyrtis group, *Didymocyrtis messanensis*, *Didymocyrtis tetrathalamus coronatus*, *Didymocyrtis tetrathalamus tetrathalamus*, *Didymocyrtis tetrathalamus*, *Ommatartus coronatus*, *Ommatartus* sp. A, *Ommatartus* sp. B, *Ommatartus tetrathalamus*, *Ommatartus tetrathalamus tetrathalamus*, *Panartus tetrathalamus*, *Panartus tetrathalamus coronatus*, *Panartus tetrathalamus tetrathalamus*, *Thecosphaera*? *diplococcus*. Rem.: Includes the subspecies *Didymocyrtis tetrathalamus tetrathalamus* and *Didymocyrtis tetrathalamus coronatus* (in most datasets surveyed these two subspecies were considered jointly).

Dipylissa bensoni Dumitrica (Pyloniidae). Ref.: Dumitrica (1988); Boltovskoy (1999).

Druppatractus irregularis Popofsky (Actinommidae). Ref.: Benson (1966) (as *Druppatractus irregularis* and *Druppatractus pyriformis*). Syn.: *Doryodruppa bensoni*, *Drupatractus sp A, Druppatractus hastatus*, *Druppatractus pyriformis*, *Druppatractus variabilis*, *Stylosphaera pyriformis*, *Stylosphaera* sp. B. Rem.: Unresolved grouping, most probably includes several species.

Drymosphaera dendrophora Haeckel (Actinommidae). Ref.: Haeckel (1887); Takahashi (1991).

Drymyomma elegans Jørgensen (Actinommidae). Ref.: Jørgensen (1905).

Elatomma penicillus Haeckel (Actinommidae). Ref.: Haeckel (1887); Takahashi (1991).

Ellipsoxiphium palliatum Haecker (Actinommidae). Ref.: Takahashi (1991).

Enneaphormis rotula (Haeckel) (Plagoniidae). Ref.: Petrushevskaya (1971); Boltovskoy (1999) (as *Sethophormis rotula*). Syn.: *Enneaphormis* (?) sp., *Enneaphormis enneastrum*, *Sethophormis rotula*, *Plectagonidium deflandrei*, *Sethophormis* sp. A, *Tetraphormis rotula rotula*.

Eucecryphalus clinatus Takahashi (Theoperidae). Ref.: Takahashi (1991).

Euchitonia elegans-furcata (Ehrenberg) (Spongodiscidae). Ref.: Boltovskoy (1999). Syn.: *Euchitonia elegans*, *Euchitonia elegans*/furcata, *Euchitonia elegans*/furcata group, *Euchitonia furcata*, *Euchitonia* sp. A, *Euchitonia* sp. B, *Euchitonia* sp. C, *Rhopalastrum* spp.. Rem.: It is unclear whether *Euchitonia elegnas* and *Euchitonia furcata* represent different species, but intergrades are at least as comon as typical shells of either morphotype. In many of the databases surveyed they have been considered jointly or the limits of the two forms were blurry, which precluded us from considering them separately in this review.

Eucyrtidium acuminatum (Ehrenberg) (Theoperidae). Ref.: Petrushevskaya (1971); Nigrini and Moore (1979). Syn.: *Eucyrtidium acuminatum acuminatum*, *Eucyrtidium acuminatum octocolum*, *Eucyrtidium* sp. aff. *E. anomalum*, *Eucyrtidium acuminatum*/E. *tropezianum*, *Eucyrtidium hexastichum*, *Eucyrtidium octocolum*, *Eucyrtidium* sp. aff. *E. acuminatum octocolum*, *Stichopilium annulatum*, *Stichopodium dictyopodium*.

Eucyrtidium anomalum (Haeckel) (Theoperidae). Ref.: Petrushevskaya (1971); Boltovskoy (1999).

Eucyrtidium erythromystax Nigrini and Caulet (Theoperidae). Ref.: Nigrini and Caulet (1992). Syn.: *Eucyrtidium calvertense*, *Eucyrtidium cienkowskii*, *Eucyrtidium heptacolum*, *Eucyrtidium teuscheri*, *Lithomitra infundibulum*. Rem.: Probably an heterogeneous grouping.

Eucyrtidium hexagonatum Haeckel (Theoperidae). Ref.: Benson (1966) (as *Eusyringium siphonostoma*); Nigrini and Moore (1979). Syn.: *Eucyrtidium acuminatum octocolum*, *Eucyrtidium cienkowskii*, *Eucyrtidium dictyopodium*, *Eucyrtidium dictyopodium siphonostomum*.

Eucyrtidium hexastichum (Haeckel) (Theoperidae). Ref.: Petrushevskaya (1971); Boltovskoy (1999). Syn.: *Eucyrtidium annulatum*.

Euscenium corynephorum Jørgensen (Theoperidae). Ref.: Jørgensen (1905); Schröder-Ritzrau (1995).

Gonosphaera primordialis Jørgensen (Plagoniidae). Ref.: Jørgensen (1905); Bjørklund (1976). Syn.: *Pseudocubus primordialis*?.

Haeckeliella macrodoras (Haeckel) (Actinommidae). Ref.: Hollande and Enjumet (1960); Takahashi (1991). Syn.: *Cladococcus stalactites*.

Haliomma castanea Haeckel (Actinommidae). Ref.: Haeckel (1862); Takahashi (1991).

Haliomma macrodoras Haeckel (Actinommidae). Ref.: Haeckel (1887); Boltovskoy and Riedel (1987).

Haliomma sp. 1 (Actinommidae). Ref.: Takahashi (1991) (as *Haliomma* sp. A). Syn.: *Heliaster hexagonium*.

Haliomma sp. 2 (Actinommidae). Ref.: Takahashi (1991) (as *Haliomma* sp. B).

Heliodiscus asteriscus Haeckel (Phacodiscidae). Ref.: Nigrini and Moore (1979); Boltovskoy (1999). Syn.: *Heliodiscus macrococcus*.

Heliodiscus echiniscus Haeckel (Phacodiscidae). Ref.: Haeckel (1887); Nigrini and Moore (1979). Syn.: *Heliodiscus phacodiscus*. Rem.: Apparently lumped with *Heliodiscus asteriscus* in most of the reports surveyed.

Heliodiscus sp. 1 (Phacodiscidae). Ref.: Takahashi (1991) (as *Heliodiscus*? sp.). Syn.: *Heliodiscus echiniscus*, *Heliosoma* sp..

Heliosoma sp. 1 (Actinommidae). Ref.: Takahashi (1991) (as *Heliosoma* sp. aff. *radians*). Syn.: *Heliosoma* spp. aff. *radians*.

Helotholus histricosa Jørgensen (Plagoniidae). Ref.: Petrushevskaya (1971); Boltovskoy (1999). Syn.: *Antarctissa strelkovi*, *Ceratocyrtis galea*, *Ceratocyrtis galeus*, *Ceratocyrtis histricosus*, *Ceratocyrtis histricosa*, *Ceratospyris histricosa*, *Dictyophimus histricosus*, *Helotholus sp* cf. *H. Vema*, *Lampromitra* spp.. Rem.: Highly variable morphotype. Organisms grouped under this name are very likely to include several species..

Heterosphaera sp. 1 (Actinommidae). Ref.: Takahashi (1991) (as *Heterosphaera* sp. A).

Heterosphaera sp. 2 (Actinommidae). Ref.: Takahashi (1991) (as *Heterosphaera* sp. B).

Hexacontium arachnoidale Hollande and Enjumet (Actinommidae). Ref.: Boltovskoy and Riedel (1980) (as *Hexalonche aristarchi*); Takahashi (1991). Syn.: *Hexalonche aristarchi*.

Hexacontium armatum-hostile group(Actinommidae). . Syn.: *Haxalonche aristarchi*, *Hexacontarium* sp., *Hexacontium entacanthum*, *Hexacontium hostile*, *Hexacontium pachydermum*, *Hexacontium armatum*, *Hexacontium asteracanthion*, *Hexacontium axotrias*, *Hexacontium hexagonum*, *Hexacontium phaenaxonium*, *Hexacontium pythagoraea*, *Hexacontium sceptrum*, *Hexalonche amaximandri*, *Hexalonche aristarchi*, *Hexalonche philosophica*. Rem.: Very heterogeneous grouping encompassing generally 3-shelled actinommids with usually 6 main spines perpendicular to each other, but up to 9 have been reported, in which case they resemble the genus *Actinomma* . Several (5-10?) species included. This group needs much additional work to sort out its troubled taxonomy.

