Cold-water Coral Distributions and Surficial Geology on the Flemish Cap, Northwest Atlantic

by

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ABSTRACT

This thesis investigates possible geological preferences of cold-water coral species over varying spatial scales. Cold-water species and surficial geology were identified from geo-referenced video imagery covering 15.09 km of seabed, at four sites on the flanks of the Flemish Cap in the Northwestern Atlantic. Species distribution and abundance were compared to the surficial geology and lithology described at five spatial scales. A total of 30,310 individual corals were enumerated comprising 27 species on 8 different geological facies. Hard substrate inhabiting species did not show a preference for attachment substrate grain size or lithology type. The most abundant species *Anthomastus spp*. (soft coral) was the only species found on all grain sizes and both lithology types. Surficial geological facies were statistically distinct when described at finer spatial scales (10 m, 50 m, 100 m) but, not at broader scales (500 m and 1000 m). Species distributions were primarily driven by depth and secondarily by substrate type. While other environmental variables described at coarse spatial scales (thousands of km) are suitable for predicting cold-water coral distributions; surficial geology is a more suitable surrogate at finer spatial scales. These observations highlight the importance of describing substrate and surficial geology at spatial scales less than 100 m.

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List of Abbreviations

ANOSIM	Analysis of Similarity
ASH	aragonite saturation horizon
Bl	boulder
Br	bedrock
Br-IG	igneous bedrock
Br-SD	sedimentary bedrock
CAM	ClassAct Mapper
CCGS	Canadian Coast Guard Ship
CSSF	Canadian Scientific Submersible Facility
CWC	Cold-water corals
DFO	Fisheries and Oceans Canada
Dib	discontinuous igneous bedrock
Dsb	discontinuous sedimentary bedrock
DWBC	Deep Western Boundary Current
EEZ	Exclusive Economic Zone
FC	Flemish Cap

Fg	fine grained
G	gravel
Gfg	gravelly fine grained
HD	high definition
HS	hard substrate
I/S	Igneous/Sedimentary bedrock outcrops
Ig	igneous bedrock outcrop
IRD	ice-rafted detritus
K-T	Cretaceous-Tertiary Boundary
LC	Labrador Current
MIS	Marine Isotope Stage
MUN	Memorial University of Newfoundland
NAC	North Atlantic Current
NAFO	Northwest Atlantic Fisheries Organization
NE	northeast
nMDS	non-metric multidimensional scaling
NSERC	Natural Sciences and Engineering Research Council of Canada

P/A	presence/absence
ROPOS	Remotely Operated Platform for Ocean Science
ROV	Remotely Operated Vehicle
Rt	root transformation
Sd	sedimentary bedrock outcrop
SIMPER	Similarity Percentages
SW	southwest
UNGA	United Nations General Assembly
VME	vulnerable marine ecosystem

Co-authorship Statement

The student's contribution to the thesis manuscripts are as follows:

- Led the finalization of research questions
- Led analysis of video for corals and surficial geology on the Flemish Cap portion of the 2010 ROPOS expedition
- Led all planning and implementation of data analyses in all chapters
- Lead author on all papers

Dr. Evan Edinger (Memorial University) co-authored Chapters 2 and 3, planned the 2010 ROPOS expedition, collected the data used in this thesis, and reviewed drafts of manuscripts. Dr. David Piper (Natural Resources Canada) co-authored Chapters 2 and 3, provided help with the geological analysis and facilities, and reviewed drafts of manuscripts. Dr. Kent Gilkinson (Fisheries and Oceans Canada) co-authored Chapter 3, and reviewed drafts of manuscripts. Dr. Rodolphe Devillers (Memorial University) assisted in the planning of the 2010 ROPOS expedition and data collection.

Publications Arising

This thesis is based on the following manuscripts:

Chapter 2[1]:

Miles, L.L., Edinger, E.N., Piper, D.J.W. Observation of surficial geology on the flanks of the Flemish Cap, Northwest Atlantic from ROV video imagery.

Chapter 3[2]:

Miles, L.L., Edinger, E.N., Piper, D.J.W., Gilkinson, K. (*in prep*). Distributional patterns of cold-water corals in relation to surficial geology on the Flemish Cap, Northwest Atlantic.

[1] Intended journal: *Atlantic Geology*
[2] Intended journal: *PeerJ Environmental Sciences*

1 Introduction to cold-water corals in Eastern Canada, Northwest Atlantic

1.1 Introduction

Cold-water corals (CWC, Phylum: Cnidaria), also known as deep-water or deep-sea corals, are sessile, long-lived invertebrates found globally in the world's oceans. It is estimated that over 50% of known coral species are found in cold waters occurring below 50 m depth (Cairns, 2007; Roberts et al., 2009). CWC provide important habitat for other benthic species (Milligan et al., 2016), and areas where CWC occur are typically associated with greater species richness than surrounding areas (Henry & Roberts, 2007; Ross & Quattrini, 2007; Mortensen, et al., 2008; Bongiorni et al., 2010). Corals are long lived (10s to 100s of years) and have slow growth rates which, makes recovery from direct and indirect anthropogenic damage slow (Risk et al., 2002; Mortensen & Buhl-Mortensen, 2005; Sherwood & Edinger, 2009). Due to their ecological importance and vulnerability, there is increasing interest in protecting CWC and their habitats (Fossa et al., 2002; Davies et al., 2007). However, their habitats tend to be in remote locations over large areas, thus much is still unknown about potential CWC locations, environmental preferences, and life histories (Ambroso et al., 2017). A key factor in CWC life histories is attachment substrate with each coral species generally adapted to only colonize either a soft or hard substrate. Soft substrates are ubiquitous on the seafloor and are composed of varying amounts of sand and mud. While hard substrates are less abundant, there are several different types found on the seafloor, each exhibiting differing physical characteristics (e.g. hardness and surface texture).

