UNIVERSITÀ DI PISA

Department of Earth Sciences

Master Degree in Geosciences and Geotechnologies

Thesis

Anoxic sediments of the Kveithola Trough, Barents Sea (Arctic region), micropaleontological and sedimentological evidences

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Anoxic sediments of the Kveithola Trough, Barents Sea (Arctic region), micropaleontological and sedimentological evidences

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Contents

Abstract

The glacially influenced Kveithola Trough is an abrupt narrow sedimentary system located in the NW Barents Sea. Along with the larger Storfjorden glacial system, it hosted, during the last glaciation, ice streams draining ice from the southern Svalbard in the north and Bear Island in the south. The Kveithola Trough has specific morphological and depositional features, a shallow water counturite drift that forms geographically well confined depocenters.

The drift consists of two main depocenters separated by the relief of a buried grounding-zone wedge. Here a distinct moat can be identified, which implies the strong influence of dense bottom currents, inferred to flow (or at least to have flown in the past) towards the outer shelf.

The highly dynamic environment depicted from the morphological and structural characteristics of the sediment drift is in contrast with the sediment facies and preserved biota observed in the surface sediments of the Kveithola drift. The analysis of 4 box-corers collected during the oceanographic cruise EUROFLEETS"-BURSTER revealed that surface sediments in the innermost part of the Kveithola Trough are fine-grained, soft and soupy with a "jelly-like" consistency. The cored sediments are mostly black, organic matter-rich, with presence of abundant H_2S, abundant black worm tubes (Siboglinidae worms) and occasionally with living reddish polychaetes (possibly ampharetid polychaetes).

The recent (about last 2000 years) benthic foraminiferal assemblage observed in the sediments is characterized by the presence of low-oxygen species as *Cassidulina laevigata* and opportunistic species (among others *Nonionellina labradorica*), indicating stressed environments.

The sediments of the Kveithola Drift that deposited under persistent dense bottom currents, thus, appears today as a stagnant environment strongly affected by low-oxygen conditions with likely ongoing seep activity. The jelly-like consistency of the sediments may be related to "organic matter-sediment-pore water bound" in presence of H_2S or to the presence of jelly microbial filaments.

Riassunto

Il Kveithola Trough è un piccolo sistema sedimentario di origine glaciale, ubicato nella parte nord occidentale del Mare di Barents. Durante l'ultima glaciazione, il Kveithola Trough insieme al più grande sistema glaciale dello Storfjorden, ospitavano degli ice stream che drenavano la calotta glaciale dalle Svalbard a nord e dall'isola di Bear nel sud. Il Kveithola Trough ha caratteristiche morfologiche e sedimentologiche peculari, è infatto caratterizzato dalla presenza di un drif countouritico di mare basso. Il drift è costituito da due depocentri principali, separati dal rilievo centrale. Qui si può individuare una fossa (*moat*), originatesi a causa della presenza di forti correnti di fondo dense (brine) che scorrevano (e forse tutt'ora scorrono) verso la parte esterna del trough. L'ambiente fortemente dinamico dedotto attraverso lo studio della morfologia e le caratteristiche strutturali del Kveithola Trough sono in contrasto con i risultati ottenuti dalle analisi sedimentologiche e micropaleontologiche dei sedimenti superficiali.

Lo studio di quattro box-corer prelevati durante la crociera oceanografica EUROFLEETS2-BURSTER ha permesso di osservare che i livelli superficiali sono costituiti da sedimenti fini, con un elevato contenuto d'acqua e con una consistenza "gelatinosa". Inoltre il colore dei sedimenti è prevalentemente nero con abbondante sostanza organica, e con tubi di vermi (*Siboglinidae*) e policheti. L'associazione recente (ultimi 200 anni) a foraminiferi bentonici è dominata dalla presenza di specie tolleranti a basse concentrazioni di ossigeno, come *Cassidulina laevigata* e da specie opportuniste (per esempio *Nonionellina labradorica)* che indicano un ambiente disossico, fortemente stressante.

I sedimenti del Kveithola Trough, che si sono depositati sotto l'influenza di forti correnti persistenti, si presentano oggi come un ambiente stagnante fortemente influenzato da condizioni disossiche-anossiche, ma con un attività biologica importante (Siboglinidae e presenza di comunità bentoniche a foraminiferi). Le strutture sedimentarie osservate possono essere interpretate come conseguenza di attività di fuga di fluidi e/o gas, così come la consistenza gelatinosa dei sedimenti può essere legata alla presenza di comunità microbiche legate a loro volta alle basse concentrazioni di ossigeno al fondo.

1. Introduction

Changes in environmental conditions provides information about the magnitude of natural climate and environmental variability, both resulting from external climate drivers and internally generated climate variability at timescales relevant for the Holocene (Borzenkova et al., 2015). This is important not only to understand the mechanisms driving variability and the climate change trends over centennial timescales, but also to estimate the extent to which future climate could deviate from the present global trend as effect of the increasing concentrations of atmospheric greenhouse gases (Borzenkova et al., 2015).

Several studies indicate that Holocene climatic changes in the Arctic are of higher amplitude than in subpolar areas. Those changes ranged from warm interstadial with strong seasonality in the early Holocene, to cooler stadial with weaker seasonal contrast in the mid-late Holocene (Kaufman et al., 2004). The Arctic zone is the area with major surface water masses exchange between the North Atlantic Ocean and the Arctic Ocean (Rasmussen et al., 2012). Changes at regional scales including deviations from the global average, can be substantial and should be incorporated in regional policy on adaptation to climate change (Borzenkova et al., 2015).

The study of foraminifera represents a tool to understand these regional changes. Foraminifera are single-celled organisms (protists) with shells. Foraminiferal tests are very abundant, they can register marine events, and depending on the species can indicate a specific marine environmental conditions.

The main impact of foraminiferal studies in the sediment record relates of their small size, large abundance, with readily preserved and highly diagnostic shells, which make them a reliable tool for stratigraphy and paleontology statistical analysis (Armstrong & Brasier, 2005; Loeblich & Tappan, 2015). Indeed, many foraminifera groups have an intricate morphology that tracers their evolutionary changes (Armstrong & Brasier, 2005).

Foraminifera group has a wide environmental range, from terrestrial to deep sea and from polar to tropical areas (Armstrong & Brasier, 2005). Their ecological sensitivity renders the group particularly useful in studies of recent and ancient environmental conditions (Armstrong & Brasier, 2005). In the modern ocean, for instance, they comprise over 55% of Arctic biomass and over 90%

of deep sea biomass (Armstrong & Brasier, 2005). Thus, they are the most widely used fossil organism in biostratigraphy, geochronology, correlation of sediments and paleoenvironmental interpretation. Both as living specimens providing ecologic data, and as mineralized shells that yield geochemical records of paleotemperatures, the extent of glaciations and other paleogeographic features (Loeblich & Tappan, 2015). Foraminifera are extremely sensitive to environmental changes, such as those related to water circulation and sea-water depth, which can be depicted of the foraminiferal assemblages (Armstrong & Brasier, 2005).

Foraminifera are especially used in the studies of climate history from the Mesozoic to Quaternary because the stable isotopes (O, C) of their carbonatic tests are record the changes in temperature and ocean chemistry (Armstrong & Brasier, 2005). The palaeo-bio-geographical patterns of benthic and planktonic foraminifera are therefore indispensable in palaeoceanography (Armstrong & Brasier, 2005), and together with sedimentological information, can give a solid interpretation about the past climate change.

The identification of sedimentary systems and processes in the Arctic area allows the reconstruction of the recent and past glacial history and ice sheet dynamics useful for the development of palaeoclimatic and palaeoenvironmental reconstruction of the Quaternary period (Lucchi et al., 2013).

Palaeoclimatic reconstructions can be achieved through biotic and abiotic proxies, such as microfossil assemblages, clay mineral distribution and grain size. They provide key information on water-mass provenance and environmental targets such as sea surface temperature (SST), salinity, sea-ice cover and marine biological productivity (Carbonara et al., 2016). The use of foraminifera on recent Arctic glaciomarine sediments provides the insights on the environmental significance of taxa improving our understanding on the palaeoenvironmental significance of fossil faunas (Korsun, et al., 1995).

1.1. Project justification

Despite recent advances in Quaternary Arctic palaeoceanographic reconstruction, relatively little is known about Quaternary environmental changes and their close relationship with foraminiferal assemblages. The interest on the Arctic Ocean rely to its key role on climate change through the formation and export of North Atlantic Deep water, the influence on the albedo Earth's budget through changing sea ice coverage (Serreze et al., 2007), and the export of fresh water from river inflow and melting ice to the North Atlantic (Peterson et al., 2006).

Sediment samples were collected during the Eurofleets-BURSTER project, focusing on the analyses of past and recent benthic foraminiferal communities for the study of environmental changes. The main objective of this study is to understand the temporal variations of benthic foraminiferal assemblages in relation to their resilience in oxygen-depleted and methane emissions from the seafloor. Benthic foraminifera assemblages can represent a potential indicator of variation in oxygen, changes in the carbon dioxide concentrations and presence of hydrocarbon seeps (Lucchi et al., 2016).

To obtain resources with this project to make a more detailed research, to get more information about climate changing and understand the processes related to the environmental influence on the foraminiferal communities is a priority of this and future research projects on the Arctic region.

1.2. Objectives

General

This research aims to establish, through the use of fossil foraminifera and sedimentological data, the evolution of paleoecological conditions also in relation to sedimentary processes, to determinate the Quaternary conditions of the Kveithola glacial trough (south of Svalbard, Arctic)

Specific

- To establish a detailed stratigraphy and sedimentology of the Kveithola glacial trough zone.
- To determine the patterns of variation in the foraminiferal paleocommunities at the Kveithola glacial trough.
- To correlate the variations of foraminifera communities and the local environmental conditions including active sedimentary processes.
- To establish the general environmental conditions during the recent and modern deposition in the Kveithola glacial trough, such as productivity, temperature, salinity, etc.

1.3. Study area

The Kveithola Trough located in the NW Barent Sea is an abrupt and narrow sedimentary system about 100 km long and 13 km wide (Rebesco et al., 2011) (Figure 1.1). The glacial dynamic history of the Kveithola Trough is strictly related to that of the Storfjorden glacial Trough located north of the Kveithola. During the last glaciation, the Storfjorden-Kveithola glacial system hosted active ice streams draining ice from the southern Svalbard in the northern area, and from the Bear Island located in the southern reaches of the glacial system (Pedrosa et al., 2011). The axial profile of the trough along the wedge is markedly staircase-like, composed of five transverse ridges about 15 km apart from each other. These ridges are composed of grounding-zone wedges (GZWs) and grounding-line fans both inferred to have formed by deposition of subglacial till and a dominance of subglacial meltwater plumes during the episodic phases of last deglacial ice stream retreat (Rebesco et al., 2016).

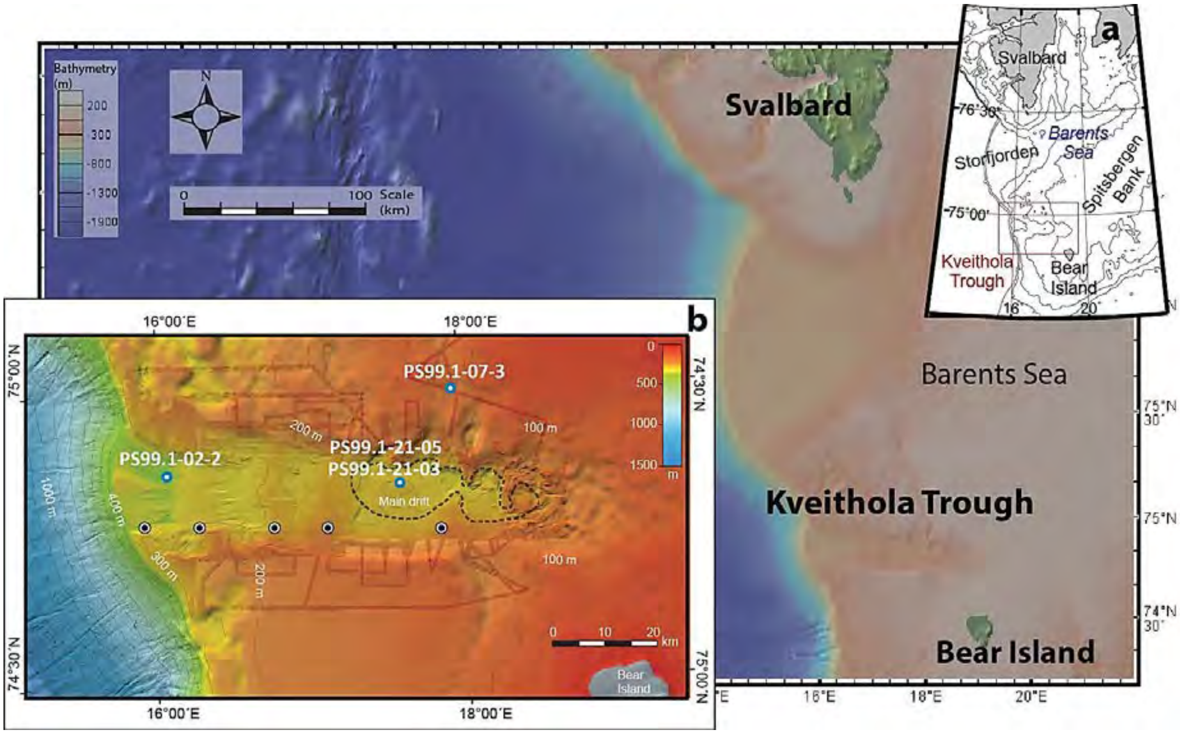

Figure 1.1: Location map of the study area: a. General location maps, with indication of the five GZW. b. Bathymetry of the Kveithola Glacial White/blue dots indicate the studied sites and Black/White dots indicate the GZW (modified by Lucchi et al., 2016).

The inner area of the Kveithola Trough (area around site PS99.1-21 in Figure 1.1), contains a sediment drift consisting of two main depocenters separated by the relief of a buried grounding-zone wedge (Rebesco et al., 2016). The seismic reflection data on the drift zone shows a drastic thinning and truncations towards the North, here a distinct longitudinal moat can be seen, which formation implies a strong influence of energetic, possibly dense, bottom currents moving towards the outer shelf (Hanebuth et al., 2014; Rebesco et al., 2016).

The morphological and structural characteristics of the sediment drift outline the high dynamism of this environment although the local sediment facies appoint to low-energy, possibly stagnant environmental conditions (Hanebuth et al., 2014). The object of this study is to understand the environmental significance of said contrasting evidences by means of the preserved biota in the surface sediments of the Kveithola Trough.

1.4. Methodology

1.4.1. Sample collection

The collection of samples was in charge of the AXED research project, undertaken during the Eurofleets 2- BURSTER cruise onboard the German icebreaker RV Polarstern (Expedition PS99-1a) during June 13–23, 2016 (Bremerhaven-Longyearbyen). The principal objective of investigating was the hydrographic and bio-geochemical conditions of the Kveithola glacial trough, to uncover the possible existence of gas seepage activity in the area (Lucchi et al., 2016). BURSTER project aimed to study climate induced environmental changes controlling the evolution of living organisms in extreme environments (Lucchi et al., 2016).

Sea bottom sediments sampling

The sediment samples were collected using a video-guided multi-corer (TV-MUC) for undisturbed surface sediment samples (Figure 1.2).

Figure 1.2: The TV-MUC sediment sampling system.

Seven sites were sampled in the Kveithola Trough of which, four sites were analyzed for this thesis: site PS99/02-2, site PS99/07-3, site PS99/21-3 and site PS99/21-5 (Table 1.1; Appendix 1)

Station	Latitude	Longitude	Depth (m)	Geological Setting	Sediment recovery (cm)
PS99-1/02-2	74° 51,49' N	16° 05,84' E	376.1	Distal. Foot of the 2° GZW	30
PS99-1/21-3	74° 52,40' N	17° 21,57' E	305.7	Inner drift	10
PS99-1/21-5	74° 52,40' N	17° 21,60' E	305.4	Inner drift	25
PS99-1/07-3	74° 59,69' N	17° 59,72' E	159.1	Frontal. Shelf surface	38

Table 1.1. TV-multi-corer sampling sites location and sediment recovery.

The cores from the TV-MUC frame were placed on a special support hosting eight plastic tubes ready to be sampled. Sediment sampling was performed to pushing the sediments out with a piston from the MUC plastic barrel in defined depths/volumes. (Figure 1.3.) (Lucchi et al., 2016).

Figure 1.3: a) Supports for MUC plastic tubes; b) piston-pushing system for MUC cores; c) MUC sediment sampling.

The sediment core samples for foraminiferal analysis, was opened on board and sliced at every 0.5 cm for the first 2 cm and each 1 cm to the bottom (Figure 1.4).

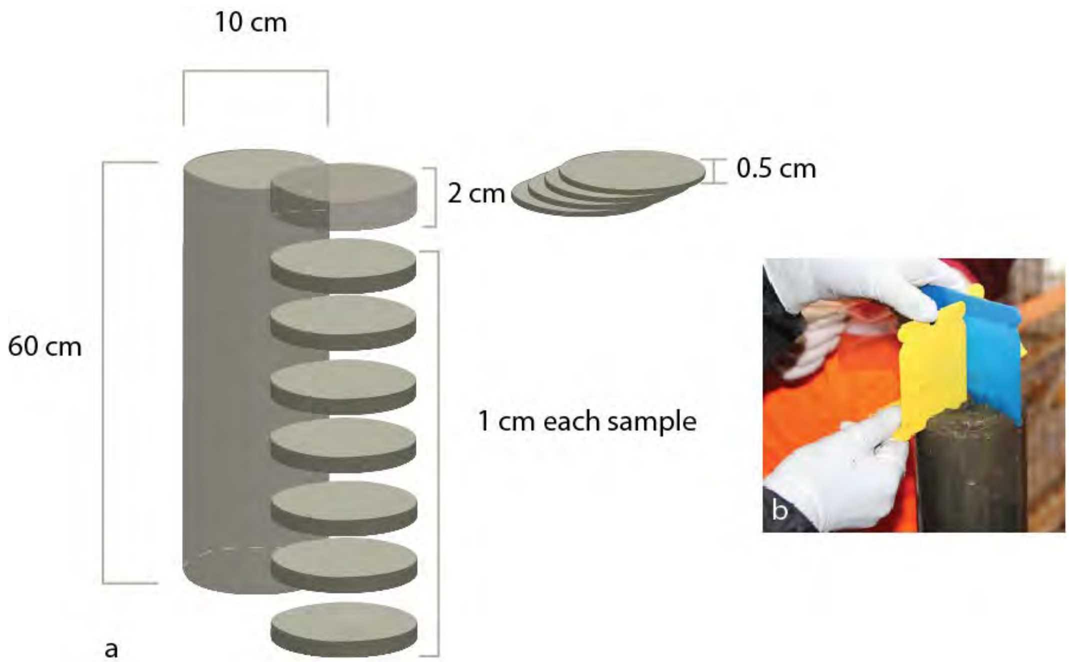

Figure 1.4: a. Schematic model for sediment sampling on board. b. Detail of the sub-sampling for fossil foraminiferal assemblages and sediment grain size analyses.

1.4.2. Laboratory work

a. Description of sediment characteristics

Detailed visual description was performed for each sediment sample. The macroscopic description consists of physical characteristics of each sample collected from the four studied cores, for a total of 104 samples.

Within the observed characteristics are: description of colour using the *Munsell Soil Color Chart* (Munsell, 2013), and a general estimation of grain size and composition (minerals recognition, biological composition, fossil content, kind and size of clasts).

This information together with the general core description and the textural instrumental analysis, were used to reconstruct the stratigraphic columns for each core and for the highly detailed uppermost 10-centimeters, from which derive the samples used for the foraminiferal analysis.

b. Preparation of sediment samples for microforaminiferal analysis

This step consists of the separation of the foraminifera tests from the unconsolidated sediments. This process consists of wet sieving the sediments, removal of the organic matter from the shells of foraminifers.

The sample is weighed and dried for 24 hours in the oven at 40˚ C. Once sediment dries, a second weighing is performed to know the amount of water contained in the sample.

The sediment is, then, left in distilled water for at least 30 minutes, then wet sieved at 63 µm (minimum size of the sediment to be analyzed). To remove traces of organic material, the sieved residue is left in a 5% sodium hypochlorite solution for 20 min, and washed again with distilled water. Finally, the sample is dried in the oven for 24 hours at 40˚ C and once dry, it residue is weighed to calculate the amount of sandy fraction (> 63 µm).

c. Foraminiferal analysis

Uniform standard sampling was achieved by picking 300 benthic foraminifera for each sandy sample. This process begins with the separation, by dry sieve, of whole sandy sample in three sub fractions 63 - 150 µm, 150 - 500 µm and greater than 500 µm. The fraction smaller than 150 µm is not suitable for picking.

The sample greater than 500 µm is used entirely for picking foraminifera. The fraction between 150–500 microns, is progressively sub-divided in equal amounts by splitter until a statistically representative sub-portion is obtained. The sub-portion is then weighted and 300 foraminifera test are picked.

Once the number of individuals is obtained from the count, a general classification is made based on composition test of foraminiferal. Some studies have developed diverse systems of fossil and recent foraminiferal test classification, in special, focussed on form and chamber arrangement, wall composition and/or structure (Pawlowski et al., 2013). One of this divisions of Foraminiferal groups is into test composition, in secreted minerals (calcite or aragonite) or of agglutinated particles. Based on this information, a first large classification was made into Miliolids with a porcellaneous high-Mg calcite wall; Agglutinated have tests mostly constructed of calcareous particles with a mineral cement, and Calcareous compounds by granular and microgranular calcitic test (Pawlowski, et al., 2013).

Then it is proceeding with the recognition of the species found at each level. This classification was made by means of bibliographic comparison from taxonomic keys and digital databases (WoRMS Editorial Board, 2017; Holbourn, et al., 2013).

1.4.3. Data processing

This stage consists of the quantitative analysis of all the information obtained from the previous phases. It includes determination of benthic foraminifera density, biodiversity and species abundance, biomass amount and vertical distribution in the sediment of the calculated parameters. The end product is a paleoclimatic and paleoenvironmental interpretation.

a. Diagrams of species distribution through the cores.

It consists of a graphical representation of the abundance of the species present in each analyzed sample. Data processing and statistics were obtained using the *PAST free software* that calculates the ecological data for each sample and core. *PAST* is a free software for scientific data analysis with functions for data manipulation, data plot, univariate and multivariate statistics, ecological analysis, time series and spatial analysis, morphometric and stratigraphy (Hammer et al., 2001).

Establishing a diversity indices provide important information about rarity and commonness of species in a community. This index aims to describe general properties of communities that allow us to compare different regions, taxa, and trophic levels. The possibility to quantify diversity in this way is an important tool to understand community structure. Diversity indices are statistically used to summarize the diversity of a population in which each member belongs to a unique group.

Patterns of foraminiferal species diversity were examined for each core sediment sample, in the upper 10 cm: Benthic foraminifera per gram of dry sediment (FB/gr dry sediment), Number or Taxa on depth (Taxa_S), Dominance index (Dominance_D) and Shannon index (Shannon_H).

FB/gr dry sediment: Corresponds to a foraminiferal density, is a number of specimens per 1 gram of dry sediment.

Taxa_S: Corresponds to the number of species identified for each sample.

Dominance_D: It's a relative abundance index, where the dominance represents the degree to which taxon is more or less numerous than its competitors in an ecological community or like a part of the biomass. Ranges from 0 (all taxa are equally present) to 1 (one taxon dominates the completely the community) (Hammer et al., 2001).

Shannon_H: This is a diversity index, taking into account the number of individuals as well as a number of taxa, that is commonly used to characterize species diversity in a community. Varies from 0 for communities with only a single taxon to high values for communities with many taxa, each with few individuals. (Hammer et al., 2001).

With the purpose to study the abundance, diversity, and distribution of a single species of modern benthic foraminifera, an analysis of foraminiferal abundance, vertical distribution, diversity, and composition, has made for each sediment core.

This analysis has been in order to aid the paleoecological interpretation of their fossil record (Pawlowski & Holzmann, 2008). Foraminiferal species are identified based on morphological characters of their organic, agglutinated or calcareous tests.

b. Definition of ecostratigraphic zones.

These zones detect the changes in foraminiferal assemblages at each studied level and determine their relation with environmental changes such as: sediment type, presence of clasts and minerals, the relative abundance of the morphotypes or changes in these assemblage and grade of preservation.

c. Correlation with other records.

To the extent of the results obtained, correlations and comparisons were made with other foraminiferal records that present similar conditions, thus expanding the environmental interpretation.

1.5. Theoretical framework

Foraminifera

The Order Foraminifera is a large group of marine amoeboid protists, included in the phylum Sarcodina, class Rhizopoda (Armstrong & Brasier, 2005).

The suprageneric classification and descriptions of most genera and species have been based on the characteristics of the shell or test, including general morphology, developmental changes, internal modifications, apertural structures, wall composition, crystal form, lamellar character, perforations, canaliculi, and ultrastructure (Loeblich & Tappan, 2015). The main classification of foraminifera does emphasis on features visible with a stereomicroscope (Armstrong & Brasier, 2005).

The life cycle of foraminifera is characterized by an alternation between two generations: an agamont generation (asexually reproduction) and gamont generation (sexual reproduction) (Figure 1.5) (Armstrong & Brasier, 2005)

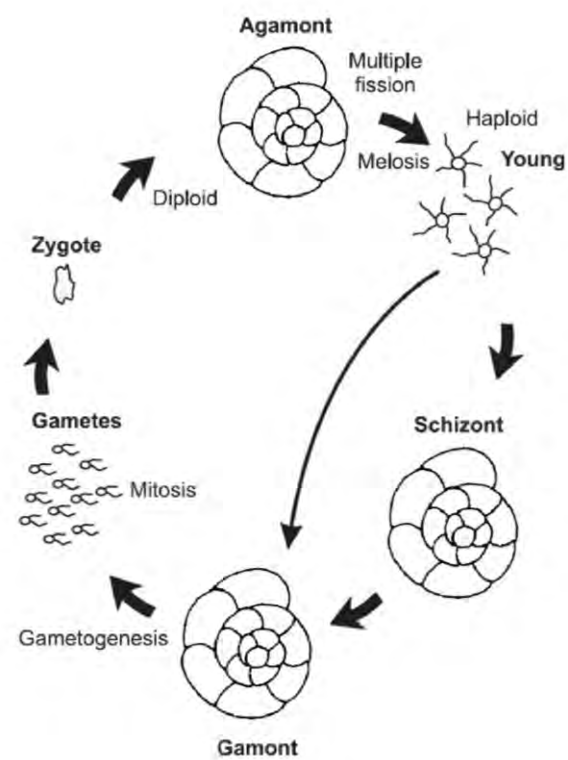

Figure 1.5. A Foraminiferal life cycle: alternation of gamont and agamont generations (after Armstrong & Brasier, 2005)

Single cells are covered by a mineralized skeleton, called shell or test (Cushman, 1948). The structure and composition of the shell is important to the classification of the group (Cushman, 1948; Armstrong & Brasier, 2005). Typically, the foraminiferal test size range from less 0.1 mm to 1 mm or more (about 0.25 mm on average) (Schiebel & Hemleben, 2005). The test can be composed of biogenic calcium carbonate (calcareous), cemented grains collected in the surrounding environment such as quartz grains or other type of sediments (agglutinated or arenaceous foraminifera), or an organic theca composed of polysaccharides (Armstrong & Brasier, 2005).

The classification of the foraminifera is based on the characteristics of the shell, such as composition, structure, test growth, chamber number, chamber shape and apertures sculpture (Figure 1.6). The main importance of the test is thought to reduce biological, physical and chemical stress. For example, they can be excellent indicators of chemical stress or such as fluxes in salinity, pH, CO_2, O_2 and toxins in the water (Armstrong & Brasier, 2005). Some characteristics of the tests can reflect the style of life. For instance, in the benthic foraminifera, the form of the shell helps with the negative buoyancy, providing an adaptation to a benthic way of life. Conversely, the surface sculpture may variously assist positive buoyancy in planktonic forms (e.g. spines and keels) (Armstrong & Brasier, 2005).

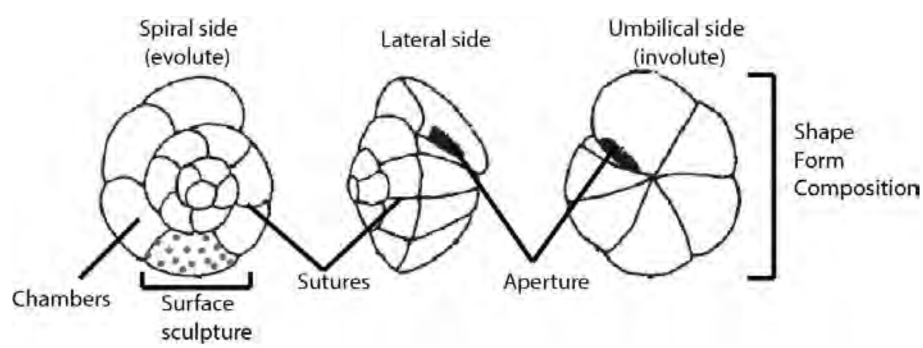

Figure 1.6: Schematic guide of the principal parts of foraminifera for their classification. This example of foraminifera has a Trochospiral tests. (after Armstrong & Brasier, 2005)

Due to its great diversity, foraminifera have colonized various marine habitats, which makes them especially useful as environmental indicators. Evidence of this wide range of habitats reflected in adaptations of test morphology (Murray, 2014). Foraminifera may indicate conditions such as the zone of light penetration in the oceans (photic zone), availability of food, kind of substrate, salinity, nutrients and oxygen, temperature conditions and water mass characteristics (Armstrong & Brasier, 2005).

Application of foraminifera

Foraminifera are small, abundant, widely distributed and extremely diverse, making both planktonic and benthonic species suitable for many marine studies. For example, their morphology can be used to trace evolutionary changes (Armstrong & Brasier, 2005).

Fossils foraminifera are used for palaeoenvironmental interpretation and in numerous studies of modern ecology (Loeblich & Tappan, 2015). The restricted distribution of benthic foraminifera and their sensibility to the climatic change, provide useful schemes for local correlation, indication of the depth of deposition and productivity in areas of upwelling (Armstrong & Brasier, 2005).

The narrow living temperature ranges of planktonic species have become useful tools in palaeoclimatology especially for the Quaternary (Schiebel & Hemleben, 2005).

The agglutinated foraminiferal assemblages varying according to the substrate, detrital input, nutrition, availability of calcium carbonate, bottom water oxygenation, interstitial waters, factors which control community equilibrium (Kuhnt et al., 1989).

Other palaeoclimatic and palaeoceanographic information are based on the oxygen isotope ratios of calcareous foraminifera shells (Armstrong & Brasier, 2005; Loeblich & Tappan, 2015). Trace element composition of tests is another important tool that can give important indications on past oceanographic conditions. Many foraminifera have adapted to extreme habitats as demonstrated in specific studies in relation to the effects of pollution on foraminifera coastal waters, hydrothermal vents, hypersalinity and pack ice zones (Armstrong & Brasier, 2005).

Sedimentology

The sedimentological analysis provides information about the depositional processes that in polar areas are strictly related to climatic changes. Marine sediments have been used to reconstruct climate variability during the last glaciation and the Holocene periods (Borzenkova et al., 2015). The sediment records indicate the modulation of interannual and decadal scale of erosion and deposition rate.

The environmental changes in the sedimentary record can be studied with the assemblages of foraminiferal fauna. These changes in the environment are analyzed whit a study of foraminiferal test preservation, productivity, the density of organisms, diversity of the taxa, nutrient availability, oxygen conditions and amount of organic matter (Borzenkova et al., 2015).

The main analysis on this study focuses on paleontological composition and sediment grain size and colour. We use this information to study trends in surface processes associated with the dynamic conditions of transportation, deposition, and their relation with the environmental conditions.

2. General scientific background (historical background)

The studies in the Arctic area related with foraminifera content in the glaciomarine sediment records is a useful tool for the interpretation of major factors controlling the eco-sedimentary environment. Therefore, a lot of research is developed in this area. In the Storfjorden-Kveithola glacial system, located in the Barents Sea, this type of studies is relevant because the fauna changes considerably depending to various environmental variables including properties of the water masses, influence of nearby glaciers and surface sediment characteristics.

Hald & Korsun, (1997), carried out one of the first studies on the modern environmental system, by investigate the total benthic foraminiferal fauna (live and dead) from six fjords from Svalbard. The goal of this study was to understand the high latitude marine faunas and the environments they inhabit. The authors used modern sampling techniques in surface sediment implying the use of a box-corer; stained samples with Rose Bengal, and performed direct measurements of environment variables such as grain size, organic carbon and total carbon, pH, temperature and salinity. In this study they found six benthic foraminiferal assemblages. The *Cassidulina reniforme* dominated assemblage occupies the inner parts of the fjords and correlates to winter-cooled, local waters and ice proximity. The *Elphidium excavatum f. clavatum* dominated assemblage occupies closer to glacier terminus, normally in the inner parts of the fjords. The *Cibicides lobatulus* dominated assemblage is a high energy indicator. The *Nonionellina labradorica* dominated assemblage occupies the outer, deeper parts of the fjords, influenced by stable transformed Atlantic water. The frequency of recent foraminifera increases towards the inner parts of the fjords where high sedimentation rates contribute to rapid burial of remaining tests. The *Adercotryma glomerata* dominated assemblage is confined to the central and outer parts of the fjords and seems to be related to Transformed Atlantic Water. The *Alveolophagmium crassimargo* dominated assemblage is the least common of the assemblages and has a patchy distribution.

Rasmussen et al., (2007), analyzed two cores from the southwestern shelf and slope of Storfjorden, taken at 389 m and 1485 m water depth that have been analyzed for benthic and planktic foraminifera, oxygen isotopes, and ice-rafted debris. The study period comprises five climate stages: 1. the LGM; 2. the Heinrich event H1; 3. the warm Bølling and Allerød interstadials; 4. the cold Younger Dryas stadial; and 5. the Holocene and in particular the Holocene climate optimum. Geologically the authors describe the zone with an inner shallow part, deepening into elongated basin (with maximum depth between 120 m and 190 m); a broad trough extending from the mouth of the fjord to the self-edge; a large fan situated in front of the trough (the TMF), consisting of glacial debris flows separated by interglacial hemipelagic sediments. The foraminiferal data indicates a dominance of planktic foraminiferal faunas represented by *Neogloboquadrina pachyderma* and *Globigerina bulloides*, *Globigerina glutinata, Globigerinita uvula*, and *Turborotalita quinqueloba*. In the benthic foraminiferal fauna, the main species are: *Cassidulina reniforme, Cassidulina neoteretis, Melonis barleeanum, Cibicides lobatulus*, and *Elphidium excavatum* on the shelf and on the upper slope; whereas on the slope water depth below 1200 m *Cibicides wellerstorfi, Epistominella exigua, Eponides tumidulus* and *Oridorsalis umbonatus* are the most abundant. Their results indicate that over the last 20000 yr., Atlantic water has been continuously present on the southwestern Svalbard shelf. During the Heinrich event H1 interval, the Bølling–Allerød interstadials and the Younger Dryas stadial (from 15000 to 10000 yr. BP) Atlantic water flowed as a subsurface water mass below a layer of polar surface water. The benthic environment analysis shows the shift to interglacial conditions occurred at 10000 yr. BP. Due the presence of a thin upper layer of polar water, surface conditions remained cold until 9000 yr. BP, when the warm Atlantic water appeared at the surface. The inflow of Atlantic water was continuous over time alhtough its warm core was submerged below the cold polar surface water. The Holocene temperature maximum (Holocene Thermal Maximum, HTM) lasted from 9000 to 8000 yr. BP, when a gradual cooling began and has continued until today, slightly accelerating during the last 4000 yr. Some of the cooling in the benthic environment may be local due to the increased overflow of brines produced in the inner part of the Storfjorden.

Rasmussen et al. (2012), worked with the distribution patterns of benthic foraminifera faunas, stable isotopes, and ice-rafted debris from Isfjorden, along the western margin of Svalbard, to reconstruct the changes of the flow of Atlantic Water during the Holocene interglacial. They present results from one sediment core from central Isfjorden, in the Spitsbergen Island. The results are compared with the records of Atlantic Water inflow in the northern and western shelf areas of Svalbard, and a sediment core from Storfjorden Trough (south of Svalbard). The palaeoenvironmental conditions in Isfjorden and the inflow of the Atlantic Water followed closely the changes in solar insolation with strong seasonality in the early Holocene and weaker seasonality in the middle to late Holocene. The study taken over the Holocene record of benthic foraminifera in Isfjorden is similar to existing Holocene records of shelf benthic foraminifera from the Svalbard–Barents Sea region with almost the same dominant species (*Nonionela labradorica* and *Elphidium* *excavatum*) and a comparable distribution patterns and timing of their maximum relative abundance in shelf records from north, west and southwest of Svalbard. The temperatures reconstruction showed an early HTM of the Atlantic Water from 11,200 to 8200 years BP. The mid-Holocene 8200–4000 years BP was characterized by weaker seasonal contrasts with the inflow of well mixed, but cooler Atlantic Water. The late-Holocene interval 4000–2000 years was very cold and characterized by a 'temperature minimum' with near-permanent sea ice cover. An amelioration of bottom water conditions was shown from 2000 years BP to today; with periods of increased episodic inflow of Atlantic Water to Isfjorden and warmer conditions interrupted by periods with reduced inflow and colder conditions.

Lucchi et al. (2013) describe the mechanisms of sediment transport and dispersion on the continental slope of Storfjorden and Kveithola trough-mouth fans (TMFs) in the northwestern Barents Sea during the deglaciation that followed the LGM (Last Glacial Maximum) as a response to climate change and glacial dynamics. They chose this glacigenic system because its small catchment area is very sensitive to climate changes with short residence time of the Last Glacial Maximum (LGM) ice-streams, and the glacial sedimentary system is located close to the interaction zone between Atlantic and Arctic water masses. In their work, the authors specifically report on the role of subglacial meltwaters in the sedimentary patterns of high-latitude continental slopes facing TMFs as a result from lateral and temporal variability of the grounding line retreat during the deglaciation. Micropaleontological analyses of benthic and planktonic foraminifera were performed for palaeoenvironmental reconstructions and for the definition of the age model in support to palaeomagnetic stratigraphy and radiocarbon dating.