Hexacontium heracliti (Haeckel) (Actinommidae). Ref.: Takahashi (1991).

Hexacontium heteracantha (Popofsky) (Actinommidae). Ref.: Benson (1966) (as *Hexacontium* cf. *heteracantha*).

Hexacontium hystricina (Haeckel) (Actinommidae). Ref.: Takahashi and Honjo (1981); Boltovskoy (1987).

Hexacontium laevigatum Haeckel (Actinommidae). Ref.: Benson (1966); Nigrini and Moore (1979); Welling (1997).

Hexacromyum elegans Haeckel (Actinommidae). Ref.: Takahashi and Honjo (1981).

Hexalonche amphisiphon Haeckel (Actinommidae). Ref.: Hollande and Enjumet (1960) (as *Heliosoma echinaster*); Boltovskoy (1999) (as *Heliosoma echinaster*). Syn.: *Cenosphaera* sp. E, *Centracontarium hexacontarium*, *Centrolonche hexalonche*, *Heliosoma echinaster*, *Tetrapetalon elegans*.

Hexastylus dimensivius Haeckel (Actinommidae). Ref.: Haeckel (1887); Paverd (1995).

Hexastylus triaxonius Haeckel (Actinommidae). Ref.: Haeckel (1887); Takahashi (1991).

Lamprocyclas maritalis Haeckel (Pterocoryidae). Ref.: Boltovskoy (1999). Syn.: *Lamprocyclas maritalis maritalis*, *Lamprocyclas maritalis polypora*, *Lamprocyclas maritalis ventricosa*, *Lamprocyclas nupitalis*. Rem.: Includes morphotypes described under the names *Lamprocyclas maritalis maritalis*, *Lamprocyclas maritalis polypora* and *Lamprocyclas maritalis ventricosa*.

Lamprocyrtis junonis (Haeckel) (Pterocoryidae). Ref.: Welling (1997); Boltovskoy (1999). Syn.: *Lamprocyclas hannai*, *Lamprocyrtis hannai*, *Lamprocyrtis junonis*, *Pterocorys* spp..

Lamprocyrtis nigriniae (Caulet) (Pterocoryidae). Ref.: Nigrini and Moore (1979). Syn.: *Conarachnium ?* sp. A, *Lamprocyrtis haysi*.

Lampromitra cracenta Takahashi (Theoperidae). Ref.: Takahashi (1991).

Lampromitra quadricuspis Haeckel (Theoperidae). Ref.: Benson (1966); Boltovskoy (1999). Syn.: *Anthocyrtidium* sp. aff. *A. anthemis*, *Dictyophimus butschlii*, *Lampromita sinuosa*, *Lampromitra cachoni*, *Lampromitra spinosiretis*, *Tetraphormis butschlii*, *Tetraphormis dodecaster*.

Lampromitra schultzei (Haeckel) (Theoperidae). Ref.: Boltovskoy (1999). Syn.: *Lampromitra coronata*, *Sethophormis pentalactis*, *Theocalyptra cornuta*.

Larcopyle buetschlii Dreyer (Litheliidae). Ref.: Nigrini and Moore (1979); Boltovskoy (1999). Syn.: *Tholospironium cervicorne*.

Larcospira quadrangula Haeckel (Litheliidae). Ref.: Nigrini and Moore (1979); Boltovskoy (1999).

Larnacalpis sp. 1 (Coccodiscidae). Ref.: Takahashi (1991) (as *Larnacalpis* sp.). Syn.: *Larnacalpis* sp. aff. *L. lentellipsis*, *Didymocyrtis* sp..

Leptosphaera minuta Popofsky (Actinommidae). Ref.: Takahashi (1991) (as *Leptosphaera minuta*?).

Lipmanella bombus (Haeckel) (Theoperidae). Ref.: Benson (1966); Petrushevskaya (1971); Boltovskoy (1999). Syn.: ?Dictyoceras *mellitta*, *Eucyrtidium anomalum f. bombus*, *Lipmanella pyramidale*, *Theopilium pyramidale*.

Lipmanella dictyoceras (Haeckel) (Theoperidae). Ref.: Petrushevskaya (1971). Syn.: *Dictyoceras acanthicum*, *Lipmanella virchowii*, *Lipmanella xiphephorum*. Rem.: Is some instances limits between this taxon and *Lipmanella virchowii* are unclear.

Lipmanella virchowii (Haeckel) (Theoperidae). Ref.: Takahashi (1991). Syn.: *Dictyoceras neglectum*, *Dictyoceras vichowii*, *Eucyrtidium anomalum f. Virchowii*, *Lipmanella dictyoceras*, *Lithopilium sphaerocephalum*. Rem.: Is some instances limits between this taxon and *Lipmanella dictyoceras* are unclear.

Liriospyris reticulata (Ehrenberg) (Spyridae). Ref.: Nigrini and Moore (1979). Syn.: *Acanthodesmia reticulata*, *Amphispyris costata*, *Amphispyris costata-thorax* group, *Amphispyris reticulata*, *Liriospyris (?) toxarium*, *Liriospyris reticulata*, *Liriospyris toxarium*, *Lithocircus reticulatus*, *Lithocircus zonaris*.

Liriospyris thorax laticapsa (Takahashi) (Spyridae). Ref.: Takahashi (1991).

Liriospyris thorax thorax (Haeckel) (Spyridae). Ref.: Haeckel (1887) (as *Amphispyris thorax*); Takahashi (1991).

Liriospyris sp. 1 (Spyridae). Ref.: Takahashi (1991) (as *Liriospyris* sp.).

Litharachnium tentorium Haeckel (Theoperidae). Ref.: Petrushevskaya (1971); Boltovskoy (1999). Syn.: *Litharachnium eupilium*, *Litharachnium permagnum*.

Lithelius minor group(Litheliidae). . Syn.: *Larcospira haliomma*, *Larcospira minor*, *Lithelius alveolina*, *Lithelius* ex gr. *minor*/spiralis, *Lithelius* sp. aff *L. spiralis*, *Lithelius spiralis*, *Lithelius* spp., *Ommatodiscus* sp. A, *Spongurus minor*, *Stylodictya* ? sp., *Stylotrochus geddesi*. Rem.: Very heterogeneous grouping encompassing variously shaped litheliids. Most probably includes several species.

Lithelius nautiloides Popofsky (Litheliidae). Ref.: Riedel (1958); Petrushevskaya (1967). Syn.: *Lithelius spiralis*.

Lithocampe platycephala (Ehrenberg) (Artostrobiidae). Ref.: Schröder-Ritzrau (1995).

Lithocampe sp. 1 (Theoperidae). Ref.: Nigrini and Moore (1979) (as *Lithocampe* sp.).

Lithomelissa hystrix Jørgensen (Plagoniidae). Ref.: Bjørklund (1976); Bjørklund et al. (1998). Syn.: *Lithomelissa stigi*, *Lophophaena witjazii*, *Lophophaenoma* sp. aff. *L. witjazii*, *Lophophaenoma witjazii*.

Lithomelissa setosa Jørgensen (Plagoniidae). Ref.: Jørgensen (1905); Bjørklund (1976); Bjørklund et al. (1998).

Lithopera bacca Ehrenberg (Theoperidae). Ref.: Boltovskoy (1999).

Lithopilium reticulatum Popofsky (Theoperidae). Ref.: Takahashi (1991).

Lithostrobus cornutus Haeckel (Theoperidae). Ref.: Renz (1976).

Lithostrobus hexagonalis Haeckel (Theoperidae). Ref.: Takahashi (1991); Welling (1997); Boltovskoy (1999).

Lophocorys polyacantha (Popofsky) (Theoperidae). Ref.: Benson (1966); Welling (1997). Syn.: *Artopilium undulatum*, *Lophocorys undulata*, *Stichopilium anocor*, *Triacartus undulatum*.

Lophophaena capito Ehrenberg (Plagoniidae). Ref.: Takahashi (1991) (as *Lophophaena* cf. *capito*). Syn.: *Dimelissa thoracites*, *Lithomeliss* cf. *thoracites*, *Lithomelissa laticeps*, *Lithomelissa* sp., *Lithomelissa thoracites*, *Lophophaenoma* spp., *Lophophaenoma witjazii*, *Peromelissa* sp.. Rem.: Heterogeneous grouping. Probably includes several species.

Lophophaena decacantha group(Plagoniidae). . Syn.: *Dimelissa laticeps*, *Dimelissa thoracites*, *Lithomelissa* cf. *galeata*, *Lithomelissa monoceras*, *Lithomelissa thoracites*, *Lophophaena buetschlii*, *Lophophaena* cf. *capito*, *Lophophaena clevei*, *Lophophaena nadezdae*. Rem.: Very heterogeneous grouping. Includes several species.

Lophophaena hispida-cylindrica (Ehrenberg) (Plagoniidae). Ref.: Petrushevskaya (1971) (as *Lophophaena cylindrica* and *Lophophaena hispida*). Syn.: *Lophophaena cylindrica*, *Lophophaena hispida*.

Lophophaena rioplatensis Boltovskoy et al. (Plagoniidae). Ref.: Boltovskoy et al. (2003).

Lophophaena variabilis group(Plagoniidae). Ref.: Welling (1997) (as *Amphiplecta acrostoma*, *Lophophaena butschlii*, and *Lophophaena variabilis*). Syn.: *Acanthocorys* cf. *variabilis*, *Amphiplecta acrostoma*, *Lophophaena nadezdae*, *Lithomelissa bütschlii*, *Lophophaena buetschlii*. Rem.: Heterogeneous grouping. Probably includes several species.

Lophospyris pentagona hyperborea (Jørgensen) (Spyridae). Ref.: Takahashi (1991). Syn.: *Ceratospyris hyperborea*, *Lophospyris damaecornis*, *Phormospyris herdisae*, *Phormospyris* sp. aff. *Lophospyris pentagona hyperborea*, *Tholospyris* sp.. Rem.: Goll (1976) revised *Ceratospyris hyperborea* and erected *Lophospyris pentagona hyperborea*.

Lophospyris pentagona pentagona (Ehrenberg) (Spyridae). Ref.: Goll (1976); Boltovskoy (1999). Syn.: *Ceratospyris* sp., *Giraffospyris circumflexa*, *Lophospyris cheni*, *Lophospyris pentagona*.

Lophospyris pentagona quadriforis (Haeckel) (Spyridae). Ref.: Goll (1976). Syn.: *Acanthodesmia micropora*, *Lophospyris quadriforis*, *Lophospyris* sp., *Semantis micropora*?.

Lychnosphaera regina Haeckel (Actinommidae). Ref.: Haeckel (1887); Takahashi (1991).

Mitrocalpis araneafera Popofsky (Plagoniidae). Ref.: Riedel (1958); Nigrini (1970).

Myelinastrinae (group?) (Spongodiscidae). Ref.: Renz (1976) (as Myelinastinae subfamily group); Takahashi (1991) (as *Myelinastrum quadrifoleum* and *Myelinastrum trinibrachium*).

Neosemantis distephanus (Haeckel) (Spyridae). Ref.: Petrushevskaya (1971); Boltovskoy (1999). Syn.: *Campylacantha cladophora*, *Neosemantis cladophora*, *Semanthes distephanus*, *Tetraplagia distephanis*.

Nephrospyris paradictyum Haeckel (Spyridae). Ref.: Petrushevskaya (1971) (as *Paradictyum paradoxum*); Renz (1976). Syn.: *Paradictyum paradoxum*.

Nephrospyris renilla Haeckel (Spyridae). Ref.: Haeckel (1887); Boltovskoy (1999). Syn.: *Nephrodictyum renilla*, *Nephrospyris docris*, *Nephrospyris renilla lana*, *Nephrospyris renilla renilla*.

Octodendron cubocentron Haeckel (Actinommidae). Ref.: Paverd (1995) (as *Spongodrymus cubocentron*); Boltovskoy (1999). Syn.: *Spongoplegma* sp., *Spongodrymus cubocentron*.

Octopyle stenozona/*Tetrapyle octacantha* (group?) (Pyloniidae). Ref.: Boltovskoy (1999) (as *Octopyle stenozona* group?). Syn.: *Octopyle octostyle*, *Octopyle stenozoa*, *Octopyle stenozona*, *Phorticium* sp., *Tetrapyle larnacilla*, *Tetrapyle octacantha*. Rem.: Probably two species lumped in this category (see, for example, Nigrini and Moore, 1979), but inconsistencies in their identification throughout the works surveyed do not allow considering them separately.

Ommatodiscus murrayi Dreyer (Spongodiscidae). Ref.: Benson (1966) (as *Ommatodiscus pantanelli*). Syn.: *Circodiscus micropora*, *Ommatodiscus pantanelli*, *Prunulum coccymelium*?, *Stylodictya centrospira*.

Otosphaera polymorpha Haeckel (Collosphaeridae). Ref.: Strelkov and Reshetnkak (1971) (as *Solenosphaera chierchiae*); Takahashi (1991). Syn.: *Otosphaera auriculata*, *Otosphaera auriculata*/Otosphaera *polymorpha*, *Solenosphaera chierchiae*, *Solenosphaera polymorpha*.

Peripyramis circumtexta Haeckel (Theoperidae). Ref.: Riedel (1958); Nigrini and Moore (1979); Boltovskoy (1999). Syn.: *Peripyramis circumtexta*/Plectopyramis *dodecomma*.

Peromelissa phalacra (Haeckel) (Plagoniidae). Ref.: Takahashi (1991); Boltovskoy (1999). Syn.: *Arachnocorallium* sp. A, *Lithomelissa monoceras*.

Phormacantha hystrix (Jørgensen) (Plagoniidae). Ref.: Petrushevskaya (1971); Boltovskoy (1999). Syn.: *Plectacantha trichoides*. Rem.: Heterogenous group, probably two different species.

Phormospyris stabilis capoiGoll (Spyridae). Ref.: Goll (1976); Takahashi (1991).

Phormospyris stabilis scaphipes(Goll)(Spyridae). Ref.: Goll (1976); Takahashi (1991); Boltovskoy (1999). Syn.: *Ceratospyris angulata*, *Lophospyris /*Phormospyris, *Phormospyris scaphipes*, *Phormospyris stabilis scaphipes*, *Tholospyris scaphipes*, *Tristylospyris scaphipes*.

Phormospyris stabilis stabilis (Goll) (Spyridae). Ref.: Goll (1976); Takahashi (1991); Boltovskoy (1999). Syn.: *?*Dendrospyris sp. aff. *D. stabilis*, *Desmospyris anthocyrtoides*, *Phormospyris stabilis*.

Phormospyris sp. 1 (Spyridae). Ref.: Takahashi (1991) (as *Phormospyris*? sp.). Syn.: *Phormospyris*? sp..

Phormostichoartus corbula (Harting) (Artostrobiidae). Ref.: Nigrini and Moore (1979); Boltovskoy (1999). Syn.: *Lithostrobus botryocyrtis*, *Siphocampe corbula*, *Siphocampium* sp..

Phorticium pylonium (Haeckel) (Pyloniidae). Ref.: Riedel (1958). Syn.: *Phorticium clevei*.

Phrenocodon clathrostomium Haeckel (Theoperidae). Ref.: Haeckel (1887); Takahashi (1991).

Plectacantha cremastoplegma Nigrini (Plagoniidae). Ref.: Nigrini (1968).

Plectacantha oikiskos Jørgensen (Plagoniidae). Ref.: Bjørklund (1976). Rem.: Limits with *Phormacantha hystrix* unclear.

Plectacantha trichoides Jørgensen (Plagoniidae). Ref.: Petrushevskaya (1971). Rem.: Limits with *Phormacantha hystrix* unclear.

Plectanium sp. 1 (Plagoniidae). Ref.: Takahashi (1991) (as *Plectanium* sp.).

Plectopyramis dodecomma Haeckel (Theoperidae). Ref.: Nigrini and Moore (1979).

Plegmosphaera coelopila Haeckel (Actinommidae). Ref.: Takahashi and Honjo (1981) (as *Plegmosphaera coelopila* and *Plegmosphaera pachypila*). Syn.: *?*Plegmosphaera *maxima*, *Plegmosphaera pachypila*.

Plegmosphaera entodictyon Haeckel (Actinommidae). Ref.: Hollande and Enjumet (1960); Boltovskoy and Riedel (1980); Takahashi (1991). Rem.: Probably synonymous with *Plegmosphaera pachyplegma*.