Rasmussen & Thomsen (2014), also worked on the Storfjorden glacial system. They investigated the distribution of calcareous and agglutinated benthic foraminifera, benthic oxygen and carbon isotopes, calcium carbonate, total organic carbon, and ice-rafted debris in five cores from Storfjorden comprising the Holocene and the deglaciation phase. The main purpose of their study was to reconstruct variations in past brine formations under a different climate context. The foraminiferal data, including stable isotopes, degree of tests fragmentation, and geochemical parameters, indicate that brine formation intensified during cold periods and weakened during warm periods. The ratio between agglutinated and calcareous foraminifera can be taken as an indicator of the influence of brines in the area, as brine are very corrosive to calcareous tests. Peaks in the relative abundance of agglutinated foraminifera indicate that brine production increased during the Older Dryas, the Intra-Allerød cold spell, and the Younger Dryas cold interval and decreased during the Bølling and Allerød interstadials. Periods dominated by calcareous species, implying a low brine production, correlate with the Roman Warm Period circa 2500–2000 years BP and the Medieval Warm Period circa 1000–700 years BP. Predominance of agglutinated species, implying a high brine production, occurred from 4000–2500 to 2000–1600 years BP and during the Dark Ages Cold Period 1500–1100 years BP and the Little Ice Age 600–100 years BP.

Groot et al. (2014), analyzed a sediment core from Kveithola Trough on the western Barents Sea margin, using down-core distribution patterns of benthic foraminiferal, stable isotopes and sedimentological parameters. The aim of their study was to reconstruct the inflow of Atlantic water during the Holocene. In modern time, the study area is dominated by Atlantic water masses and is located close to the Arctic front. Also these authors reach the conclusion that the Atlantic water has continuously been present in the western Barents Sea throughout the studied time interval, supporting the studies made by Rasmussen et al., (2007) in the Storfjorden area. During the early Holocene, the inflow of Atlantic water increased, although sea ice was still present in Kveithola Trough. The sharp replace of subpolar benthic foraminifera fauna with polar benthic foraminifera indicates a rapid warming of their studied area. The following transition to the mid-Holocene is characterized by a local shift in water current regime, which may have caused the ceased of the supply of fine material with provenience of the shallow areas surrounding Kveithola Trough. After this time the climatic conditions became more unstable, with periods of increased influence of Arctic water that caused periodically colder conditions.

Lucchi et al. (2015) also describe spatial and temporal changes in the Storfjorden and Kveithola TMF sedimentation area in relation to bathymetric, glaciological, and oceanographic factors whose interaction produces different styles of sedimentary architecture within the same TMF. The authors define five main sedimentary facies associated with the onset of climatically driven depositional mechanisms including: 1) massive transport of high-density, low shear strength glacigenic debris flows, which is an indication of ice streams grounded at the shelf edge during the maximum glacial advance; 2) massive delivery of IRD-rich sediments associated with initial climatic warming with enhanced calving rate; 3) massive sediment input associated with rapid ice stream melting and retreat; 4) crudely-layered and 5) heavily bioturbated sediments deposited by contour currents during progressively ameliorated climatic/environmental conditions favorable to the biological productivity. Moreover, Lucchi et al. (2013) identified two intervals of red-oxidized sediments associated with the release of cold oxygenated waters, marking in the studied cores the post LGM inception of deglaciation and the Younger Dryas climatic interval. The authors recovered a thick plumite sequence on the upper slope, which represents an extreme depositional event associated with an outstanding glacial meltwater phase: the Melt Water Pulse 1a. This concept was then furthermore developed in Lucchi et al. (2016), and Sagnotti et al. (2015).

Rasmussen & Thomsen (2015), aim to reconstruct changes in the palaeoecology and palaeoceanography of Storfjorden in relation to past climate changes during the Late Glacial and Holocene time period. They studied the distribution of water-masses, food, the occurrence of glaciers and sea ice, and brine production. To identify potential indicator species for brine-affected environments, the authors analyze the distribution patterns of the most important agglutinated and calcareous foraminiferal species, and the reaction of the individual species to the ecological changes in a brine-influenced environment. The investigation focused on the distribution of benthic foraminiferal species in four cores from a brine-enriched environment. Stratigraphically, the cores comprise the last 15 000 years. The most important calcareous foraminiferal species in this area are *Cassidulina reniforme, Elphidium excavatum, Nonionellina labradorica, Buccella spp*. and *Islandiella norcrossi*. The most important agglutinated species are *Reophax scorpiurus, Adercotryma glomerata, Cribrostomoides crassimargo, Ammotium cassis, Recurvoides turbinatus* and *Spiroplectammina earlandi/biformis*. During the deglaciation c. 15 000–11 700 a BP, the shelf of Storfjorden Trough was occupied by ice stream. The calcareous faunas were dominated by *E. excavatum* and *C. reniforme*. The fauna was characterized by species-poor assemblages with typical fauna for Arctic environments close to glacier fronts. During the cold spells of the deglaciation (Older Dryas,14 600 a BP), Intra-Allerød Cold Period (13 300 a BP) and the Younger Dryas (12 900–11 700 a BP), the proportion of agglutinated species increased. However, each cold event was dominated by a different set of agglutinated species and the conditions were clearly unstable. The most persistent agglutinated species are *R. scorpiurus* and *A. glomerata*. They are probably the most tolerant species living in the brine-influenced, acidic environment of the Storfjorden Trough.

Carbonara et al. (2016), focus on the marine biotic response to Late Pleistocene and Holocene climate changes, using an integrated approach on a sediment core collected on the middle slope of the Kveithola Trough Mouth Fan, during the CORIBAR cruise (2013). They use a multi proxy-based approach for palaeoenvironmental and palaeoclimatic reconstructions, conducted on sediment cores, compared with summer insolation and Greenland ice core $\delta^{18}O$ data in order to establish a framework for climate changes from Late Pleistocene to late Holocene. Analysis of microfossil assemblages and clay minerals from the sedimentary record evidenced their close relation to the climatically-induced changes. Furthermore, reconstructions of surface water conditions highlighted the strong coupling between the advances and retreats of the Svalbard-Barents Sea Ice Sheet, the interplay of Atlantic/ Arctic water-mass flows over the study area, and insolation orbital forcing. The authors identified three main intervals of significant climatic changes, each one characterized by a paleontological assemblage and sedimentological conditions that define a certain palaeoenvironmental condition: late Pleistocene (14.5–11.7 cal ka BP) represents the transition to warmer conditions; early Holocene (11.7– 8.2 cal ka BP) generally warm with an environmental cooling trend depicted on the microfossil assemblages at approximately 9.3 cal ka BP; and the middle-late Holocene (8.2–0.3 cal ka BP) that was characterized by an initial environmental amelioration, characterized by a slight dominance of warm taxa, after which another gradual cooling was recorded by the increase of cold-water adapted taxa associated to the decline of summer insolation in the Northern high latitude.

Lantzsch et al. (2017) combined high-resolution echosounder data and radiocarbon-dated sediment cores for the reconstruct of the Late Quaternary stratigraphic architecture of the Kveithola Trough and surrounding Spitsbergenbanken. Here the deposits display the successive deglacial retreat of the Svalbard-Barents Sea Ice Sheet in the area. Basal subglacial till indicates that the grounded ice sheet covered both the Spitsbergenbanken and Kveithola Trough during the Late Weichselian (LGM). After the establishment of the open-marine conditions (13.5 cal ka BP), a sediment drift developed in the confined setting of the Kveithola Trough, contemporary with laminated mud deposition, an overlying lag deposit, and modern bioclastic-rich sand on Spitsbergenbanken. The Kveithola Drift shows a grain-size coarsening from the moat towards the southern flank of the trough. This trend contradicts the concept of a separated drift (which would imply coarser grain sizes in the proximity of the moat) and indicates that the southern bank acted as the main sediment source for the coarse-grained material building up the Kveithola Drift. The authors propose that the Kveithola is a combination of an off-bank wedge and a confined drift. Besides, in spite of that deposits inside Kveithola Trough and on Spitsbergenbanken display different depocenter geometries, time-equivalent grain-size changes implied a region-wide sediment-dynamic connection. They relate a phase of coarsest sediment supply to an increase in bottom current strength, which might be related to a stronger Atlantic Water inflow from the Southeast across the bank leading to winnowing and off-bank export of sandy sediments.

3. Results

3.1. Sedimentological characterization

Core description

A first general description of the cores was made onboard ship during the Eurofleets-BURSTER research cruise. Detailed descriptions took place in the laboratory at a resolution of 0.5 or 1 cm for the uppermost 10 cm of the cores.

General characteristic of the core, which document main changes, included colour, grain size, biological and paleontological composition, mineralogical composition, and smell occurring (in some cases and indicating the presence of abundant organic material).

Core PS99-1/02-2

General description

0–14 cm: clean, fine-grained sand;

14–16 cm: mud with diffuse mottles (large rounded bioturbations) filled with fine sand;

15–17 cm: sandy layer containing broken shells;

17–30 cm: silty clay sediments with black mottling (Figure 3.1. a).

The detailed description of the top most 10 cm (Figure 3.1. b) indicates a predominance of fine silty sand:

0–1 cm: dark grayish brown (2,5Y 4/2), fine to very-fine sand with foraminiferal skeletons, broken shells of bivalves and gastropods and a lot of siliceous sponge spicules (Figure 3.1. b).

1–1.5 cm: dark grayish brown (2,5Y 4/2) very fine silty sand with foraminiferal skeletons, broken shells of bivalves and gastropods and siliceous sponge spicules (Figure 3.1. b).

1.5–5 cm: olive gray (5Y 4/2) very-fine silty sand with an upwards increase in the silt fraction. Small colour change at 4–5 cm to dark gray (5Y 4/1) possibly associated to a small increase in the amount of organic matter. Presence of foraminiferal skeletons, broken shells of bivalves and gastropods and siliceous sponge spicules (Figure 3.1. b).

5–7 cm: olive gray (5Y 4/2), fine to very-fine silty sand, with foraminiferal skeletons, microfossils and upwards decrease in the amount of broken shells of bivalves and gastropods (Figure 3.1. b).

7–8 cm: dark gray (5Y 4/1), very fine silty sand with an upwards increase in the silt fraction, presence of foraminiferal skeletons, microfossils and a small amount of broken shells of bivalves and gastropods (Figure 3.1. b).

8–9 cm: dark gray (5Y 4/1), very fine silty sand with some millimeter-sized lithic clasts. Presence of foraminiferal skeletons and microfossils (Figure 3.1. b).

9–10 cm: dark gray (5Y 4/1), very fine silty sand with an upwards increase in the silt fraction. Presence of some millimeter-sized lithic clasts, foraminiferal skeletons and microfossils (Figure 3.1. b).

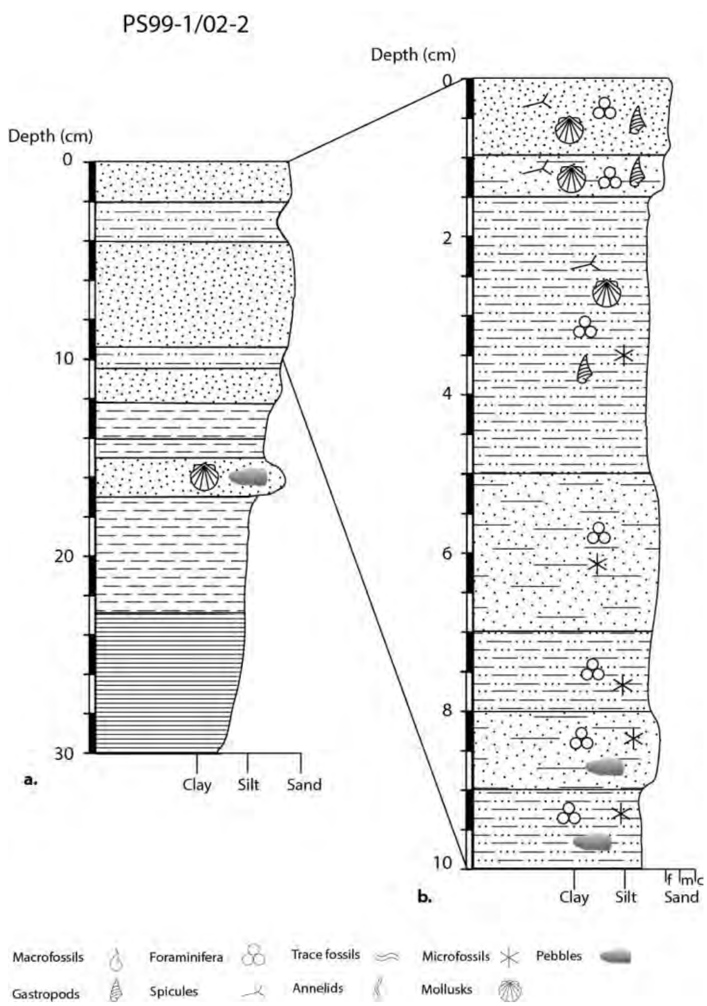

Figure 3.1. Lithological log of the core PS99-1/02-2. a Whole core; b. Detail of the topmost 10 cm.

According to the granulometric analysis, the entire core is a silty sand (Figure 3.2.a.), where the sandy fraction corresponds to the top 10 cm, whereas the rest of the core is mostly silty (Figure 3.2.b.).

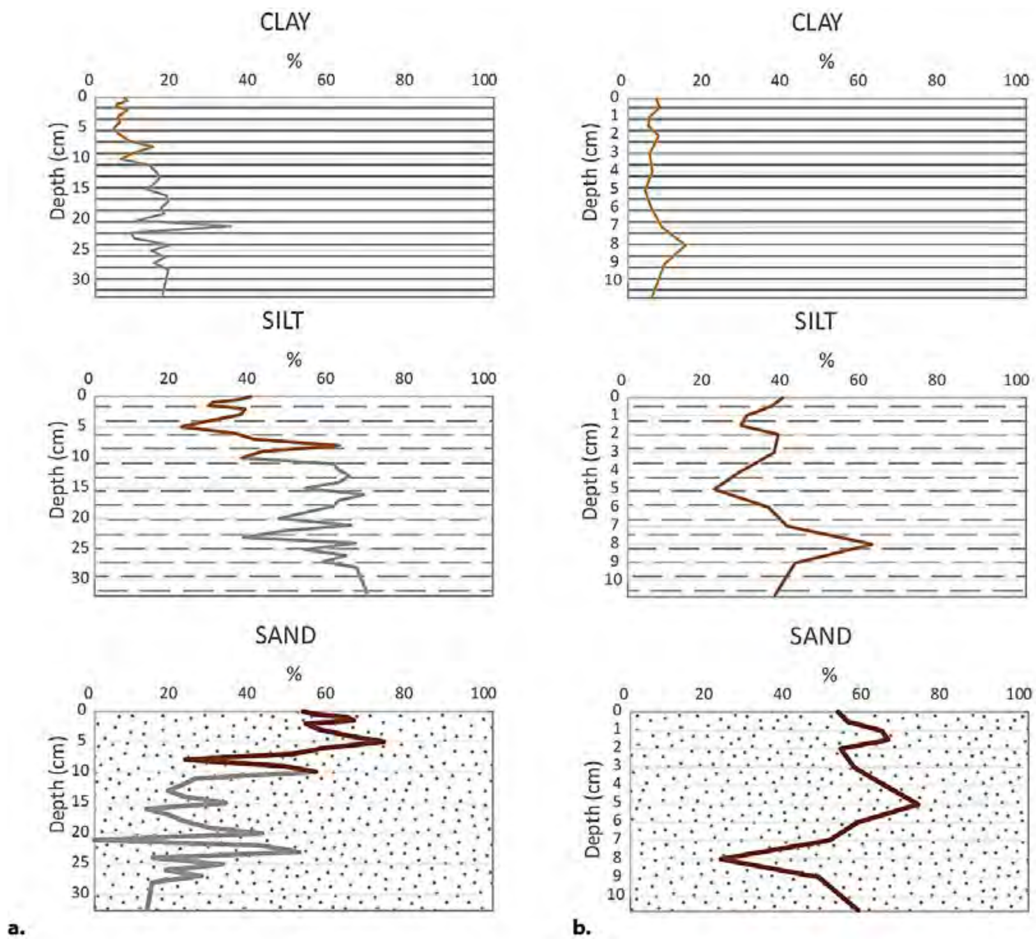

Figure3.2. Grain size distribution in core PS99-1/02-2: a. Entire core. b. Detail of the uppermost 10 cm

Core PS99-1/21-3

This core contains black sediments with abundant large holes, black tubes (worms), and broken shells. The uppermost 0.5 cm of sediments are oxidized (Figure 3.3.a.). This core was only 6 cm long and therefore was studied for the whole length.

The analysis was made of the top 6 cm (Figure 3.3.b.). We classified this interval as a silt, with a constant content of fragmented shells and black worm-tubes. This core contains a large amount of organic matter, that yields to a very dark grey colour (5Y 4/1) with a strong smell of hydrogen sulfides (H_2S).

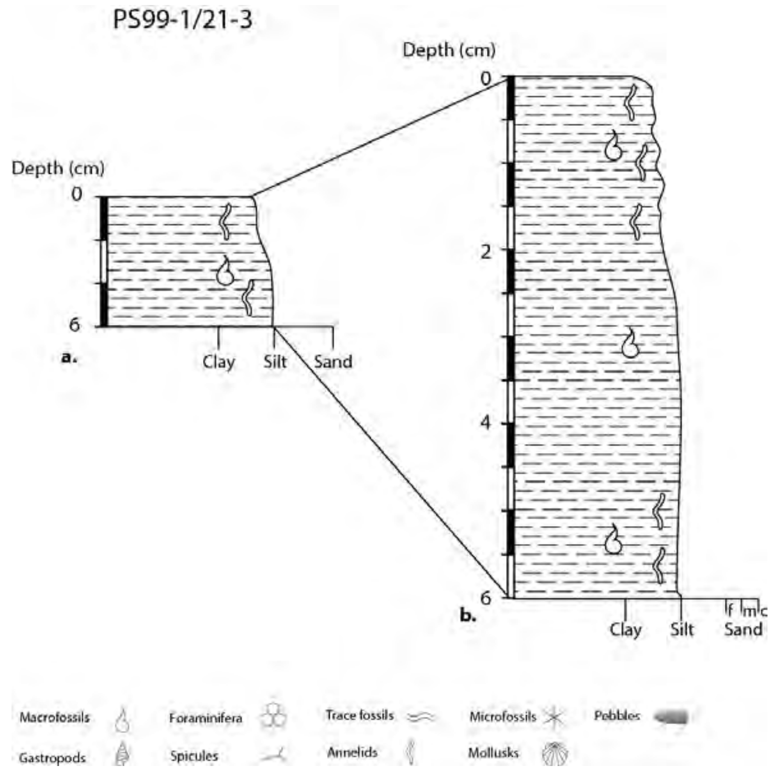

Figure 3.3. Lithological log of core PS99-1/21-3. a Whole core; b. Detail of the topmost 6 cm.

Core PS99-1/21-5

This core is composed by sand alternated with silty sand containing abundant broken shells (Figure 3.4.a.).

The description of the topmost 10 cm indicates a predominance in silty sand and fine-medium sand (Figure 3.4. b):

0–2 cm olive (5Y 4/3) silt with a colour change to olive gray (5Y 4/2) between 1-1.5 cm. The sediment contains foraminiferal skeletons, broken shells of bivalves and gastropods, unidentified broken shells, microfossils, and abundant black tubes (worms) (Figure 3.4. b).

Between 2 cm and 2.5 cm the sediment core exhibits a lithological transition from silt to silty sand.

2.5–4 cm olive gray (5Y 4/2) silty sand with foraminiferal skeletons, broken shells of bivalves and gastropods, unidentified broken shells, microfossils, and abundant black tubes (worms) (Figure 3.4. b).

4–9 cm olive gray (5Y 4/2) fine sand with foraminiferal skeletons, a minor amount of broken shells of bivalves and gastropods unidentified broken shells, microfossils, and black tubes (worms) (Figure 3.4. b).

9–10 cm correspond to the same lithology of the previous level, with olive gray (5Y 4/2) fine sand, containing foraminiferal skeletons, unidentified broken shells, microfossils, and black tubes (worms) (Figure 3.4. b).

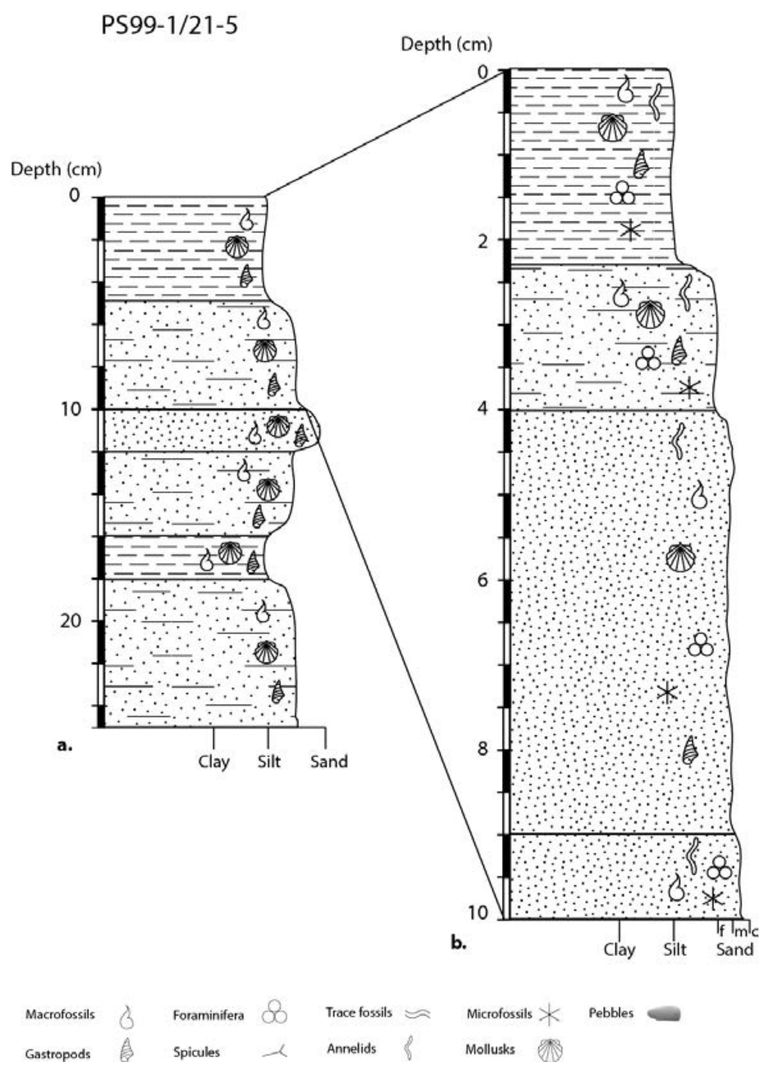

Figure 3.4. Lithological log of core PS99-1/21-5. a Whole core; b. Detail of the topmost 10 cm.

Core PS99-1/07-3

The core corresponds to a very dark gray muddy sand with bioturbation and mottling marks, containing white, sub-mm jelly filaments, red worms (Figure 3.5.a.).

The detailed description of the upper 10 cm indicates predominance of silt with a sparse content of sand throughout the section (Figure 3.5. b):

0–2 cm olive gray (5Y 4/2), silt with a small amount of sand. Slight colour change at 1–2 cm to dark gray (5Y 4/1) due to a small increase in the amount of organic matter. The sediment contains foraminiferal skeletons, broken shells of bivalves and gastropods (Figure 3.5. b).

2–6 cm dark gray (5Y 4/1) silt with an upward increase in the sand fraction. This interval contains foraminiferal skeletons, broken shells of bivalves and gastropods, and microfossils (Figure 3.5. b).

6–10 cm predominantly sandy with a small amount a silty clay. The colour in this interval varies several time: between 6–8 cm is olive (5Y 4/3), 8–9 cm is dark gray (5Y 4/1), and 9–10 cm is olive gray (5Y 4/2). The sediments contain some millimeter sized lithic clasts, foraminiferal skeletons, broken shells of bivalves and gastropods, and unidentified microfossils (Figure 3.5. b).

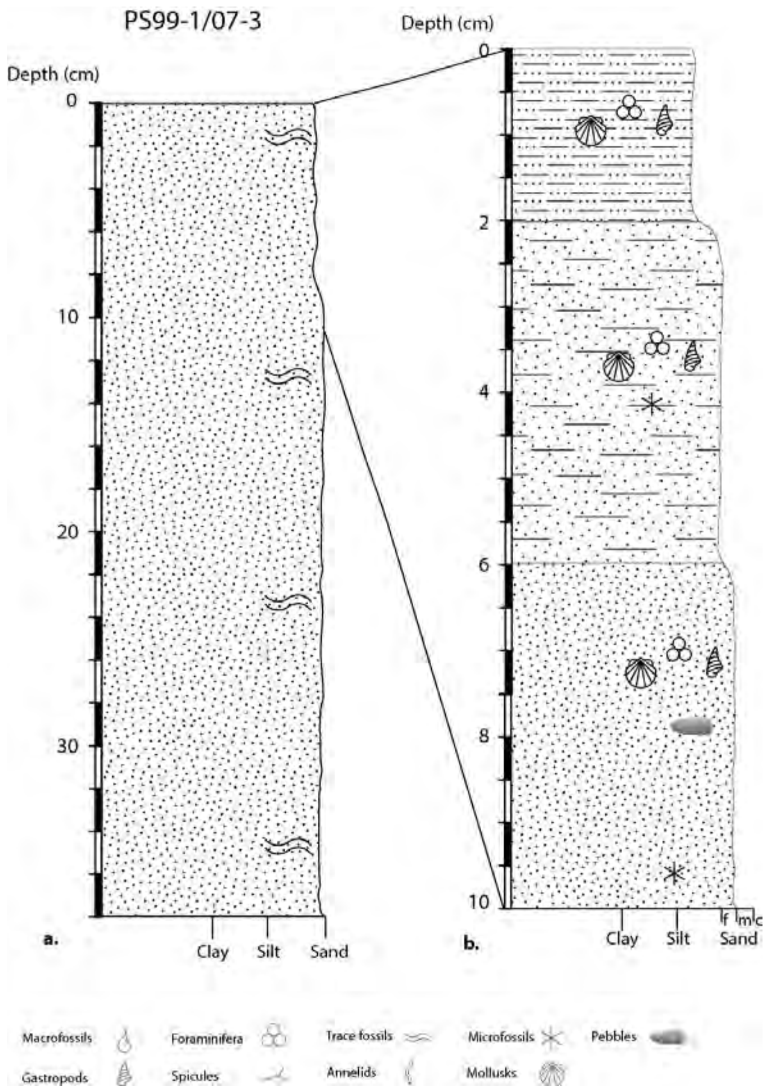

Figure 3.5. Lithological log of the core PS99-1/07-3. a Whole core; b. Detail of the topmost 10 cm.

According to the granulometric analysis, the entire core is predominantly composed by silt (Figure 3.6.a.). The upper 10 cm contain an important percent of sand and some clay (Figure 3.6.b.).

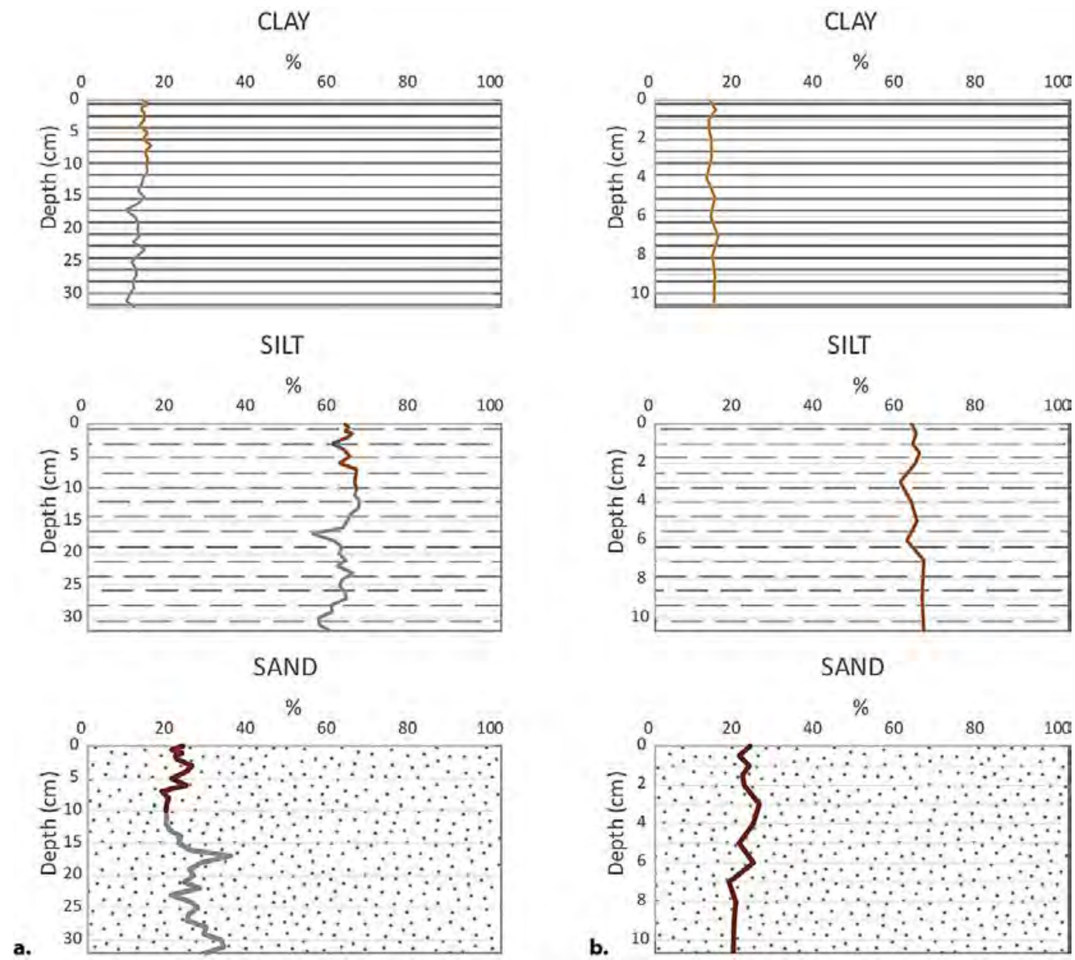

Figure 3.6. Grain size distribution in core PS99-1/07-3: a. Entire core. b. Detail of the uppermost 10 cm

3.2. Paleontological characterization

Foraminiferal patterns

All our benthic foraminifera were classified on compositional group. (Figure 3.7).

This three groups division reveals the predominance of Calcareous foraminiferal group, with more than 90% in all four cores: PS99-1/02-2: 99.60%; PS99-1/21-03: 99.57%; PS99-1/21-05: 99.53% and PS99-1/07-3: 96.19%. It is a very high concentration of a group of Miliolids foraminiferal (2.13 %) and Agglutinated foraminiferal (1.68%) on the core PS99-1/07-3 (Figure 3.7).

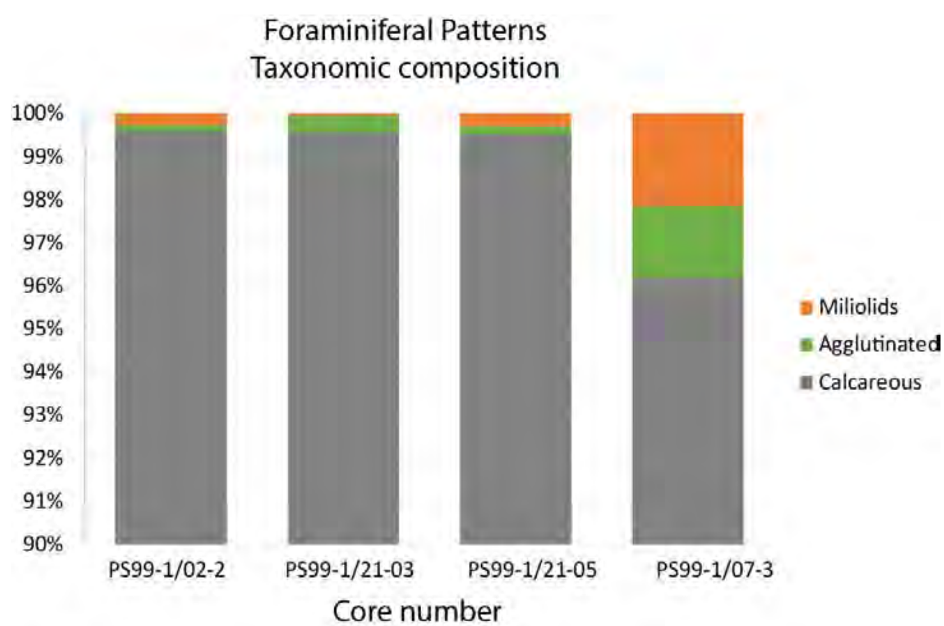

Figure 3.7: General taxonomic classification of the studied foraminifera, with percentages of taxonomic groups within each sediment core.

Foraminiferal abundance and diversity data

In total seventy-four unfragmented species were recognized in the >150µm fraction. In detail: 54 species in the core PS99-1/02-2; 38 species in the core PS99-1/21-03; 41 species in the core PS99-1/21-05; and 53 species in the core PS99-1/07-3.

Following taxa:

Calcareous foraminiferal group (calcareous wall composition)

Alabaminella weddellensis

Astrononion hamadaense

Biasterigerina planorbis

Bolivina earlandi

Bolivina spathulata

Bolivina spp.

Bolivinellina pseudopunctata

Buccella frigida

Buccella inusitata

Cassidulina laevigata

Cassidulina reniforme

Cassidulina teretis

Cibicides refulgens

Cibicidoides lobatulus

Cribroelphidium excavatum

Dentalina spp.

Discorbinella bertheloti

Discorbis vilardeboanus

Elphidium clavatum

Eponides spp.

Fissurina spp.

Fursenkoina schreibersiana

Globigerinita uvula

Globobulimina auriculata

Globobulimina ovata

Globocassidulina subglobosa

Guttulina spp.

Hoeglundina elegans

Islandiella islandica

Islandiella norcrossi

Lagena ssp.

Melonis barleeanus

Nonionella auricula

Nonionella iridea

Nonionellina labradorica

Nonionoides turgida

Oolina ssp.

Patellina corrugata

Pullenia bulloides

Pullenia osloensis

Pullenia subcarinata

Robertinoides charlottensis

Robertinoides normani

Robertinoides pumilum

Rosalina spp.

Stainforthia fusiformis

Stainforthia loeblichi

Trifarina angulosa

Trifarina bradyi

Trifarina carinata

Trifarina fluens

Turrispirillina arctica

Agglutinated foraminiferal group (composed of sand grains or another particle fixed in the organic or calcareous cemented matrix)

Adercotryma glomerata

Astrorhiza granulosa

Astrorhiza spp.

Eggerelloides scaber

Hormosina pilulifera

Hormosinella guttifera

Hyperammina elongata

Hyperammina friabilis

Labrospira crassimargo

Lagenammina difflugiformis

Lagenammina micacea

Psammosiphonella crassatina

Psammosphaera spp.

Reophax scorpiurus

Reophax spp.

Reophax subfusiformis

Rhabdammina scabra

Rhabdammina spp

Saccammina sphaerica

Saccorhiza ramosa

Testulosiphon indivisus

Miliolids foraminiferal group (with glassy, perforate, ''hyaline'' tests)

Cornuspira foliacea

Pyrgo spp.

Quinqueloculina sclerotica

Quinqueloculina seminula

Quinqueloculina stalkeri

Siphonaperta agglutinata

Triloculina tricarinata

Diversity index

We recorded the relative abundance of seventy-four species of benthic foraminifera identified on the top 10 cm of the 4 sediment cores, from the >150 µm size fraction.

The data of BF/gr dry sediment shows for the cores PS99-1/02-2, PS99-1/21-03 and PS99-1/21-05 a high concentration of foraminifera on the section top, with rarely fluctuations, and a decrease of concentration in depth. The core PS99-1/07-3 exhibit a relative opposite distribution, the highest concentration of foraminifera occurs at the bottom, however, a number of foraminiferal present is very low in comparison with the other cores (Figure 3.8). The first three sediment cores present a similar concentration of foraminifera between 15-20 foraminifera per gram of sediment as a minimum concentration in depth and 110-162 foraminifera per gram of sediment as a maximum concentration on top of the core. But for the core PS99-1/07-3 the concentration rate is between 1 and 13 foraminifera per gram of sediment (Figure 3.8).

The taxa number has the same general pattern in all cores, the largest number of taxa are concentrated on top (first 3-4 cm) and decrease in depth (Figure 3.8). The largest number of taxa is found on the core PS99-1/07-3 with the range between 27 taxa on depth and 40 taxa on top. Some variations in this trend show between 1-3 cm in all the cores, but only on the first centimeter of the core PS99-1/21-05 represent the lowest concentration of taxa, with 20 to 26 recognized taxa (both extremes on the top of the core) (Figure 3.8).

Dominance and Shannon values have an opposite trend, which can be seen in all sediment core data when the fluctuations show opposite values (that is when the number of H is low the D is high, and vice versa). In the case of data for Dominance, the range of values of all the cores are relatively low (D=0.075-0.175), that means has an equal presence for all taxa in all the samples, there is not a species dominant (Figure 3.8). While the high values of Shannon index (H=2.17-2.99) show the number of species present with the evenness of the assemblage. The high numbers of H indicate an increased diversities of species (Figure 3.8).

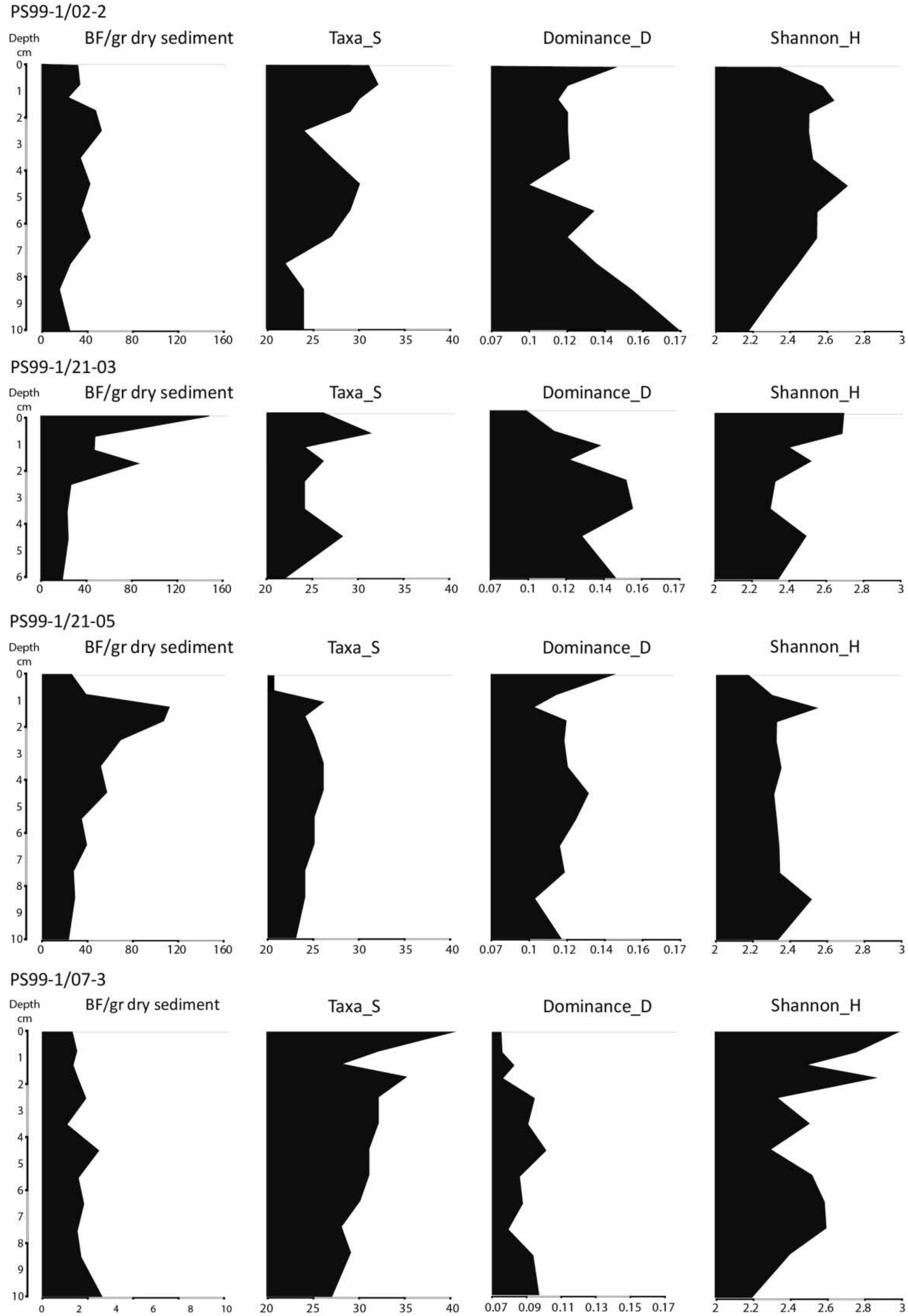

Figure 3.8: Paleontological data set of diversity for each core sediment analyzed. The graphic BF/gr dry sediment has a different scale due to its low quantity.

Abundance of species index

With the purpose of improving the study and the comparison among the four cores studied, we made subdivision by an abundance of the groups of Calcareous foraminifera, which is the most abundant group present in all cores, we divided it into three groups with an abundance higher than 10%, between 1-10% and less than 1%.

Group of Calcareous foraminifera

It is the most represented group in all the sediment cores, appears with total abundance of more than 90% (96.19%-99.60%) (Figure 3.7). For each sediment core there are four or five dominant species, with more than 10% of abundance each one, and some fluctuations in all the cores (Figure 3.9).

This group of dominant species is represented for each sediment core of the species with higher to lower abundance by

PS99-1/02-2: *Cassidulina teretis, Cibicidoides lobatulus, Cassidulina laevigata* and *Trifarina angulosa*

PS99-1/21-03: *Cassidulina laevigata, Cibicidoides lobatulus*, *Cassidulina teretis, Islandiella islandica* and *Melonis barleeanus*

PS99-1/21-05: *Islandiella islandica, Cibicidoides lobatulus, Cassidulina teretis, Cassidulina laevigata* and *Cassidulina reniforme*

PS99-1/07-3: *Cassidulina reniforme, Elphidium clavatum, Rosalina spp., Astrononion hamadaense* and *Cibicidoides lobatulus* (Figure 3.9).

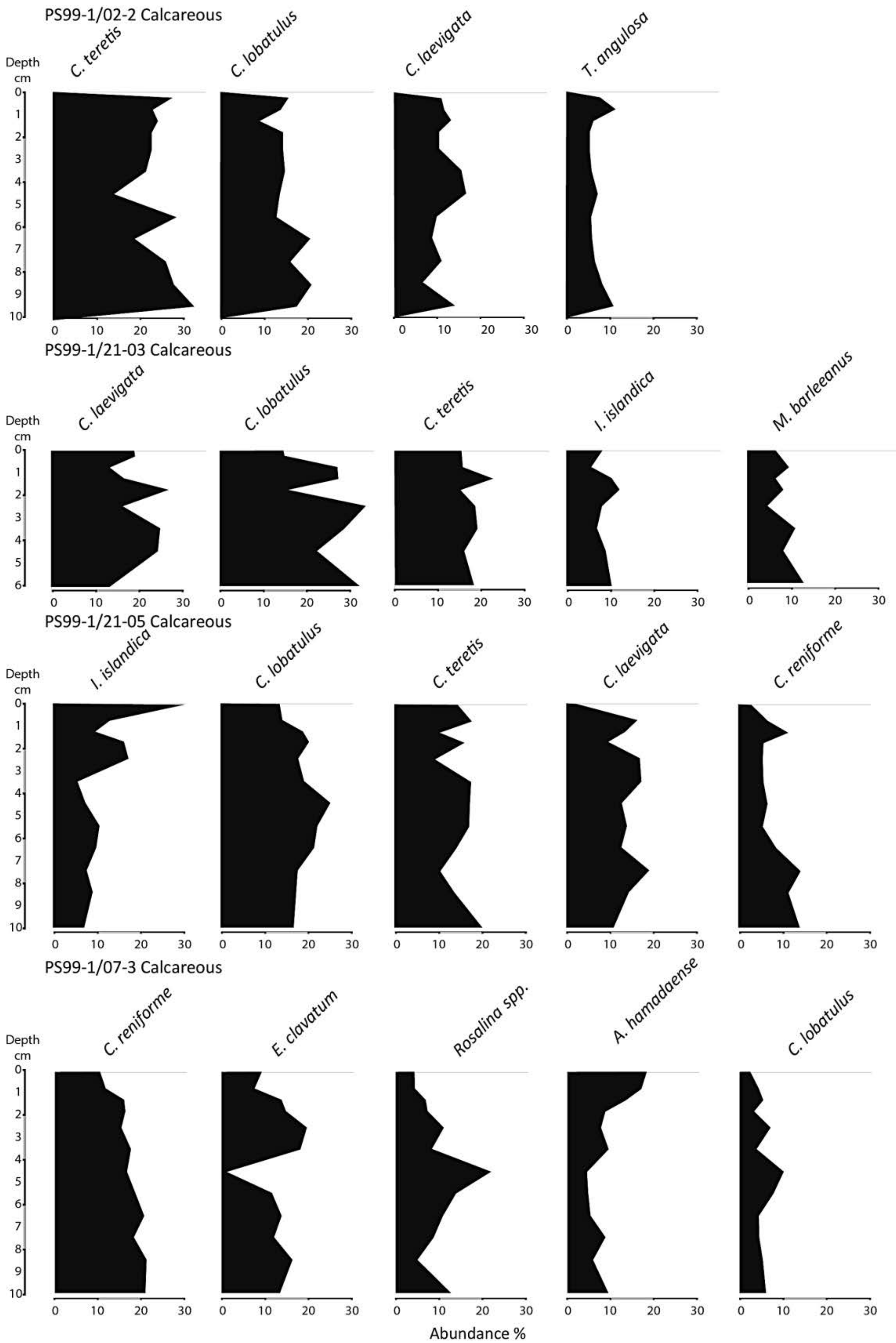

Figure 3.9: Comparison of Calcareous foraminifera group with abundance higher than 10%. Each row represents the main species present in the cores.

Cassidulina teretis is the most abundant species, appears in all the samples as a principal species. The highest abundance in the sediment core PS99-1/02-2 with a maximum of 32% at 9–10 cm (Figure 3.9). It appears in the second group of abundance for the sediment core PS99-1/07-3, with less of 5% of abundance (Figure 3.10).

Cibicidoides lobatulus is a common and abundant species, it shows a high concentration in all the samples (Figure 3.9). With the general maximum percentage in the sediment core PS99-2/21-03, (max. 28% at level 2–3 cm), and the lowest percentage appears in the sediment core PS99-1/07-3 (max. 10% at level 5–6 cm and min. 2% at level 0–0.5 cm)

Cassidulina laevigata has a high concentration in almost all samples (max. PS99-2/21-03 with 22% at1.5–2 cm) (Figure 3.9), except in the sediment core PS99-1/07-3 where appears with a concentration less than 10% (1-6%) (Figure 3.10).

Trifarina angulosa have the maximum concentration in the sediment core PS99-1/02-2 with 11.07% of abundance at 0.5–1 cm (Figure 3.9). They appear in other samples with less concentration (1-10%), in the sample PS99-1/07-3 is absent (Figure 3.10).

Islandiella islandica reaches the maximum abundance in the sediment cores PS99-1/21-03 and PS99-1/21-5 (Figure 3.9), and in the cores PS99-1/02-2 and PS99-1/07-3 is present with an abundance of more than 1% (Figure 3.10).

Melonis barleeanus appears frequently in the sediment core PS99-1/21-03 (with 3-10.7% of abundance) (Figure 3.9), but in all the rest samples always appears with a concentration between 1-10% of abundance (Figure 3.10).

Cassidulina reniforme appears frequently in the sediments core PS99-1/21-05 and PS99-1/07-3 (Figure 3.9), in the samples PS99-1/02-2 and PS99-1/21-03 always appears with a concentration between 1-10% of abundance (Figure 3.10).

Elphidium clavatum appears frequently in the sediment core PS99-1/07-3 (1-19% of abundance) (Figure 3.9), in all the rest samples always appears with a concentration between 1-10% of abundance (Figure 3.10).

Rosalina spp. shows a high concentration in the sediment core PS99-1/07-3 with 4-13% of abundance (Figure 3.9). Is common to find them but normally in concentrations under 10% (Figure 3.10), in the sediment core PS99-1/02-2 appears with less than 1% (Figure 3.11).

Astrononion hamadaense appears frequently in all the core sediment with a concentration between 1-10% of abundance (Figure 3.10), in the sediment core PS99-1/07-3 has a reaches concentration between 4-18% of abundance (Figure 3.9).

The second group of Calcareous foraminifera represent the mid abundance (1-10%), is the largest group, with 17 species for the sample PS99-1/02-2, 17 species for the sample PS99-1/21-03, 19 species for the sample PS99-1/21-05, and 22 species for the sample PS99-1/07-3.

The most representative species or with an ecological significance are:

Islandiella norcrossi appears frequently in all the sediments core, with concentration higher than 1% (Figure 3.10), except in the sediment core PS99-1/02-2 where has a less concentration with 0-0.3% (Figure 3.11).

Nonionellina labradorica is always present in all the sediment cores with abundance between 1-10% (max. in the sediment core PS99-1/07-3 with 1-7.8% of abundance, and min. in the sediment core PS99-1/02-2 with 0-2% of abundance) (Figure 3.10)

Globocassidulina subglobosa is a common species in almost all samples (Figure 3.10), except in the sediment core PS99-1/21-05 where appears with a concentration less than 1% (Figure 3.11).

Trifarina fluens is a common species, it shows in all the samples with maximum concentration in the sediment core PS99-1/02-2 with abundance between 3-9%, and minimum concentration in the sediment core PS99-1/07-3 with 0-1% of abundance (Figure 3.10).

Cribroelphidium excavatum appears frequently in all the core sediment, the highest abundance is in the sediment core PS99-1/07-3 (with 0.8-19.5%), and the less concentration is in the core PS99-1/21-03 (0-2.8% of abundance) (Figure 3.10).

Buccella spp. are used in a group since its ecological meaning is the same, each specie didn't have a big representation but in group has more than 1%, with the highest concentration in the sediment core PS99-1/27-3 with 9.7% at level 7-8 cm (Figure 3.10).

The group with a lower abundance of Calcareous foraminifera is represented by species that appear with less than 1% of abundance. It is represented by 18 species in the sediment core PS99-1/02-2; 11 species in the sediment core PS99-1/21-03; 10 species in the core PS99-1/21-05; and 12 species in the sediment core PS99-1/07-3 (Figure 3.11).

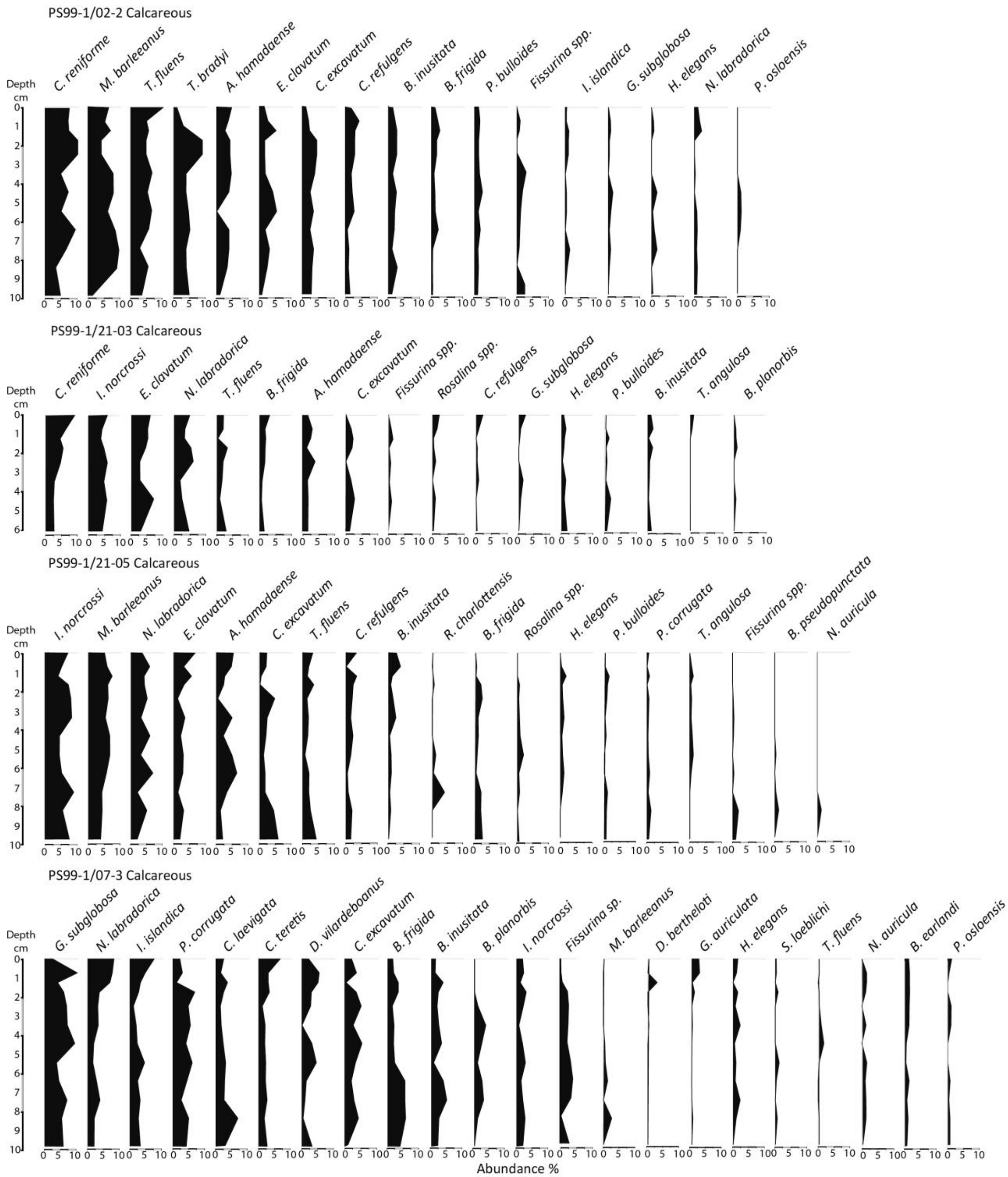

Figure 3.10: Comparison of Calcareous foraminifera group with abundance between 1% and 10%. Each row represents the main species present in the cores.

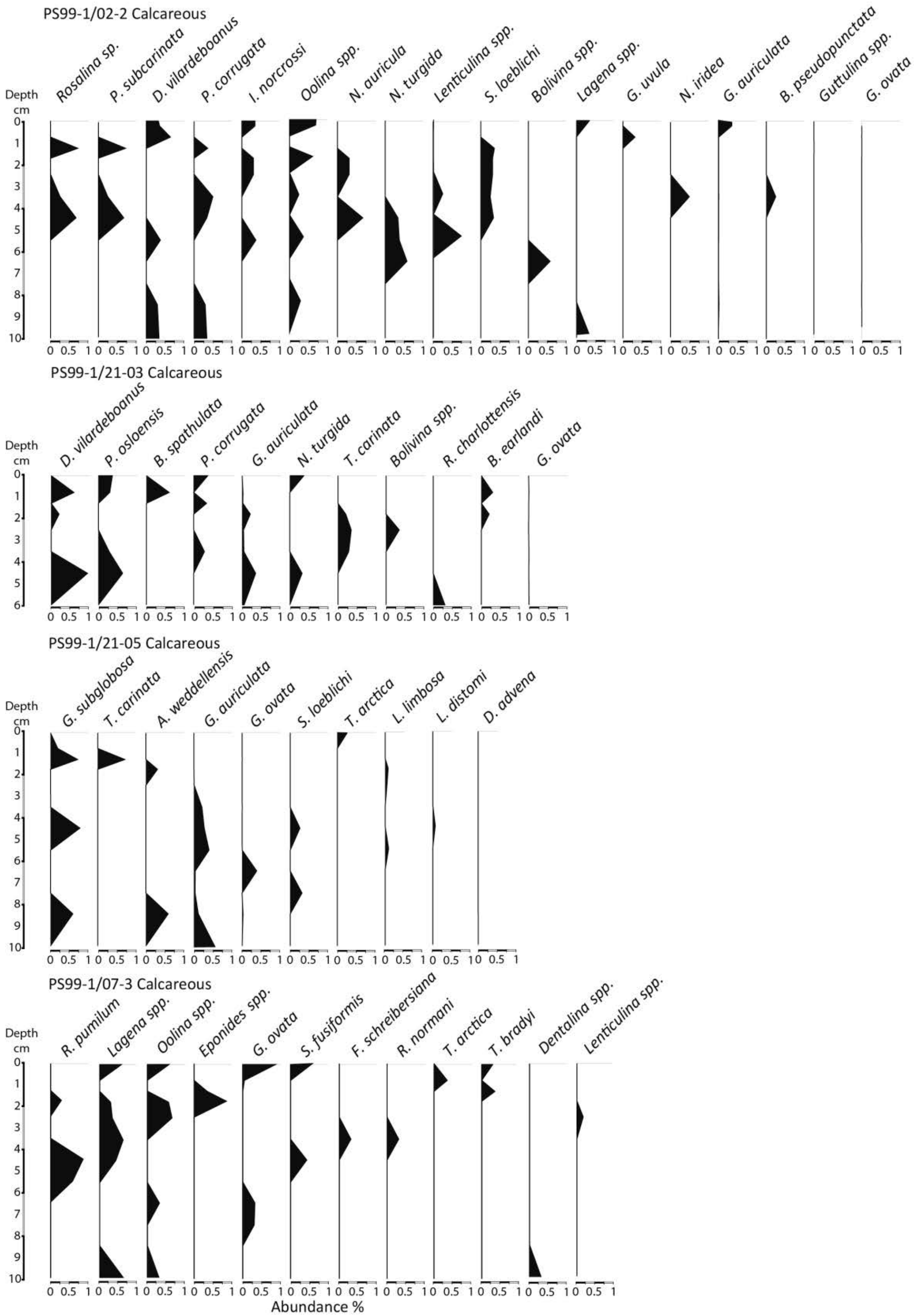

Figure 3.11: Comparison of Calcareous foraminifera group with abundance less than 1%. Each row represents the main species present in the cores.

Group of Agglutinated and Miliolid foraminifera

The relatively high concentration of agglutinated foraminifera in the sediment core PS99-1/07-3 is relevant with 1.6%, in special *Adercotryma glomerata* together with *Labrospira crassimargo*, on the top of the cores they show concentrations with more than 3% each one (Figure 3.12 a.).

The most recurrence miliolid foraminiferal *Quinqueloculina seminula* is present in all the cores with high concentration in the sediment core PS99-1/07-3 with a concentration between 0.1-1.8% of abundance (Figure 3.12 b.).

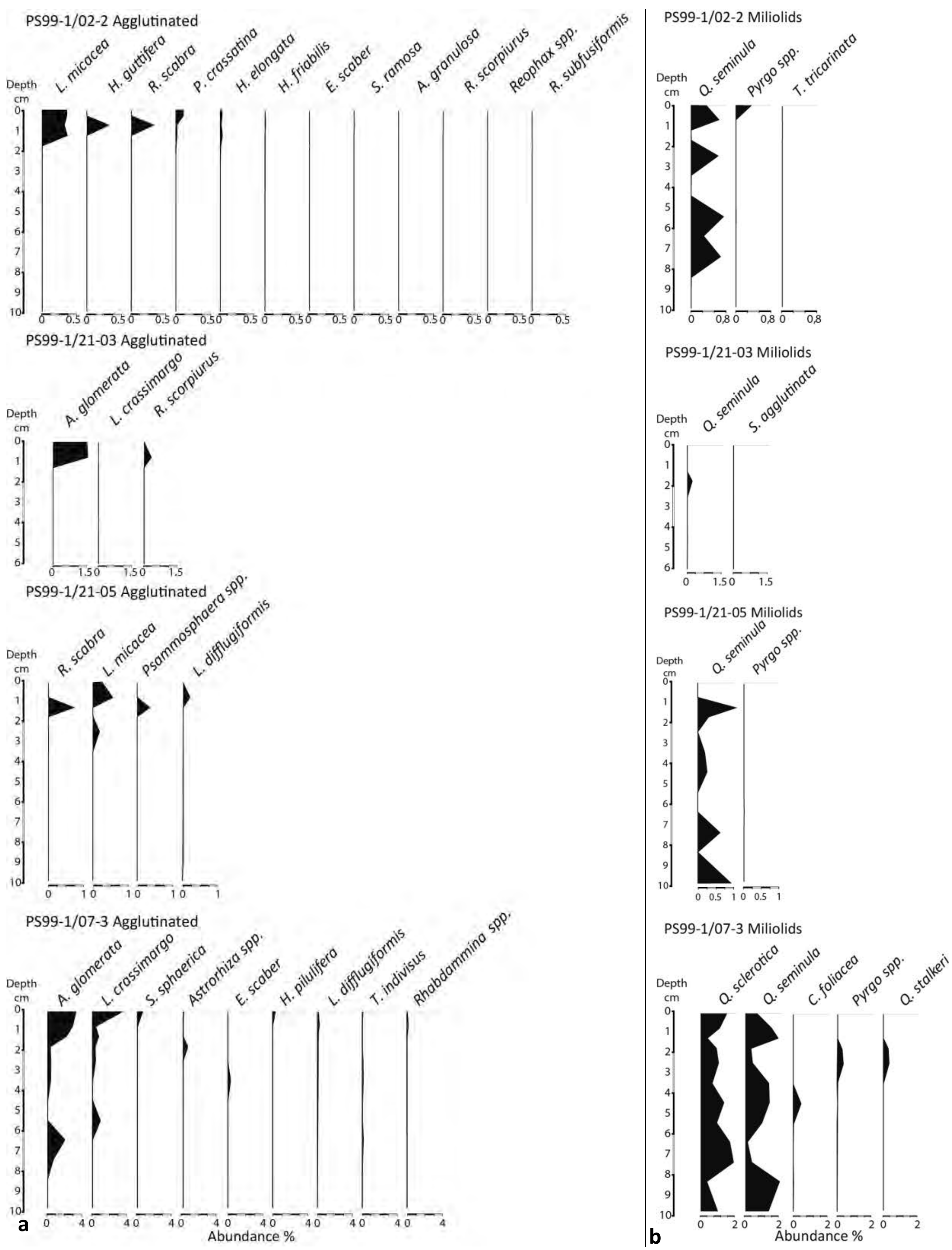

Figure 3.12: Comparison of a. Agglutinated foraminifera group. b. Miliolids foraminifera group. All the sediment core has a different scale of abundance. Each row represents the main species present in the cores.

4. Discussion

4.1. Age of sediment cores

The age model for the studied cores was based on the measurements of cesium (Cs^{137}) combined with lead (Pb^{210}) that allows to constrain dating and to have tie points of known age (known point with co-presence of cesium and lead peaks). The sedimentation rate for the cores PS99-1/21-3 and PS99-1/21-5 corresponds to 0.2179 cm/year and 0.2103 cm/year, respectively (Dominiczak, 2017).

Based on this data we calculate the median rate of sedimentation for the study area, corresponding to 0.2141 cm/year. According to this information and the depth of the sediment core record, the age of the sediment cores corresponds to:

PS99-1/02-2: 140.18 years for 30 cm; and 44.39 years for the top 10 cm

PS99-1/21-3: 45.89 years for 10 cm; and 25.21 years for the top 6 cm

PS99-1/21-5: 118.87 years for 25 cm; and 45.17 years for the top 10 cm

PS99-1/07-3: 177.57 years 38 cm; and 44.39 for the top 10 cm (Figure 4.1).

The age of the sediment records is similar for the topmost 10 cm. They comprise the last 45 years, for the cores PS99-1/02-2, PS99-1/21-05 and PS99-1/07-3 and the last 25 years for the core PS99-1/21-03 (Figure 4.1).

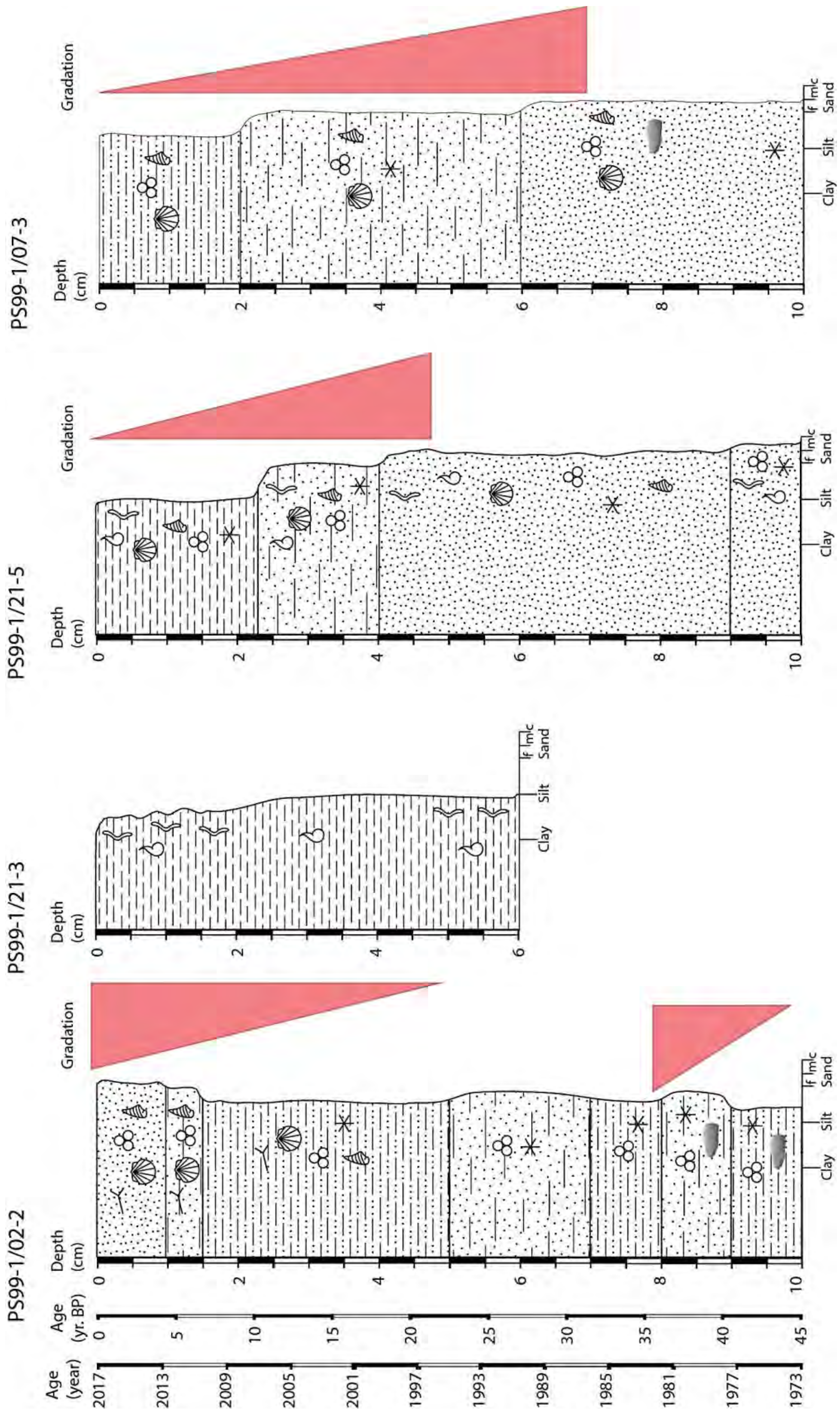

Figure 4.1: Lithological log for all the cores with the scale in centimeters (depth) and their equivalent in years. The red triangles show the positive or negative gradation.

4.2. Relation between microfaunal and environmental changes

The analyzed sedimentary records contain Holocene interglacial deposits of the Kveithola Trough area. This zone is strongly influenced by both Arctic (Eastern Spitsbergen Current, ESC) and North Atlantic (Western Spitsbergen Current, WSC) water masses. The increase of the effects of global warming is evidenced by the progressive ice-sheet melting and by the absorbed solar radiation increase and spring warming (Saher et al., 2012). Some papers (among others Carton et al., 2011; Stroeve et al., 2012) indicate that in the Barents Sea during the last 45 years, there was an increase in temperature and salinity and a decrease in sea-ice cover.

The WSC flow along the western and northern coast of Svalbard, corresponding to the northernmost part of the North Atlantic Current. The polar areas affected by this warm and saline water masses are usually ice-free even during wintertime. The WSC flows along the western Barents Sea coast and turns North-Eastwards into the Polar Basin, north of the Svalbard archipelago (Misund et al., 2016). Part of the WSC turns back to the south moving along the eastern margin of the Svalbard Archipelago and taking the name of ESC. This low salinity, cold current rounds the southern tip of Svalbard and flows as a cold, coastal current northward along the western coast of Svalbard (Figure 4.2). The effect of the ESC is responsible for normally frozen fjords during the winter, although during the past decade this effect diminished drastically on the western coast of Svalbard (Misund et al., 2016).

The global warming effects in the last decades increased, in special in the Arctic areas, with the sea ice extent, that shows a 13% (around 3100 km^3) of reduction in the period of 1979-2012 (Misund et al., 2016). The Atlantic Water (WSC) entering the Arctic Ocean has warmed by about 0.3˚C per decade, and the maximum temperatures on the west coast of Svalbard have increased by about 2˚C during the last hundred years (Pavlov et al., 2013).

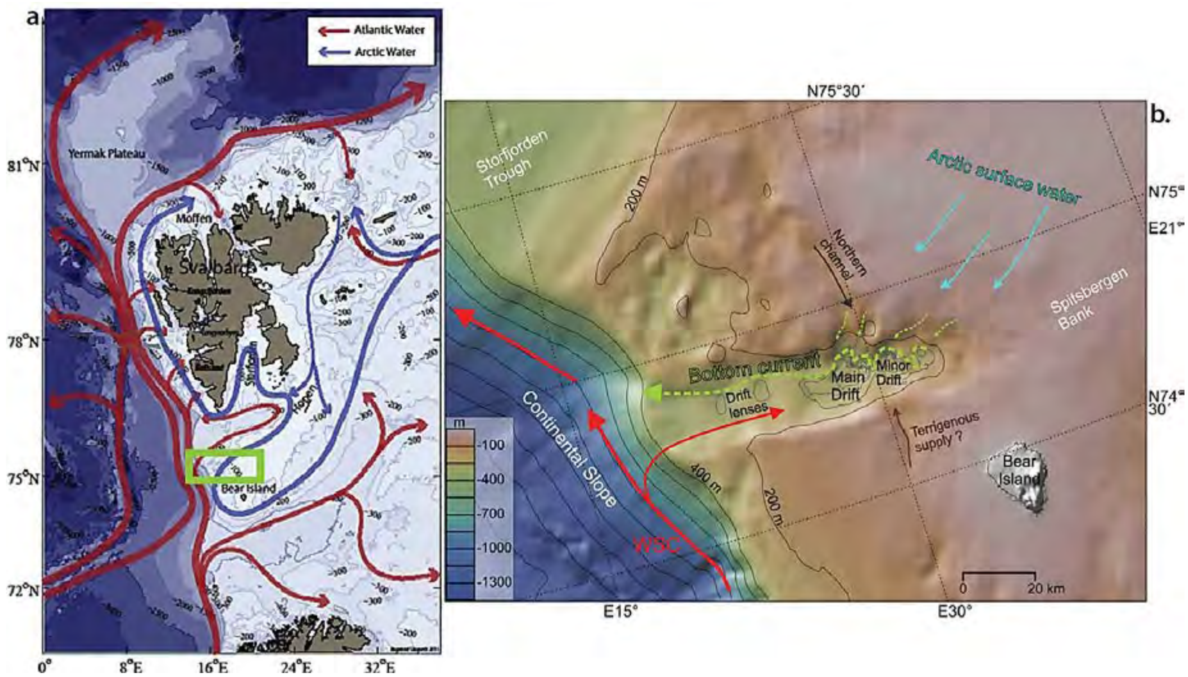

Figure 4.2: Main current systems in the area around Kveithola Trough. a. In the Barents Sea. The blue arrows indicate Arctic Water and red arrows Atlantic Water. The West Spitsbergen Current is shown by the thick red lines west of Svalbard. The study area is indicated by green box (modified by Misund et al., 2016). b. In the Kveithola Trough. A branch of the West Spitsbergen Current (WSC) (red arrow), may enter the trough, follow the bathymetry and turn west on the northern side. In light blue is the cold Arctic surface water coming from the north. Bottom current flow (green dashed arrows) within the moat to the north of the Kveithola Drift is inferred to be comprised of brine-enriched shelf water spilling from morphological shelf depressions to the north of the Kveithola Trough. A possible preferential terrigenous supply (mainly through a structurally controlled southern channel) is also shown (brown arrow) (by Rebesco et al., 2016).

The Storfjorden constitutes a special marine environment with intense brine formation, which affects Kveithola Trough by the influence of brine-enriched shelf water produced during winter and flowing westward in the moat, is suggested to be responsible for the genesis of the Kveithola Drift (Rebesco et al., 2016). Brines are cold, salty and rich in oxygen and CO_2 (Rasmussen & Thomsen, 2015). The brines are often dense enough to cross the shelf and reach the deep slope, from Storfjorden to the Kveithola Trough (Rasmussen & Thomsen, 2015)

According to the establish age model, the topmost 10 cm of the cores comprise the last 45 years, for the cores PS99-1/02-2, PS99-1/21-03 and PS99-1/21-05 and the last 25 years for the core PS99-1/07-3 (Figure 4.1).

The sediment cores show a heterogeneous distribution of the grain size, ranging from silty-clay to sand (Figure 4.1). The sediment core PS99-1/02-2 is located in front of the Kviethola Trough and was taken deeper (376.1 m), and receive the frontal interaction with the currents (Figure 4.3). These conditions are reflected in the sediment record, with more alternation in grain size of sediments, in the thickness of the deposits and in the negative gradation. This negative gradation can be seen in the detailed grain size analysis for the sediment core PS99-1/02-2 (Figure 3.2), which shows an increase of sand fraction, from 25 yr. (6 cm depth)

The sediment cores PS99-1/21-05 and PS99-1/07-3 show a fining-upward sequence during the last 30 – 25 years, whereas core PS99-1/02-2 (water depth 376.1) located in outer part of the Kveithola Trough, shows two coarsening-upward sequences, from 1973 to 1982 and a second from 1997 to 2017. The sediment core PS99-1/21-03 has had a constant deposition of silt material. These differences are conditioned by the proximity to the sediment source, the depth, and the influence of the currents. The sediment core PS99-1/07-3 is the shallower, collected at a water depth of 159.1 m on the shelf, close to Spitsbergenbanken and Svalbard archipelago, which are the principal sediments sources. The sediment cores PS99-1/21-5 and PS99-1/21-3 are deeper and have been collected on the inner drift of the Kveithola Trough.

These variations in the lithology with an opposite trend in the studied area may indicate a different influence of water masses in the inner and outer part of the Kveithola Trough. In fact, the outer part seems to be influenced by stronger bottom current activities during the last 20-30 years, whereas the inner part of the Kveithola and the shallower site recorded weak bottom currents, bringing to the deposition of finer sediments. In particular, the core PS99-1/02-2 recorded a phase of coarsest sediment supply, which might be related to a stronger Atlantic Water inflow. The presence of dropstones (centimetric-thick clast), indicate transit of icebergs in this area.

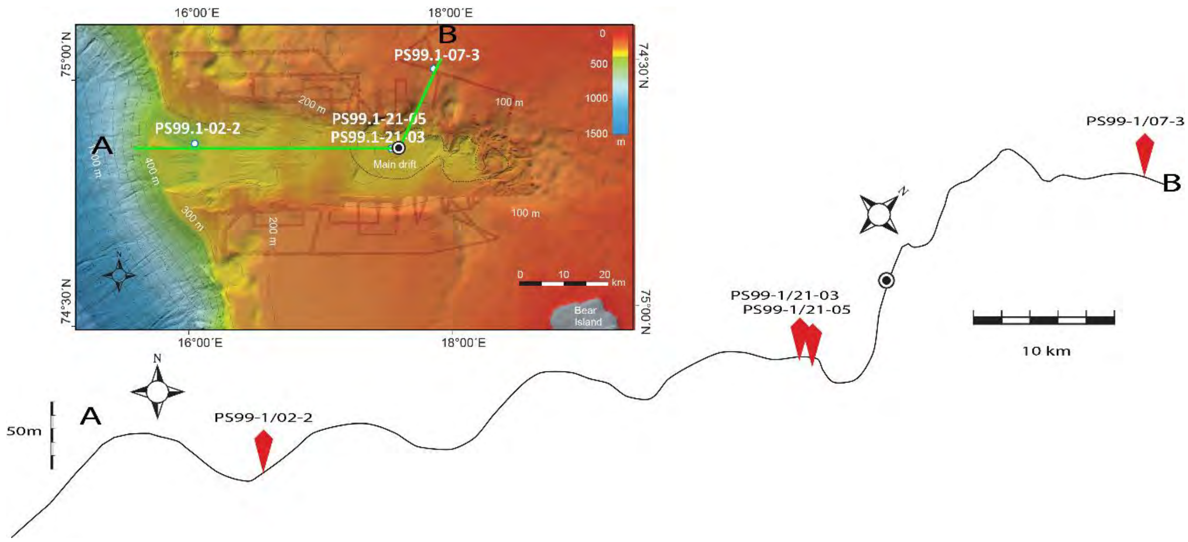

Figure 4.3: Bathymetric profile of Kveithola Trough. The green line on the map shows the profile section. The red arrows on the profile section indicate the sediment core points.