Plegmosphaera lepticali Renz (Actinommidae). Ref.: Renz (1976); Takahashi (1991) (as *Plegmosphaera* sp. aff. *P. lepticali*).

Plegmosphaera oblonga Takahashi (Actinommidae). Ref.: Takahashi (1991).

Plegmosphaera pachyplegma Haeckel (Actinommidae). Ref.: Hollande and Enjumet (1960); Boltovskoy and Riedel (1980). Rem.: Probably synonymous with *Plegmosphaera entodictyon*.

Porodiscus microporus (Stohr) (Spongodiscidae). Ref.: Takahashi (1991) (as *Circodiscus* spp.); Boltovskoy and Riedel (1987) (as *Lithocyclia heteropora*). Syn.: *Circodiscus microporus*, *Circodiscus* sp. group, *Lithocyclia heteropora*.

Pseudocubus obeliscus Haeckel (Plagoniidae). Ref.: Petrushevskaya (1971); Takahashi (1991); Boltovskoy (1999). Syn.: *Plectophora triacantha*.

Pseudocubus octostylus Haeckel (Plagoniidae). Ref.: Petrushevskaya (1971).

Pseudodictyophimus bicornis (Ehrenberg) (Plagoniidae). Ref.: Welling (1997). Syn.: *Dictyophimus bicornis*, *Theocalyptra bicornis*.

Pseudodictyophimus gracilipes Bailey (Plagoniidae). Ref.: Petrushevskaya (1971); Boltovskoy (1999) (as *Dictyophimus gracilipes*). Syn.: *? Dictyophimus bicornis*, *Dictyophimus clevii*, *Dictyophimus* spp., *Dictyophimus tetracanthus*, *Dictyophymus hirundo*, *Dictyophimus gracilipes*, *Pseudodictyophimus multispinus*, *Pseudodictyophimus tetracanthus*. Rem.: In some surveys the limits of this species are uncertain.

Pterocanium auritum Nigrini and Caulet (Theoperidae). Ref.: Nigrini and Caulet (1992). Syn.: *Dictyophimus infabricatus*, *Pterocanium* sp..

Pterocanium korotnevi (Dogiel) (Theoperidae). Ref.: Nigrini and Moore (1979). Syn.: *Carpocanarium* sp., *Dictyophimus macropterus*, *Dictyophimus* sp., *Lychnocanium grande*.

Pterocanium praetextum (Ehrenberg) (Theoperidae). Ref.: Boltovskoy (1999). Syn.: *Pterocanium praetextum* aff. *eucolpum*, *Pterocanium praetextum eucolpum*, *Pterocanium praetextum praetextum*, *Pterocanium virgineum*. Rem.: Includes the subspecies *Pterocanium praetextum praetextum* and *Pterocanium praetextum eucolpum* recognized by some authors (e.g., Nigrini and Mo0re, 1979).

Pterocanium trilobum Haeckel (Theoperidae). Ref.: Nigrini and Moore (1979); Boltovskoy (1999). Syn.: *Lychnocanium* sp. aff. *Lychnocanium sigmopodium*, *Pterocanium charybdeum*, *Pterocanium grandiporus*, *Pterocanium orcinum*, *Pterocanium polypylum*.

Pterocorys hertwigii (Haeckel) (Pterocoryidae). Ref.: Nigrini and Moore (1979); Boltovskoy (1999). Syn.: *Eucyrtidium hertwigii*.

Pterocorys minythorax (Nigrini) (Pterocoryidae). Ref.: Nigrini (1968); Caulet and Nigrini (1988).

Pterocorys zancleus (Muller) (Pterocoryidae). Ref.: Benson (1966); Petrushevskaya (1971); Boltovskoy (1999). Syn.: *Pterocorys campanula*, *Pterocorys clausus*, *Pterocorys macroceras*, *Pterocorys sabae*, *Theoconus zancleus*, *Theoconus junonis*.

Pterocyrtidium dogieli Petrushevskaya (Theoperidae). Ref.: Petrushevskaya (1971); Boltovskoy (1999). Syn.: *Gondwanaria campanulaeformis*, *Sethoconus (?) reschetnhakae*, *Sethoconus* (?) sp. cf. *S.*(?) *dogieli*.

Pteropilium stratiotes Haeckel (Theoperidae). Ref.: Haeckel(1887); Boltovskoy and Riedel (1987).

Pteroscenium pinnatum Haeckel (Plagoniidae). Ref.: Haeckel (1887); Benson (1966); Boltovskoy (1999). Syn.: *?*Clathrocorys *murrayi*, *Verticillata hexacantha*.

Pylolena armata Haeckel (Pyloniidae). Ref.: Boltovskoy (1999). Syn.: *Hexapyle armata*, *Hexapyle dodecacantha*, *Hexapyle* sp., *Pylolena hexagona*.

Pylospira octopyle Haeckel (Litheliidae). Ref.: Nigrini and Moore (1979). Syn.: *? Tholospira* (?) sp., *Phorticium octopyle*, *Tholospyra* group.

Rhizoplegma boreale Cleve (Actinommidae). Ref.: Bjørklund (1976); Schröder-Ritzrau (1995).

Saccospyris antarctica Haecker (Cannobotryidae). Ref.: Riedel (1958) (as *Botryopyle*? *antarctica*); Petrushevskaya (1967); Boltovskoy (1999). Syn.: *Botryopyle*? *antarctica*, *Saccospyris* cf. *antarctica*, *Saccospyris preantarctica*.

Saccospyris conithorax Petrushevskaya (Cannobotryidae). Ref.: Petrushevskaya (1967). Syn.: *Botryocampe inflata*, *Acrobotrissa cribrosa*, *Saccospyris preantarctica*.

Saturnalis circularis Haeckel (Actinommidae). Ref.: Nigrini (1967); Boltovskoy (1999).

Sethoconus anthocyrtis Haeckel (Theoperidae). Ref.: Haeckel (1887); Boltovskoy (1999). Syn.: *Conarachnium facetum*, *Conarachnium parabolicum*, *Lampromitra parabolica*.

Sethoconus myxobrachia Strelkov and Reshetnjak (Theoperidae). Ref.: Petrushevskaya (1971); Renz (1976); Takahashi (1991).

Sethoconus tabulatus (Ehrenberg) (Theoperidae). Ref.: Riedel (1958) (as *Sichopilium variabile*); Boltovskoy and Riedel (1987). Syn.: *Sethoconus (*Artostrobus) *tabulatus*, *Sichopilium variabile*.

Sethodiscus macrococcus Haeckel (Phacodiscidae). Ref.: Haeckel (1887); Boltovskoy and Riedel (1980).

Sethophormis aurelia Haeckel (Plagoniidae). Ref.: Petrushevskaya (1971); Boltovskoy (1999). Syn.: *Theophormis callipilium*.

Siphocampe arachnea (Ehrenberg) (Artostrobiidae). Ref.: Petrushevskaya (1967); Boltovskoy (1999). Syn.: *Lithomitra arachnea*, *Lithomitra* sp.aff. *L. lineata*.

Siphocampe lineata (Ehrenberg) (Artostrobiidae). Ref.: Petrushevskaya (1967); Boltovskoy (1999). Syn.: *Lithomitra lineata*, *Siphocampe nodosaria*.

Siphonosphaera martensi Brandt (Collosphaeridae). Ref.: Strelkov and Reshetnjak (1971) (as *Siphonosphaera cyathina* and *Siphonosphaera martensi*); Boltovskoy (1999). Syn.: *Siphonosphaera cyathina*, *Siphonosphaera* sp. B.

Siphonosphaera polysiphonia Haeckel (Collosphaeridae). Ref.: Takahashi (1991); Boltovskoy (1999). Syn.: *Siphonosphaera compacta*, *Siphonosphaera macropora*, *Siphonosphaera* spp., *Siphonosphaera tenera*, *Siphonosphaera tubulosa*. Rem.: Probably synonymous with *Siphonosphaera socialis*.

Siphonosphaera socialis Haeckel (Collosphaeridae). Ref.: Strelkov and Reshetnjak (1971) (as *Siphonosphaera socialis*, *Siphonosphaera socialis mazosphaeroides*, and *Siphonosphaera socialis tubuliloba*). Syn.: *Siphonosphaera socialis mazosphaeroides*, *Siphonosphaera socialis tubuliloba*. Rem.: Probably synonymous with *Siphonosphaera polysiphonia*.

Solenosphaera collina (Haeckel) (Collosphaeridae). Ref.: Strelkov and Reshetnjak (1971). Syn.: *Disolenia collina*, *Solenosphaera* sp. aff. *S. collina*.

Solenosphaera polysolenia Strelkov and Reshetnjak (Collosphaeridae). Ref.: Strelkov and Reshetnjak (1971); Boltovskoy (1999). Syn.: *Siphonosphaera magnisphaera*, *Siphonosphaera* sp. aff. *S. hippotis*, *Solenosphaera* sp. aff. *S. polisolenia*.

Solenosphaera tenuissima Hilmers (Collosphaeridae). Ref.: Strelkov and Reshetnjak (1971). Syn.: *Otosphaera tenuissima*.

Solenosphaera zanguebarica (Ehrenberg) (Collosphaeridae). Ref.: Boltovskoy (1999). Syn.: *Disolenia quadrata*, *Disolenia* sp., *Disolenia* sp. A, *Disolenia* sp. B, *Disolenia* spp., *Disolenia zanguebarica*, *Solenosphaera pandora*, *Solenosphaera polymorpha*, *Solenosphaera quadrata*, *Solenosphaera* spp., *Solenosphaera zanguebarica pyriformis*, *Trisolenia magalactis megalactis*, *Trisolenia zanguebarica*. Rem.: Variable morphotype, probably includes more than one species. Bjørklund (1981) recorded colonial shells ascribable to *Disolenia*, *Trisolenia*, *Tertasolenis*, and *Polysolenia* in the same living colony. This group needs extensive research to clarify its taxonomy.

Sphaeropyle mespilus Dreyer (Actinommidae). Ref.: Takahashi (1991) (as *Sphaeropyle mespilus*?).

Spirocyrtis scalaris Haeckel (Artostrobiidae). Ref.: Petrushevskaya (1971); Takahashi (1991); Boltovskoy (1999). Syn.: *Botryostrobus scalaris*, *Spirocyrtis cornutella*, *Spirocyrtis scalaris*/cornutella, *Spirocyrtis* spp., *Spirocyrtis subscalaris*, *Spyrocyrtis cornutella*, *Spyrocyrtis scalaris*/cornutella.

Spongaster pentas Riedel and Sanfilippo (Spongodiscidae). Ref.: Riedel and Sanfilippo (1970); Takahashi (1991). Syn.: *Spongaster* sp. aff. *S. pentas*.

Spongaster tetras Ehrenberg (Spongodiscidae). Ref.: Nigrini and Moore (1979) (as *Spongaster tetras tetras* and *Spongaster tetras irregularis*). Syn.: *Spongaster tetras irregularis*, *Spongaster tetras tetras*, *Spongodiscus tetras*. Rem.: Includes *Spongaster tetras tetras* and *Spongaster tetras irregularis* (cf. Nigrini, 1967).

Spongobrachium sp. 1 (Spongodiscidae). Ref.: Nigrini and Moore (1979) (as *Spongobrachium* sp.). Syn.: *Spongaster berminghami*, *Spongaster* sp. A, *Spongobrachium* sp., *Spongobrachium* sp. aff. *Spongobrachium ellipticum*.

Spongodictyon spongiosum (Muller) (Actinommidae). Ref.: Boltovskoy and Riedel (1987).

Spongodiscus resurgens Ehrenberg (Spongodiscidae). Ref.: Boltovskoy (1999). Syn.: *Elliptical spongodiscid*, *Spongaster* cf. *pentas*, *Spongodiscus anomalus*, *Spongodiscus biconcavus*, *Spongodiscus* sp., *Spongotrochus brevispinus*, *Spongotrochus glacialis*. Rem.: In a few of the databases surveyed this species was counted together with *Spongotrochus glacialis*.

Spongodrymus elaphococcus Haeckel (Actinommidae). Ref.: Boltovskoy and Riedel (1980) (as *Spongodrymus* sp. aff. *Spongdrymus elaphococcus*). Syn.: *Spongodrymus* sp. aff. *Spongdrymus elaphococcus*.

Spongolena sp. 1 (Spongodiscidae). Ref.: Renz (1976); Boltovskoy and Riedel (1987).

Spongoliva ellipsoides Popofsky (Coccodiscidae). Ref.: Benson (1966); Takahashi (1991); Boltovskoy (1999). Syn.: *Cypassis irregularis*, *Didymocyrtis ellipsoidis*, *Pylonium* sp., *Spongoliva* cf. *ellipsoides*.

Spongoplegma antarcticum Haeckel (Actinommidae). Ref.: Boltovskoy and Riedel (1980).

Spongoplegma rugosa Hollande and Enjumet (Actinommidae). Ref.: Hollande and Enjumet (1960); Boltovskoy and Jankilevich (1985) (as *Spongoplegma rugosa* and *Spongoplegma* sp. aff. *S. rugosa*).

Spongopyle osculosa Dreyer (Spongodiscidae). Ref.: Nigrini and Moore (1979). Syn.: *Spongodiscus osculosus*, *Spongopyle setosa*.

Spongosphaera streptacantha Haeckel (Actinommidae). Ref.: Hollande and Enjumet (1960); Boltovskoy (1999). Syn.: *?*Hexadoidium *streptacanthum*, *Spongosphaera polyacantha*, *Staurolonche* sp..

Spongosphaera sp. aff. *S. helioides* Haeckel (Actinommidae). Ref.: Takahashi (1991). Syn.: *Spongosphaera* sp..

Spongotrochus glacialis Popofsky (Spongodiscidae). Ref.: Riedel (1958); Petrushevskaya (1967); Boltovskoy (1999). Syn.: *Spongodiscus glacialis*, *Spongotrochus multispinus*, *Spongotrochus* sp. A, *Spongotrochus* sp. B, *Stylochlamidium venustum*. Rem.: In a few of the databases surveyed this species was counted together with *Spongodiscus resurgens*. Heterogenous group, probably includes more than one species.

Spongurus cylindricus Haeckel (Spongodiscidae). Ref.: Benson (1966); Boltovskoy (1999). Syn.: *Spongocore diplocylindrica*, *Spongocore puella*, *Spongocore cylindrica*.

Spongurus pylomaticus Riedel (Spongodiscidae). Ref.: Riedel (1958); Petrushevskaya (1967); Boltovskoy (1999). Syn.: *?*Spongurus *ellipticus*, *Larcopyle pylomaticus*, *Spongurus* cf. *elliptica*, *Spongurus* sp..

Spongurus sp. 1 (Spongodiscidae). Ref.: Petrushevskaya (1967); Boltovskoy (1999) (as *Spongurus* spp. group?). Syn.: *Larcopyle weddellium*, *Prunopyle titan*, *Spongurus*? sp., *Spongurus* cf. *elliptica*, *Spongurus elliptica*, *Spongurus ellipticus*, *Spongurus pylomaticus*, *Spongurus* sp., *Spongurus* sp. aff. *S. elliptica*, *Spongurus spindalis*.

Stichopilium bicorne Haeckel (Theoperidae). Ref.: Haeckel (1887); Benson (1966); Takahashi (1991).

Stigmosphaera cruciata Hollande and Enjumet (Actinommidae). Ref.: Hollande and Enjumet (1960); Boltovskoy and Riedel (1987).

Stylatractus sp. 1 (Actinommidae). . Syn.: *Amphisphaera* group, *Axoprunum bispiculum*, *Axoprunum* spp., *Axoprunum stauraxonium*, *Axoprunum stauraxonium*/Stylosphaera *lithatractus*, *Drupatractus* sp., *Druppatractis acquilonius*, *Druppatractus ostracion*, *Druppatractus ostracion* group, *Druppatractus pyriformis*, *Druppatractus variabilis*, *Ellipsoxiphus atractus*, *Spumellarian form B*, *Stylacontarium bispiculum*, *Stylatractus neptunus*, *Stylatractus pluto*, *Stylatractus pyriformis*, *Stylatractus* sp., *Stylatractus* sp. cf. *S. universus*, *Stylosphaera hispida*, *Stylosphaera lithatractus*, *Stylosphaera stauraxonium*, *Xiphatractus brevispina*, *Xiphatractus pluto*, *Xiphatractus* sp.. Rem.: Very heterogeneous grouping. Includes several species.