Several environmental factors control the distribution, the taxonomic composition and the abundance of the foraminiferal assemblages. The factors that mostly influenced the benthic communities are the bottom water masses, the grain size of the sediment, the depth to which the oxic surface layer is developed, and the availability of food (phytodetritus, bacteria or refractory organic matter) (Murray, 2014). In the sediment, it is generally observed a marked downward decrease in abundance of the foraminiferal assemblage, although certain species prefer to live and proliferate few centimeters below the surface: this depends by the ecological requirements of each taxon and by the sediment conditions.

The paleontological assemblage analysis highlights the dominant species in all sediment cores, these species belonging to the Calcareous foraminiferal group, which represents more than 95% of species in each sediment core. They are 16 main species, used for environmental diagnosis (Table 4.1).

Conditions/ Species	Arctic Water	Atlantic Water	Organic matter	Oxygen high+ or low-	Phytodetritus	Type of Sediment
C. teretis		++	+			**Fine**
C. lobatulus		++		+++		**Coarse**
C. laevigata		+++		---		**Coarse**
T. angulosa		++		+++		**Coarse**
I. islandica		++	+			
M. barleeanus		++	+++			**Fine**
E. clavatum	+++					
C. reniforme	+++					
Rosalina spp.				+++		**Coarse**
A. hamadaense	+++					
I. norcrossi	++++				++	
N. labradorica	+++			---	++	
G. subglobosa	++		+			
T. fluens	++++					
C. excavatum			+			
Buccella spp.	++++					

Table 4.1: Main species and their principal ecological conditions. The symbol "+" means the level of importance as an ecological indicator and "- " for low quantity of oxygen indicators

Some Authors (Seidenkrantz, 1995; Forster, 2013; Knudsen, et al., 2012; Murray, 2014) indicate that *Cassidulina teretis, C. laevigata, Cibicides lobatulus, Trifarina angulosa, Islandiella islandica* and *Melonis barleeanus* are taxa mainly related to the Atlantic warm waters, and preferably sandy and silty sediments. These warm-water species show the higher abundance in the distal zone of the Kveithola Trough, in the three core sediments, PS99-1/02-2, PS99-1/21-03 and PS99-1/21-05. The species that indicates an Arctic Water masses, as *Elphidium clavatum*, *Cassidulina reniformis*, *Astrononion hamadaense, Islandiella norcrossi, Nonionellina labradorica, Globocassidulina subglobosa* and *Trifarina fluens* are especially present in the sediment core PS99-1/07-3, which is closer to the ice cover, and therefore receive more influence from cold waters. This coincides with the fact that the warm waters of Atlantic origin, in this area are saltier and dense and are found to a greater depth than cold waters of Arctic provenance (Jungclaus, 2005). The Arctic Water due to the contribution that receives from the ice melting makes is less salty and therefore less dense.

Some species are related to specific environmental conditions like oxygen, availability of food and substrate; for this reason, this marker species, can be used as specific proxy. Many organisms show a good correlation between their form, size, and the environment in which they live. This is complex for the benthic foraminifera because a small size and a deformed test can indicate a stressful environmental condition or the lack of any of the environmental factors ideal for its development.

Stressful conditions are evident in the sediment cores PS99-1/21-3 and PS99-1/07-3, which have a large number of species, with high dominance of few species. Furthermore, the assemblages is characterised by reduced size of the foraminiferal test, deformed skeletons, and evidence in many tests of strong infestation (traces of feeding on the tests) of microbial communities that can developed in organic polluted environments (Cherchi et al., 2009).

Variations in diversity and abundance data between the ridges and troughs bring out the topography to play an important role, for the troughs have higher organic carbon values and more variable bottom temperatures than the ridges. This is demonstrated by the compares of data of diversity of the four sediment cores.

The sediment cores PS99-1/02-2, PS99-1/21-03 and PS99-1/21-05, which show a similar record, are both located on the trough. The BF/gr dry sediment and taxa number have higher concentrations in the topmost centimeters, including the highest concentrations of agglutinated foraminifera. Such concentrations are related to optimum environmental conditions for these species development (i.e. high concentrations of organic carbon), while the sediment core PS99-1/07-3, located on the ridge, shows a less quantity of BF/gr dry sediment. However, the distribution of taxa is similar, with the highest concentration at the top.

The distribution of the most abundant species of Foraminifera (>10%) and their ecological significance were used to describe and interpreted the environmental changes (see section 4.2). Also, sedimentological data are added to give a complete ecological reconstruction of the fossil record for the last 45 years.

Currents and sediment flux

The Kveithola Trough is influenced by both Arctic and Atlantic Water; these two water masses regulate the distribution of Foraminifera species, generating changes in the assemblages. In general, the species related to Arctic Water indicate a prevalence of cold climate and the species related to Atlantic Water indicates warmer conditions (Table 4.1).

Although the analysis of each sediment core reveals constant interaction between this two currents, with a clear separation between the dominance of foraminifera species characteristic of Atlantic Water conditions and of Arctic Water (Figure 4.4 and Figure 4.5.), our data show a strong influence of Atlantic Water species during the last 45 years in the zone, which reflects a constant increase in temperature during this period (Figure 4.5).

A strong influence of Arctic Water is evident the core PS 99-1/07-3: this agrees with its shallower position in respect to the others sediment cores. This core receives more strongly the influence of cold, fresh, and less dense waters melting from the Svalbard glaciers (Figure 4.4). Coherently, Atlantic water in this area have a smaller influence on the assemblages (Figure 4.5), while it becomes important approaching to the more distal part of the Kveithola Trough (Figure 4.4 and Figure 4.5.).

Throughout the time registered by the sediment cores (the bottom of the cores corresponding to year 1973 A.D.), Arctic water species and Atlantic water species at the two ends of the Kveithola Trough follow an almost opposite pattern. The Atlantic Water is dominant in the environment of the core PS99-1/02-2, with a little decrease until the end of the 80's (figure 4.5); During the same period the foraminiferal records in the northern zone (sediment core PS99-1/07-3) display a positive trend for the Atlantic Water, although Arctic water are still dominating in the area (Figure 4.4 and Figure 4.5).

The Kveithola Trough area has a prevalent coarse-grained sedimentation (Figure 4.6). High energy environments are commonly associated with high and coarse sediment flux, and, in turn, this is associated with a well-oxygenated environment (Demaison & Moore, 1980; Oschmann, 1991)

The sediment cores PS99-1/02-2 and PS99-1/07-3 present a decrease in species related to coarse sediment at their bottom. An opposite trend is recorded in the innermost part of the area, with the sediment core PS99-1/21-03 documenting an increase of species related to coarse sediment (Figure 4.6).

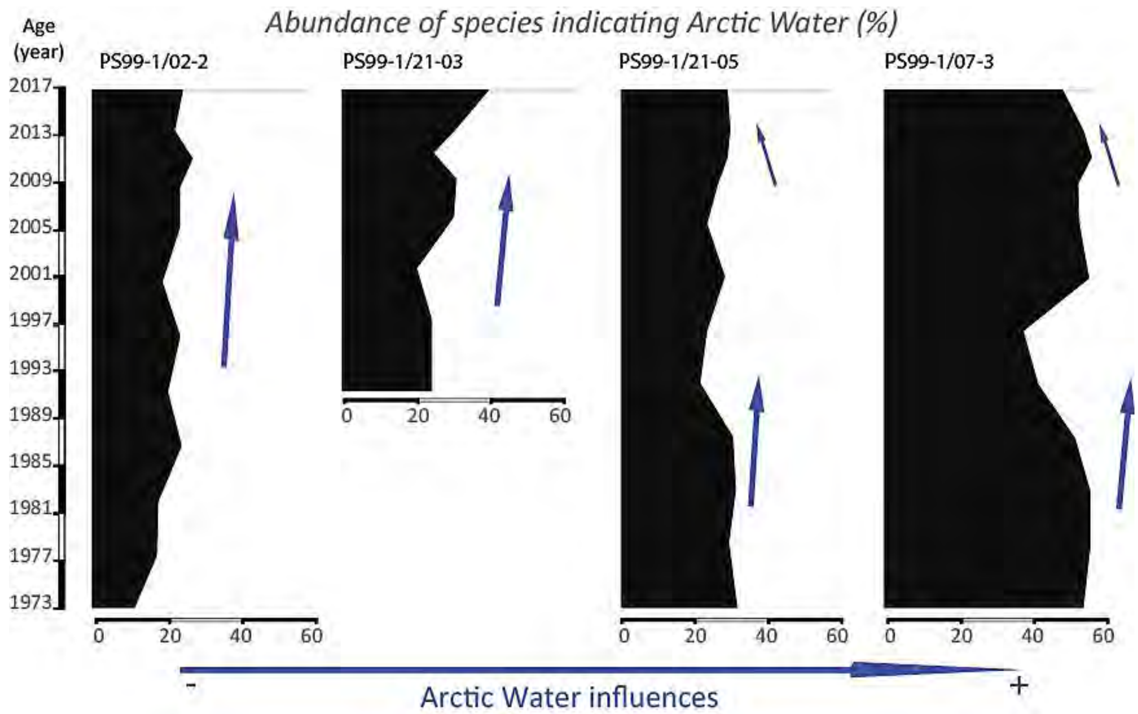

Figure 4.4: Abundance of foraminiferal species indicating presence of Arctic Water. The blue arrows show the trend of the principal events in the foraminiferal record (for the species used see the Table 4.1).

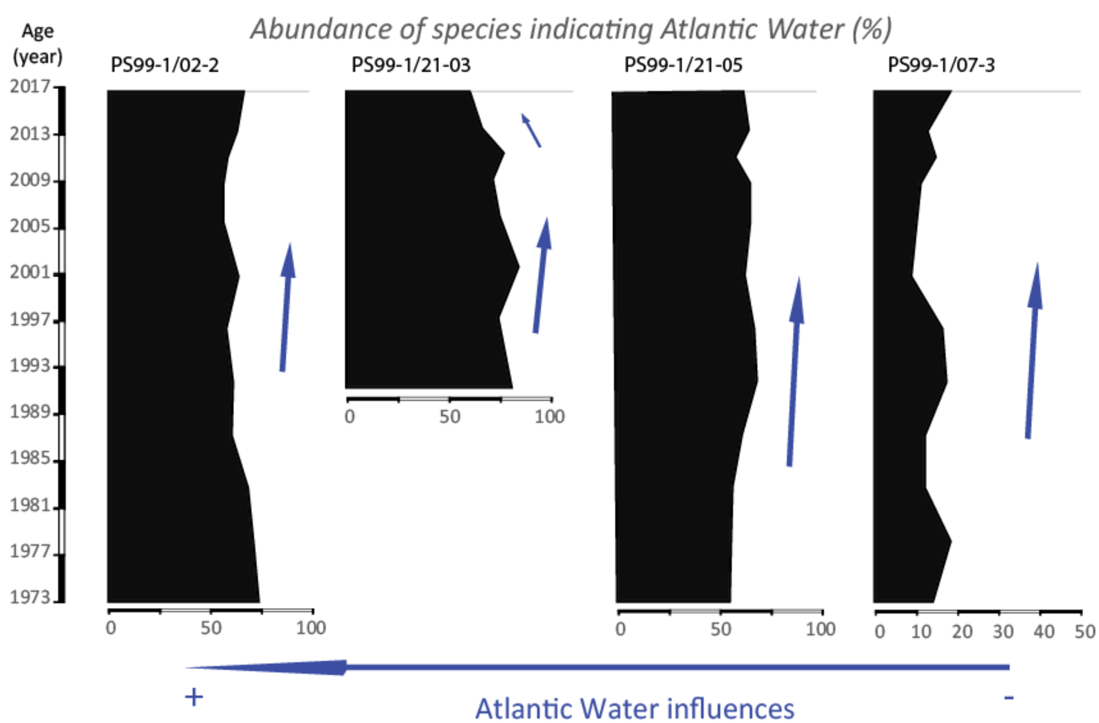

Figure 4.5: Abundance of foraminiferal species indicating presence of Atlantic Water. The blue arrows show the trend of the principal events in the foraminiferal record (for the species used see the Table 4.1).

In the sediment corresponding to year 1997 A.D. the trend shows a new important change, which, at this time, can be seen in all the sediment cores. For the PS99-1/02-2 and PS99-1/07-3 the tendency is the same exhibited in previous years, that is to say a positive trend for the Atlantic Water, but the prevalence of Arctic Water in the area

The sediment trend shows some fluctuations, one of the most evident is in 1997 A.D. with a positive trend in PS99-1/02-2 and PS99-1/07-3, indicating a strong flow of coarse sediment towards the center of the Trough. This peak can be associated to the shallower and more proximal position of these core. (Figure 4.6).

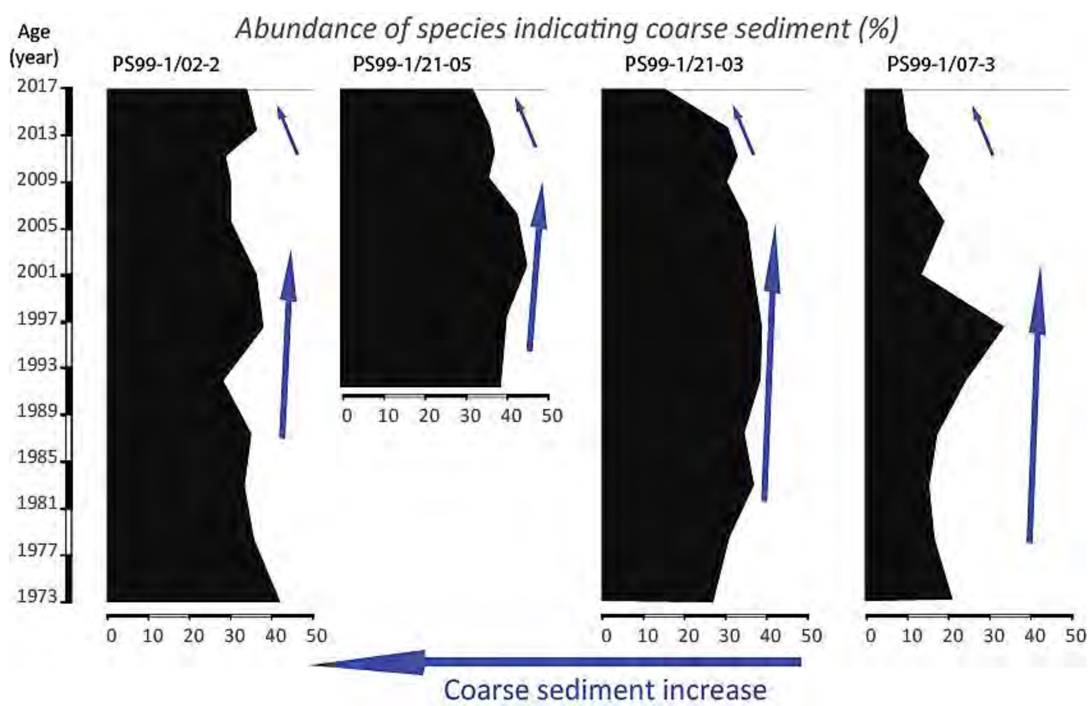

Figure 4.6: Abundance of foraminiferal species indicating presence of coarse sediment. The blue arrows show the trend of the principal events in the foraminiferal record (for the species used see the Table 4.1).

In the innermost part of the Kveithola Trough a diverse phenomenon occurs: the sediment cores PS99-1 / 21-03 and PS99-1 / 21-05 are very close but present an opposite trend as the influence by different water masses is concerned (Figure 4.4 and Figure 4.5.). Although this area is clearly influenced by Atlantic Water, the reaction to Arctic Water is opposite (positive in core PS99-1 / 21-05 and negative in core PS99-1 / 21-03). The same opposite trend can be observed from 2010 until today, with the foraminiferal assemblages in the sediment core PS99-1/21-03 showing a greater sensitivity to the influence of Arctic Water input (Figure 4.4). Due to their geographical proximity, it can be hypothesized that the opposite trends of foraminifera species in cores PS99-1 / 21-05 and PS99-1 / 21-03) are due to the sum of other environmental factors rather than only to the influence of different water masses.

In these cores the sedimentation trend shows a decrease in coarse sediment, which can be associated with a strong erosion. (Figure 4.6).

Organic matter and Oxygen indicators

The parameters of food (organic matter) and oxygen are linked. The flux of organic matter influences the abundance of foraminiferal species and, in general, oxygen is consumed by organic matter degradation, therefore rapidly decreasing in areas rich in organic matter. In the Kveithola Trough, the quantity of organic material decreases in function of the water depth (Figure 4.7). In the sediment core PS99-1/07-3 a clear opposite trend between foraminifera species indicating high levels of organic matter and species indicating oxygenated environment is observed (Figure 4.7 and 4.8) positive peaks of organic matter, correspond to negative peaks of low oxygen concentrations (Figures 4.7 and 4.9).

From 1973 A.D. to 1983 A.D., there is an increase in the levels of organic matter in the sediment cores PS99-1 / 02-2 and PS99-1 / 07-3 and the opposite process in the central core PS99-1 / 21-05 (Figure 4.6), while oxygen has an opposite pattern for this period in these sediment cores. Subtle negative changes in the oxygenated environmental pattern also bring about positive changes in the abundances of species indicative of organic matter and oxygen-depleted environment (Figure 4.7, Figure 4.8 and Figure 4.9).

In 1993 A.D., an important peak in organic matter indicator and a negative peak in oxygenated environmental indicators is observed (Figure 4.7; Figure 4.8 and Figure 4.9). Another peak can be seen in 2009 A.D. in the sediment cores PS99-1/21-05 and PS99-1/07-3; and in 2012, in the sediment cores PS99-1/02-2 and PS99-1/21-03. These peaks can occur for seasonal changes, where the conditions are more extreme than the normal ranges and incite this type of sudden events sometimes not prevalent for a long time (Figure 4.7).

At the same time, the oxygen tendency shows a reduction in species indicative of an oxygenated environment (Figure 4.8). The sediment cores PS99-1/07-3 and, in special, in the sediment core PS99-1/21-03 show an increase in the species indicative an oxygen-depleted environment (Figure 4.9).

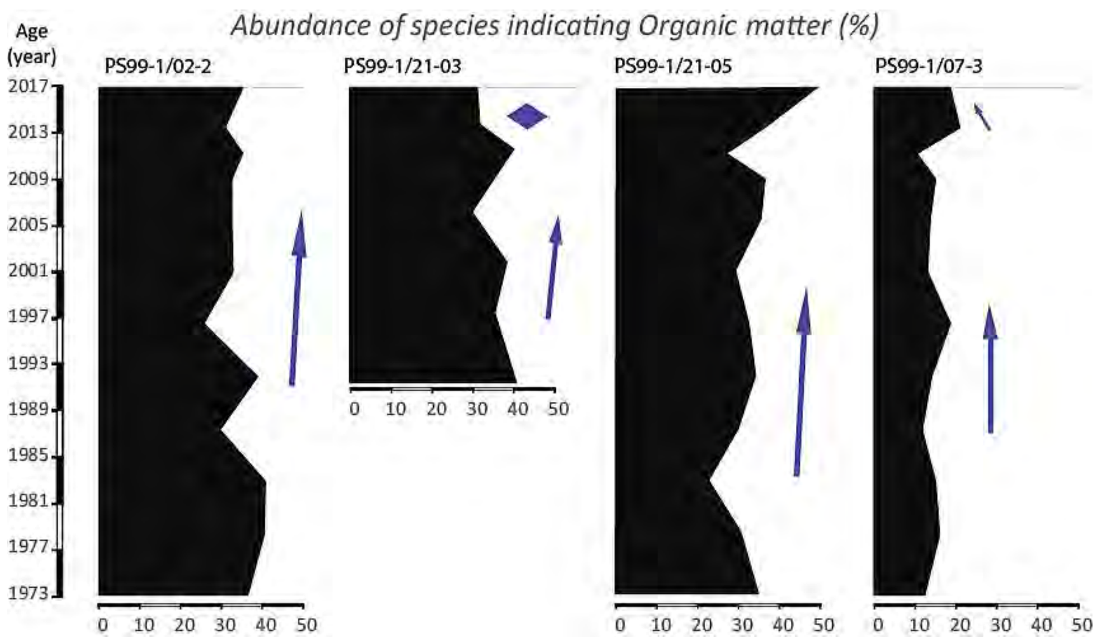

Figure 4.7: Abundance of foraminiferal species indicating presence of Organic matter. The blue arrows show the trend of the principal events in the foraminiferal record (for the species used see the Table 4.1).

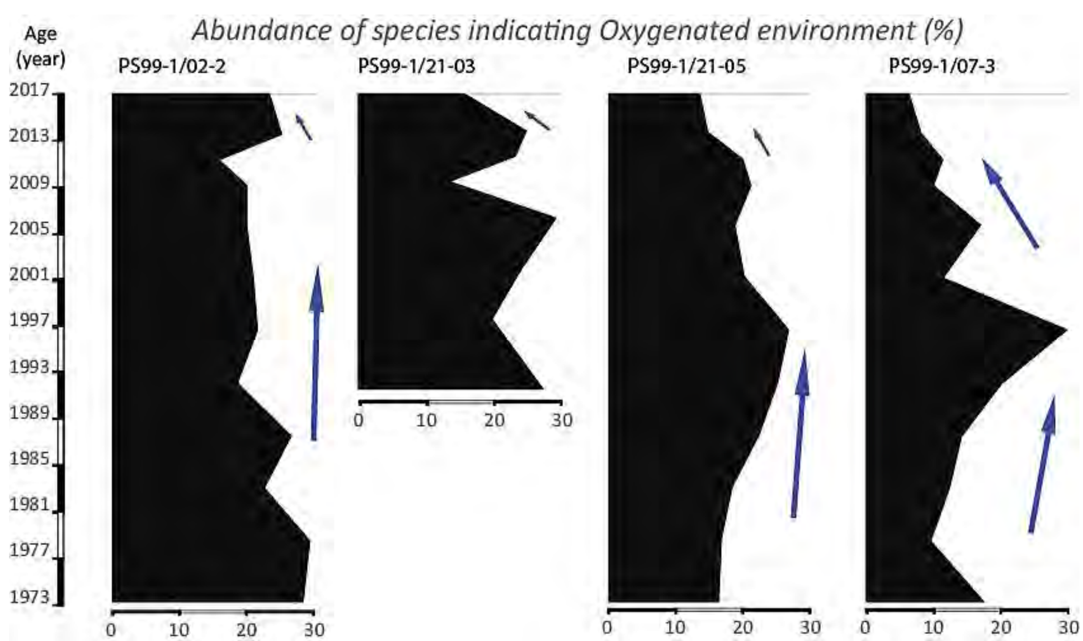

Figure 4.8: Abundance of foraminiferal species indicating Oxygenated environments. The blue arrows show the trend of the principal events in the foraminiferal record (for the species used see the Table 4.1).

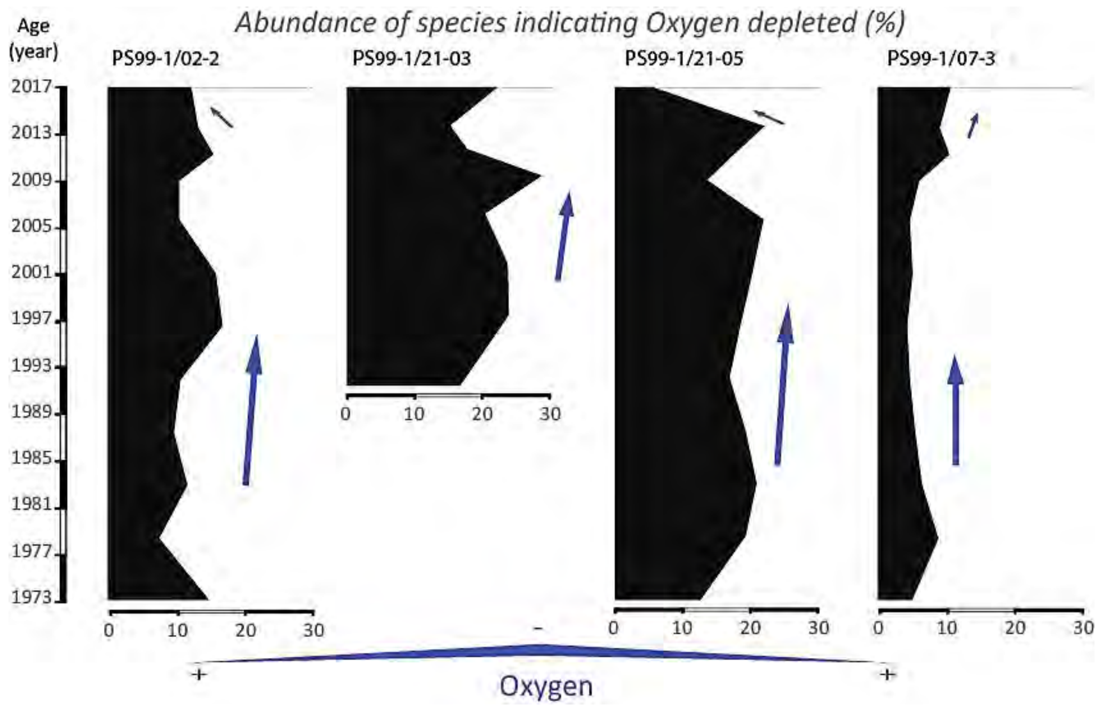

Figure 4.9: Abundance of foraminiferal species indicating depleted Oxygen. The blue arrows show the trend of the principal events in the foraminiferal record (for the species used see the Table 4.1).

Phytodetritus

In general, the flux of organic matter supplies the food requirements of the foraminiferal benthic communities The variations of the fluxes of phytodetritus reflect seasonal surface production and their effect is the arrive of opportunistic species (Forster, 2013). In general, the Kveithola Trough is depleted in phytodetritus (species related to phytodetritus do not exceed 12% of the total assemblages, figure 4.10).

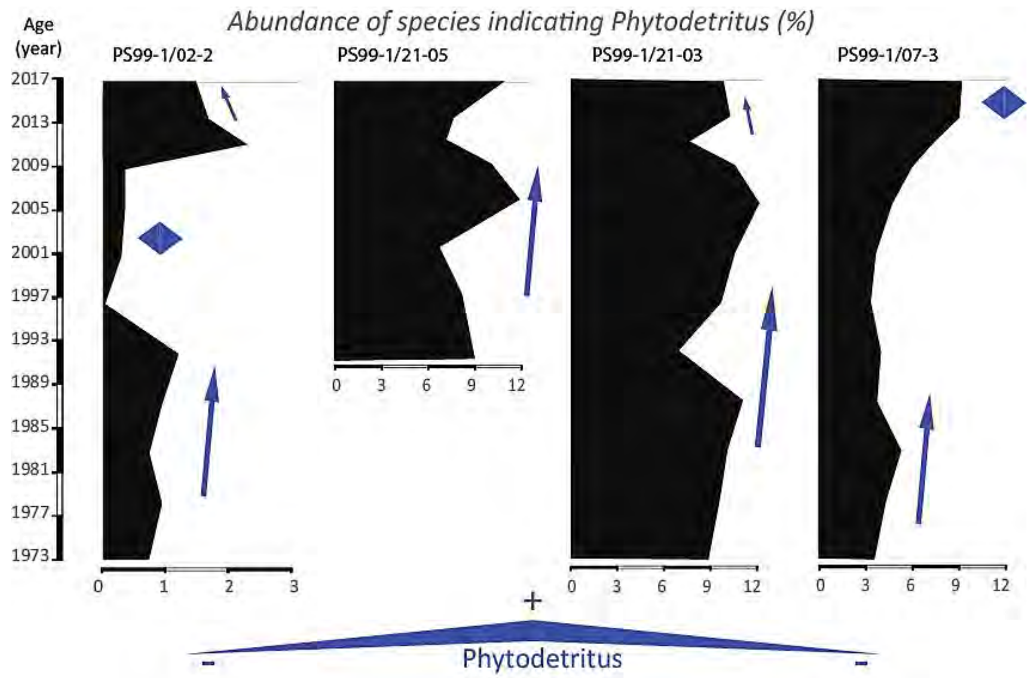

Figure 4.10: Abundance of foraminiferal species indicating presence of phytodetritus. The blue arrows show the trend of the principal events in the foraminiferal record (for the species used see the Table 4.1).

At the bottom of the cores, the sediments show a general increase in phytodetritus (1973-1983 A.D.). In 1997 an extreme depletion has been occurred in the distal part of Kveithola Trough (core PS99-1/02-2). The other cores also record this depletion, although it is not as sharp as in PS99-1/02-2. Even all the entire sedimentary core PS99-1/02-2 shows these poor concentrations of phytodetritus (Figure 4.10). The recovery of the phytodetritus-related species is observed from ca. 2005 A.D., made exception for core PS99-1/02-2, were this general recovery is delayed and appears to start in ca. 2009 A.D. (Figure 4.10).

It is interesting to observe that the abundances of species related to phytodetritus (figure 4.10) resemble the general abundance patterns of species related to oxygen-depleted conditions (figure 4.8). This relationship is particularly clear when comparing this two pattern in core PS99-1/07-3, located on the shelf: here both the abundances species related to phytodetritus and to oxygen depleted environment is scarce. However, this resemblance may not be always related to a cause/effect phenomenon (meaning that the great abundance of phytodetritus is related to low oxygen conditions); indeed, the species related to oxygen depleted conditions are found in the middle of the Kveithola Trough (figure 4.9), where the currents circulation (and therefore the oxygen exchange) is limited by a topographic sill (figure 4.3).

General environmental trends of Kveithola Trough

The Arctic area is that is responding more rapidly to global warming than most other areas on our planet. The Kveithola Trough located in NW Barent Sea has an interesting sedimentary record due to its geographical conditions and its dynamic glacial history formation. Its location allows the input and interaction of two of the main water masses, the Arctic Water which is cold, and the Atlantic Water which is warm.

1973 – 1997

The distal and innermost zone of the Kveithola Trough was influenced mostly by the Atlantic Water during this period, while the Arctic Water influence is fluctuating but with a general trend to increase. At the bottom of the PS99-1/07-3 sediment core, located in the proximal zone an opposite trend is observed. The first event (1973-1997 A.D.) starts with a dominance of Arctic Water with the sporadic arrival of Atlantic Water, that means a mainly cold weather. During the second half of this period, although there is a slight decrease in Arctic Water influence and a slight increase in Atlantic Water, cold conditions are always dominating over warm conditions (Figure 4.11).

The oxygenated environment conditions decrease and the oxygen-depleted conditions increase. These conditions favour the accumulation of the organic matter. This ideal relation between organic matter-oxygen ratio is only fulfilled in the distal part of Kveithola Trough (sediment core PS99-1/02-2). In the innermost area that conditions are variable, with a general increase in oxygen-depleted, and high rates of organic matter and phytodetritus. This improvement in the conditions for the formation of organic matter can be explained by the bathymetry because that zone is protected by a topographical barrier which favor the accumulation of sediments. On the other hand, the frontal zone is dominated by high oxygen levels.

In all the Kveithola Trough the coarse sedimentation input is prevalent, with a general coarsening upward trend. Only a little change on the sedimentation in 1993 A.D. in the distal part, where the sediment core PS99-1/02-2 shows a fining upward, but then continues with a coarsening upward trend (Figure 4.11).

In 1997, the frontal area of Kveithola Trough, (sediment core PS99-1/07-3) shows a positive peak of coarse sediment, which is correlated with a positive peak of oxygen. This may be due to the presence of brines (Figure 4.11).

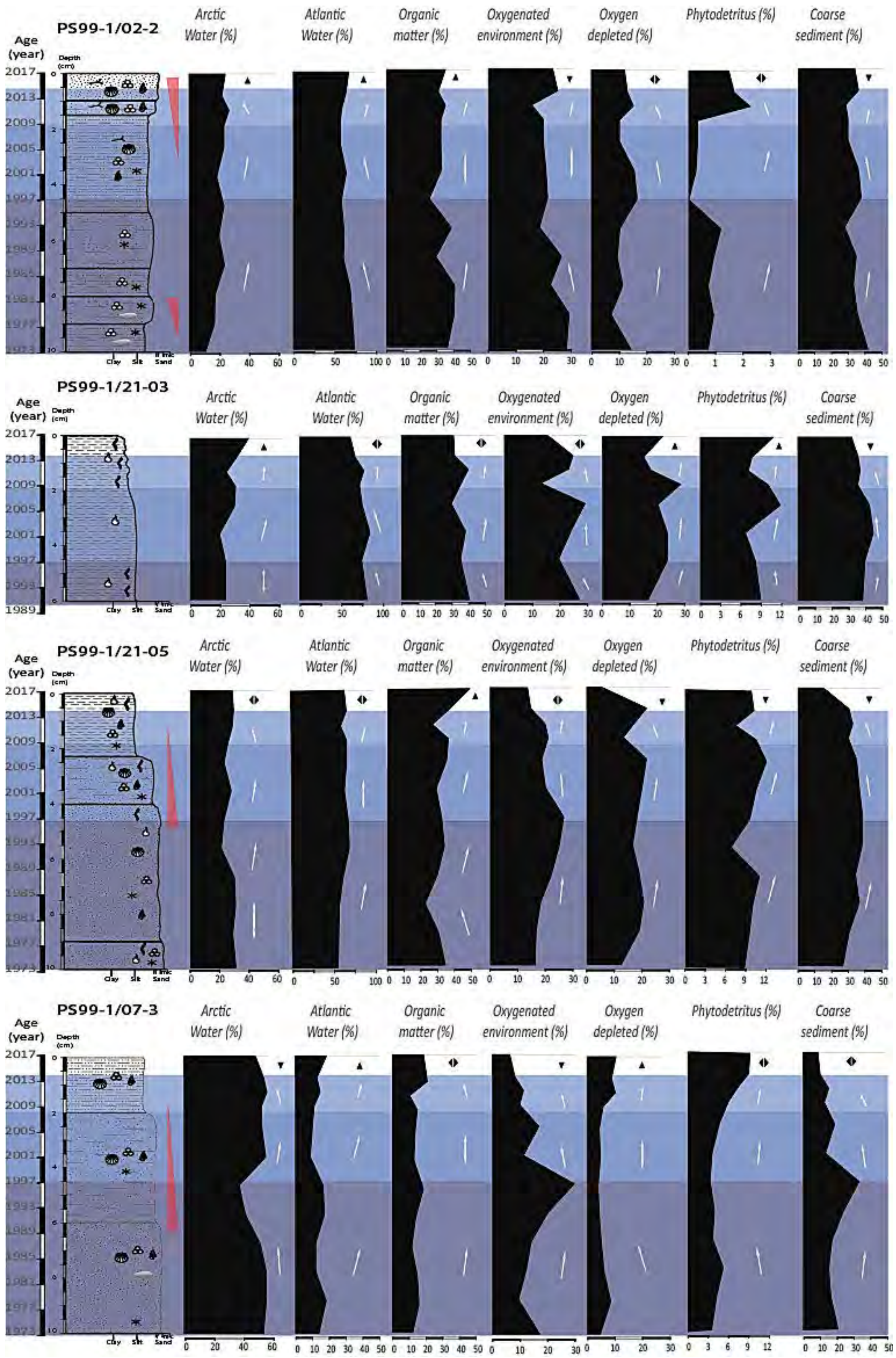

Figure 4.11: Lithology and environmental conditions for each sediment core. The blue areas show the three main events in the foraminiferal environmental record. The top of the cores (white areas) correspond to the actual conditions. The arrows represent the general trend for each period. (for the species used see the Table 4.1).

1997 – 2009

During this period in all the Kveithola Trough, the input of Arctic Water increased. Despite the predominance of Atlantic Water, a decrease of in its influence in the innermost and distal areas is observed. In the frontal area the predominance of Arctic Water persists, although the Atlantic Water input increases (Figure 4.11).

This period was characterized by an increase of organic matter and phytodetritus, favouring the decrease of oxygenated conditions. The innermost area shows an increase of oxygen-depleted conditions, which could be related to the decreased input of coarse sediment (finning upward) in all the Kveithola Trough. Indeed, fine sediments are related to weak bottom currents, which would have not favored the oxygen recharge at the sea bottom (Figure 4.11).

2009 - 2014

A general decrease in the input of Arctic Water and an increased input in Atlantic Water is observed in all the Kveithola Trough (Figure 4.11).

Along the area, the organic matter trend shows an increase. The oxygenated environment increase in a half of the innermost part (sediment core PS99-1/21-03) and in distal part (sediment core PS99-1/02-2). While the oxygen-depleted conditions increase in the rest of the innermost part (sediment core PS99-1/21-05) and in a frontal area (sediment core PS99-1/07-3). The phytodetritus increases in the center and in the front area (Figure 4.11).

The sedimentation shows a coarsening upward trend in the distal area, while in the innermost and front area a fining upward trend is recognized.

2014 – 2017

The last period shows a general increase in Atlantic Water input for all the Kveithola Trough, while the Arctic Water remains dominant in the front of the Kveithola Trough (Figure 4.11).

A general increase in organic matter and phytodetritus is associated to the increase in oxygen-depleted conditions, while the input of coarse sediment tends to decrease together with oxygenated conditions (Figure 4.11)

4.3. Relationship with other studies

Many studies have been carried out in the Arctic area using foraminiferal assemblages and sedimentologic data to establish the environmental evolution of this region. The comparisons of these different studies helps to depict a more detailed environmental framework of the region.

In the Kveithola Through the assemblages of species that indicate cold water conditions are the same as those identified in the work of Saher et al. (2012). Among these, the most important species are *Buccella* spp*., E. clavatum, I. norcrossi* and *N. labradorica*. The Authors observed a general decrease in this group and an increase in the group of warm water species with time. In both studies, a general shift toward dominance of warm water species and temperature tolerant species agrees well with the indicated temperature increase which is possibly related to a stronger penetration of Atlantic Water. Saher et al. (2012) indicate that the most fragile species and the species that display the most pronounced change are those associated with cold water and proximity of the ice edge. The area of the study made by Saher et al. (2012) has a lower temperature and salinity gradient through the last decades than the rest of the area, and its high faunal change may be due to the position of the Polar Front moving away from this area and associated changes in the sea ice edge. This closeness to areas covered by sea ice can be the reason for the high presence of species associated with cold water in the sediment core PS99-1/07-3.