Stylochlamydium asteriscus Haeckel (Spongodiscidae). Ref.: Nigrini and Moore (1979); Boltovskoy and Vrba (1988); Boltovskoy (1999). Syn.: *Porodiscus (?)* sp. B, *Stylodictya stellata*.

Stylochlamydium venustum (Bailey) (Spongodiscidae). Ref.: Welling (1997). Syn.: *Ommatodiscus murrayi*, *Sylochlamydium asteriscus*.

Stylodictya aculeata Jørgensen (Spongodiscidae). Ref.: Petrushevskaya (1967); Boltovskoy and Vrba (1988). Syn.: *Porodiscus micromma*, *Stylodictia validispina*. Rem.: Records of this taxon are restricted to the few publications where it was counted separately from *Stylodictya multispina*.

Stylodictya aculeata-multispina (Spongodiscidae). . Syn.: *Ommatodiscus* sp. A, *Ommatodiscus* sp. B, *Ommatodiscus* spp., *Perichlamydium arachnium*, *Porodiscus micromma*, *Spongotrochus multispina*, *Stylodictya multispina*, *Stylodictya* sp., *Stylodictya validispina*. Rem.: Includes records where the two taxa were not identified separately.

Stylodictya multispina Haeckel (Spongodiscidae). Ref.: Boltovskoy and Vrba (1988); Boltovskoy (1999). Syn.: *Ommatodiscus* sp., *Porodiscus* sp., *Porodiscus* sp. aff *P. micromma*, *Stlodictya validispina*, *Stylochlamydium asteriscus*, *Stylodictya asteriscus*/ multispina, *Stylodictya* sp., *Stylodictya* sp. A, *Stylodictya* sp. B, *Stylodictya tenuispina*, *Stylodictya validispina*. Rem.: Records of this taxon are restricted to the few publications where it was counted separately from *Stylodictya aculeata*.

Stylosphaera melpomene Haeckel (Actinommidae). Ref.: Benson (1966); Boltovskoy (1999). Syn.: *?*Stylosphaera *melpomene*, *Hexacontium melpomene*, *Hexacontium melpomene*, *Stylacontarium bispiculum*, *Stylosphaera*? sp. A.

Styptosphaera spongiacea Haeckel (Actinommidae). Ref.: Haeckel (1887); Takahashi (1991). Syn.: *Spongodrymus elaphococcus*, *Styptosphaera (?) spongiacea*. Rem.: Synonymy of this species with *Spongodrymus elaphococcus* is conditional.

Styptosphaera spumacea Haeckel (Actinommidae). Ref.: Nigrini (1970) (as *Styptosphaera*? *spumacea*); Boltovskoy and Riedel (1987).

Styptosphaera sp. 1 (Actinommidae). Ref.: Takahashi (1991) (as *Styptosphaera* sp. B).

Styptosphaera sp. 2 (Actinommidae). Ref.: Takahashi (1991) (as *Styptosphaera* sp. C).

Tessarastrum straussii Haeckel (Spongodiscidae). Ref.: Renz (1976); Takahashi (1991) (as *Amphirhopalum straussi*). Syn.: *Amphirhopalum straussii*.

Tetracorethra tetracorethra (Haeckel) (Pterocoryidae). Ref.: Renz (1976); Takahashi (1991).

Tetraplecta corynephorum? Jørgensen (Plagoniidae). Ref.: Takahashi (1991).

Tetraplecta pinigera Haeckel (Plagoniidae). Ref.: Takahashi (1991). Syn.: *Plagiacantha arachnoides*.

Tetraplecta plectaniscus Haeckel (Plagoniidae). Ref.: Haeckel (1887); Takahashi (1991).

Thecosphaera inermis (Haeckel) (Actinommidae). Ref.: Boltovskoy and Riedel (1980); Boltovskoy (1999). Syn.: *Actinomma* sp. A, *Stylosphaera* sp. C, *Thecosphaera phaenaxonia*.

Theocalyptra bicornis (Popofsky) (Theoperidae). Ref.: Riedel (1958); Takahashi (1991). Syn.: *Clathrocyclas bicornis*, *Cycladophora bicornis*, *Eucecryphalus alcmenae*, *Eucecryphalus bicornis*, *Pterocorys bicornis*.

Theocorys veneris (Haeckel) (Theoperidae). Ref.: Boltovskoy (1999). Syn.: *Clathrocanium insectum*, *Corocalyptra columba*.

Theocorythium trachelium (Ehrenberg) (Pterocoryidae). Ref.: Petrushevskaya (1971); Boltovskoy (1999). Syn.: *Calocyclas amicae*, *Theocorythium trachelium dianae*, *Theocorythium trachelium trachelium*.

Theopilium tricostatum (Haeckel) (Theoperidae). Ref.: Haeckel (1887); Benson (1966); Boltovskoy (1999). Syn.: *Cecryphalium sestrodiscus*, *Eucecryphalus sestrodiscus*, *Eucecryphalus tricostatum*, *Eucecryphalus tricostatus*, *Theocalyptra* sp..

Tholospyris anthophora (Haeckel) (Spyridae). Ref.: Goll (1969); Goll (1972); Boltovskoy (1999). Syn.: *Tholospyris distoma*, *Tholospyris ramosa*, *Tholospyris* sp. 2.

Tholospyris baconiana (Haeckel) (Spyridae). Ref.: Takahashi (1991) (as *Tholospyris baconiana baconiana* and *Tholospyris baconiana variabilis*). Syn.: *Tholospyris baconiana baconiana*, *Tholospyris baconiana variabilis*.

Tholospyris macropora (Popofsky) (Spyridae). Ref.: Takahashi (1991).

Tholospyris procera Goll (Spyridae). Ref.: Nigrini and Moore (1979); Goll and Bjørklund (1974). Syn.: *Amphispyris* sp. D, *Amphispyris subquadrata*.

Tholospyris tripodiscus Haeckel (Spyridae). Ref.: Petrushevskaya (1971); Renz (1976); Boltovskoy (1999).

Tribonosphaera centripetalis Haeckel (Collosphaeridae). Ref.: Strelkov and Reshetnjak (1971) (as *Collosphaera armata* and *Tribonosphaera centripetalis*); Boltovskoy and Riedel (1980); Boltovskoy (1999). Syn.: *Collosphaera armata*.

Triceraspyris antarctica (Haecker) (Spyridae). Ref.: Petrushevskaya (1971); Boltovskoy (1999). Syn.: *Desmospyris spongiosa*, *Phormospyris stabilis antarctica*.

Tricolocampe cylindrica Haeckel (Artostrobiidae). Ref.: Benson (1966) (as *Siphocampium* cf. *cylindrica*); Petrushevskaya (1971); Boltovskoy (1999). Syn.: *Lithomitra lineata*, *Siphocampe lineata*, *Siphocampe lineata* group.

Trisulcus triacanthus Popofsky (Plagoniidae). Ref.: Petrushevskaya (1971); Renz (1976); Boltovskoy (1999).

Udan undulata Renz (Theoperidae). Ref.: Renz (1976).

Xiphosphaera gaea Haeckel (Actinommidae). Ref.: Goll (1969); Takahashi (1991).

Xiphosphaera tessaractis Dreyer (Actinommidae). Ref.: Dreyer (1913); Takahashi (1991). Syn.: *Xiphosphaera gaea*/tesseractis, *Diplosphaera lychnosphaera*.

Zygocircus productus (Hertwig) (Spyridae). Ref.: Takahashi (1991) (as *Zygocircus productus* group); Boltovskoy and Riedel (1987).

APPENDIX 3.

Index of species included in maps, graphs, and tables.