The study elaborated by Hess et al. (2014), focuses on the anoxic Bekkelag basin in the inner Oslofjord, Norway. This basin has been re-oxygenated since 2001 and some strongly polluted, organic-rich sediments were capped with uncontaminated clay in 2007. Hess et al. (2014) studied the recovery and colonization of the benthic community at the reoxygenated and capping with uncontaminated sediments site and compared its foraminiferal community with one site with non-capped sediments. They found that foraminiferal faunal species are common at both sites, but show pronounced differences in relative abundance. The authors conclude the new environmental conditions (re-oxygenation) in the basin are several times faster if anoxic and polluted sediments are capped with uncontaminated clay. The dominance was lower and the species richness was significantly higher at the site exposed to new conditions. These faunal characteristics probably reflect the fundamentally different environmental properties of the sediments. This may help to explain the situation in the sediment core PS99-1/07-3 where the species are less abundant, but the dominance is lower than the other sites. This analysis can also help to clarify the situation in the sediment core PS99-1 / 21-03, located in an organic matter-rich site whereas large number of species are present with high abundance but with extremely small specimens, probably due to the great competition for space in a low oxygenated environment and under the influence of gas outflow.

Murray & Alve (2016), studied the modern faunas to provide essential baseline data for the interpretation of the postglacial and continuing environmental changes in the Svalbard fjords. They worked with superficial sediments in shallow water foraminiferal assemblages, with the common species occurring in the fjords. They observed a progressive change during a drastic temperature change. The authors found an area of overlap of the northern and southern species corresponding with the previously recognized boundary between the Barents Sea Province and the Norwegian Coast Province. They come to the conclusion that temperature is the main abiotic control on the distributions. As we can observe in the present study, the general trend is closely linked to the input of the Atlantic or Arctic waters. However, it is not the only environmental factor which controls the foraminiferal communities.

Łącka & Zajączkowski, (2016), studied the benthic foraminiferal tests (both of living and dead specimens), and their relation with conductivity, temperature, and depth in records from the Hornsund Fjord (SW Spitsbergen), over a period of five non-consecutive summer seasons during 2002–2011. The authors found changes in the foraminiferal assemblages. The increased inflow of Atlantic Water (AW) resulted in higher foraminiferal biodiversity and a greater number of rare species; however, many of these were fragile and were thus poorly preserved in the sediment. Cold years significantly reduced species richness in the fjord center, while more stable hydrological conditions lead to a predominance of opportunistic foraminifera. In the case of Kveithola Through this type of behaviour is similar in foraminiferal assemblages of the innermost part in the sediments cores PS99-1/021-03 and PS99-1/2105, these species present great variability, but they are not very abundant and have a small test.

5. Conclusions

The studied area is located in the Kveithola, a glacially-carved trough located in the NW Barents Sea. Its present-day seafloor morphology is largely inherited from the paleo-seafloor topography, which formed during the episodic phases of last deglacial ice stream retreat.

Four sediment cores from the Kveithola trough were analysed with regard to benthic foraminiferal assemblages and sedimentological parameters in high resolution, in order to elucidate past variability of the water masses, the organic flux and oxygen concentration to the sea floor during the last 45 years. The foraminiferal assemblages, data, abundance and taxonomic composition allow inferring significant changes of the different environmental parameters that influenced the sediment flux in the trough and the proximal shelf.

Many dominant foraminifera species are recurrent along the Kveithola Trough. However, the distribution of species seems to be regulated by few principal environmental parameters: water temperature and presence of organic matter/oxygen concentration.

The influence of two different water masses within the Trough (Arctic cold waters and Atlantic warm waters) is reflected in the dominance of warm water vs cold water species. Core PS99-1/02-2, located in the outer part of the Kveithola Trough, shows a clear influence of the warm water masses, while the shallower site, core PS99-1/07-3, located in the inner area, shows the dominance of coolest conditions due to the influence of Arctic waters.

On the other hand, the organic matter and oxygen concentration within the trough is regulated by the presence of a sill: this allows the stagnation of the bottom water leading to dysoxic conditions in the central part of the Kveithola Trough and to the accumulation and non-degradation of the organic matter, favouring furthermore the decreasing of oxygen at the sea bottom, as testified also by taxa adapted to stressful environmental conditions.

Many other environmental parameters, such as sediment grain size, salinity, and current speed regulate the presence and distribution of taxa within the Kveithola Trough. Although these are secondary parameters compared to water temperature and presence of organic matter, their influence on the assemblages smooth the main ecological trends recognised along the cores.

Four different phases are recognised during the last 45 years:

1973 – 1997 Dominance of Atlantic Water in the distal and innermost area, with an increase tendency to oxygen-depleted conditions, while the frontal area is dominated by Arctic Waters and by oxygenated conditions.

1997 – 2009 Predominance of Atlantic Water increase and increase of organic matter and phytodetritus.

2009 – 2014 General decrease in the input of Arctic Water and an increased input in Atlantic Water. The organic matter trend shows an increase.

2014 – 2017 Increase in Atlantic Water input and general increase in oxygen-depleted conditions.

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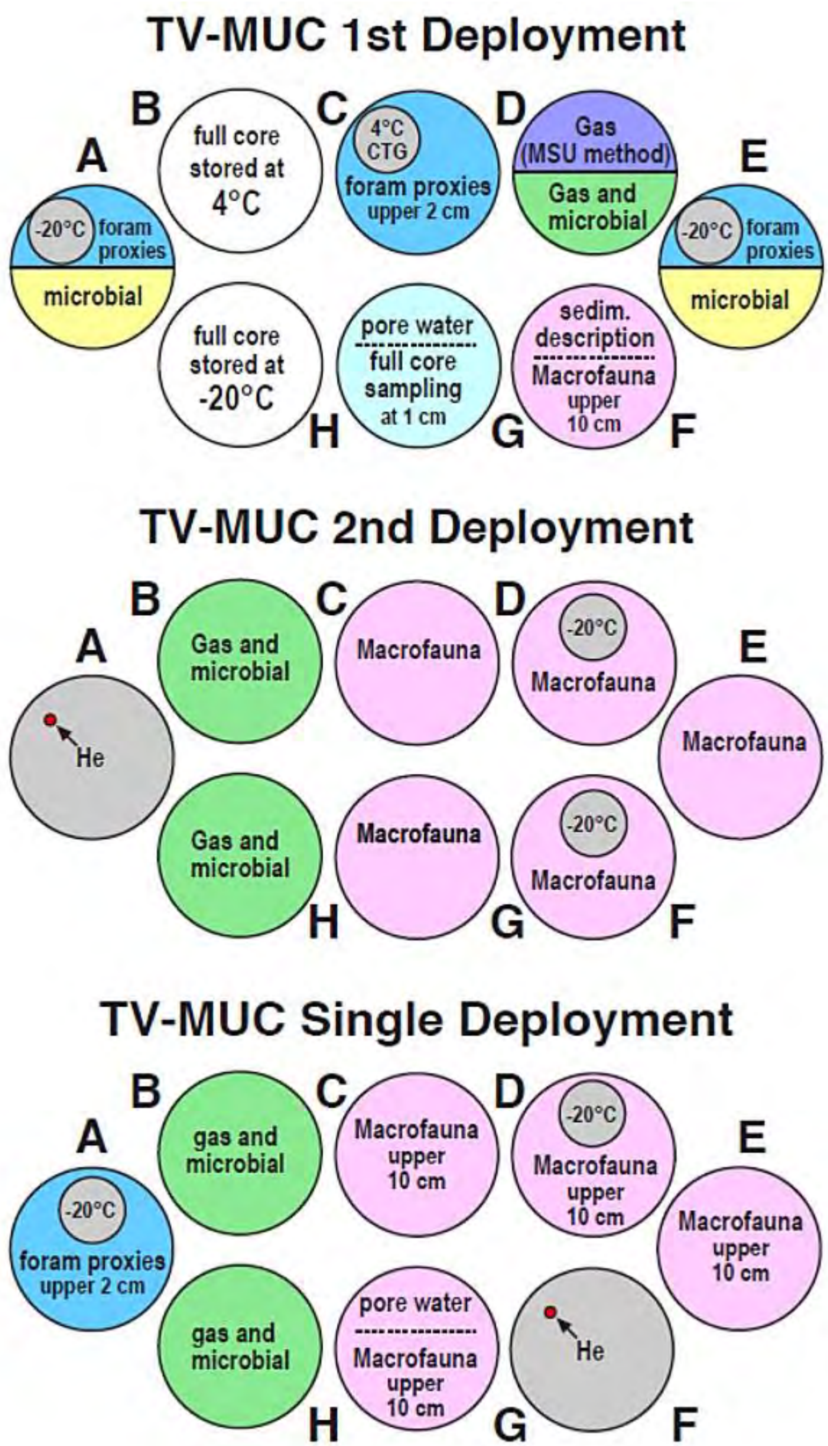
Appendix 1 Work on-board

1.1. Sampling strategy during the RV Polarstern Expedition PS99-1a (Lucchi et al., 2016).



1.2. *TV-multi-corer sampling sites location –all samples-* (Lucchi et al., 2016).

Station	Latitude	Longitude	Depth [m]	Action
PS99/02-2	74° 51,49' N	16° 05,84' E	376.1	first deployment
PS99/02-3	74° 51,53' N	16° 05,93' E	376.0	second deployment
PS99/03-1	74° 51,00' N	16° 54,52' E	317.1	one deployment only
PS99/04-1	74° 50,75' N	17° 20,86' E	304.7	one deployment only
PS99/05-2	74° 50,56' N	17° 38,27' E	294.6	first deployment
PS99/05-3	74° 50,53' N	17° 38,37' E	293.6	second deployment
PS99/06-3	74° 50,73' N	18° 10,64' E	335.9	first deployment
PS99/06-4	74° 50,75' N	18° 10,55' E	335.7	second deployment
PS99/07-2	74° 59,68' N	17° 59,62' E	159.0	first deployment empty
PS99/07-3	74° 59,69' N	17° 59,72' E	159.1	second deployment
PS99/21-3	74° 52,40' N	17° 21,57' E	305.7	first deployment
PS99/21-4	74° 52,40' N	17° 21,62' E	305.6	second deployment
PS99/21-5	74° 52,40' N	17° 21,60' E	305.4	third deployment

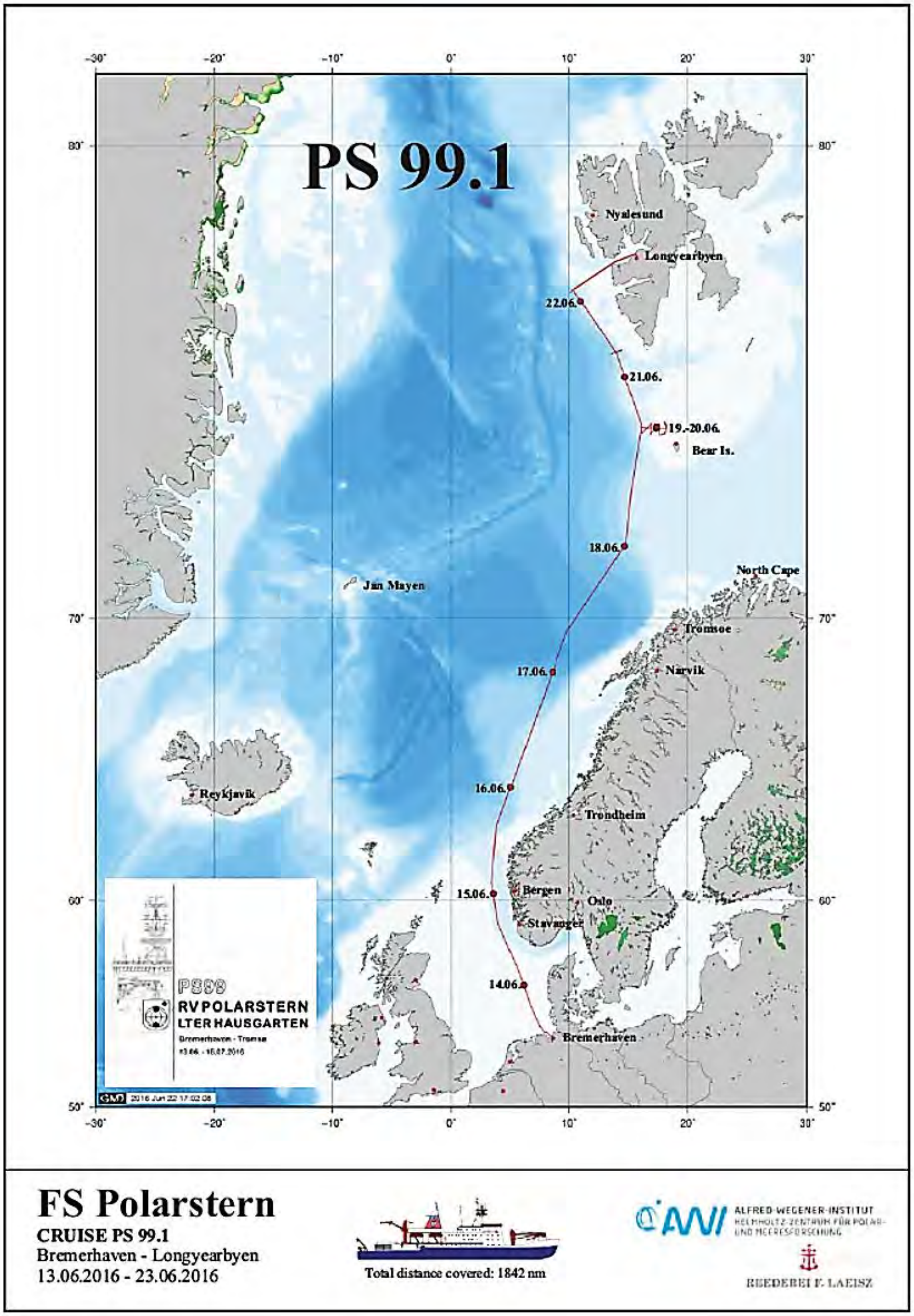
1.3. *Sediment sampling summary* (Lucchi et al., 2016).

Analyses / Sites	PS99-1 02-02	PS99-1 02-03	PS99-1 03-01	PS99-1 04-01	PS99-1 05-02	PS99-1 05-03	PS99-1 06-03	PS99-1 06-04	PS99-1 07-02	PS99-1 07-03	PS99-1 21-03	PS99-1 21-04	PS99-1 21-05	Analyses total samples	Location	Responsible
Macrofauna (sieved on board)	3	9	12	9	3	12	3	12	0	12	1	Empty	6	82	UnivPM	Sabbatini
foraminiferal proxies	3	1	2	2	3	1	3	1	2	1	1		2	22	UnivPM	Sabbatini
Living and fossil foraminifera and metazoan meiofauna core L=10 cm; Ø=4cm	2	0	2	2	2	0	2	0	1	1	0		2	14	UnivPM	Sabbatini
Living and fossil foraminifera and metazoan meiofauna core L=10 cm; Ø=4cm sampled on board (CTG method)	12	0	0	0	12	0	12	0	12	0	9		0	57	UnivPM	Sabbatini
Gas sampling	6	6	4	5	8	0	6	0	5	0	5		5	50	BGR MSU	Kruger Tropchii
^{210}Pb ^{137}Cs	32	0	0	0	0	32	0	21	0	35	10		27	157	AMU	Dominiczak
Grain size, and stable isotopes (O, C)	32	0	0	0	0	32	0	21	0	35	10		27	157	UniBCN	Povea
Micropaleontology	32	0	0	0	0	32	0	21	0	35	10		27	157	UniPI	Morigi
Microbial	9	6	4	5	10	2	8	2	8	4	4		8	70	BGR	Kruger
Pore water	5	0	5	4	5	0	4	0	0	5	2		4	34	BGR	Kruger
He	0	1	0	1	1	0	0	1	0	1	0		0	5	UiO	Mazzini
Composition of Organic Matter (full core)	1	0	0	0	1	0	1	0	0	1	1		1	6	OGS	De Vittor
Sedimentology and geochemistry (full core)	1	1	0	0	1	0	1	0	0	0	0		1	5	OGS	Lucchi
Total samples	138	24	29	28	46	111	40	79	28	130	53	0	110	816		
Total small sub-cores	2	0	2	2	2	0	2	0	1	1	0	0	2	14		
Total full cores	2	1	0	0	2	0	2	0	0	1	1	0	2	11		
Recovered cores	8	8	8	8	8	8	8	8	3	8	6	0	8	89		
Core length (cm)	30	27	21	30	30	30	19	19	37	38	10	0	25	22.50 m		

LEGEND

- Stored at -20 °C
- Total at site
- Total

1.4. Expedition map. PS99.1



Appendix 2: Environmental parameters

Calcareous foraminiferal group (calcareous wall composition)

Alabaminella weddellensis (Earland, 1936). They are small, is a phytodetritus species, live on or near the sediment surface, is an abundant opportunistic when phytodetritus deposition increases, reflecting seasonal phytoplankton bloom in surface water (Thomas et al., 1995). The phytodetritus species cannot dwell in high-productivity regions throughout the year because of oxygen depletion in the bottom water due to decomposition of organic matter (Thomas et al., 1995). The dominance of this species indicates an intermittently high, but strongly and unpredictably fluctuating primary productivity, coupled with conditions favorable to the formation of phytodetritus (Thomas et al., 1995). But, such conditions do not necessarily lead to high accumulation rates of organic carbon in the sediments, because in the well - oxygenated bottom waters of today's deep basins organic matter are quickly used by bacteria as well as foraminifera (Thomas et al., 1995).

Astrononion hamadaense Asano, 1950. It can be associated with relatively warm, but still Arctic, saline bottom waters in the recent Arctic (Mudie et al., 1984). *A. hamadaense* are an arctic species which is known to occur in some abundance in the vicinity of calving glaciers. They can occur in increasing amounts, associated with indications of somewhat ameliorated environmental conditions, of which calving or melting ice may be a result (Funder, 1990). Can reflect high-arctic conditions (faunal dominance high, diversity low, few subarctic specimens), and the assemblage species whit low content of shallow-water specimens can indicate a sublittoral environment (Funder, 1990).

Biasterigerina planorbis (d'Orbigny, 1846) It indicates a deep epibathyal environment (Amakrane et al., 2016).

Bolivina spp*.* d'Orbigny, 1839. It includes Bolivina earlandi and Bolivina spathulata. Indicates high bottom water oxygen and shallow water (Rathburn & Corliss, 1994).

Bolivinellina pseudopunctata (Höglund, 1947): is an opportunistic and a low oxygen tolerant species (Hess et al., 2014).

Buccella spp*.* Andersen, 1952. Includes Buccella frigida and Buccella inusitata. This group represent a cold water condition (Saher et al., 2012).

Cassidulina laevigata d'Orbigny, 1826. It is most abundant in the basin-core, (is rare in the sill-core), associates with sandy substrates. In recent faunas is mainly reported from Boreal areas. It is a characteristic species of the Holocene in the North Sea region, and it immigrated with the first inflow of warmer bottom water to Norwegian fjords after Younger Dryas cooling event (Forster, 2013). It also represents temperatures of 2-4˚C, but disappears in the Barents Sea where temperatures are below 2˚C. Shows a strong relationship to warm, high-salinity bottom water of Atlantic origin (Forster, 2013). The species lives epifaunal, prefers high carbon flux rates and tolerates temporarily low oxygen levels (Forster, 2013).

Cassidulina reniforme Nørvang, 1945. It is an Arctic species who can support live in cooled Atlantic Water in groups of faunas with relatively high diversity. Il species can stay in distal glaciomarine environments in faunas of low diversity (Rasmussen et al., 2007).

Cassidulina teretis Tappan, 1951. It has been documented from both arctic and boreal regions in inner shelf to bathyal environments (between about 50 and 2000 m water depth) and in temperate/cold waters (Seidenkrantz, 1995). Can support cooling of the surface and bottom waters. It is confined to areas influenced by Atlantic Water, which salinity and temperature are stable (Forster, 2013). Lives in shallow infaunal, and prefers fine-grained, organic-rich, terrigenous mud (Forster, 2013).

Cibicides refulgens Montfort, 1808. The species lives firmly attached to smooth and stable surfaces such as dropstones or biogenic fragments. Its strong fixation and its ability to use different nutrition strategies (in particular grazing and filter feeding) enable *C. refulgens* to live in high-energy environments and under highly variable food supply (Forster, 2013). The species is abundant in various environments is considered cosmopolitan, which is able to adapt its living strategies according to the prevailing conditions (Forster, 2013).

Cibicidoides lobatulus (Walker & Jacob, 1878) It is among the pioneer settlers, was found living attached to hard substrates and on coarser sediments in high-energy environments. Variations in the shape of the tests are primarily caused by the nature of the substrate, highest proportions were found at temperatures between 5 and 5.5˚C shows good correlation with high energy sediments (Forster, 2013).

Cribroelphidium excavatum (Terquem, 1875) It is a motile species, highly adaptable to changes in food availability and/or changing environmental conditions. It is able to grow successfully in polluted, near-shore environments, it is the most tolerant species to heavy metal pollution, is considered as a pollution bio-indicator, especially in open ocean harbors. But to be good indicators of pollution, taxa must live in areas where natural conditions are favorable to their maintenance and reproduction (Du Chatelet et al., 2004).

Dentalina spp. Risso, 1826 Typically of oxygenated ambient (Murray, 2006).

Discorbinella bertheloti (d'Orbigny, 1839). It is typical of the middle to outer shelf assemblage, in shallower water, less than 150m. (Smith & Gallagher, 2003)

Discorbis vilardeboanus (d'Orbigny, 1839). Marine (www.marinespecies.org/foraminifera). Known from seamounts and knolls (Stocks, 2009).

Elphidium clavatum Cushman, 1930. It is a highly adaptable, and opportunistic, can live in infaunal or epifaunal ambient and motile (Funder, 1990). Can support in cold bottom water (2˚C), tolerate unstable conditions (salinity, sediment supply); their adaptability in different microhabitat depending on food availability (Funder, 1990; Forster, 2013).

Eponides spp. Montfort, 1808. Marine (www.marinespecies.org/foraminifera).

Fissurina spp. Reuss, 1850. Marine (www.marinespecies.org/foraminifera). Known from seamounts and knolls (Stocks, 2009).

Fursenkoina schreibersiana (Cžjžek, 1848). It appears to be widespread and abundant in the abyssal North Atlantic (less of 4000 m depth) (Gooday & Alve, 2001)

Globigerinita uvula (Ehrenberg, 1861). It is a frequent faunal component of the temperature to polar ocean and decreases in abundance towards lower latitudes (Schiebel & Hemleben, 2017)

Globobulimina auriculata (Bailey, 1894). It is a low-oxygen tolerant (Gooday et al., 2001)

Globobulimina ovata Fujita & Ito, 1957 †. Marine (www.marinespecies.org/foraminifera).

Globocassidulina subglobosa (Brady, 1881). It is a common species around the Antarctic, at water depths from 240 to 4500 m. After stressful depositional events represent a valuable nutritional resource for other benthic organisms (Suhr et al., 2003)

Guttulina spp. d'Orbigny, 1839. Marine (www.marinespecies.org/foraminifera).

Hoeglundina elegans (d'Orbigny, 1826). Marine (www.marinespecies.org/foraminifera). Known from seamounts and knolls (Stocks, 2009).

Islandiella islandica (Nørvang, 1945). It is commonly associated with 30-32% salinity, temperatures of 4-12˚C and depth 50-485m (Murray, 2014).

Islandiella norcrossi (Cushman, 1933). Is an Arctic Water indicator, normal marine salinity, connected to oceanic frontal areas such as the Polar Front. This infaunal species is strongly associated with episodic production of fresh phytodetritus (high-quality C_{org} species) in oceanic frontal areas and other areas of high seasonal productivity, related to organic-rich sediments (Knudsen, et al., 2012).

Lagena ssp. Harris, 1897. Marine (www.marinespecies.org/foraminifera).

Melonis barleeanus (Williamson, 1858). Live organism shows its ability to change its microhabitat from epifaunal to infaunal (Forster, 2013). Hence, the species is highly adaptable to changes in food availability and changing environmental conditions. It can consume the degrading organic matter (even preferring organic matter very altered) (Rasmussen et al., 2007). It relates to chilled Atlantic Water, marine salinities, absent or seasonal ice cover, and fine sediments accumulated in shelf depressions and on the continental slope. The species is sensitive to changes of the bottom-water temperatures (Forster, 2013).

Nonionella auricula Heron-Allen & Earland, 1930. Marine (www.marinespecies.org/foraminifera). High frequencies of *N. auricula* have been found is Fjøsanger, where it occurs in the Early Weichselian (Mangerud et al. 1981)

Nonionella iridea Heron-Allen & Earland, 1932. *N. iridea* is abundant is not dependent upon fresh organic material. The maximum abundance of *N. iridea* occurs under oxic conditions, however, it grows also under hypoxic– suboxic conditions. It is not a highly motile species. *N. iridea* feeds on microbes, such as bacteria, associated with hypoxic–suboxic sediment pore water conditions (Duffield et al., 2015).

Nonionellina labradorica (Dawson, 1860). This species has its maximum abundance in colder waters where bottom temperatures were lower than -2C, e.g. northern parts of Barents Sea. It occupies the deeper outer parts, influenced by stable Atlantic Water. It has infaunal live mode who suggests the affinity for environments with a least seasonally elevated concentration of food in sediment, it is capable to survive prolonged starvation. The species seems to be associated with the episodic influx of fresh phytodetritus, produced along oceanic fronts and areas with seasonal productivity (Forster, 2013). This species may be controlled by food availability. Under dysaerobic conditions can migrate upward in the sediment (Forster, 2013).

Nonionoides turgida (Williamson, 1858). Marine (www.marinespecies.org/foraminifera). Found in moderately oxygenated mesotrophic environment with episodic pulses of fresh organic matter (Pérez-Asensio et al., 2016).

Oolina ssp. d'Orbigny, 1839. Marine (www.marinespecies.org/foraminifera). Known from seamounts and knolls (Stocks, 2009).

Patellina corrugata Williamson, 1858. Marine (www.marinespecies.org/foraminifera).

Pullenia bulloides (d'Orbigny, 1846) The species is associated with high organic flux rates, prefers an infaunal living strategy. Its regional abundance suggests a preference for Atlantic Water conditions specially in terms of bottom-water temperature (Forster, 2013).

Pullenia osloensis Feyling-Hanssen, 1954. Marine (www.marinespecies.org/foraminifera). Known from seamounts and knolls (Stocks, 2009).

Pullenia subcarinata (d'Orbigny, 1839). Marine (www.marinespecies.org/foraminifera). Known from seamounts and knolls (Stocks, 2009).

Robertinoides spp. Höglund, 1947. It includes *Robertinoides charlottensis* (Cushman, 1925), *Robertinoides normani* (Goës, 1894), *Robertinoides pumilum* Höglund, 1947. Marine (www.marinespecies.org/foraminifera).

Rosalina spp. d'Orbigny, 1826 It is observed in high-energy environments, where it lives attached to different objects. This species is common in areas with strong currents activity and coarse-grained sediments. Commonly in association with *Cibicidoides lobatulus* (Funder, 1990).

Stainforthia fusiformis (Williamson, 1848). It is a common species in continental shelf and coastal settings. It extends onto the continental slope in the North Atlantic but has not been reported reliably from depths greater than about 2500 m (Gooday & Alve, 2001)

Stainforthia loeblichi (Feyling-Hanssen, 1954). Marine (www.marinespecies.org/foraminifera).

Trifarina angulosa (Williamson, 1858). This species has a cosmopolitan character, can live in shallow infaunal in coarse-grained sediments of various environments, in particular where high bottom currents prevail. It can withstand permanent winnowing and redeposition (Forster, 2013). However, it is also found in the muddy sediments of fjords, is most abundant in Boreal regions, while its abundances decrease in Arctic Regions (Forster, 2013). It was classified as oxic species (Forster, 2013).

Trifarina bradyi Cushman, 1923. Marine (www.marinespecies.org/foraminifera).

Trifarina carinata (Cushman, 1923). Marine (www.marinespecies.org/foraminifera). Known from seamounts and knolls (Stocks, 2009).

Trifarina fluens (Todd, 1948). Is an Arctic water indicator, glacier-distal, possibly related to high productivity zones along oceanic fronts. Is an infaunal species. Indicates Low-quality C_{org} species may be linked to the primary productivity at the sea-ice edge and to the presence of seasonal sea ice (Knudsen, et al., 2012).

Turrispirillina arctica (Cushman, 1933). Marine (www.marinespecies.org/foraminifera).

Agglutinated foraminiferal group (composed of sand grains or another particle fixed in the organic or calcareous cemented matrix)

Adercotryma glomerata (Brady, 1878). Marine (www.marinespecies.org/foraminifera).

Astrorhiza granulosa (Brady, 1879). Marine (www.marinespecies.org/foraminifera).

Astrorhiza spp. Sandahl, 1858. Marine (www.marinespecies.org/foraminifera).

Eggerelloides scaber (Williamson, 1858). Marine (www.marinespecies.org/foraminifera). It has a preference for higher salinity (Polovodov I., 2009).

Hormosina pilulifera (Brady, 1884). Marine (www.marinespecies.org/foraminifera).

Hormosinella guttifera (Brady, 1881). Marine (www.marinespecies.org/foraminifera).

Hyperammina elongata Brady, 1878. Marine (www.marinespecies.org/foraminifera).

Hyperammina friabilis Brady, 1884. Marine (www.marinespecies.org/foraminifera). Coldresistant and specific to the regions with Arctic bottom water mass (Saidova, 2011).

Labrospira crassimargo (Norman, 1892). Marine (www.marinespecies.org/foraminifera).

Lagenammina difflugiformis (Brady, 1879). Marine (www.marinespecies.org/foraminifera). Known from seamounts and knolls (Stocks, 2009). Living from 0 to 4 cm below the sea bottom surface in dysoxic sediment of the Sulu sea (Szarek et al.)

Lagenammina micacea (Cushman, 1918). Marine (www.marinespecies.org/foraminifera).

Psammosiphonella crassatina (Brady, 1881). Marine.

Psammosphaera spp. Schulze, 1875 Marine (www.marinespecies.org/foraminifera).

Reophax scorpiurus Montfort, 1808. Marine (www.marinespecies.org/foraminifera). Known from seamounts and knolls (Stocks, 2009).

Reophax spp. Montfort, 1808. Marine (www.marinespecies.org/foraminifera).

Reophax subfusiformis Earland Em Höglund, 1947. Marine (www.marinespecies.org/foraminifera).

Rhabdammina scabra Höglund, 1947. Marine (www.marinespecies.org/foraminifera).

Rhabdammina spp. Sars, 1869. Marine (www.marinespecies.org/foraminifera).

Saccammina sphaerica Brady, 1871. Marine (www.marinespecies.org/foraminifera). Known from seamounts and knolls (Stocks, 2009).

Saccorhiza ramose (Brady, 1879). Marine (www.marinespecies.org/foraminifera). It responses positevely to enhanced fluxes of suspended organic particles (Schmiedl et al., 2000).

Testulosiphon indivisus (Brady, 1884). Marine (www.marinespecies.org/foraminifera)

Miliolids foraminiferal group (with glassy, perforate, ‘‘hyaline’’ tests)

Cornuspira foliacea (Philippi, 1844). Marine (www.marinespecies.org/foraminifera)

Pyrgo spp. Defrance, 1824. Marine (www.marinespecies.org/foraminifera)

Quinqueloculina sclerotica Karrer, 1868. Marine (www.marinespecies.org/foraminifera)

Quinqueloculina seminula (Linnaeus, 1758) It indicates salt-pans ambient (Murray, 2006).

Quinqueloculina stalkeri Loeblich & Tappan, 1953 It indicates Subarctic -Arctic conditions (Whittaker et al., 2010)

Siphonaperta agglutinata (Cushman, 1917) Marine environment (Hayward, 2013)

Triloculina tricarinata d'Orbigny in Deshayes, 1832 It is indicative of clear marine waters (McPhee, 2017)

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Appendix 3: Foraminiferal counting data

COUNTED ˀS99-1/02-2

Calcareous

Station	Depth (cm)	Prof (cm)	Fraction	weight dry sediment	Split (mL)	Split %	*Astrononion hamadaense*	*Bolivinellina pseudopunctata*	*Bolivina*	*Buccella frigida*	*Buccella inusitata*	*Cassidulina laevigata*	*Cassidulina reniforme*	*Cassidulina teretis*	*Cibicides refulgens*	*Cibicidoides lobatulus*	*Cribroelphidium excavatum*	*Discorbis vilardeboanus*	*Elphidium clavatum*	*Globigerinita uvula*	*Globobulimina auriculata*	*Globobulimina ovata*	*Globocassidulina subglobosa*	*Guttulina spp*	*Hoeglundina elegans*	*Islandiella islandica*	*Islandiella norcrossi*	*Melonis barleeanus*	*Nonionella auricula*	*Nonionella iridea*	*Nonionellina labradorica*	*Nonionoides turgida*
	0-0,5	0.25	>500µm		all										13	1					1	1										
	0,5-1	0.75	>500µm		all											1					1											
	1-1,5	1.25	>500µm		all										3	2					1	1		1								
	1,5-2	1.75	>500µm		all											6					2											
	2-3	2.5	>500µm		all											1					6											
	3-4	3.5	>500µm		all										3	16	1				6											
	4-5	4.5	>500µm		all										6	10					3											
	5-6	5.5	>500µm		all										7	14					6											
	6-7	6.5	>500µm		all										5	11					2	1										
	7-8	7.5	>500µm		all										4	7					2											
	8-9	8.5	>500µm		all										2	12					5											
	9-10	9.5	>500µm		all										12	16					1	1										
	0-0,5	0.25	150-500µm				13			3		31	21	78	5	44	3	1	4		1					1	1	18			3	
	0,5-1	0.75	150-500µm				11			6	4	36	22	72	13	43	6	2	8	1			2		2	1		16			5	
	1-1,5	1.25	150-500µm				7			7	7	36	20	67	8	24	6		14				2		2	3		19			6	
	1,5-2	1.75	150-500µm				13			5	8	33	32	73	9	46	14		5				1			3	1	13	1			
	2-3	2.5	150-500µm				17	3		1	6	40	68	46	8	37	5	2	8						4	2		14			4	
	3-4	3.5	150-500µm				18	1		3	5	62	19	86	7	59	15		7									31		2	1	
	4-5	4.5	150-500µm				11			3	7	49	21	41	6	40	7		12				4		5	1		23	2			1
	5-6	5.5	150-500µm							3	5	26	13	76	7	34	9	1	14				2		1	1	1	16			2	1
	6-7	6.5	150-500µm				13		2	7	6	30	32	65	2	71	8		6				1		3		1	29			3	2
	7-8	7.5	150-500µm				11			1	3	32	19	77	3	47	10		9				2		5	4		28			2	
	8-9	8.5	150-500µm				11			1	9	22	11	95	3	71	10	1	8				1			2		30			3	
	9-10	9.5	150-500µm				3			1	3	41	14	97	4	52	8	1	2						1			4			2	
thic foraminifera per split																																
	0-0,5	0.25	>500µm		all	100	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.130	0.010	0.000	0.000	0.000	0.000	0.010	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	0,5-1	0.75	>500µm		all	100	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.010	0.000	0.000	0.000	0.000	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	1-1,5	1.25	>500µm		all	100	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.030	0.020	0.000	0.000	0.000	0.000	0.010	0.010	0.000	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	1,5-2	1.75	>500µm		all	100	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.060	0.000	0.000	0.000	0.000	0.020	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	2-3	2.5	>500µm		all	100	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.010	0.000	0.000	0.000	0.000	0.060	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	3-4	3.5	>500µm		all	100	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.030	0.160	0.010	0.000	0.000	0.000	0.060	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	4-5	4.5	>500µm		all	100	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.060	0.100	0.000	0.000	0.000	0.000	0.030	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	5-6	5.5	>500µm		all	100	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.070	0.140	0.000	0.000	0.000	0.000	0.060	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	6-7	6.5	>500µm		all	100	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.050	0.110	0.000	0.000	0.000	0.000	0.020	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	7-8	7.5	>500µm		all	100	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.040	0.070	0.000	0.000	0.000	0.000	0.020	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	8-9	8.5	>500µm		all	100	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.020	0.120	0.000	0.000	0.000	0.000	0.050	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	9-10	9.5	>500µm		all	100	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.120	0.160	0.000	0.000	0.000	0.000	0.010	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	0-0,5	0.25	150-500µm		0.004	0.391	33.280	0.000	0.000	7.680	0.000	79.360	53.760	199.680	12.800	112.640	7.680	2.560	10.240	0.000	2.560	0.000	0.000	0.000	0.000	2.560	2.560	46.080	0.000	0.000	7.680	0.000
	0,5-1	0.75	150-500µm		0.006	0.586	18.773	0.000	0.000	10.240	6.827	61.440	37.547	122.880	22.187	73.387	10.240	3.413	13.653	1.707	0.000	0.000	3.413	0.000	3.413	1.707	0.000	27.307	0.000	0.000	8.533	0.000
	1-1,5	1.25	150-500µm		0.008	0.781	8.960	0.000	0.000	8.960	8.960	46.080	25.600	85.760	10.240	30.720	7.680	0.000	17.920	0.000	0.000	0.000	2.560	0.000	2.560	3.840	0.000	24.320	0.000	0.000	7.680	0.000
	1,5-2	1.75	150-500µm		0.004	0.391	33.280	0.000	0.000	12.800	20.480	84.480	81.920	186.880	23.040	117.760	35.840	0.000	12.800	0.000	0.000	0.000	2.560	0.000	0.000	7.680	2.560	33.280	2.560	0.000	0.000	0.000
	2-3	2.5	150-500µm		0.002	0.195	66.560	0.000	0.000	25.600	40.960	168.960	163.840	373.760	46.080	235.520	71.680	0.000	25.600	0.000	0.000	0.000	5.120	0.000	0.000	15.360	5.120	66.560	5.120	0.000	0.000	0.000
	3-4	3.5	150-500µm		0.004	0.391	46.080	2.560	0.000	7.680	12.800	158.720	48.640	220.160	17.920	151.040	38.400	0.000	17.920	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	79.360	0.000	5.120	2.560	0.000
	4-5	4.5	150-500µm		0.002	0.195	56.320	0.000	0.000	15.360	35.840	250.880	107.520	209.920	30.720	204.800	35.840	0.000	61.440	0.000	0.000	0.000	20.480	0.000	25.600	5.120	0.000	117.760	10.240	0.000	0.000	5.120
	5-6	5.5	150-500µm		0.002	0.195	0.000	0.000	0.000	15.360	25.600	133.120	66.560	389.120	35.840	174.080	46.080	5.120	71.680	0.000	0.000	0.000	10.240	0.000	5.120	5.120	5.120	81.920	0.000	0.000	10.240	5.120
	6-7	6.5	150-500µm		0.002	0.195	66.560	0.000	10.240	35.840	30.720	153.600	163.840	332.800	10.240	363.520	40.960	0.000	30.720	0.000	0.000	0.000	5.120	0.000	15.360	0.000	0.000	148.480	0.000	0.000	15.360	10.240
	7-8	7.5	150-500µm		0.004	0.391	28.160	0.000	0.000	2.560	7.680	81.920	48.640	197.120	7.680	120.320	25.600	0.000	23.040	0.000	0.000	0.000	5.120	0.000	12.800	10.240	0.000	71.680	0.000	0.000	5.120	0.000
	8-9	8.5	150-500µm		0.008	0.781	14.080	0.000	0.000	1.280	11.520	28.160	14.080	121.600	3.840	90.880	12.800	1.280	10.240	0.000	0.000	0.000	1.280	0.000	0.000	2.560	0.000	38.400	0.000	0.000	3.840	0.000
	9-10	9.5	150-500µm		0.004	0.391	7.680	0.000	0.000	2.560	7.680	104.960	35.840	248.320	10.240	133.120	20.480	2.560	5.120	0.000	0.000	0.000	0.000	0.000	2.560	0.000	0.000	10.240	0.000	0.000	5.120	0.000
n of 2 fractions																																
	0-0,5	0.25	>500µm+(150-500µm)				33.280	0.000	0.000	7.680	0.000	79.360	53.760	199.680	12.930	112.650	7.680	2.560	10.240	0.000	2.570	0.010	0.000	0.000	0.000	2.560	2.560	46.080	0.000	0.000	7.680	0.000
	0,5-1	0.75	>500µm+(150-500µm)				18.773	0.000	0.000	10.240	6.827	61.440	37.547	122.880	22.187	73.397	10.240	3.413	13.653	1.707	0.010	0.000	3.413	0.000	3.413	1.707	0.000	27.307	0.000	0.000	8.533	0.000
	1-1,5	1.25	>500µm+(150-500µm)				8.960	0.000	0.000	8.960	8.960	46.080	25.600	85.760	10.270	30.740	7.680	0.000	17.920	0.000	0.010	0.010	2.560	0.010	2.560	3.840	0.000	24.320	0.000	0.000	7.680	0.000
	1,5-2	1.75	>500µm+(150-500µm)				33.280	0.000	0.000	12.800	20.480	84.480	81.920	186.880	23.040	117.820	35.840	0.000	12.800	0.000	0.020	0.000	2.560	0.000	0.000	7.680	2.560	33.280	2.560	0.000	0.000	0.000
	2-3	2.5	>500µm+(150-500µm)				66.560	0.000	0.000	25.600	40.960	168.960	163.840	373.760	46.080	235.530	71.680	0.000	25.600	0.000	0.060	0.000	5.120	0.000	0.000	15.360	5.120	66.560	5.120	0.000	0.000	0.000
	3-4	3.5	>500µm+(150-500µm)				46.080	2.560	0.000	7.680	12.800	158.720	48.640	220.160	17.950	151.200	38.410	0.000	17.920	0.000	0.060	0.000	0.000	0.000	0.000	0.000	0.000	79.360	0.000	5.120	2.560	0.000
	4-5	4.5	>500µm+(150-500µm)				56.320	0.000	0.000	15.360	35.840	250.880	107.520	209.920	30.780	204.900	35.840	0.000	61.440	0.000	0.030	0.000	20.480	0.000	25.600	5.120	0.000	117.760	10.240	0.000	0.000	5.120
	5-6	5.5	>500µm+(150-500µm)				0.000	0.000	0.000	15.360	25.600	133.120	66.560	389.120	35.910	174.220	46.080	5.120	71.680	0.000	0.060	0.000	10.240	0.000	5.120	5.120	5.120	81.920	0.000	0.000	10.240	5.120
	6-7	6.5	>500µm+(150-500µm)				66.560	0.000	10.240	35.840	30.720	153.600	163.840	332.800	10.290	363.630	40.960	0.000	30.720	0.000	0.020	0.010	5.120	0.000	15.360	0.000	0.000	148.480	0.000	0.000	15.360	10.240
	7-8	7.5	>500µm+(150-500µm)				28.160	0.000	0.000	2.560	7.680	81.920	48.640	197.120	7.720	120.390	25.600	0.000	23.040	0.000	0.020	0.000	5.120	0.000	12.800	10.240	0.000	71.680	0.000	0.000	5.120	0.000
	8-9	8.5	>500µm+(150-500µm)				14.080	0.000	0.000	1.280	11.520	28.160	14.080	121.600	3.860	91.000	12.800	1.280	10.240	0.000	0.050	0.000	1.280	0.000	0.000	2.560	0.000	38.400	0.000	0.000	3.840	0.000
	9-10	9.5	>500µm+(150-500µm)				7.680	0.000	0.000	2.560	7.680	104.960	35.840	248.320	10.360	133.280	20.480	2.560	5.120	0.000	0.010	0.010	0.000	0.000	2.560	0.000	0.000	10.240	0.000	0.000	5.120	0.000
per dry sediment																																
0	0-0,5	0.25	>500µm+(150-500µm)	23.70			1.404	0.000	0.000	0.324	0.000	3.349	2.268	8.425	0.546	4.753	0.324	0.108	0.432	0.000	0.108	0.000	0.000	0.000	0.000	0.108	0.108	1.944	0.000	0.000	0.324	0.000
	0,5-1	0.75	>500µm+(150-500µm)	16.40			1.145	0.000	0.000	0.624	0.416	3.746	2.289	7.493	1.353	4.475	0.624	0.208	0.833	0.104	0.001	0.000	0.208	0.000	0.208	0.104	0.000	1.665	0.000	0.000	0.520	0.000
	1-1,5	1.25	>500µm+(150-500µm)	15.80			0.567	0.000	0.000	0.567	0.567	2.916	1.620	5.428	0.650	1.946	0.486	0.000	1.134	0.000	0.001	0.001	0.162	0.001	0.162	0.243	0.000	1.539	0.000	0.000	0.486	0.000
	1,5-2	1.75	>500µm+(150-500µm)	17.80			1.870	0.000	0.000	0.719	1.151	4.746	4.602	10.499	1.294	6.619	2.013	0.000	0.719	0.000	0.001	0.000	0.144	0.000	0.000	0.431	0.144	1.870	0.144	0.000	0.000	0.000
	2-3	2.5	>500µm+(150-500µm)	32.20			2.067	0.000	0.000	0.795	1.272	5.247	5.088	11.607	1.431	7.315	2.226	0.000	0.795	0.000	0.002	0.000	0.159	0.000	0.000	0.477	0.159	2.067	0.159	0.000	0.000	0.000
	3-4	3.5	>500µm+(150-500µm)	31.30			1.472	0.082	0.000	0.245	0.409	5.071	1.554	7.034	0.573	4.831	1.227	0.000	0.573	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.000	2.535	0.000	0.164	0.082	0.000
	4-5	4.5	>500µm+(150-500µm)	36.80			1.530	0.000	0.000	0.417	0.974	6.817	2.922	5.704	0.836	5.568	0.974	0.000	1.670	0.000	0.001	0.000	0.557	0.000	0.696	0.139	0.000	3.200	0.278	0.000	0.000	0.139
	5-6	5.5	>500µm+(150-500µm)	40.70			0.000	0.000	0.000	0.377	0.629	3.271	1.635	9.561	0.882	4.281	1.132	0.126	1.761	0.000	0.001	0.000	0.252	0.000	0.126	0.126	0.126	2.013	0.000	0.000	0.252	0.126
	6-7	6.5	>500µm+(150-500µm)	42.80			1.555	0.000	0.239	0.837	0.718	3.589	3.828	7.776	0.240	8.496	0.957	0.000	0.718	0.000	0.000	0.000	0.120	0.000	0.359	0.000	0.000	3.469	0.000	0.000	0.359	0.239
	7-8	7.5	>500µm+(150-500µm)	30.80			0.914	0.000	0.000	0.083	0.249	2.660	1.579	6.400	0.251	3.909	0.831	0.000	0.748	0.000	0.001	0.000	0.166	0.000	0.416	0.332	0.000	2.327	0.000	0.000	0.166	0.000
	8-9	8.5	>500µm+(150-500µm)	29.20			0.482	0.000	0.000	0.044	0.395	0.964	0.482	4.164	0.132	3.116	0.438	0.044	0.351	0.000	0.002	0.000	0.044	0.000	0.000	0.088	0.000	1.315	0.000	0.000	0.132	0.000
	9-10	9.5	>500µm+(150-500µm)	31.80			0.242	0.000	0.000	0.081	0.242	3.301	1.127	7.809	0.326	4.191	0.644	0.081	0.161	0.000	0.000	0.000	0.000	0.000	0.081	0.000	0.000	0.322	0.000	0.000	0.161	0.000
BUNDANCE %																																
	0-0,5	0.25	>500µm+(150-500µm)				4.522	0.000	0.000	1.044	0.000	10.784	7.305	27.133	1.757	15.307	1.044	0.348	1.391	0.000	0.349	0.001	0.000	0.000	0.000	0.348	0.348	6.261	0.000	0.000	1.044	0.000
	0,5-1	0.75	>500µm+(150-500µm)				3.479	0.000	0.000	1.898	1.265	11.387	6.959	22.774	4.112	13.603	1.898	0.633	2.530	0.316	0.002	0.000	0.633	0.000	0.633	0.316	0.000	5.061	0.000	0.000	1.582	0.000
	1-1,5	1.25	>500µm+(150-500µm)				2.507	0.000	0.000	2.507	2.507	12.894	7.163	23.998	2.874	8.602	2.149	0.000	5.014	0.000	0.003	0.003	0.716	0.003	0.716	1.075	0.000	6.805	0.000	0.000	2.149	0.000
	1,5-2	1.75	>500µm+(150-500µm)				4.011	0.000	0.000	1.543	2.469	10.183	9.874	22.525	2.777	14.201	4.320	0.000	1.543	0.000	0.002	0.000	0.309	0.000	0.000	0.926	0.309	4.011	0.309	0.000	0.000	0.000
	2-3	2.5	>500µm+(150-500µm)				4.012	0.000	0.000	1.543	2.469	10.185	9.876	22.530	2.778	14.197	4.321	0.000	1.543	0.000	0.004	0.000	0.309	0.000	0.000	0.926	0.309	4.012	0.309	0.000	0.000	0.000
	3-4	3.5	>500µm+(150-500µm)				4.443	0.247	0.000	0.741	1.234	15.304	4.690	21.229	1.731	14.579	3.704	0.000	1.728	0.000	0.006	0.000	0.000	0.000	0.000	0.000	0.000	7.652	0.000	0.494	0.247	0.000
	4-5	4.5	>500µm+(150-500µm)				3.678	0.000	0.000	1.003	2.341	16.385	7.022	13.710	2.010	13.382	2.341	0.000	4.013	0.000	0.002	0.000	1.338	0.000	1.672	0.334	0.000	7.691	0.669	0.000	0.000	0.334
	5-6	5.5	>500µm+(150-500µm)				0.000	0.000	0.000	1.111	1.851	9.627	4.814	28.141	2.597	12.600	3.333	0.370	5.184	0.000	0.004	0.000	0.741	0.000	0.370	0.370	0.370	5.925	0.000	0.000	0.741	0.370
	6-7	6.5	>500µm+(150-500µm)				3.714	0.000	0.571	2.000	1.714	8.570	9.142	18.569	0.574	20.289	2.285	0.000	1.714	0.000	0.001	0.001	0.286	0.000	0.857	0.000	0.000	8.285	0.000	0.000	0.857	0.571
	7-8	7.5	>500µm+(150-500µm)				3.691	0.000	0.000	0.336	1.007	10.736	6.375	25.834	1.012	15.778	3.355	0.000	3.020	0.000	0.003	0.000	0.671	0.000	1.678	1.342	0.000	9.394	0.000	0.000	0.671	0.000
	8-9	8.5	>500µm+(150-500µm)				3.196	0.000	0.000	0.291	2.615	6.392	3.196	27.604	0.876	20.657	2.906	0.291	2.325	0.000	0.011	0.000	0.291	0.000	0.000	0.581	0.000	8.717	0.000	0.000	0.872	0.000
	9-10	9.5	>500µm+(150-500µm)				0.996	0.000	0.000	0.332	0.996	13.616	4.649	32.213	1.344	17.289	2.657	0.332	0.664	0.000	0.001	0.001	0.000	0.000	0.332	0.000	0.000	1.328	0.000	0.000	0.664	0.000

															Agglutinated													Miliolids					
Patellina corrugata	*Pullenia bulloides*	*Pullenia osloensis*	*Pullenia subcarinata*	*Rosalina sp*	*Stainforthia loeblichi*	*Trifarina angulosa*	*Trifarina bradyi*	*Trifarina fluens*	*Fissurina*	*Lagena*	*Lenticulina*	*Lenticulina limbosa*	*Oolina*		*Astrorhiza granulosa*	*Eggerelloides scaber*	*Hormosinella guttifera*	*Hyperammina elongata*	*Hyperammina friabilis*	*Lagenammina micacea*	*Psammosiphonella crassatina*	*Reophax scorpiurus*	*Reophax spp*	*Reophax subfusiformis*	*Rhabdammina scabra*	*Saccorhiza ramosa*		*Pyrgo*	*Pyrgo oblonga*	*Pyrgoella sphaera*	*Quinqueloculina seminula*	*Triloculina tricarinata*	
								2			1			19	1			16	2	2	77	3				1	102						0
														2				6	4		7	2			1	2	22				1		1
														8				10			6						16					1	1
														8		1		5			2		1	1			10			1	1		2
												2		9								1					1						0
						1						1		28													0				1		1
										1	2			22		1											1					1	1
												1		28													0			3	2		5
						1								20													0					1	1
														13													0				1		1
														19													0				1		1
								1						31													0	1					1
	4					22		28		1			2	284						1							1		1		1		2
	5					35	3	15	3					311			1			1					1		3				2		2
1	4			2	1	17	8	15	2					278						1							1						0
	4				1	17	28	15					2	324													0						0
1	1	1				16	7	12	8					311													0				2		2
2	6		2	1	1	23	15	26	11			1	1	405													0						0
1	7	3		2	1	21	11	15	5					299													0						0
	3	3				15	12	17	3		1	1	1	268													0				2		2
	6	3	1			20	17	19	3					349													0				1		1
	3					19	11	8	2					296													0				2		2
1	4		1			28	13	18					1	344													0						0
1	3					32	14	10	7	1				301													0						0
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.020	0.000	0.000	0.010	0.000	0.000	0.190	0.010	0.000	0.000	0.160	0.020	0.020	0.770	0.030	0.000	0.000	0.000	0.010	1.020	0.000	0.000	0.000	0.000	0.000	0.000
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.020	0.000	0.000	0.000	0.060	0.040	0.000	0.070	0.020	0.000	0.000	0.010	0.020	0.220	0.000	0.000	0.000	0.010	0.000	0.010
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.080	0.000	0.000	0.000	0.100	0.000	0.000	0.060	0.000	0.000	0.000	0.000	0.000	0.160	0.000	0.000	0.000	0.000	0.010	0.010
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.080	0.000	0.010	0.000	0.050	0.000	0.000	0.020	0.000	0.010	0.010	0.000	0.000	0.100	0.000	0.000	0.010	0.010	0.000	0.020
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.020	0.000	0.090	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.010	0.000	0.000	0.000	0.000	0.010	0.000	0.000	0.000	0.000	0.000	0.000
0.000	0.000	0.000	0.000	0.000	0.000	0.010	0.000	0.000	0.000	0.000	0.000	0.010	0.000	0.280	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.010	0.000	0.010
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.010	0.020	0.000	0.000	0.220	0.000	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.010	0.000	0.000	0.000	0.000	0.010	0.010
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.010	0.000	0.280	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.030	0.020	0.000	0.050
0.000	0.000	0.000	0.000	0.000	0.000	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.200	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.010	0.010
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.130	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.010	0.000	0.010
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.190	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.010	0.000	0.010
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.010	0.000	0.000	0.000	0.000	0.000	0.310	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.010	0.000	0.000	0.000	0.000	0.010
0.000	10.240	0.000	0.000	0.000	0.000	56.320	0.000	71.680	0.000	2.560	0.000	0.000	5.120	727.040	0.000	0.000	0.000	0.000	0.000	2.560	0.000	0.000	0.000	0.000	0.000	0.000	2.560	0.000	2.560	0.000	2.560	0.000	5.120
0.000	8.533	0.000	0.000	0.000	0.000	59.733	5.120	25.600	5.120	0.000	0.000	0.000	0.000	530.773	0.000	0.000	1.707	0.000	0.000	1.707	0.000	0.000	0.000	0.000	1.707	0.000	5.120	0.000	0.000	0.000	3.413	0.000	3.413
1.280	5.120	0.000	0.000	2.560	1.280	21.760	10.240	19.200	2.560	0.000	0.000	0.000	0.000	355.840	0.000	0.000	0.000	0.000	0.000	1.280	0.000	0.000	0.000	0.000	0.000	0.000	1.280	0.000	0.000	0.000	0.000	0.000	0.000
0.000	10.240	0.000	0.000	0.000	2.560	43.520	71.680	38.400	0.000	0.000	0.000	0.000	5.120	829.440	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.000	20.480	0.000	0.000	0.000	5.120	87.040	143.360	76.800	0.000	0.000	0.000	0.000	0.000	1648.640	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	10.240	0.000	10.240
5.120	15.360	0.000	5.120	2.560	2.560	58.880	38.400	66.560	28.160	0.000	0.000	2.560	2.560	1036.800	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
5.120	35.840	15.360	0.000	10.240	5.120	107.520	56.320	76.800	25.600	0.000	0.000	0.000	0.000	1530.880	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.000	15.360	15.360	0.000	0.000	0.000	76.800	61.440	87.040	15.360	0.000	5.120	5.120	5.120	1372.160	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	10.240	0.000	10.240
0.000	30.720	15.360	5.120	0.000	0.000	102.400	87.040	97.280	15.360	0.000	0.000	0.000	0.000	1786.880	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	5.120	0.000	5.120
0.000	7.680	0.000	0.000	0.000	0.000	48.640	28.160	20.480	5.120	0.000	0.000	0.000	0.000	757.760	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	5.120	0.000	5.120
1.280	5.120	0.000	1.280	0.000	0.000	35.840	16.640	23.040	0.000	0.000	0.000	0.000	1.280	440.320	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2.560	7.680	0.000	0.000	0.000	0.000	81.920	35.840	25.600	17.920	2.560	0.000	0.000	0.000	770.560	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.000	10.240	0.000	0.000	0.000	0.000	56.320	0.000	71.700	0.000	2.560	0.010	0.000	5.120	727.230	0.010	0.000	0.000	0.160	0.020	2.580	0.770	0.030	0.000	0.000	0.000	0.010	3.580	0.000	2.560	0.000	2.560	0.000	5.120
0.000	8.533	0.000	0.000	0.000	0.000	59.733	5.120	25.600	5.120	0.000	0.000	0.000	0.000	530.793	0.000	0.000	1.707	0.060	0.040	1.707	0.070	0.020	0.000	0.000	1.717	0.020	5.340	0.000	0.000	0.000	3.423	0.000	3.423
1.280	5.120	0.000	0.000	2.560	1.280	21.760	10.240	19.200	2.560	0.000	0.000	0.000	0.000	355.920	0.000	0.000	0.000	0.100	0.000	1.280	0.060	0.000	0.000	0.000	0.000	0.000	1.440	0.000	0.000	0.000	0.000	0.010	0.010
0.000	10.240	0.000	0.000	0.000	2.560	43.520	71.680	38.400	0.000	0.000	0.000	0.000	5.120	829.520	0.000	0.010	0.000	0.050	0.000	0.000	0.020	0.000	0.010	0.010	0.000	0.000	0.100	0.000	0.000	0.010	0.010	0.000	0.020
0.000	20.480	0.000	0.000	0.000	5.120	87.040	143.360	76.800	0.000	0.000	0.000	0.020	0.000	1648.730	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.010	0.000	0.000	0.000	0.000	0.010	0.000	0.000	0.000	10.240	0.000	10.240
5.120	15.360	0.000	5.120	2.560	2.560	58.890	38.400	66.560	28.160	0.000	0.000	2.570	2.560	1037.080	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.010	0.000	0.010
5.120	35.840	15.360	0.000	10.240	5.120	107.520	56.320	76.800	25.600	0.010	0.020	0.000	0.000	1531.100	0.000	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.010	0.000	0.000	0.000	0.000	0.010	0.010
0.000	15.360	15.360	0.000	0.000	0.000	76.800	61.440	87.040	15.360	0.000	5.120	5.130	5.120	1372.440	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.030	10.260	0.000	10.290
0.000	30.720	15.360	5.120	0.000	0.000	102.410	87.040	97.280	15.360	0.000	0.000	0.000	0.000	1787.080	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	5.120	0.010	5.130
0.000	7.680	0.000	0.000	0.000	0.000	48.640	28.160	20.480	5.120	0.000	0.000	0.000	0.000	757.890	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	5.130	0.000	5.130
1.280	5.120	0.000	1.280	0.000	0.000	35.840	16.640	23.040	0.000	0.000	0.000	0.000	1.280	440.510	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.010	0.000	0.010
2.560	7.680	0.000	0.000	0.000	0.000	81.920	35.840	25.610	17.920	2.560	0.000	0.000	0.000	770.870	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.010	0.000	0.000	0.000	0.000	0.010
0.000	0.432	0.000	0.000	0.000	0.000	2.376	0.000	3.025	0.000	0.108	0.000	0.000	0.216	30.685	0.000	0.000	0.000	0.007	0.001	0.109	0.032	0.001	0.000	0.000	0.000	0.000	0.151	0.000	0.108	0.000	0.108	0.000	0.216
0.000	0.520	0.000	0.000	0.000	0.000	3.642	0.312	1.561	0.312	0.000	0.000	0.000	0.000	32.365	0.000	0.000	0.104	0.004	0.002	0.104	0.004	0.001	0.000	0.000	0.105	0.001	0.326	0.000	0.000	0.000	0.209	0.000	0.209
0.081	0.324	0.000	0.000	0.162	0.081	1.377	0.648	1.215	0.162	0.000	0.000	0.000	0.000	22.527	0.000	0.000	0.000	0.006	0.000	0.081	0.004	0.000	0.000	0.000	0.000	0.000	0.091	0.000	0.000	0.000	0.000	0.001	0.001
0.000	0.575	0.000	0.000	0.000	0.144	2.445	4.027	2.157	0.000	0.000	0.000	0.000	0.288	46.602	0.000	0.001	0.000	0.003	0.000	0.000	0.001	0.000	0.001	0.001	0.000	0.000	0.006	0.000	0.000	0.001	0.001	0.000	0.001
0.000	0.636	0.000	0.000	0.000	0.159	2.703	4.452	2.385	0.000	0.000	0.000	0.001	0.000	51.203	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.318	0.000	0.318
0.164	0.491	0.000	0.164	0.082	0.082	1.881	1.227	2.127	0.900	0.000	0.000	0.082	0.082	33.134	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.139	0.974	0.417	0.000	0.278	0.139	2.922	1.530	2.087	0.696	0.000	0.001	0.000	0.000	41.606	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.000	0.377	0.377	0.000	0.000	0.000	1.887	1.510	2.139	0.377	0.000	0.126	0.126	0.126	33.721	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.252	0.000	0.253
0.000	0.718	0.359	0.120	0.000	0.000	2.393	2.034	2.273	0.359	0.000	0.000	0.000	0.000	41.754	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.120	0.000	0.120
0.000	0.249	0.000	0.000	0.000	0.000	1.579	0.914	0.665	0.166	0.000	0.000	0.000	0.000	24.607	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.167	0.000	0.167
0.044	0.175	0.000	0.044	0.000	0.000	1.227	0.570	0.789	0.000	0.000	0.000	0.000	0.044	15.086	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.081	0.242	0.000	0.000	0.000	0.000	2.576	1.127	0.805	0.564	0.081	0.000	0.000	0.000	24.241	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.000	1.391	0.000	0.000	0.000	0.000	7.653	0.000	9.743	0.000	0.348	0.001	0.000	0.696	98.818	0.001	0.000	0.000	0.022	0.003	0.351	0.105	0.004	0.000	0.000	0.000	0.001	0.486	0.000	0.348	0.000	0.348	0.000	0.696
0.000	1.582	0.000	0.000	0.000	0.000	11.071	0.949	4.745	0.949	0.000	0.000	0.000	0.000	98.376	0.000	0.000	0.316	0.011	0.007	0.316	0.013	0.004	0.000	0.000	0.318	0.004	0.990	0.000	0.000	0.000	0.634	0.000	0.634
0.358	1.433	0.000	0.000	0.716	0.358	6.089	2.865	5.373	0.716	0.000	0.000	0.000	0.000	99.594	0.000	0.000	0.000	0.028	0.000	0.358	0.017	0.000	0.000	0.000	0.000	0.000	0.403	0.000	0.000	0.000	0.000	0.003	0.003
0.000	1.234	0.000	0.000	0.000	0.309	5.246	8.640	4.629	0.000	0.000	0.000	0.000	0.617	99.986	0.000	0.001	0.000	0.006	0.000	0.000	0.002	0.000	0.001	0.001	0.000	0.000	0.012	0.000	0.000	0.001	0.001	0.000	0.002
0.000	1.234	0.000	0.000	0.000	0.309	5.247	8.641	4.629	0.000	0.000	0.000	0.001	0.000	99.382	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.617	0.000	0.617
0.494	1.481	0.000	0.494	0.247	0.247	5.678	3.703	6.418	2.715	0.000	0.000	0.248	0.247	99.999	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.001
0.334	2.341	1.003	0.000	0.669	0.334	7.022	3.678	5.016	1.672	0.001	0.001	0.000	0.000	99.999	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.001	0.001
0.000	1.111	1.111	0.000	0.000	0.000	5.554	4.443	6.295	1.111	0.000	0.370	0.371	0.370	99.256	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.742	0.000	0.744
0.000	1.714	0.857	0.286	0.000	0.000	5.714	4.857	5.428	0.857	0.000	0.000	0.000	0.000	99.714	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.286	0.001	0.286
0.000	1.007	0.000	0.000	0.000	0.000	6.375	3.691	2.684	0.671	0.000	0.000	0.000	0.000	99.328	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.672	0.000	0.672
0.291	1.162	0.000	0.291	0.000	0.000	8.136	3.777	5.230	0.000	0.000	0.000	0.000	0.291	99.998	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.000	0.002
0.332	0.996	0.000	0.000	0.000	0.000	10.627	4.649	3.322	2.325	0.332	0.000	0.000	0.000	99.999	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.001

supertotal
121
25
25
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33
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32
287
316
279
324
313
405
299
270
350
298
344
301
1.210
0.250
0.250
0.200
0.100
0.290
0.240
0.330
0.210
0.140
0.200
0.320
734.720
539.307
357.120
829.440
1658.880
1036.800
1530.880
1382.400
1792.000
762.880
440.320
770.560
735.930
539.557
357.370
829.640
1658.980
1037.090
1531.120
1382.730
1792.210
763.020
440.520
770.880
31.052
32.900
22.618
46.609
51.521
33.134
41.607
33.974
41.874
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15.086
24.242
100.000
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COUNTED **PS99-1/21-03**

Station	Depth (cm)	Prof (cm)	Fraction	weight dry sediment	Split (mL)	Split %	*Astrononion hamadaense*	*Biasterigerina planorbis*	*Bolivina spp*	*Bolivina earlandi*	*Bolivina spathulata*	*Buccella frigida*	*Buccella inusitata*	*Cassidulina laevigata*	*Cassidulina reniforme*	*Cassidulina teretis*	*Cibicides refulgens*	*Cibicidoides lobatulus*	*Cribroelphidium excavatum*	*Discorbis vilardeboanus*	*Elphidium clavatum*	*Globobulimina auriculata*	*Globobulimina ovata*	*Globocassidulina subglobosa*	*Hoeglundina elegans*	*Islandiella islandica*
							Calcareous																			
	0-0,5	0.25	>500µm		all		1							7	1			3				3				
	0,5-1	0.75	>500µm		all									1	1			5				13	4	1		
	1-1,5	1.25	>500µm		all												1	21	3		1	11	1			
	1,5-2	1.75	>500µm		all									2				62		1		11	3		1	
	2-3	2.5	>500µm		all													11	1			17				
	3-4	3.5	>500µm		all											1		17				25	5			2
	4-5	4.5	>500µm		all							1					3	23			2	18	3			
	5-6	5.5	>500µm		all												2	46				26	5			
	6-7	6.5	>500µm		all																					
	7-8	7.5	>500µm		all																					
	0-0,5	0.25	150-500µm				5					9	3	45	26	36	6	35	1		17			6	2	19
	0,5-1	0.75	150-500µm				11	2		1	2	6	6	38	22	45	3	78	6	2	18			2	5	16
	1-1,5	1.25	150-500µm				8	2				6	1	42	14	57		69	7		16			1	3	26
	1,5-2	1.75	150-500µm				7	5		1		9	8	112	28	63	2	64	10	1	23	1			4	51
	2-3	2.5	150-500µm				12		1			5	2	40	14	46	1	83			8				1	20
	3-4	3.5	150-500µm				6					3	2	76	10	58	3	87	6		10			5	5	21
	4-5	4.5	150-500µm				6	2				2	1	66	8	43		60	9	3	23	1		2	3	24
	5-6	5.5	150-500µm				6					5	4	38	9	51	1	90	4		10				6	29
	6-7	6.5	150-500µm																							
	7-8	7.5	150-500µm																							
Number of benthic foraminifera per split	0-0,5	0.25	>500µm		all	100	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.070	0.010	0.000	0.000	0.030	0.000	0.000	0.000	0.030	0.000	0.000	0.000	0.000
	0,5-1	0.75	>500µm		all	100	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.010	0.010	0.000	0.000	0.050	0.000	0.000	0.000	0.130	0.040	0.010	0.000	0.000
	1-1,5	1.25	>500µm		all	100	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.010	0.210	0.030	0.000	0.010	0.110	0.010	0.000	0.000	0.000
	1,5-2	1.75	>500µm		all	100	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.020	0.000	0.000	0.000	0.620	0.000	0.010	0.000	0.110	0.030	0.000	0.010	0.000
	2-3	2.5	>500µm		all	100	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.110	0.010	0.000	0.000	0.170	0.000	0.000	0.000	0.000
	3-4	3.5	>500µm		all	100	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.010	0.000	0.170	0.000	0.000	0.000	0.250	0.050	0.000	0.000	0.020
	4-5	4.5	>500µm		all	100	0.000	0.000	0.000	0.000	0.000	0.010	0.000	0.000	0.000	0.000	0.030	0.230	0.000	0.000	0.020	0.180	0.030	0.000	0.000	0.000
	5-6	5.5	>500µm		all	100	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.020	0.460	0.000	0.000	0.000	0.260	0.050	0.000	0.000	0.000
	6-7	6.5	>500µm		all	100	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	7-8	7.5	>500µm		all	100	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	0-0,5	0.25	150-500µm		0.03125	3.125	6.400	0.000	0.000	0.000	0.000	11.520	3.840	57.600	33.280	46.080	7.680	44.800	1.280	0.000	21.760	0.000	0.000	7.680	2.560	24.320
	0,5-1	0.75	150-500µm		0.01171875	1.171875	14.080	2.560	0.000	1.280	2.560	7.680	7.680	48.640	28.160	57.600	3.840	99.840	7.680	2.560	23.040	0.000	0.000	2.560	6.400	20.480
	1-1,5	1.25	150-500µm		0.01171875	1.171875	10.240	2.560	0.000	0.000	0.000	7.680	1.280	53.760	17.920	72.960	0.000	88.320	8.960	0.000	20.480	0.000	0.000	1.280	3.840	33.280
	1,5-2	1.75	150-500µm		0.015625	1.5625	8.960	6.400	0.000	1.280	0.000	11.520	10.240	143.360	35.840	80.640	2.560	81.920	12.800	1.280	29.440	1.280	0.000	0.000	5.120	65.280
	2-3	2.5	150-500µm		0.0078125	0.78125	15.360	0.000	1.280	0.000	0.000	6.400	2.560	51.200	17.920	58.880	1.280	106.240	0.000	0.000	10.240	0.000	0.000	0.000	1.280	25.600
	3-4	3.5	150-500µm		0.0078125	0.78125	7.680	0.000	0.000	0.000	0.000	3.840	2.560	97.280	12.800	74.240	3.840	111.360	7.680	0.000	12.800	0.000	0.000	6.400	6.400	26.880
	4-5	4.5	150-500µm		0.0078125	0.78125	7.680	2.560	0.000	0.000	0.000	2.560	1.280	84.480	10.240	55.040	0.000	76.800	11.520	3.840	29.440	1.280	0.000	2.560	3.840	30.720
	5-6	5.5	150-500µm		0.00390625	0.390625	7.680	0.000	0.000	0.000	0.000	6.400	5.120	48.640	11.520	65.280	1.280	115.200	5.120	0.000	12.800	0.000	0.000	0.000	7.680	37.120
	6-7	6.5	150-500µm				0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	7-8	7.5	150-500µm				0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Sum of 2 fractions																										
	0-0,5	0.25	>500µm+(150-500µm)				6.410	0.000	0.000	0.000	0.000	11.520	3.840	57.670	33.290	46.080	7.680	44.830	1.280	0.000	21.760	0.030	0.000	7.680	2.560	24.320
	0,5-1	0.75	>500µm+(150-500µm)				14.080	2.560	0.000	1.280	2.560	7.680	7.680	48.650	28.170	57.600	3.840	99.890	7.680	2.560	23.040	0.130	0.040	2.570	6.400	20.480
	1-1,5	1.25	>500µm+(150-500µm)				10.240	2.560	0.000	0.000	0.000	7.680	1.280	53.760	17.920	72.960	0.010	88.530	8.990	0.000	20.490	0.110	0.010	1.280	3.840	33.280
	1,5-2	1.75	>500µm+(150-500µm)				8.960	6.400	0.000	1.280	0.000	11.520	10.240	143.380	35.840	80.640	2.560	82.540	12.800	1.290	29.440	1.390	0.030	0.000	5.130	65.280
	2-3	2.5	>500µm+(150-500µm)				15.360	0.000	1.280	0.000	0.000	6.400	2.560	51.200	17.920	58.880	1.280	106.350	0.010	0.000	10.240	0.170	0.000	0.000	1.280	25.600
	3-4	3.5	>500µm+(150-500µm)				7.680	0.000	0.000	0.000	0.000	3.840	2.560	97.280	12.800	74.250	3.840	111.530	7.680	0.000	12.800	0.250	0.050	6.400	6.400	26.900
	4-5	4.5	>500µm+(150-500µm)				7.680	2.560	0.000	0.000	0.000	2.570	1.280	84.480	10.240	55.040	0.030	77.030	11.520	3.840	29.460	1.460	0.030	2.560	3.840	30.720
	5-6	5.5	>500µm+(150-500µm)				7.680	0.000	0.000	0.000	0.000	6.400	5.120	48.640	11.520	65.280	1.300	115.660	5.120	0.000	12.800	0.260	0.050	0.000	7.680	37.120
	6-7	6.5	>500µm+(150-500µm)				0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	7-8	7.5	>500µm+(150-500µm)				0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total per dry sediment																										
	0-0,5	0.25	>500µm+(150-500µm)	2.20			2.914	0.000	0.000	0.000	0.000	5.236	1.745	26.214	15.132	20.945	3.491	20.377	0.582	0.000	9.891	0.014	0.000	3.491	1.164	11.055
	0,5-1	0.75	>500µm+(150-500µm)	8.40			1.676	0.305	0.000	0.152	0.305	0.914	0.914	5.792	3.354	6.857	0.457	11.892	0.914	0.305	2.743	0.015	0.005	0.306	0.762	2.438
	1-1,5	1.25	>500µm+(150-500µm)	7.50			1.365	0.341	0.000	0.000	0.000	1.024	0.171	7.168	2.389	9.728	0.001	11.804	1.199	0.000	2.732	0.015	0.001	0.171	0.512	4.437
	1,5-2	1.75	>500µm+(150-500µm)	6.80			1.318	0.941	0.000	0.188	0.000	1.694	1.506	21.085	5.271	11.859	0.376	12.138	1.882	0.190	4.329	0.204	0.004	0.000	0.754	9.600
	2-3	2.5	>500µm+(150-500µm)	12.90			1.191	0.000	0.099	0.000	0.000	0.496	0.198	3.969	1.389	4.564	0.099	8.244	0.001	0.000	0.794	0.013	0.000	0.000	0.099	1.984
	3-4	3.5	>500µm+(150-500µm)	18.10			0.424	0.000	0.000	0.000	0.000	0.212	0.141	5.375	0.707	4.102	0.212	6.162	0.424	0.000	0.707	0.014	0.003	0.354	0.354	1.486
	4-5	4.5	>500µm+(150-500µm)	15.40			0.499	0.166	0.000	0.000	0.000	0.167	0.083	5.486	0.665	3.574	0.002	5.002	0.748	0.249	1.913	0.095	0.002	0.166	0.249	1.995
	5-6	5.5	>500µm+(150-500µm)	20.70			0.371	0.000	0.000	0.000	0.000	0.309	0.247	2.350	0.557	3.154	0.063	5.587	0.247	0.000	0.618	0.013	0.002	0.000	0.371	1.793
	6-7	6.5	>500µm+(150-500µm)	23.10																						
	7-8	7.5	>500µm+(150-500µm)	27.10																						
ABUNDANCE %																										
	0-0,5	0.25	>500µm+(150-500µm)				1.794	0.000	0.000	0.000	0.000	3.224	1.075	16.138	9.316	12.895	2.149	12.545	0.358	0.000	6.089	0.008	0.000	2.149	0.716	6.806
	0,5-1	0.75	>500µm+(150-500µm)				3.214	0.584	0.000	0.292	0.584	1.753	1.753	11.106	6.430	13.149	0.877	22.802	1.753	0.584	5.259	0.030	0.009	0.587	1.461	4.675
	1-1,5	1.25	>500µm+(150-500µm)				2.654	0.664	0.000	0.000	0.000	1.991	0.332	13.935	4.645	18.912	0.003	22.948	2.330	0.000	5.311	0.029	0.003	0.332	0.995	8.627
	1,5-2	1.75	>500µm+(150-500µm)				1.401	1.001	0.000	0.200	0.000	1.801	1.601	22.418	5.604	12.608	0.400	12.905	2.001	0.202	4.603	0.217	0.005	0.000	0.802	10.207
	2-3	2.5	>500µm+(150-500µm)				4.077	0.000	0.340	0.000	0.000	1.699	0.679	13.589	4.756	15.628	0.340	28.227	0.003	0.000	2.718	0.045	0.000	0.000	0.340	6.795
	3-4	3.5	>500µm+(150-500µm)				1.660	0.000	0.000	0.000	0.000	0.830	0.553	21.027	2.767	16.049	0.830	24.107	1.660	0.000	2.767	0.054	0.011	1.383	1.383	5.814
	4-5	4.5	>500µm+(150-500µm)				1.872	0.624	0.000	0.000	0.000	0.626	0.312	20.592	2.496	13.416	0.007	18.776	2.808	0.936	7.181	0.356	0.007	0.624	0.936	7.488
	5-6	5.5	>500µm+(150-500µm)				1.793	0.000	0.000	0.000	0.000	1.494	1.195	11.353	2.689	15.237	0.303	26.996	1.195	0.000	2.988	0.061	0.012	0.000	1.793	8.664
	6-7	6.5	>500µm+(150-500µm)																							
	7-8	7.5	>500µm+(150-500µm)																							