	Geographic distribution of the species (Figs. 8-229)	Vertical abundance profiles (Figs. 230-234)	Dominant species at different depths (Figs. 225, 236)	Occurrences of selected species in water column and in sediment samples (Figs. 259-260)	Comparison of mean species percentages in the water-column and the sediments (Figs. 261-275)	Interoceanic differences (Table 4)	Interoceanic differences (Table 5)	Endemisms (Table 6)
Acanthodesmia vinculata	8	231	225, 236	259				X
Acanthodesmia zonaria								X
Acanthosphaera actinota	9							X
Acanthosphaera castanea	102							X
Acanthosphaera dodecastyla	103							X
Acanthosphaera pinchuda	104							X
Acrobotrys sp. group								X
Acrosphaera cyrtodon	105							X
Acrosphaera murrayana	10			259				X
Acrosphaera spinosa	11	230	225, 236	259				X
Actinomma antarcticum	12							X
Actinomma arcadophorum	13			259				X
Actinomma capillaceum								X
Actinomma delicatulum				259	261	X	X	X
Actinomma leptodermum		230	225, 236	259				X
Actinomma medianum	14			259				X
Actinomma sol	106							X
Actinomma sp. 1	107							X
Actinommidae, family	243							
Actinosphaera acanthophora	108							X
Actinosphaera capillacea	109			260				X
Actinosphaera tenella								X
Amphimelissa setosa	15			259				X
Amphirhopalum ypsilon	16			259				X
Androcyclas gamphonycha	110							X
Androspyris huxleyi	111							X
Androspyris ramosa	112							X
Androspyris reticulodisca								X
Anomalacantha dentata				260				X
Antarctissa denticulata-strelkovi	17			259				X
Anthocyrtidium ophirense	18	231	225, 236	259				X
Anthocyrtidium zanguebaricum	19	231	225, 236	259	269			X
Arachnocorallium sp. group				259				X
Arachnocorys circumtexta	113							X
Arachnocorys sp. group				260				X
Arachnosphaera myriacantha	114			260				X
Arachnosphaera sp. 1								X
Archipilium sp. 1	115							X
Artobotrys borealis	20			259				X

	Geographic distribution of the species (Figs. 8-229)	Vertical abundance profiles (Figs. 230-234)	Dominant species at different depths (Figs. 225, 236)	Occurrences of selected species in water column and in sediment samples (Figs. 259-260)	Comparison of mean species percentages in the water-column and the sediments (Figs. 261-275)	Interoceanic differences (Table 4)	Interoceanic differences (Table 5)	Endemisms (Table 6)
Artostrobiidae, family	255							
Artostrobus annulatus	116			259				X
Artostrobus joergenseni	117							X
Astrosphaera hexagonalis	118			260				X
Bathropyramis woodringii	119							X
Botryocephalina armata	120							X
Botryocyrtis scutum	21			259				X
Botryopyle dictyocephalus	121							X
Botryostrobus aquilonaris	22			259	262			X
Botryostrobus auritus-australis	23	233	225, 236	259				X
Buccinosphaera invaginata	122							X
Callimitra carolotae	123			259				X
Callimitra solocicribrata	124							X
Calocyclas monumentum	125							X
Cannobotryidae, family	256							
Carpocanarium papillosum	24	232	225, 236	259				X
Carpocaniidae, family	253							
Carpocanium sp.group	25	232	225, 236	259				X
Carposphaera acanthophora	126							X
Carposphaera capillacea								X
Cenosphaera cristata								X
Cenosphaera elysia								X
Cenosphaera hirsuta								X
Cenosphaera spp.								X
Centrobotrys thermophila	26							X
Centrocubus cladostylus	127							X
Cephalospyris cancellata	128							X
Cephalospyris platybursa				260				X
Ceratocyrtis sinuosa								X
Ceratospyris borealis	27							X
Cladococcus abietinus	129							X
Cladococcus bifurcus								X
Cladococcus cervicornis	130			260				X
Cladococcus megaceros								X
Cladococcus scoparius	131			260				X
Cladococcus sp. 1								X
Cladococcus viminalis	132			260				X
Cladoscenium ancoratum	133			260				X
Cladoscenium limbatum	134							X
Clathrocanium coarctatum	28			259				X
Clathrocorys teuscheri	135							X
Clathrocyclas sp. 1								X

	Geographic distribution of the species (Figs. 8-229)	Vertical abundance profiles (Figs. 230-234)	Dominant species at different depths (Figs. 225, 236)	Occurrences of selected species in water column and in sediment samples (Figs. 259-260)	Comparison of mean species percentages in the water-column and the sediments (Figs. 261-275)	Interoceanic differences (Table 4)	Interoceanic differences (Table 5)	Endemisms (Table 6)
Clathromitra pentacantha								X
Clathromitra pterophormis								X
Clathrosphaera arachnoides								X
Coccodiscidae, family	244							
Collosphaera huxleyi	29							X
Collosphaera macropora	136							X
Collosphaera tuberosa	30	230	225, 236	259				X
Collosphaeridae, family	242							
Conarachnium facetum	137			260				X
Conarachnium polyacanthum	138			260				X
Conarachnium sp. 1								X
Conicavus tipiopsis								X
Cornutella profunda	31	233	225, 236	259				X
Corocalyptra cervus		233	225, 236	259				X
Corocalyptra krugeri	139							X
Cromyechinus antarctica	32	234	225, 236	259				X
Cromyechinus sp. 1								X
Cromyomma circumtextum	140							X
Cromyomma sp. 1								X
Cromyomma villosum	141							X
Cubotholus sp.	142							X
* *Cycladophora davisiana cornutoides*	143			259		X	X	X
* *Cycladophora davisiana davisiana*	143			259				X
Cyclampterium neatum								X
Cyrtidosphaera reticulata	144							X
Cyrtolagena laguncula	33			259				X
Dictyocodon elegans	145							X
Dictyocodon palladius	146			260				X
Dictyocoryne profunda	34	231	225, 236	259				X
Dictyocoryne truncatum	35			259				X
Dictyophimus hirundo	36	232	225, 236	259				X
Dictyophimus histricosus	147							X
Dictyophimus infabricatus	148		225, 236	259		X	X	X
Dictyophimus mawsoni								X
Dictyophimus sp. 1								X
Dictyospyris sp. 1	149							X
Didymocyrtis tetrathalamus	37	230	225, 236	259				X
Dipylissa bensoni	150							X
Druppatractus irregularis				259		X		X
Drymosphaera dendrophora	151							X

	Geographic distribution of the species (Figs. 8-229)	Vertical abundance profiles (Figs. 230-234)	Dominant species at different depths (Figs. 225, 236)	Occurrences of selected species in water column and in sediment samples (Figs. 259-260)	Comparison of mean species percentages in the water-column and the sediments (Figs. 261-275)	Interoceanic differences (Table 4)	Interoceanic differences (Table 5)	Endemisms (Table 6)
Drymyomma elegans	152							X
Elatomma penicillus	153							X
Ellipsoxiphium palliatum	154							X
Enneaphormis rotula	38			259				X
Eucecryphalus clinatus	155							X
Euchitonia elegans-furcata	39	234	225, 236	259	264			X
Eucyrtidium acuminatum	40	232	225, 236	259				X
Eucyrtidium anomalum	156			259				X
Eucyrtidium erythromystax								X
Eucyrtidium hexagonatum	41	230	225, 236	259				X
Eucyrtidium hexastichum	42			259				X
Euscenium corynephorum	157							X
Gonosphaera primordialis				260				X
Haeckeliella macrodoras	158							X
Haliomma castanea	159							X
Haliomma macrodoras	160							X
Haliomma sp. 1								X
Haliomma sp. 2								X
Heliodiscus asteriscus	43	230	225, 236	259	265			X
Heliodiscus echiniscus								X
Heliodiscus sp. 1								X
Heliosoma sp. 1								X
Helotholus histricosa	44	234	225, 236	259				X
Heterosphaera sp. 1								X
Heterosphaera sp. 2								X
Hexacontium arachnoidale	161							X
Hexacontium armatum-hostile group				259				X
Hexacontium heracliti								X
Hexacontium heteracantha								X
Hexacontium hystricina								X
Hexacontium laevigatum	162							X
Hexacromyum elegans	163			260				X
Hexalonche amphisiphon	164							X
Hexastylus dimensivius	165							X
Hexastylus triaxonius								X
Lamprocyclas maritalis	45			259				X
Lamprocyrtis junonis	46							X
Lamprocyrtis nigriniae	47			259		X		X
Lampromitra cracenta	166							X
Lampromitra quadricuspis	167	231	225, 236	259				X
Lampromitra schultzei	168							X