														Agglutinated				Miliolids			
Islandiella norcrossi	*Melonis barleeanus*	*Nonionellina labradorica*	*Nonionoides turgida*	*Patellina corrugata*	*Pullenia bulloides*	*Pullenia osloensis*	*Robertinoides charlottensis*	*Rosalina sp*	*Trifarina angulosa*	*Trifarina carinata*	*Trifarina fluens*	*Fissurina*	*total*	*Adercotryma glomerata*	*Labrospira crassimargo*	*Reophax scorpiurus*	*total*	*Quinqueloculina seminula*	*Siphonaperta agglutinata*	*total*	*Supertotal*
1	3	2		1									22			1	1			0	23
	1												26		2	3	5			0	31
	4	7						1					50				0			0	50
	1	5											86				0			0	86
	2	11			1								43				0	1	1	2	45
	5	2											57				0			0	57
	2	10											62		2		2	2		2	66
	5	6											90		1		1			0	91
													0				0			0	0
													0				0			0	0
17	15	14	1	1	1	1		6	3		6		275	4			4			0	279
15	27	12			1	1		5	2		7	3	336	5		1	6			0	342
12	16	10		1	4			1			1	4	301				0			0	301
25	34	27			2			2		1	17	1	498				0	1		1	499
18	11	18			2			3		1	6	2	294				0			0	294
18	33	7		1	1	1				1	6	1	361				0			0	361
19	22	8	1		6	2		3			3	3	320				0			0	320
15	36	16			2		1	1			10		334				0			0	334
													0				0			0	0
													0				0			0	0
0.010	0.030	0.020	0.000	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.220	0.000	0.000	0.010	0.010	0.000	0.000	0.000	0.230
0.000	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.260	0.000	0.020	0.030	0.050	0.000	0.000	0.000	0.310
0.000	0.040	0.070	0.000	0.000	0.000	0.000	0.000	0.010	0.000	0.000	0.000	0.000	0.500	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.500
0.000	0.010	0.050	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.860	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.860
0.000	0.020	0.110	0.000	0.000	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.430	0.000	0.000	0.000	0.000	0.010	0.010	0.020	0.450
0.000	0.050	0.020	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.570	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.570
0.000	0.020	0.100	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.620	0.000	0.020	0.000	0.020	0.020	0.000	0.020	0.660
0.000	0.050	0.060	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.900	0.000	0.010	0.000	0.010	0.000	0.000	0.000	0.910
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
21.760	19.200	17.920	1.280	1.280	1.280	1.280	0.000	7.680	3.840	0.000	7.680	0.000	352.000	5.120	0.000	0.000	5.120	0.000	0.000	0.000	357.120
19.200	34.560	15.360	0.000	0.000	1.280	1.280	0.000	6.400	2.560	0.000	8.960	3.840	426.240	6.400	0.000	1.280	7.680	0.000	0.000	0.000	433.920
15.360	20.480	12.800	0.000	1.280	5.120	0.000	0.000	1.280	0.000	0.000	1.280	5.120	380.160	0.000	0.000	0.000	0.000	0.000	0.000	0.000	380.160
32.000	43.520	34.560	0.000	0.000	2.560	0.000	0.000	2.560	0.000	1.280	21.760	1.280	636.160	0.000	0.000	0.000	0.000	1.280	0.000	1.280	637.440
23.040	14.080	23.040	0.000	0.000	2.560	0.000	0.000	3.840	0.000	1.280	7.680	2.560	373.760	0.000	0.000	0.000	0.000	0.000	0.000	0.000	373.760
23.040	42.240	8.960	0.000	1.280	1.280	1.280	0.000	0.000	0.000	1.280	7.680	1.280	460.800	0.000	0.000	0.000	0.000	0.000	0.000	0.000	460.800
24.320	28.160	10.240	1.280	0.000	7.680	2.560	0.000	3.840	0.000	0.000	3.840	3.840	405.760	0.000	0.000	0.000	0.000	0.000	0.000	0.000	405.760
19.200	46.080	20.480	0.000	0.000	2.560	0.000	1.280	1.280	0.000	0.000	12.800	0.000	427.520	0.000	0.000	0.000	0.000	0.000	0.000	0.000	427.520
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
21.770	19.230	17.940	1.280	1.290	1.280	1.280	0.000	7.680	3.840	0.000	7.680	0.000	352.220	5.120	0.000	0.010	5.130	0.000	0.000	0.000	357.350
19.200	34.570	15.360	0.000	0.000	1.280	1.280	0.000	6.400	2.560	0.000	8.960	3.840	430.340	6.400	0.020	1.310	7.730	0.000	0.000	0.000	438.070
15.360	20.520	12.870	0.000	1.280	5.120	0.000	0.000	1.290	0.000	0.000	1.280	5.120	385.780	0.000	0.000	0.000	0.000	0.000	0.000	0.000	385.780
32.000	43.530	34.610	0.000	0.000	2.560	0.000	0.000	2.560	0.000	1.280	21.760	1.280	638.300	0.000	0.000	0.000	0.000	1.280	0.000	1.280	639.580
23.040	14.100	23.150	0.000	0.000	2.570	0.000	0.000	3.840	0.000	1.280	7.680	2.560	376.750	0.000	0.000	0.000	0.000	0.010	0.010	0.020	376.770
23.040	42.290	8.980	0.000	1.280	1.280	1.280	0.000	0.000	0.000	1.280	7.680	1.280	462.650	0.000	0.000	0.000	0.000	0.000	0.000	0.000	462.650
24.320	28.180	10.340	1.280	0.000	7.680	2.560	0.000	3.840	0.000	0.000	3.840	3.840	410.220	0.000	0.020	0.000	0.020	0.020	0.000	0.020	410.260
19.200	46.130	20.540	0.000	0.000	2.560	0.000	1.280	1.280	0.000	0.000	12.800	0.000	428.420	0.000	0.010	0.000	0.010	0.000	0.000	0.000	428.430
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
9.895	8.741	8.155	0.582	0.586	0.582	0.582	0.000	3.491	1.745	0.000	3.491	0.000	160.100	2.327	0.000	0.005	2.332	0.000	0.000	0.000	162.432
2.286	4.115	1.829	0.000	0.000	0.152	0.152	0.000	0.762	0.305	0.000	1.067	0.457	51.231	0.762	0.002	0.156	0.920	0.000	0.000	0.000	52.151
2.048	2.736	1.716	0.000	0.171	0.683	0.000	0.000	0.172	0.000	0.000	0.171	0.683	51.437	0.000	0.000	0.000	0.000	0.000	0.000	0.000	51.437
4.706	6.401	5.090	0.000	0.000	0.376	0.000	0.000	0.376	0.000	0.188	3.200	0.188	93.868	0.000	0.000	0.000	0.000	0.188	0.000	0.188	94.056
1.786	1.093	1.795	0.000	0.000	0.199	0.000	0.000	0.298	0.000	0.099	0.595	0.198	29.205	0.000	0.000	0.000	0.000	0.001	0.001	0.002	29.207
1.273	2.336	0.496	0.000	0.071	0.071	0.071	0.000	0.000	0.000	0.071	0.424	0.071	25.561	0.000	0.000	0.000	0.000	0.000	0.000	0.000	25.561
1.579	1.830	0.671	0.083	0.000	0.499	0.166	0.000	0.249	0.000	0.000	0.249	0.249	26.638	0.000	0.001	0.000	0.001	0.001	0.000	0.001	26.640
0.928	2.229	0.992	0.000	0.000	0.124	0.000	0.062	0.062	0.000	0.000	0.618	0.000	20.697	0.000	0.000	0.000	0.000	0.000	0.000	0.000	20.697
													0.000				0.000			0.000	0.000
													0.000				0.000			0.000	0.000
6.092	5.381	5.020	0.358	0.361	0.358	0.358	0.000	2.149	1.075	0.000	2.149	0.000	98.564	1.433	0.000	0.003	1.436	0.000	0.000	0.000	100.000
4.383	7.891	3.506	0.000	0.000	0.292	0.292	0.000	1.461	0.584	0.000	2.045	0.877	98.235	1.461	0.005	0.299	1.765	0.000	0.000	0.000	100.000
3.982	5.319	3.336	0.000	0.332	1.327	0.000	0.000	0.334	0.000	0.000	0.332	1.327	100.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	100.000
5.003	6.806	5.411	0.000	0.000	0.400	0.000	0.000	0.400	0.000	0.200	3.402	0.200	99.800	0.000	0.000	0.000	0.000	0.200	0.000	0.200	100.000
6.115	3.742	6.144	0.000	0.000	0.682	0.000	0.000	1.019	0.000	0.340	2.038	0.679	99.995	0.000	0.000	0.000	0.000	0.003	0.003	0.005	100.000
4.980	9.141	1.941	0.000	0.277	0.277	0.277	0.000	0.000	0.000	0.277	1.660	0.277	100.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	100.000
5.928	6.869	2.520	0.312	0.000	1.872	0.624	0.000	0.936	0.000	0.000	0.936	0.936	99.990	0.000	0.005	0.000	0.005	0.005	0.000	0.005	100.000
4.481	10.767	4.794	0.000	0.000	0.598	0.000	0.299	0.299	0.000	0.000	2.988	0.000	99.998	0.000	0.002	0.000	0.002	0.000	0.000	0.000	100.000
													0.000				0.000			0.000	0.000
													0.000				0.000			0.000	0.000

COUNTED PS99-1/21-05

Calcareous

Station	Depth (cm)	Prof (cm)	Fraction	weight dry sediment	Split (mL)	Split %	*Alabaminella weddellensis*	*Astrononion hamadaense*	*Bolivinellina pseudopunctata*	*Buccella frigida*	*Buccella inusitata*	*Cassidulina laevigata*	*Cassidulina reniforme*	*Cassidulina teretis*	*Cibicides refulgens*	*Cibicidoides lobatulus*	*Cribroelphidium excavatum*	*Elphidium clavatum*	*Globobulimina auriculata*	*Globobulimina ovata*	*Globocassidulina subglobosa*	*Hoeglundina elegans*	*Islandiella islandica*	*Islandiella norcrossi*	*Melonis barleeanus*	*Nonionella auricula*	*Nonionellina labradorica*	*Patellina corrugata*	*Pullenia bulloides*	*Robertinoides charlottensis*
	0-0,5	0.25	>500µm		all		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0	0	0
	0,5-1	0.75	>500µm		all		0	0	0	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0	0		0	0	0	0
	1-1,5	1.25	>500µm		all		0	0	0	1	0	0	1	1	0	16	1	0	0	1	0	1	1	0	2		0	0	0	0
	1,5-2	1.75	>500µm		all		0	0	0	0	0	0	0	0	0	9	0	0	0	0	0	1	0	0	1		0	0	0	0
	2-3	2.5	>500µm		all		0	0	0	0	0	0	0	0	13	17	0	0	8	0	0	0	0	0	0		8	0	0	0
	3-4	3.5	>500µm		all		0	0	0	0	1	1	0	0	15	9	0	0	18	4	1	0	0	0	0		1	0	0	0
	4-5	4.5	>500µm		all		0	0	0	0	0	0	0	0	7	5	0	0	12	0	0	0	0	0	0		1	0	0	0
	5-6	5.5	>500µm		all		0	0	0	0	0	0	0	0	6	4	0	0	26	2	0	1	0	0	2		2	0	0	0
	6-7	6.5	>500µm		all		0	0	0	0	0	0	0	2	8	7	0	0	21	1	0	0	1	1	0		0	0	0	0
	7-8	7.5	>500µm		all		0	0	0	0	0	0	0	0	6	6	0	0	12	0	0	0	2	0	1		0	0	0	0
	8-9	8.5	>500µm		all		0	0	0	0	1	0	0	0	17	31	0	0	49	10	0	0	0	0	0		7	0	0	0
	9-10	9.5	>500µm		all		0	0	0	0	0	0	0	0	21	36	0	0	53	2	0	5	0	0	0		1	0	0	0
	0-0,5	0.25	150-500µm		0		0	20	0	1	9	8	11	56	12	52	8	25	0	0	0	0	113	27	19		13	2	1	1
	0,5-1	0.75	150-500µm		0		0	24	0	3	19	85	35	93	0	74	10	16	0	0	1	2	68	27	30		30	0	1	0
	1-1,5	1.25	150-500µm				0	7	0	1	3	37	31	28	9	52	1	15	0	0	2	5	26	11	20		11	2	4	1
	1,5-2	1.75	150-500µm				1	7	0	6	2	30	18	51	7	65	0	10	0	0	0	2	52	23	19		13	0	3	2
	2-3	2.5	150-500µm				0	2	0	12	7	89	29	48	10	94	24	6	0	0	0	4	91	42	32		26	3	4	0
	3-4	3.5	150-500µm		0		0	24	0	5	11	86	28	88	7	96	11	17	1	0	0	6	27	41	26		15	2	1	0
	4-5	4.5	150-500µm		0		0	8	0	4	1	48	25	66	8	96	7	8	1	0	3	2	28	17	25		22	1	2	0
	5-6	5.5	150-500µm				0	13	1	2	2	38	15	47	4	61	3	8	1	0	0	2	29	12	18		8	1	0	3
	6-7	6.5	150-500µm				0	16	0	1	2	32	22	36	1	55	4	7	0	1	0	3	25	13	14		17	2	0	1
	7-8	7.5	150-500µm				0	10	1	6	1	60	45	33	2	56	5	4	0	0	0	2	24	28	13		6	1	3	12
	8-9	8.5	150-500µm				1	2	2	3	1	24	19	23	3	28	7	5	0	0	1	0	15	9	7	2	8	2	1	0
	9-10	9.5	150-500µm				0	4	0	5	0	23	30	43	3	34	12	4	1	0	0	0	15	16	8		4	1	1	0
Number of benthic foraminifera per split	0-0,5	0.25	>500µm		all	100	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	0,5-1	0.75	>500µm		all	100	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.060	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	1-1,5	1.25	>500µm		all	100	0.000	0.000	0.000	0.010	0.000	0.000	0.010	0.010	0.000	0.160	0.010	0.000	0.000	0.010	0.000	0.010	0.010	0.000	0.020	0.000	0.000	0.000	0.000	0.000
	1,5-2	1.75	>500µm		all	100	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.090	0.000	0.000	0.000	0.000	0.000	0.010	0.000	0.000	0.010	0.000	0.000	0.000	0.000	0.000
	2-3	2.5	>500µm		all	100	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.130	0.170	0.000	0.000	0.080	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.080	0.000	0.000	0.000
	3-4	3.5	>500µm		all	100	0.000	0.000	0.000	0.000	0.010	0.010	0.000	0.000	0.150	0.090	0.000	0.000	0.180	0.040	0.010	0.000	0.000	0.000	0.000	0.000	0.010	0.000	0.000	0.000
	4-5	4.5	>500µm		all	100	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.070	0.050	0.000	0.000	0.120	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.010	0.000	0.000	0.000
	5-6	5.5	>500µm		all	100	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.060	0.040	0.000	0.000	0.260	0.020	0.000	0.010	0.000	0.000	0.020	0.000	0.020	0.000	0.000	0.000
	6-7	6.5	>500µm		all	100	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.020	0.080	0.070	0.000	0.000	0.210	0.010	0.000	0.000	0.010	0.010	0.000	0.000	0.000	0.000	0.000	0.000
	7-8	7.5	>500µm		all	100	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.060	0.060	0.000	0.000	0.120	0.000	0.000	0.000	0.020	0.000	0.010	0.000	0.000	0.000	0.000	0.000
	8-9	8.5	>500µm		all	100	0.000	0.000	0.000	0.000	0.010	0.000	0.000	0.000	0.170	0.310	0.000	0.000	0.490	0.100	0.000	0.000	0.000	0.000	0.000	0.000	0.070	0.000	0.000	0.000
	9-10	9.5	>500µm		all	100	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.210	0.360	0.000	0.000	0.530	0.020	0.000	0.050	0.000	0.000	0.000	0.000	0.010	0.000	0.000	0.000
	0-0,5	0.25	150-500µm		0.031	3.125	0.000	6.400	0.000	0.320	2.880	2.560	3.520	17.920	3.840	16.640	2.560	8.000	0.000	0.000	0.000	0.000	36.160	8.640	6.080	0.000	4.160	0.640	0.320	0.320
	0,5-1	0.75	150-500µm		0.031	3.125	0.000	7.680	0.000	0.960	6.080	27.200	11.200	29.760	0.000	23.680	3.200	5.120	0.000	0.000	0.320	0.640	21.760	8.640	9.600	0.000	9.600	0.000	0.320	0.000
	1-1,5	1.25	150-500µm		0.004	0.391	0.000	17.920	0.000	2.560	7.680	94.720	79.360	71.680	23.040	133.120	2.560	38.400	0.000	0.000	5.120	12.800	66.560	28.160	51.200	0.000	28.160	5.120	10.240	2.560
	1,5-2	1.75	150-500µm		0.004	0.391	2.560	17.920	0.000	15.360	5.120	76.800	46.080	130.560	17.920	166.400	0.000	25.600	0.000	0.000	0.000	5.120	133.120	58.880	48.640	0.000	33.280	0.000	7.680	5.120
	2-3	2.5	150-500µm		0.004	0.391	0.000	5.120	0.000	30.720	17.920	227.840	74.240	122.880	25.600	240.640	61.440	15.360	0.000	0.000	0.000	10.240	232.960	107.520	81.920	0.000	66.560	7.680	10.240	0.000
	3-4	3.5	150-500µm		0.004	0.391	0.000	61.440	0.000	12.800	28.160	220.160	71.680	225.280	17.920	245.760	28.160	43.520	2.560	0.000	0.000	15.360	69.120	104.960	66.560	0.000	38.400	5.120	2.560	0.000
	4-5	4.5	150-500µm		0.004	0.391	0.000	20.480	0.000	10.240	2.560	122.880	64.000	168.960	20.480	245.760	17.920	20.480	2.560	0.000	7.680	5.120	71.680	43.520	64.000	0.000	56.320	2.560	5.120	0.000
	5-6	5.5	150-500µm		0.004	0.391	0.000	33.280	2.560	5.120	5.120	97.280	38.400	120.320	10.240	156.160	7.680	20.480	2.560	0.000	0.000	5.120	74.240	30.720	46.080	0.000	20.480	2.560	0.000	7.680
	6-7	6.5	150-500µm		0.004	0.391	0.000	40.960	0.000	2.560	5.120	81.920	56.320	92.160	2.560	140.800	10.240	17.920	0.000	2.560	0.000	7.680	64.000	33.280	35.840	0.000	43.520	5.120	0.000	2.560
	7-8	7.5	150-500µm		0.008	0.781	0.000	12.800	1.280	7.680	1.280	76.800	57.600	42.240	2.560	71.680	6.400	5.120	0.000	0.000	0.000	2.560	30.720	35.840	16.640	0.000	7.680	1.280	3.840	15.360
	8-9	8.5	150-500µm		0.004	0.391	2.560	5.120	5.120	7.680	2.560	61.440	48.640	58.880	7.680	71.680	17.920	12.800	0.000	0.000	2.560	0.000	38.400	23.040	17.920	5.120	20.480	5.120	2.560	0.000
	9-10	9.5	150-500µm		0.004	0.391	0.000	10.240	0.000	12.800	0.000	58.880	76.800	110.080	7.680	87.040	30.720	10.240	2.560	0.000	0.000	0.000	38.400	40.960	20.480	0.000	10.240	2.560	2.560	0.000
Sum of 2 fractions																														
	0-0,5	0.25	>500µm+(150-500µm)				0.000	6.400	0.000	0.320	2.880	2.560	3.520	17.920	3.840	16.640	2.560	8.000	0.000	0.000	0.000	0.000	36.160	8.640	6.080	0.000	4.160	0.640	0.320	0.320
	0,5-1	0.75	>500µm+(150-500µm)				0.000	7.680	0.000	0.960	6.080	27.200	11.200	29.760	0.000	23.740	3.200	5.120	0.000	0.000	0.320	0.640	21.760	8.640	9.600	0.000	9.600	0.000	0.320	0.000
	1-1,5	1.25	>500µm+(150-500µm)				0.000	17.920	0.000	2.570	7.680	94.720	79.370	71.690	23.040	133.280	2.570	38.400	0.000	0.010	5.120	12.810	66.570	28.160	51.220	0.000	28.160	5.120	10.240	2.560
	1,5-2	1.75	>500µm+(150-500µm)				2.560	17.920	0.000	15.360	5.120	76.800	46.080	130.560	17.920	166.490	0.000	25.600	0.000	0.000	0.000	5.130	133.120	58.880	48.650	0.000	33.280	0.000	7.680	5.120
	2-3	2.5	>500µm+(150-500µm)				0.000	5.120	0.000	30.720	17.920	227.840	74.240	122.880	25.730	240.810	61.440	15.360	0.080	0.000	0.000	10.240	232.960	107.520	81.920	0.000	66.640	7.680	10.240	0.000
	3-4	3.5	>500µm+(150-500µm)				0.000	61.440	0.000	12.800	28.170	220.170	71.680	225.280	18.070	245.850	28.160	43.520	2.740	0.040	0.010	15.360	69.120	104.960	66.560	0.000	38.410	5.120	2.560	0.000
	4-5	4.5	>500µm+(150-500µm)				0.000	20.480	0.000	10.240	2.560	122.880	64.000	168.960	20.550	245.810	17.920	20.480	2.680	0.000	7.680	5.120	71.680	43.520	64.000	0.000	56.330	2.560	5.120	0.000
	5-6	5.5	>500µm+(150-500µm)				0.000	33.280	2.560	5.120	5.120	97.280	38.400	120.320	10.300	156.200	7.680	20.480	2.820	0.020	0.000	5.130	74.240	30.720	46.100	0.000	20.500	2.560	0.000	7.680
	6-7	6.5	>500µm+(150-500µm)				0.000	40.960	0.000	2.560	5.120	81.920	56.320	92.180	2.640	140.870	10.240	17.920	0.210	2.570	0.000	7.680	64.010	33.290	35.840	0.000	43.520	5.120	0.000	2.560
	7-8	7.5	>500µm+(150-500µm)				0.000	12.800	1.280	7.680	1.280	76.800	57.600	42.240	2.620	71.740	6.400	5.120	0.120	0.000	0.000	2.560	30.740	35.840	16.650	0.000	7.680	1.280	3.840	15.360
	8-9	8.5	>500µm+(150-500µm)				2.560	5.120	5.120	7.680	2.570	61.440	48.640	58.880	7.850	71.990	17.920	12.800	0.490	0.100	2.560	0.000	38.400	23.040	17.920	5.120	20.550	5.120	2.560	0.000
	9-10	9.5	>500µm+(150-500µm)				0.000	10.240	0.000	12.800	0.000	58.880	76.800	110.080	7.890	87.400	30.720	10.240	3.090	0.020	0.000	0.050	38.400	40.960	20.480	0.000	10.250	2.560	2.560	0.000
Total per dry sediment																														
	0-0,5	0.25	>500µm+(150-500µm)	4.90			0.000	1.306	0.000	0.065	0.588	0.522	0.718	3.657	0.784	3.396	0.522	1.633	0.000	0.000	0.000	0.000	7.380	1.763	1.241	0.000	0.849	0.131	0.065	0.065
	0,5-1	0.75	>500µm+(150-500µm)	4.50			0.000	1.707	0.000	0.213	1.351	6.044	2.489	6.613	0.000	5.276	0.711	1.138	0.000	0.000	0.071	0.142	4.836	1.920	2.133	0.000	2.133	0.000	0.071	0.000
	1-1,5	1.25	>500µm+(150-500µm)	6.50			0.000	2.757	0.000	0.395	1.182	14.572	12.211	11.029	3.545	20.505	0.395	5.908	0.000	0.002	0.788	1.971	10.242	4.332	7.880	0.000	4.332	0.788	1.575	0.394
	1,5-2	1.75	>500µm+(150-500µm)	7.90			0.324	2.268	0.000	1.944	0.648	9.722	5.833	16.527	2.268	21.075	0.000	3.241	0.000	0.000	0.000	0.649	16.851	7.453	6.158	0.000	4.213	0.000	0.972	0.648
	2-3	2.5	>500µm+(150-500µm)	20.20			0.000	0.253	0.000	1.521	0.887	11.279	3.675	6.083	1.274	11.921	3.042	0.760	0.004	0.000	0.000	0.507	11.533	5.323	4.055	0.000	3.299	0.380	0.507	0.000
	3-4	3.5	>500µm+(150-500µm)	25.70			0.000	2.391	0.000	0.498	1.096	8.567	2.789	8.766	0.703	9.566	1.096	1.693	0.107	0.002	0.000	0.598	2.689	4.084	2.590	0.000	1.495	0.199	0.100	0.000
	4-5	4.5	>500µm+(150-500µm)	17.70			0.000	1.157	0.000	0.579	0.145	6.942	3.616	9.546	1.161	13.888	1.012	1.157	0.151	0.000	0.434	0.289	4.050	2.459	3.616	0.000	3.182	0.145	0.289	0.000
	5-6	5.5	>500µm+(150-500µm)	21.00			0.000	1.585	0.122	0.244	0.244	4.632	1.829	5.730	0.490	7.438	0.366	0.975	0.134	0.001	0.000	0.244	3.535	1.463	2.195	0.000	0.976	0.122	0.000	0.366
	6-7	6.5	>500µm+(150-500µm)	17.30			0.000	2.368	0.000	0.148	0.296	4.735	3.255	5.328	0.153	8.143	0.592	1.036	0.012	0.149	0.000	0.444	3.700	1.924	2.072	0.000	2.516	0.296	0.000	0.148
	7-8	7.5	>500µm+(150-500µm)	15.30			0.000	0.837	0.084	0.502	0.084	5.020	3.765	2.761	0.171	4.689	0.418	0.335	0.008	0.000	0.000	0.167	2.009	2.342	1.088	0.000	0.502	0.084	0.251	1.004
	8-9	8.5	>500µm+(150-500µm)	15.50			0.165	0.330	0.330	0.495	0.166	3.964	3.138	3.799	0.506	4.645	1.156	0.826	0.032	0.006	0.165	0.000	2.477	1.486	1.156	0.330	1.326	0.330	0.165	0.000
	9-10	9.5	>500µm+(150-500µm)	24.60			0.000	0.416	0.000	0.520	0.000	2.393	3.122	4.475	0.321	3.553	1.249	0.416	0.126	0.001	0.000	0.002	1.561	1.665	0.833	0.000	0.417	0.104	0.104	0.000
ABUNDANCE %																														
	0-0,5	0.25	>500µm+(150-500µm)				0.000	5.102	0.000	0.255	2.296	2.041	2.806	14.286	3.061	13.265	2.041	6.378	0.000	0.000	0.000	0.000	28.827	6.888	4.847	0.000	3.316	0.510	0.255	0.255
	0,5-1	0.75	>500µm+(150-500µm)				0.000	4.484	0.000	0.561	3.550	15.882	6.540	17.377	0.000	13.862	1.869	2.990	0.000	0.000	0.187	0.374	12.706	5.045	5.606	0.000	5.606	0.000	0.187	0.000
	1-1,5	1.25	>500µm+(150-500µm)				0.000	2.490	0.000	0.357	1.067	13.162	11.029	9.962	3.202	18.521	0.357	5.336	0.000	0.001	0.711	1.780	9.251	3.913	7.118	0.000	3.913	0.711	1.423	0.356
	1,5-2	1.75	>500µm+(150-500µm)				0.306	2.140	0.000	1.835	0.612	9.173	5.504	15.594	2.140	19.885	0.000	3.058	0.000	0.000	0.000	0.613	15.900	7.033	5.811	0.000	3.975	0.000	0.917	0.612
	2-3	2.5	>500µm+(150-500µm)				0.000	0.372	0.000	2.230	1.301	16.537	5.388	8.919	1.867	17.478	4.459	1.115	0.006	0.000	0.000	0.743	16.908	7.804	5.946	0.000	4.837	0.557	0.743	0.000
	3-4	3.5	>500µm+(150-500µm)				0.000	4.713	0.000	0.982	2.161	16.890	5.499	17.282	1.386	18.860	2.160	3.339	0.210	0.003	0.001	1.178	5.302	8.052	5.106	0.000	2.947	0.393	0.196	0.000
	4-5	4.5	>500µm+(150-500µm)				0.000	2.061	0.000	1.031	0.258	12.368	6.442	17.006	2.068	24.741	1.804	2.061	0.270	0.000	0.773	0.515	7.215	4.380	6.442	0.000	5.670	0.258	0.515	0.000
	5-6	5.5	>500µm+(150-500µm)				0.000	4.657	0.358	0.716	0.716	13.611	5.373	16.835	1.441	21.856	1.075	2.866	0.395	0.003	0.000	0.718	10.388	4.298	6.450	0.000	2.868	0.358	0.000	1.075
	6-7	6.5	>500µm+(150-500µm)				0.000	6.150	0.000	0.384	0.769	12.300	8.456	13.840	0.396	21.151	1.537	2.691	0.032	0.386	0.000	1.153	9.611	4.998	5.381	0.000	6.534	0.769	0.000	0.384
	7-8	7.5	>500µm+(150-500µm)				0.000	3.094	0.309	1.856	0.309	18.563	13.922	10.210	0.633	17.340	1.547	1.238	0.029	0.000	0.000	0.619	7.430	8.663	4.024	0.000	1.856	0.309	0.928	3.713
	8-9	8.5	>500µm+(150-500µm)				0.587	1.173	1.173	1.760	0.589	14.080	11.147	13.494	1.799	16.498	4.107	2.933	0.112	0.023	0.587	0.000	8.800	5.280	4.107	1.173	4.710	1.173	0.587	0.000
	9-10	9.5	>500µm+(150-500µm)				0.000	1.831	0.000	2.289	0.000	10.527	13.731	19.681	1.411	15.626	5.492	1.831	0.552	0.004	0.000	0.009	6.866	7.323	3.662	0.000	1.833	0.458	0.458	0.000

											Agglutinated					Miliolids				
Rosalina sp	*Stainforthia loeblichi*	*Trifarina angulosa*	*Trifarina carinata*	*Trifarina fluens*	*Turrispirillina arctica*	*Dentalina advena*	*Fissurina*	*Lagena distomi*	*Lenticulina limbosa*	*total*	*Lagenammina difflugiformis*	*Lagenammina micacea*	*Psammosphaera sp.*	*Rhabdammina scabra*	*total*	*Pyrgo*	*Pyrgo williamsoni*	*Quinqueloculina seminula*	*total*	*Supertotal*
0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0		0	6	0	0	0	0	0	0	0	0	0	6
0	0	0	0	0	0	0	0		0	25	0	0	0	1	1	0	0	1	1	27
0	0	0	0	0	0	1	0		0	11	0	1	0	0	1	0	0	0	0	12
0	0	0	0	0	0	0	0		0	46	0	0	0	4	4	0	0	0	0	50
0	0	0	0	0	0	0	0		0	50	0	0	0	1	1	0	0	1	1	52
0	0	0	0	0	0	0	0		0	25	0	0	0	0	0	0	0	2	2	27
0	0	0	0	0	0	0	0		0	43	0	0	0	0	0	0	0	2	2	45
0	0	0	0	0	0	0	0		0	41	0	0	0	0	0	1	1	0	2	43
0	0	0	0	0	0	0	0		0	27	0	0	0	0	0	0	0	1	1	28
0	0	0	0	0	0	0	0		0	115	0	0	0	0	0	0	0	0	0	115
0	0	0	0	0	0	2	0		0	118	0	0	0	0	0	0	0	3	3	121
0	0	0	0	12	1		0		0	391	0	1	0	0	1	0	0	0	0	392
0	0	3	0	10	0		0		0	531	1	3	0	0	4	0	0	0	0	535
0	0	3	2	4	0		0		0	275			1	2	3			3	3	281
2	0	1	0	11	0		0		1	325					0			1	1	326
2	0	3	0	7	0		1		1	535		1			1				0	536
3	0	2	0	9	0		2		0	506					0			1	1	507
3	1	3	0	6	0		1	1	0	385					0			1	1	386
5	0	3	0	2	0		0		1	278					0				0	278
1	0	1	0	5	0		1		0	259					0				0	259
2	1	0	0	6	0		0		0	321					0			2	2	323
0	0	0	0	4	0		3		0	167					0				0	167
1	0	0	0	9	0		2		0	214					0			2	2	216
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.060	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.060
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.250	0.000	0.000	0.000	0.010	0.010	0.000	0.000	0.010	0.010	0.270
0.000	0.000	0.000	0.000	0.000	0.000	0.010	0.000	0.000	0.000	0.110	0.000	0.010	0.000	0.000	0.010	0.000	0.000	0.000	0.000	0.120
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.460	0.000	0.000	0.000	0.040	0.040	0.000	0.000	0.000	0.000	0.500
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.500	0.000	0.000	0.000	0.010	0.010	0.000	0.000	0.010	0.010	0.520
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.250	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.020	0.020	0.270
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.430	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.020	0.020	0.450
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.410	0.000	0.000	0.000	0.000	0.000	0.010	0.010	0.000	0.020	0.430
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.270	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.010	0.010	0.280
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.150	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.150
0.000	0.000	0.000	0.000	0.000	0.000	0.020	0.000	0.000	0.000	1.180	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.030	0.030	1.210
0.000	0.000	0.000	0.000	3.840	0.320	0.000	0.000	0.000	0.000	125.120	0.000	0.320	0.000	0.000	0.320	0.000	0.000	0.000	0.000	125.440
0.000	0.000	0.960	0.000	3.200	0.000	0.000	0.000	0.000	0.000	169.920	0.320	0.960	0.000	0.000	1.280	0.000	0.000	0.000	0.000	171.200
0.000	0.000	7.680	5.120	10.240	0.000	0.000	0.000	0.000	0.000	704.000	0.000	0.000	2.560	5.120	7.680	0.000	0.000	7.680	7.680	719.360
5.120	0.000	2.560	0.000	28.160	0.000	0.000	0.000	0.000	2.560	832.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.560	2.560	834.560
5.120	0.000	7.680	0.000	17.920	0.000	0.000	2.560	0.000	2.560	1369.600	0.000	2.560	0.000	0.000	2.560	0.000	0.000	0.000	0.000	1372.160
7.680	0.000	5.120	0.000	23.040	0.000	0.000	5.120	0.000	0.000	1295.360	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.560	2.560	1297.920
7.680	2.560	7.680	0.000	15.360	0.000	0.000	2.560	2.560	0.000	985.600	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.560	2.560	988.160
12.800	0.000	7.680	0.000	5.120	0.000	0.000	0.000	0.000	2.560	711.680	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	711.680
2.560	0.000	2.560	0.000	12.800	0.000	0.000	2.560	0.000	0.000	663.040	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	663.040
2.560	1.280	0.000	0.000	7.680	0.000	0.000	0.000	0.000	0.000	410.880	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.560	2.560	413.440
0.000	0.000	0.000	0.000	10.240	0.000	0.000	7.680	0.000	0.000	427.520	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	427.520
2.560	0.000	0.000	0.000	23.040	0.000	0.000	5.120	0.000	0.000	547.840	0.000	0.000	0.000	0.000	0.000	0.000	0.000	5.120	5.120	552.960
0.000	0.000	0.000	0.000	3.840	0.320	0.000	0.000	0.000	0.000	125.120	0.000	0.320	0.000	0.000	0.320	0.000	0.000	0.000	0.000	125.440
0.000	0.000	0.960	0.000	3.200	0.000	0.000	0.000	0.000	0.000	169.980	0.320	0.960	0.000	0.000	1.280	0.000	0.000	0.000	0.000	171.260
0.000	0.000	7.680	5.120	10.240	0.000	0.000	0.000	0.000	0.000	704.250	0.000	0.000	2.560	5.130	7.690	0.000	0.000	7.690	7.690	719.630
5.120	0.000	2.560	0.000	28.160	0.000	0.010	0.000	0.000	2.560	832.110	0.000	0.010	0.000	0.000	0.010	0.000	0.000	2.560	2.560	834.680
5.120	0.000	7.680	0.000	17.920	0.000	0.000	2.560	0.000	2.560	1370.060	0.000	2.560	0.000	0.040	2.600	0.000	0.000	0.000	0.000	1372.660
7.680	0.000	5.120	0.000	23.040	0.000	0.000	5.120	0.000	0.000	1295.860	0.000	0.000	0.000	0.010	0.010	0.000	0.000	2.570	2.570	1298.440
7.680	2.560	7.680	0.000	15.360	0.000	0.000	2.560	2.560	0.000	985.850	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.580	2.580	988.430
12.800	0.000	7.680	0.000	5.120	0.000	0.000	0.000	0.000	2.560	712.110	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.020	0.020	712.130
2.560	0.000	2.560	0.000	12.800	0.000	0.000	2.560	0.000	0.000	663.450	0.000	0.000	0.000	0.000	0.000	0.010	0.010	0.000	0.020	663.470
2.560	1.280	0.000	0.000	7.680	0.000	0.000	0.000	0.000	0.000	411.150	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.570	2.570	413.720
0.000	0.000	0.000	0.000	10.240	0.000	0.000	7.680	0.000	0.000	436.350	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	436.350
2.560	0.000	0.000	0.000	23.040	0.000	0.020	5.120	0.000	0.000	554.160	0.000	0.000	0.000	0.000	0.000	0.000	0.000	5.150	5.150	559.310
0.000	0.000	0.000	0.000	0.784	0.065	0.000	0.000	0.000	0.000	25.535	0.000	0.065	0.000	0.000	0.065	0.000	0.000	0.000	0.000	25.600
0.000	0.000	0.213	0.000	0.711	0.000	0.000	0.000	0.000	0.000	37.773	0.071	0.213	0.000	0.000	0.284	0.000	0.000	0.000	0.000	38.058
0.000	0.000	1.182	0.788	1.575	0.000	0.000	0.000	0.000	0.000	108.346	0.000	0.000	0.394	0.789	1.183	0.000	0.000	1.183	1.183	110.712
0.648	0.000	0.324	0.000	3.565	0.000	0.001	0.000	0.000	0.324	105.656	0.000	0.001	0.000	0.000	0.001	0.000	0.000	0.324	0.324	105.981
0.253	0.000	0.380	0.000	0.887	0.000	0.000	0.127	0.000	0.127	68.078	0.000	0.127	0.000	0.002	0.129	0.000	0.000	0.000	0.000	68.207
0.299	0.000	0.199	0.000	0.896	0.000	0.000	0.199	0.000	0.000	50.622	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.100	0.100	50.722
0.434	0.145	0.434	0.000	0.868	0.000	0.000	0.145	0.145	0.000	55.987	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.146	0.146	56.133
0.610	0.000	0.366	0.000	0.244	0.000	0.000	0.000	0.000	0.122	34.032	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.001	34.033
0.148	0.000	0.148	0.000	0.740	0.000	0.000	0.148	0.000	0.000	38.498	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.000	0.001	38.499
0.167	0.084	0.000	0.000	0.502	0.000	0.000	0.000	0.000	0.000	26.873	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.168	0.168	27.041
0.000	0.000	0.000	0.000	0.661	0.000	0.000	0.495	0.000	0.000	28.152	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	28.152
0.104	0.000	0.000	0.000	0.937	0.000	0.001	0.208	0.000	0.000	22.527	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.209	0.209	22.736
0.000	0.000	0.000	0.000	3.061	0.255	0.000	0.000	0.000	0.000	99.745	0.000	0.255	0.000	0.000	0.255	0.000	0.000	0.000	0.000	100.000
0.000	0.000	0.561	0.000	1.869	0.000	0.000	0.000	0.000	0.000	99.253	0.187	0.561	0.000	0.000	0.747	0.000	0.000	0.000	0.000	100.000
0.000	0.000	1.067	0.711	1.423	0.000	0.000	0.000	0.000	0.000	97.863	0.000	0.000	0.356	0.713	1.069	0.000	0.000	1.069	1.069	100.000
0.612	0.000	0.306	0.000	3.363	0.000	0.001	0.000	0.000	0.306	99.693	0.000	0.001	0.000	0.000	0.001	0.000	0.000	0.306	0.306	100.000
0.372	0.000	0.557	0.000	1.301	0.000	0.000	0.186	0.000	0.186	99.811	0.000	0.186	0.000	0.003	0.189	0.000	0.000	0.000	0.000	100.000
0.589	0.000	0.393	0.000	1.767	0.000	0.000	0.393	0.000	0.000	99.802	0.000	0.000	0.000	0.001	0.001	0.000	0.000	0.197	0.197	100.000
0.773	0.258	0.773	0.000	1.546	0.000	0.000	0.258	0.258	0.000	99.740	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.260	0.260	100.000
1.791	0.000	1.075	0.000	0.716	0.000	0.000	0.000	0.000	0.358	99.997	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003	0.003	100.000
0.384	0.000	0.384	0.000	1.922	0.000	0.000	0.384	0.000	0.000	99.997	0.000	0.000	0.000	0.000	0.000	0.002	0.002	0.000	0.003	100.000
0.619	0.309	0.000	0.000	1.856	0.000	0.000	0.000	0.000	0.000	99.379	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.621	0.621	100.000
0.000	0.000	0.000	0.000	2.347	0.000	0.000	1.760	0.000	0.000	100.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	100.000
0.458	0.000	0.000	0.000	4.119	0.000	0.004	0.915	0.000	0.000	99.079	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.921	0.921	100.000

COUNTED | PS 99-1/07-3

Station	Depth (cm)	Prof (cm)	Fraction	weight dry sediment	Split (mL)	Split %	Calcareous																								
							Astrononion hamadaense	*Biasterigerina planorbis*	*Bolivina earlandi*	*Buccella frigida*	*Buccella inusitata*	*Cassidulina laevigata*	*Cassidulina reniforme*	*Cassidulina teretis*	*Cibicidoides lobatulus*	*Cribroelphidium excavatum*	*Discorbinella bertheloti*	*Discorbis vilardeboanus*	*Elphidium clavatum*	*Eponides sp*	*Fursenkoina schreibersiana*	*Globobulimina auriculata*	*Globobulimina ovata*	*Globocassidulina subglobosa*	*Hoeglundina elegans*	*Islandiella islandica*	*Islandiella norcrossi*	*Melonis barleeanus*	*Nonionella auricula*	*Nonionellina labradorica*	*Patellina corrugata*
	0-0,5	0.25	>500µm		all																	20								1	
	0,5-1	0.75	>500µm		all																	7	1							1	
	1-1,5	1.25	>500µm		all																	5								1	
	1,5-2	1.75	>500µm		all																	8								1	
	2-3	2.5	>500µm		all										1							4								1	
	3-4	3.5	>500µm		all																	8								2	
	4-5	4.5	>500µm		all																	4								2	
	5-6	5.5	>500µm		all										1							2								1	
	6-7	6.5	>500µm		all																										
	7-8	7.5	>500µm		all																	1									
	8-9	8.5	>500µm		all										2							2								1	
	9-10	9.5	>500µm		all										2							6								1	
	0-0,5	0.25	150-500µm				62		4	5	4	8	35	22	8	7	1	7	31			5	3	8	5	25	6	1		27	7
	0,5-1	0.75	150-500µm				48		4	5	3	4	33	8	12	10		15	21			6		28	3	13	6		4	21	8
	1-1,5	1.25	150-500µm				38		4	9	10	10	45	8	15	1	8	14	39	1				11		9	3		4	19	3
	1,5-2	1.75	150-500µm				30		5	11	7	8	56	11	11	12		10	51	3		2		20	5	9	10		4	12	23
	2-3	2.5	150-500µm				23	3	4	4	5	4	46	3	21	15		8	59					20	2	3	6			9	14
	3-4	3.5	150-500µm				30	11	4	6	7	5	56	6	12	8	1		58		1			22	7	6	2		4	10	17
	4-5	4.5	150-500µm				10	5	1	4	7	5	38	4	23	12		7	2					21	1	5	4	1		4	9
	5-6	5.5	150-500µm				16	3	1	7	2	10	63	7	26	11		15	39					12	3	15	9	2	5	5	20
	6-7	6.5	150-500µm				16	7	4	16	11	8	63	6	13	6		4	42				1	13	2	7	4	4	3	8	13
	7-8	7.5	150-500µm				28	9	2	17	15	8	59	8	14	9		3	39				1	22	7	10	6		4	12	8
	8-9	8.5	150-500µm				18	3	3	17	7	21	66	5	16	13		1	51			1		16	3	8	8	8	4	6	15
	9-10	9.5	150-500µm				30		2	12	6	9	67	8	19	3		10	43					18		10	6		1	6	13
Number of benthic foraminifera per split	0-0,5	0.25	>500µm		all	100	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.200	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.010	0.000
	0,5-1	0.75	>500µm		all	100	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.070	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.010	0.000
	1-1,5	1.25	>500µm		all	100	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.050	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.010	0.000
	1,5-2	1.75	>500µm		all	100	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.080	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.010	0.000
	2-3	2.5	>500µm		all	100	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.040	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.010	0.000
	3-4	3.5	>500µm		all	100	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.080	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.020	0.000
	4-5	4.5	>500µm		all	100	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.040	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.020	0.000
	5-6	5.5	>500µm		all	100	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.020	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.010	0.000
	6-7	6.5	>500µm		all	100	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	7-8	7.5	>500µm		all	100	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	8-9	8.5	>500µm		all	100	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.020	0.000	0.000	0.000	0.000	0.000	0.000	0.020	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.010	0.000
	9-10	9.5	>500µm		all	100	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.020	0.000	0.000	0.000	0.000	0.000	0.000	0.060	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.010	0.000
	0-0,5	0.25	150-500µm		0.125	12.500	4.960	0.000	0.320	0.400	0.320	0.640	2.800	1.760	0.640	0.560	0.080	0.560	2.480	0.000	0.000	0.400	0.240	0.640	0.400	2.000	0.480	0.080	0.000	2.160	0.560
	0,5-1	0.75	150-500µm		0.125	12.500	3.840	0.000	0.320	0.400	0.240	0.320	2.640	0.640	0.960	0.800	0.000	1.200	1.680	0.000	0.000	0.480	0.000	2.240	0.240	1.040	0.480	0.000	0.320	1.680	0.640
	1-1,5	1.25	150-500µm		0.125	12.500	3.040	0.000	0.320	0.720	0.800	0.800	3.600	0.640	1.200	0.080	0.640	1.120	3.120	0.080	0.000	0.000	0.000	0.880	0.000	0.720	0.240	0.000	0.320	1.520	0.240
	1,5-2	1.75	150-500µm		0.125	12.500	2.400	0.000	0.400	0.880	0.560	0.640	4.480	0.880	0.880	0.960	0.000	0.800	4.080	0.240	0.000	0.160	0.000	1.600	0.400	0.720	0.800	0.000	0.320	0.960	1.840
	2-3	2.5	150-500µm		0.063	6.250	3.680	0.480	0.640	0.640	0.800	0.640	7.360	0.480	3.360	2.400	0.000	1.280	9.440	0.000	0.000	0.000	0.000	3.200	0.320	0.480	0.960	0.000	0.000	1.440	2.240
	3-4	3.5	150-500µm		0.094	9.375	3.200	1.173	0.427	0.640	0.747	0.533	5.973	0.640	1.280	0.853	0.107	0.000	6.187	0.000	0.107	0.000	0.000	2.347	0.747	0.640	0.213	0.000	0.427	1.067	1.813
	4-5	4.5	150-500µm		0.031	3.125	3.200	1.600	0.320	1.280	2.240	1.600	12.160	1.280	7.360	3.840	0.000	2.240	0.640	0.000	0.000	0.000	0.000	6.720	0.320	1.600	1.280	0.320	0.000	1.280	2.880
	5-6	5.5	150-500µm		0.063	6.250	2.560	0.480	0.160	1.120	0.320	1.600	10.080	1.120	4.160	1.760	0.000	2.400	6.240	0.000	0.000	0.000	0.000	1.920	0.480	2.400	1.440	0.320	0.800	0.800	3.200
	6-7	6.5	150-500µm		0.063	6.250	2.560	1.120	0.640	2.560	1.760	1.280	10.080	0.960	2.080	0.960	0.000	0.640	6.720	0.000	0.000	0.000	0.160	2.080	0.320	1.120	0.640	0.640	0.480	1.280	2.080
	7-8	7.5	150-500µm		0.063	6.250	4.480	1.440	0.320	2.720	2.400	1.280	9.440	1.280	2.240	1.440	0.000	0.480	6.240	0.000	0.000	0.000	0.160	3.520	1.120	1.600	0.960	0.000	0.640	1.920	1.280
	8-9	8.5	150-500µm		0.063	6.250	2.880	0.480	0.480	2.720	1.120	3.360	10.560	0.800	2.560	2.080	0.000	0.160	8.160	0.000	0.000	0.160	0.000	2.560	0.480	1.280	1.280	1.280	0.640	0.960	2.400
	9-10	9.5	150-500µm		0.031	3.125	9.600	0.000	0.640	3.840	1.920	2.880	21.440	2.560	6.080	0.960	0.000	3.200	13.760	0.000	0.000	0.000	0.000	5.760	0.000	3.200	1.920	0.000	0.320	1.920	4.160
Sum of 2 fractions																															
	0-0,5	0.25	>500µm+(150-500µm)				4.960	0.000	0.320	0.400	0.320	0.640	2.800	1.760	0.640	0.560	0.080	0.560	2.480	0.000	0.000	0.600	0.240	0.640	0.400	2.000	0.480	0.080	0.000	2.170	0.560
	0,5-1	0.75	>500µm+(150-500µm)				3.840	0.000	0.320	0.400	0.240	0.320	2.640	0.640	0.960	0.800	0.000	1.200	1.680	0.000	0.000	0.550	0.010	2.240	0.240	1.040	0.480	0.000	0.320	1.690	0.640
	1-1,5	1.25	>500µm+(150-500µm)				3.040	0.000	0.320	0.720	0.800	0.800	3.600	0.640	1.200	0.080	0.640	1.120	3.120	0.080	0.000	0.050	0.000	0.880	0.000	0.720	0.240	0.000	0.320	1.530	0.240
	1,5-2	1.75	>500µm+(150-500µm)				2.400	0.000	0.400	0.880	0.560	0.640	4.480	0.880	0.880	0.960	0.000	0.800	4.080	0.240	0.000	0.240	0.000	1.600	0.400	0.720	0.800	0.000	0.320	0.970	1.840
	2-3	2.5	>500µm+(150-500µm)				3.680	0.480	0.640	0.640	0.800	0.640	7.360	0.480	3.370	2.400	0.000	1.280	9.440	0.000	0.000	0.040	0.000	3.200	0.320	0.480	0.960	0.000	0.000	1.450	2.240
	3-4	3.5	>500µm+(150-500µm)				3.200	1.173	0.427	0.640	0.747	0.533	5.973	0.640	1.280	0.853	0.107	0.000	6.187	0.000	0.107	0.080	0.000	2.347	0.747	0.640	0.213	0.000	0.427	1.087	1.813
	4-5	4.5	>500µm+(150-500µm)				3.200	1.600	0.320	1.280	2.240	1.600	12.160	1.280	7.360	3.840	0.000	2.240	0.640	0.000	0.000	0.040	0.000	6.720	0.320	1.600	1.280	0.320	0.000	1.300	2.880
	5-6	5.5	>500µm+(150-500µm)				2.560	0.480	0.160	1.120	0.320	1.600	10.080	1.120	4.170	1.760	0.000	2.400	6.240	0.000	0.000	0.020	0.000	1.920	0.480	2.400	1.440	0.320	0.800	0.810	3.200
	6-7	6.5	>500µm+(150-500µm)				2.560	1.120	0.640	2.560	1.760	1.280	10.080	0.960	2.080	0.960	0.000	0.640	6.720	0.000	0.000	0.000	0.160	2.080	0.320	1.120	0.640	0.640	0.480	1.280	2.080
	7-8	7.5	>500µm+(150-500µm)				4.480	1.440	0.320	2.720	2.400	1.280	9.440	1.280	2.240	1.440	0.000	0.480	6.240	0.000	0.000	0.010	0.160	3.520	1.120	1.600	0.960	0.000	0.640	1.920	1.280
	8-9	8.5	>500µm+(150-500µm)				2.880	0.480	0.480	2.720	1.120	3.360	10.560	0.800	2.580	2.080	0.000	0.160	8.160	0.000	0.000	0.180	0.000	2.560	0.480	1.280	1.280	1.280	0.640	0.970	2.400
	9-10	9.5	>500µm+(150-500µm)				9.600	0.000	0.640	3.840	1.920	2.880	21.440	2.560	6.100	0.960	0.000	3.200	13.760	0.000	0.000	0.060	0.000	5.760	0.000	3.200	1.920	0.000	0.320	1.930	4.160
Total per dry sediment																															
	0-0,5	0.25	>500µm+(150-500µm)	17.30			0.287	0.000	0.018	0.023	0.018	0.037	0.162	0.102	0.037	0.032	0.005	0.032	0.143	0.000	0.000	0.035	0.014	0.037	0.023	0.116	0.028	0.005	0.000	0.125	0.032
	0,5-1	0.75	>500µm+(150-500µm)	12.50			0.307	0.000	0.026	0.032	0.019	0.026	0.211	0.051	0.077	0.064	0.000	0.096	0.134	0.000	0.000	0.044	0.001	0.179	0.019	0.083	0.038	0.000	0.026	0.135	0.051
	1-1,5	1.25	>500µm+(150-500µm)	14.10			0.216	0.000	0.023	0.051	0.057	0.057	0.255	0.045	0.085	0.006	0.045	0.079	0.221	0.006	0.000	0.004	0.000	0.062	0.000	0.051	0.017	0.000	0.023	0.109	0.017
	1,5-2	1.75	>500µm+(150-500µm)	14.80			0.162	0.000	0.027	0.059	0.038	0.043	0.303	0.059	0.059	0.065	0.000	0.054	0.276	0.016	0.000	0.016	0.000	0.108	0.027	0.049	0.054	0.000	0.022	0.066	0.124
	2-3	2.5	>500µm+(150-500µm)	21.00			0.175	0.023	0.030	0.030	0.038	0.030	0.350	0.023	0.160	0.114	0.000	0.061	0.450	0.000	0.000	0.002	0.000	0.152	0.015	0.023	0.046	0.000	0.000	0.069	0.107
	3-4	3.5	>500µm+(150-500µm)	26.70			0.120	0.044	0.016	0.024	0.028	0.020	0.224	0.024	0.048	0.032	0.004	0.000	0.232	0.000	0.004	0.003	0.000	0.088	0.028	0.024	0.008	0.000	0.016	0.041	0.068
	4-5	4.5	>500µm+(150-500µm)	24.70			0.130	0.065	0.013	0.052	0.091	0.065	0.492	0.052	0.298	0.155	0.000	0.091	0.026	0.000	0.000	0.002	0.000	0.272	0.013	0.065	0.052	0.013	0.000	0.053	0.117
	5-6	5.5	>500µm+(150-500µm)	28.90			0.089	0.017	0.006	0.039	0.011	0.055	0.349	0.039	0.144	0.061	0.000	0.083	0.216	0.000	0.000	0.001	0.000	0.066	0.017	0.083	0.050	0.011	0.028	0.028	0.111
	6-7	6.5	>500µm+(150-500µm)	22.50			0.114	0.050	0.028	0.114	0.078	0.057	0.448	0.043	0.092	0.043	0.000	0.028	0.299	0.000	0.000	0.000	0.007	0.092	0.014	0.050	0.028	0.028	0.021	0.057	0.092
	7-8	7.5	>500µm+(150-500µm)	28.30			0.158	0.051	0.011	0.096	0.085	0.045	0.334	0.045	0.079	0.051	0.000	0.017	0.220	0.000	0.000	0.000	0.006	0.124	0.040	0.057	0.034	0.000	0.023	0.068	0.045
	8-9	8.5	>500µm+(150-500µm)	24.60			0.117	0.020	0.020	0.111	0.046	0.137	0.429	0.033	0.105	0.085	0.000	0.007	0.332	0.000	0.000	0.007	0.000	0.104	0.020	0.052	0.052	0.052	0.026	0.039	0.098
	9-10	9.5	>500µm+(150-500µm)	32.70			0.294	0.000	0.020	0.117	0.059	0.088	0.656	0.078	0.187	0.029	0.000	0.098	0.421	0.000	0.000	0.002	0.000	0.176	0.000	0.098	0.059	0.000	0.010	0.059	0.127
ABUNDANCE %																															
	0-0,5	0.25	>500µm+(150-500µm)				17.945	0.000	1.158	1.447	1.158	2.315	10.130	6.368	2.315	2.026	0.289	2.026	8.973	0.000	0.000	2.171	0.868	2.315	1.447	7.236	1.737	0.289	0.000	7.851	2.026
	0,5-1	0.75	>500µm+(150-500µm)				16.710	0.000	1.393	1.741	1.044	1.393	11.488	2.785	4.178	3.481	0.000	5.222	7.311	0.000	0.000	2.393	0.044	9.748	1.044	4.526	2.089	0.000	1.393	7.354	2.785
	1-1,5	1.25	>500µm+(150-500µm)				13.189	0.000	1.388	3.124	3.471	3.471	15.618	2.777	5.206	0.347	2.777	4.859	13.536	0.347	0.000	0.217	0.000	3.818	0.000	3.124	1.041	0.000	1.388	6.638	1.041
	1,5-2	1.75	>500µm+(150-500µm)				8.517	0.000	1.419	3.123	1.987	2.271	15.898	3.123	3.123	3.407	0.000	2.839	14.478	0.852	0.000	0.852	0.000	5.678	1.419	2.555	2.839	0.000	1.136	3.442	6.529
	2-3	2.5	>500µm+(150-500µm)				7.507	0.979	1.306	1.306	1.632	1.306	15.014	0.979	6.875	4.896	0.000	2.611	19.257	0.000	0.000	0.082	0.000	6.528	0.653	0.979	1.958	0.000	0.000	2.958	4.570
	3-4	3.5	>500µm+(150-500µm)				9.217	3.379	1.229	1.843	2.151	1.536	17.204	1.843	3.687	2.458	0.307	0.000	17.819	0.000	0.307	0.230	0.000	6.759	2.151	1.843	0.614	0.000	1.229	3.130	5.223
	4-5	4.5	>500µm+(150-500µm)				4.284	2.142	0.428	1.714	2.999	2.142	16.278	1.714	9.853	5.141	0.000	2.999	0.857	0.000	0.000	0.054	0.000	8.996	0.428	2.142	1.714	0.428	0.000	1.740	3.855
	5-6	5.5	>500µm+(150-500µm)				4.631	0.868	0.289	2.026	0.579	2.894	18.234	2.026	7.543	3.184	0.000	4.342	11.288	0.000	0.000	0.036	0.000	3.473	0.868	4.342	2.605	0.579	1.447	1.465	5.789
	6-7	6.5	>500µm+(150-500µm)				5.133	2.246	1.283	5.133	3.529	2.567	20.213	1.925	4.171	1.925	0.000	1.283	13.475	0.000	0.000	0.000	0.321	4.171	0.642	2.246	1.283	1.283	0.963	2.567	4.171
	7-8	7.5	>500µm+(150-500µm)				8.478	2.725	0.606	5.148	4.542	2.422	17.865	2.422	4.239	2.725	0.000	0.908	11.809	0.000	0.000	0.019	0.303	6.662	2.120	3.028	1.817	0.000	1.211	3.634	2.422
	8-9	8.5	>500µm+(150-500µm)				5.654	0.942	0.942	5.340	2.199	6.596	20.730	1.570	5.065	4.083	0.000	0.314	16.019	0.000	0.000	0.353	0.000	5.026	0.942	2.513	2.513	2.513	1.256	1.904	4.711
	9-10	9.5	>500µm+(150-500µm)				9.190	0.000	0.613	3.676	1.838	2.757	20.525	2.451	5.840	0.919	0.000	3.063	13.173	0.000	0.000	0.057	0.000	5.514	0.000	3.063	1.838	0.000	0.306	1.848	3.982

															Agglutinated										Miliolids						
Pullenia osloensis	*Robertinoides normani*	*Robertinoides pumilum*	*Rosalina sp*	*Stainforthia fusiformis*	*Stainforthia loeblichi*	*Trifarina bradyi*	*Trifarina fluens*	*Turrispirillina arctica*	*Dentalina inortata*	*Fissurina*	*Lagena*	*Lenticulina*	*Oolina*		*Adercotryma glomerata*	*Astrorhiza sp*	*Eggerelloides scaber*	*Hormosina pilulifera*	*Labrospira crassimargo*	*Lagenammina difflugiformis*	*Rhabdammina sp*	*Saccammina sphaerica*	*Testulosiphon indivisus*		*Cornuspira foliacea*	*Pyrgo subglobulus*	*Quinqueloculina sclerotica*	*Quinqueloculina seminula*	*Quinqueloculina stalkeri*		*supertotal*
														21		2			4	3	1		2	12		2		1		3	36
														9						5	3			8				***1***		1	18
														6										0		1		***2***		3	9
														9		15				2				17						0	26
														6									5	5		1		2		3	14
														10									4	4				2		2	16
														6									3	3		2		3		5	14
														4									1	1	1			2		3	8
														0									7	7				4		4	11
														1									2	2				1		1	4
														5										0	1					1	6
														9										0				5		5	14
4			14	2	1	1	1			1	2		2	309	11			1	11			2		25			5	2		7	341
1			12		1		1	1		1				269	8				1					9			3	4		7	285
			19			1				2				273	6				2					8			1	5		6	287
		1	25		3		1			8	1		2	341	1				1					2		1	3	1	1	6	349
3			33				1		1	7	2	1		297	1									1	1	1	4			6	304
3	1		26				3			8	2			316	1		1							2			2	4		6	324
		2	50	1			4			5	1			226										0	1		3	3		7	233
		2	47		4		1			11				336					3					3			3	3		6	345
2			33		1					12			1	300	6									6			5			5	311
1			28							11				321	2									2			6	1		7	330
2			15		2		1			1				311										0			1	6		7	318
2			40				1		1	9	2		1	319										0			3	4		7	326
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.210	0.000	0.020	0.000	0.000	0.040	0.030	0.010	0.000	0.020	0.120	0.000	0.020	0.000	0.010	0.000	0.030	0.360
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.090	0.000	0.000	0.000	0.000	0.000	0.050	0.030	0.000	0.000	0.080	0.000	0.000	0.000	0.010	0.000	0.010	0.180
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.060	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.010	0.000	0.020	0.000	0.030	0.090
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.090	0.000	0.150	0.000	0.000	0.000	0.020	0.000	0.000	0.000	0.170	0.000	0.000	0.000	0.000	0.000	0.000	0.260
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.060	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.050	0.050	0.000	0.010	0.000	0.020	0.000	0.030	0.140
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.100	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.040	0.040	0.000	0.000	0.000	0.020	0.000	0.020	0.160
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.060	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.030	0.030	0.000	0.020	0.000	0.030	0.000	0.050	0.140
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.040	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.010	0.010	0.010	0.000	0.000	0.020	0.000	0.030	0.080
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.070	0.070	0.000	0.000	0.000	0.040	0.000	0.040	0.110
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.020	0.020	0.000	0.000	0.000	0.010	0.000	0.010	0.040
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.050	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.010	0.000	0.000	0.000	0.000	0.010	0.060
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.090	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.050	0.000	0.050	0.140
0.320	0.000	0.000	1.120	0.160	0.080	0.080	0.080	0.000	0.000	0.080	0.160	0.000	0.160	24.720	0.880	0.000	0.000	0.080	0.880	0.000	0.000	0.160	0.000	0.160	0.000	0.000	0.400	0.160	0.000	0.560	25.440
0.080	0.000	0.000	0.960	0.000	0.080	0.000	0.080	0.080	0.000	0.080	0.000	0.000	0.000	21.520	0.640	0.000	0.000	0.000	0.080	0.000	0.000	0.000	0.000	0.720	0.000	0.000	0.240	0.320	0.000	0.560	22.800
0.000	0.000	0.000	1.520	0.000	0.000	0.080	0.000	0.000	0.000	0.160	0.000	0.000	0.000	21.840	0.480	0.000	0.000	0.000	0.160	0.000	0.000	0.000	0.000	0.640	0.000	0.000	0.080	0.400	0.000	0.480	22.960
0.000	0.000	0.080	2.000	0.000	0.240	0.000	0.080	0.000	0.000	0.640	0.080	0.000	0.160	27.280	0.080	0.000	0.000	0.000	0.080	0.000	0.000	0.000	0.000	0.160	0.000	0.080	0.240	0.080	0.080	0.480	27.920
0.480	0.000	0.000	5.280	0.000	0.000	0.000	0.160	0.000	0.000	1.280	0.160	0.080	0.320	47.600	0.160	0.000	0.000	0.000	0.160	0.000	0.000	0.000	0.000	0.320	0.000	0.160	0.480	0.160	0.160	0.960	48.880
0.320	0.107	0.000	2.773	0.000	0.000	0.000	0.320	0.000	0.000	0.853	0.213	0.000	0.000	33.707	0.107	0.000	0.107	0.000	0.000	0.000	0.000	0.000	0.000	0.213	0.000	0.000	0.213	0.427	0.000	0.640	34.560
0.000	0.000	0.640	16.000	0.320	0.000	0.000	1.280	0.000	0.000	1.600	0.320	0.000	0.000	72.320	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.320	0.000	0.960	0.960	0.000	2.240	74.560
0.000	0.000	0.320	7.520	0.000	0.640	0.000	0.160	0.000	0.000	1.760	0.000	0.000	0.000	53.760	0.000	0.000	0.000	0.000	0.480	0.000	0.000	0.000	0.000	0.480	0.000	0.000	0.480	0.480	0.000	0.960	55.200
0.320	0.000	0.000	5.280	0.000	0.160	0.000	0.000	0.000	0.000	1.920	0.000	0.000	0.160	48.000	0.960	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.960	0.000	0.000	0.800	0.000	0.000	0.800	49.760
0.160	0.000	0.000	4.480	0.000	0.000	0.000	0.000	0.000	0.000	1.760	0.000	0.000	0.000	51.360	0.320	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.320	0.000	0.000	0.960	0.160	0.000	1.120	52.800
0.320	0.000	0.000	2.400	0.000	0.320	0.000	0.160	0.000	0.000	0.160	0.000	0.000	0.000	49.760	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.160	0.960	0.000	1.120	50.880
0.640	0.000	0.000	12.800	0.000	0.000	0.000	0.320	0.000	0.320	2.880	0.640	0.000	0.320	102.080	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.960	1.280	0.000	2.240	104.320
																								0.000							
0.320	0.000	0.000	1.120	0.160	0.080	0.080	0.080	0.000	0.000	0.080	0.160	0.000	0.160	24.930	0.880	0.020	0.000	0.080	0.920	0.030	0.010	0.160	0.020	0.220	0.000	0.020	0.400	0.170	0.000	0.590	25.740
0.080	0.000	0.000	0.960	0.000	0.080	0.000	0.080	0.080	0.000	0.080	0.000	0.000	0.000	21.610	0.640	0.000	0.000	0.000	0.080	0.050	0.030	0.000	0.000	0.800	0.000	0.000	0.240	0.330	0.000	0.570	22.980
0.000	0.000	0.000	1.520	0.000	0.000	0.080	0.000	0.000	0.000	0.160	0.000	0.000	0.000	21.900	0.480	0.000	0.000	0.000	0.160	0.000	0.000	0.000	0.000	0.640	0.000	0.010	0.080	0.420	0.000	0.510	23.050
0.000	0.000	0.080	2.000	0.000	0.240	0.000	0.080	0.000	0.000	0.640	0.080	0.000	0.160	27.370	0.080	0.150	0.000	0.000	0.080	0.020	0.000	0.000	0.000	0.330	0.000	0.080	0.240	0.080	0.080	0.480	28.180
0.480	0.000	0.000	5.280	0.000	0.000	0.000	0.160	0.000	0.000	1.280	0.160	0.080	0.320	47.660	0.160	0.000	0.000	0.000	0.160	0.000	0.000	0.000	0.050	0.370	0.000	0.170	0.480	0.180	0.160	0.990	49.020
0.320	0.107	0.000	2.773	0.000	0.000	0.000	0.320	0.000	0.000	0.853	0.213	0.000	0.000	33.807	0.107	0.000	0.107	0.000	0.000	0.000	0.000	0.000	0.040	0.253	0.000	0.000	0.213	0.447	0.000	0.660	34.720
0.000	0.000	0.640	16.000	0.320	0.000	0.000	1.280	0.000	0.000	1.600	0.320	0.000	0.000	72.380	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.030	0.030	0.320	0.020	0.960	0.990	0.000	2.290	74.700
0.000	0.000	0.320	7.520	0.000	0.640	0.000	0.160	0.000	0.000	1.760	0.000	0.000	0.000	53.800	0.000	0.000	0.000	0.000	0.480	0.000	0.000	0.000	0.010	0.490	0.010	0.000	0.480	0.500	0.000	0.990	55.280
0.320	0.000	0.000	5.280	0.000	0.160	0.000	0.000	0.000	0.000	1.920	0.000	0.000	0.160	48.000	0.960	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.070	1.030	0.000	0.000	0.800	0.040	0.000	0.840	49.870
0.160	0.000	0.000	4.480	0.000	0.000	0.000	0.000	0.000	0.000	1.760	0.000	0.000	0.000	51.370	0.320	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.020	0.340	0.000	0.000	0.960	0.170	0.000	1.130	52.840
0.320	0.000	0.000	2.400	0.000	0.320	0.000	0.160	0.000	0.000	0.160	0.000	0.000	0.000	49.810	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.010	0.000	0.160	0.960	0.000	1.130	50.940
0.640	0.000	0.000	12.800	0.000	0.000	0.000	0.320	0.000	0.320	2.880	0.640	0.000	0.320	102.170	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.960	1.330	0.000	2.290	104.460
0.018	0.000	0.000	0.065	0.009	0.005	0.005	0.005	0.000	0.000	0.005	0.009	0.000	0.009	1.441	0.051	0.001	0.000	0.005	0.053	0.002	0.001	0.009	0.001	0.123	0.000	0.001	0.023	0.010	0.000	0.034	1.598
0.006	0.000	0.000	0.077	0.000	0.006	0.000	0.006	0.006	0.000	0.006	0.000	0.000	0.000	1.729	0.051	0.000	0.000	0.000	0.006	0.004	0.002	0.000	0.000	0.064	0.000	0.000	0.019	0.026	0.000	0.046	1.838
0.000	0.000	0.000	0.108	0.000	0.000	0.006	0.000	0.000	0.000	0.011	0.000	0.000	0.000	1.553	0.034	0.000	0.000	0.000	0.011	0.000	0.000	0.000	0.000	0.045	0.000	0.001	0.006	0.030	0.000	0.036	1.635
0.000	0.000	0.005	0.135	0.000	0.016	0.000	0.005	0.000	0.000	0.043	0.005	0.000	0.011	1.849	0.005	0.010	0.000	0.000	0.005	0.001	0.000	0.000	0.000	0.022	0.000	0.005	0.016	0.005	0.005	0.032	1.904
0.023	0.000	0.000	0.251	0.000	0.000	0.000	0.008	0.000	0.000	0.061	0.008	0.004	0.015	2.270	0.008	0.000	0.000	0.000	0.008	0.000	0.000	0.000	0.002	0.018	0.000	0.008	0.023	0.009	0.008	0.047	2.334
0.012	0.004	0.000	0.104	0.000	0.000	0.000	0.012	0.000	0.000	0.032	0.008	0.000	0.000	1.266	0.004	0.000	0.004	0.000	0.000	0.000	0.000	0.000	0.001	0.009	0.000	0.000	0.008	0.017	0.000	0.025	1.300
0.000	0.000	0.026	0.648	0.013	0.000	0.000	0.052	0.000	0.000	0.065	0.013	0.000	0.000	2.930	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.013	0.001	0.039	0.040	0.000	0.093	3.024
0.000	0.000	0.011	0.260	0.000	0.022	0.000	0.006	0.000	0.000	0.061	0.000	0.000	0.000	1.862	0.000	0.000	0.000	0.000	0.017	0.000	0.000	0.000	0.000	0.017	0.000	0.000	0.017	0.017	0.000	0.034	1.913
0.014	0.000	0.000	0.235	0.000	0.007	0.000	0.000	0.000	0.000	0.085	0.000	0.000	0.007	2.133	0.043	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003	0.046	0.000	0.000	0.036	0.002	0.000	0.037	2.216
0.006	0.000	0.000	0.158	0.000	0.000	0.000	0.000	0.000	0.000	0.062	0.000	0.000	0.000	1.815	0.011	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.012	0.000	0.000	0.034	0.006	0.000	0.040	1.867
0.013	0.000	0.000	0.098	0.000	0.013	0.000	0.007	0.000	0.000	0.007	0.000	0.000	0.000	2.025	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.007	0.039	0.000	0.046	2.071
0.020	0.000	0.000	0.391	0.000	0.000	0.000	0.010	0.000	0.010	0.088	0.020	0.000	0.010	3.124	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.029	0.041	0.000	0.070	3.194
1.158	0.000	0.000	4.052	0.579	0.289	0.289	0.289	0.000	0.000	0.289	0.579	0.000	0.579	90.195	3.184	0.072	0.000	0.289	3.329	0.109	0.036	0.579	0.072	7.670	0.000	0.072	1.447	0.615	0.000	2.135	100.000
0.348	0.000	0.000	4.178	0.000	0.348	0.000	0.348	0.348	0.000	0.348	0.000	0.000	0.000	94.038	2.785	0.000	0.000	0.000	0.348	0.218	0.131	0.000	0.000	3.481	0.000	0.000	1.044	1.436	0.000	2.480	100.000
0.000	0.000	0.000	6.594	0.000	0.000	0.347	0.000	0.000	0.000	0.694	0.000	0.000	0.000	95.011	2.082	0.000	0.000	0.000	0.694	0.000	0.000	0.000	0.000	2.777	0.000	0.043	0.347	1.822	0.000	2.213	100.000
0.000	0.000	0.284	7.097	0.000	0.852	0.000	0.284	0.000	0.000	2.271	0.284	0.000	0.568	97.126	0.284	0.532	0.000	0.000	0.284	0.071	0.000	0.000	0.000	1.171	0.000	0.284	0.852	0.284	0.284	1.703	100.000
0.979	0.000	0.000	10.771	0.000	0.000	0.000	0.326	0.000	0.000	2.611	0.326	0.163	0.653	97.226	0.326	0.000	0.000	0.000	0.326	0.000	0.000	0.000	0.102	0.755	0.000	0.347	0.979	0.367	0.326	2.020	100.000
0.922	0.307	0.000	7.988	0.000	0.000	0.000	0.922	0.000	0.000	2.458	0.614	0.000	0.000	97.369	0.307	0.000	0.307	0.000	0.000	0.000	0.000	0.000	0.115	0.730	0.000	0.000	0.614	1.286	0.000	1.901	100.000
0.000	0.000	0.857	21.419	0.428	0.000	0.000	1.714	0.000	0.000	2.142	0.428	0.000	0.000	96.894	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.040	0.040	0.428	0.027	1.285	1.325	0.000	3.066	100.000
0.000	0.000	0.579	13.603	0.000	1.158	0.000	0.289	0.000	0.000	3.184	0.000	0.000	0.000	97.323	0.000	0.000	0.000	0.000	0.868	0.000	0.000	0.000	0.018	0.886	0.018	0.000	0.868	0.904	0.000	1.791	100.000
0.642	0.000	0.000	10.588	0.000	0.321	0.000	0.000	0.000	0.000	3.850	0.000	0.000	0.321	96.250	1.925	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.140	2.065	0.000	0.000	1.604	0.080	0.000	1.684	100.000
0.303	0.000	0.000	8.478	0.000	0.000	0.000	0.000	0.000	0.000	3.331	0.000	0.000	0.000	97.218	0.606	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.038	0.643	0.000	0.000	1.817	0.322	0.000	2.139	100.000
0.628	0.000	0.000	4.711	0.000	0.628	0.000	0.314	0.000	0.000	0.314	0.000	0.000	0.000	97.782	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.020	0.000	0.314	1.885	0.000	2.218	100.000
0.613	0.000	0.000	12.253	0.000	0.000	0.000	0.306	0.000	0.306	2.757	0.613	0.000	0.306	97.808	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.919	1.273	0.000	2.192	100.000


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