	Geographic distribution of the species (Figs. 8-229)	Vertical abundance profiles (Figs. 230-234)	Dominant species at different depths (Figs. 225, 236)	Occurrences of selected species in water column and in sediment samples (Figs. 259-260)	Comparison of mean species percentages in the water-column and the sediments (Figs. 261-275)	Interoceanic differences (Table 4)	Interoceanic differences (Table 5)	Endemisms (Table 6)
Larcopyle buetschlii	48	231	225, 236	259			X	X
Larcospira quadrangula	49	232	225, 236	259		X		X
Larnacalpis sp. 1	169							X
Leptosphaera minuta								X
Lipmanella bombus	170							X
Lipmanella dictyoceras	171		225, 236	259				X
Lipmanella virchowii	50							X
Liriospyris reticulata	51	234	225, 236	259				X
Liriospyris sp. 1								X
Liriospyris thorax laticapsa								X
Liriospyris thorax thorax	172			260				X
Litharachnium tentorium	52	233	225, 236	259	270			X
Litheliidae, family	247							
Lithelius minor group			225, 236	259				X
Lithelius nautiloides	53			259				X
Lithocampe platycephala	173			260				X
Lithocampe sp. 1	174							X
Lithomelissa hystrix								X
Lithomelissa setosa	54			259				X
Lithopera bacca	55							X
Lithopilium reticulatum	175							X
Lithostrobus cornutus								X
Lithostrobus hexagonalis	176	231	225, 236	259	271			X
Lophocorys polyacantha	177							X
Lophophaena capito	178			259				X
Lophophaena decacantha group				259				X
Lophophaena hispida-cylindrica	56	231	225, 236	259				X
Lophophaena rioplatensis								X
Lophophaena variabilis group				259				X
** Lophospyris pentagona*	179			260				X
** Lophospyris pentagona pentagona*	179		225, 236	259	272			X
** Lophospyris pentagona quadriforis*	179							X
Lychnosphaera regina								X
Mitrocalpis araneafera	180							X
Myelinastrinae				260				X
Nassellaria, order	257							
Neosemantis distephanus	57			259				X
Nephrospyris paradictyum	181			260				X
Nephrospyris renilla	182							X
Octodendron cubocentron	183							X

	Geographic distribution of the species (Figs. 8-229)	Vertical abundance profiles (Figs. 230-234)	Dominant species at different depths (Figs. 225, 236)	Occurrences of selected species in water column and in sediment samples (Figs. 259-260)	Comparison of mean species percentages in the water-column and the sediments (Figs. 261-275)	Interoceanic differences (Table 4)	Interoceanic differences (Table 5)	Endemisms (Table 6)
Octopyle stenozona/Tetrapyle octacantha	58	233	225, 236	259	266			X
Ommatodiscus murrayi	184							X
Otosphaera polymorpha	59							X
Peripyramis circumtexta	60			259		X		X
Peromelissa phalacra	61	231	225, 236	259				X
Phacodiscidae, family	245							
Phormacantha hystrix	62			259				X
Phormospyris sp. 1								X
Phormospyris stabilis capoi	185							X
Phormospyris stabilis scaphipes	63			259		X		X
Phormospyris stabilis stabilis	64		225, 236	259				X
Phormostichoartus corbula	65			259				X
Phorticium pylonium	66	231	225, 236	259				X
Phrenocodon clathrostomium								X
Plagoniidae, family	251							
Plectacantha cremastoplegma	186			260				X
Plectacantha oikiskos								X
Plectacantha trichoides	187							X
Plectanium sp. 1								X
Plectopyramis dodecomma	188							X
Plegmosphaera coelopila	189			260				X
Plegmosphaera entodictyon								X
Plegmosphaera lepticali	190			260				X
Plegmosphaera oblonga								X
Plegmosphaera pachyplegma	191							X
Porodiscus microporus	192							X
Pseudocubus obeliscus	67			259				X
Pseudocubus octostylus								X
Pseudodictyophimus bicornis	193							X
Pseudodictyophimus gracilipes	68	233	225, 236	259	273			X
Pterocanium auritum	194							X
Pterocanium korotnevi	69			259		X	X	X
Pterocanium praetextum	70	232	225, 236	259				X
Pterocanium trilobum	71	232	225, 236	259				X
Pterocorys hertwigii	72							X
Pterocorys minythorax	73							X
Pterocorys zancleus	74	232	225, 236	259				X
Pterocorythidae, family	254							
Pterocyrtidium dogieli	195							X
Pteropilium stratiotes								X
Pteroscenium pinnatum	196							X

	Geographic distribution of the species (Figs. 8-229)	Vertical abundance profiles (Figs. 230-234)	Dominant species at different depths (Figs. 225, 236)	Occurrences of selected species in water column and in sediment samples (Figs. 259-260)	Comparison of mean species percentages in the water-column and the sediments (Figs. 261-275)	Interoceanic differences (Table 4)	Interoceanic differences (Table 5)	Endemisms (Table 6)
Pylolena armata	75	231	225, 236	259				X
Pyloniidae, family	248							
Pylospira octopyle	76							X
Rhizoplegma boreale	77			259				X
Saccospyris antarctica	197							X
Saccospyris conithorax	198							X
Saturnalis circularis	199							X
Sethoconus anthocyrtis	200							X
Sethoconus myxobrachia	201							X
Sethoconus tabulatus	202							X
Sethodiscus macrococcus	203							X
Sethophormis aurelia	78			259	274			X
Siphocampe arachnea	79			259				X
Siphocampe lineata	80							X
Siphonosphaera martensi	204							X
Siphonosphaera polysiphonia	81			259				X
Siphonosphaera socialis	205							X
Solenosphaera collina	206							X
Solenosphaera polysolenia	207							X
Solenosphaera tenuissima								X
Solenosphaera zanguebarica	82			259				X
Sphaeropyle mespilus	208							X
Spirocyrtis scalaris	83			259				X
Spongaster pentas								X
Spongaster tetras	84	230	225, 236	259				X
Spongobrachium sp. 1	209							X
Spongodictyon spongiosum	210							X
Spongodiscidae, family	246							
Spongodiscus resurgens	85			259				X
Spongodrymus elaphococcus								X
Spongolena sp. 1	211							X
Spongoliva ellipsoides	212							X
Spongoplegma antarcticum								X
Spongoplegma rugosa	213							X
Spongopyle osculosa	86		225, 236	259				X
Spongosphaera sp. aff. *S. helioides*								X
Spongosphaera streptacantha	87							X
Spongotrochus glacialis	88	233	225, 236	259				X
Spongurus cylindricus	89	232	225, 236	259				X
Spongurus pylomaticus	90			259				X
Spongurus sp. 1	91			259				X

	Geographic distribution of the species (Figs. 8-229)	Vertical abundance profiles (Figs. 230-234)	Dominant species at different depths (Figs. 225, 236)	Occurrences of selected species in water column and in sediment samples (Figs. 259-260)	Comparison of mean species percentages in the water-column and the sediments (Figs. 261-275)	Interoceanic differences (Table 4)	Interoceanic differences (Table 5)	Endemisms (Table 6)
Spumellaria, order	257							
Spyridae, family	250							
Stichopilium bicorne	92	231	225, 236	259	275			X
Stigmosphaera cruciata								X
Stylatractus sp. 1				259	267			X
Stylochlamydium asteriscus	93				268			X
Stylochlamydium venustum	94	234	225, 236	259			X	X
Stylodictya aculeata	95			259				X
Stylodictya aculeata-multispina								X
Stylodictya multispina	96			259				X
Stylosphaera melpomene	214							X
Styptosphaera sp. 1								X
Styptosphaera sp. 2								X
Styptosphaera spongiacea				260				X
Styptosphaera spumacea	215							X
Tessarastrum straussii	216							X
Tetracorethra tetracorethra	217							X
Tetraplecta corynephorum?								X
Tetraplecta pinigera	97			259, 260				X
Tetraplecta plectaniscus								X
Thecosphaera inermis	218							X
Theocalyptra bicornis	98			259				X
Theocorys veneris	219							X
Theocorythium trachelium	99	232	225, 236	259				X
Theoperidae, family	252							
Theopilium tricostatum	100	232	225, 236	259				X
Tholoniidae, family	249							
Tholospyris anthophora	220							X
Tholospyris baconiana	221			260				X
Tholospyris macropora								X
Tholospyris procera	222							X
Tholospyris tripodiscus	223							X
Tribonosphaera centripetalis	224							X
Triceraspyris antarctica	225							X
Tricolocampe cylindrica	226							X
Trisulcus triacanthus	227							X
Udan undulata	228							X
Xiphosphaera gaea								X
Xiphosphaera tessaractis	229							X
Zygocircus productus	101	232	225, 236	259				X

* Subspecies pooled under the specific designation in most graphs