Coral species could prefer or have adapted to any one substrate characteristic, for instance hard substrate characteristics include resistance to erosion, irregular surfaces, or grain size. Additionally, hard substrates undergo erosion (e.g. physically and chemically) at different rates depending on their location which may influence the ability of coral species to colonize a substrate. However, attachment substrate is rarely described in studies (e.g. geological origin or lithology), and it is unknown if different coral species have substrate preferences.

CWC have been documented along the continental margin of Eastern Canada, which has several areas of exposed hard substrates of several different origins and lithologies (Piper, 1990; Edinger et al., 2011). This diverse assemblage is due to the unique geological history of seafloor spreading and repeated glaciations in the region. The Flemish Cap offers a unique opportunity to study corals on different substrate types. Located on the eastern most edge of the Canadian continental shelf, it is an isolated piece of continental crust that throughout its history has encountered different oceanic regimes as the North Atlantic Ocean formed (e.g. shallow warm seas and deep polar conditions). Bedrock outcrops of various ages and lithologies are found at all depths of the Flemish Cap. Fine grained sediments (e.g. muds and biogenic detritus), as well as ice-rafted debris (IRD) are deposited onto the continental shelf and slope by passing currents. Thus, this area has a unique assemblage of different types of substrate of different physical characteristics at a range of depths available for coral colonization.

The purpose of this thesis is to investigate the relationship between CWC and substrate preferences by fulfilling 4 primary goals:

i. To describe and map the surficial geology observed from ROV video imagery;
ii. To identify cold-water coral species and map their distribution at four locations on the Flemish Cap from ROV video imagery;
iii. To describe the surficial geology at different spatial scales; and
iv. To determine if there is a relationship between cold-water coral distribution and surficial geology using video imagery.

Chapter 1 introduces the thesis and includes background on CWC biology, factors that control their distribution, equipment used in this study, and threats to CWC.

Chapter 2 describes the geological history of the Flemish Cap and presents new *in situ* observations of the surficial geology by:

i. For a general understanding, review the geological history of the Flemish Cap; and
ii. To describe and map the surficial geology from HD ROV video and grab samples collected at four sites on the Flemish Cap.

Chapter 3 addresses the importance of attachment substrate and surficial geology in coral habitat descriptions by:

i. Mapping coral distribution at four sites on the Flemish Cap; and
ii. Analyzing the coral distributions in relation to depth and surficial geology at five spatial scales.

In Chapter 4, I conclude my dissertation with a summary of the findings of this research described above and identify applications for species distribution modeling and progress in coral conservation off Newfoundland and Labrador.

1.1.1 What are Cold-water Corals?

Cold-water corals (CWC) have a broad distribution, found globally from the Arctic to the Antarctic (Cairns, 2007; Watling et al., 2011; Yesson et al., 2012). CWC are found in cold (>0-12ºC) and deep (10 to 1000s of m) waters on continental shelves, seamounts, and ridges (Freiwald et al., 2004; Bryan & Metaxas, 2006). While warm-water corals get nutrients from photosynthetic symbionts; CWC are azooxanthellate (lacking symbiotic dinoflagellates), living below the photic zone, and rely on surface derived particulate matter carried on currents (Roberts et al., 2009; Watling et al., 2011).

Depending on the species, polyps either develop into solitary corals that form cup like structures or colonial organisms that can form large arboreal like fans. Corals have a slow growth rate, and colonies that are several meters tall can take hundreds to thousands of years to form (Sherwood & Edinger, 2009; Roberts et al., 2009).

CWC are described into several groups: octocorals, scleractinians, antipatharians, stylasteridae, and zoanthidae. In this thesis only octocorals, scleractinians, and antipatharians were observed. Octocorals (Class Anthozoa: Subclass Octocorallia) have polyps comprised of eight tentacles surrounding a mouth, and each coral colony is made of hundreds of genetically identical polyps. Within octocorals is the order Alcyonacea which includes both soft corals (no hard skeleton) and branching corals (sea-fans). For this thesis, the branching corals (also known as gorgonians) were classified into two different functional groups based on their maximum growth (height). Gorgonians have a rigid, semi-flexible internal skeleton which, in many species, forms a multi-branching fan. The skeleton is comprised of calcium carbonate (calcite or aragonite), proteinaceous gorgonin or both (Bayer, 1973). Large gorgonians differ from small gorgonians in that they can grow to greater than 1 m in height, while small gorgonians grow to less than 1 m (Edinger et al., 2007a). Soft corals are supported by microscopic calcite sclerites within their tissue and hydrostatic pressure, and can fully retract their polyps into their hydroskeletons (Fabricius & Alderslade, 2001). Sea pens (Pennatulacea) are colonial corals that have a single stalked skeleton with polyps growing along the axis or from branches which, gives the coral colony a feather like appearance (Williams, 2011). These corals range in height from a few centimeters to several meters.

Scleractinians (Class Anthozoa: Subclass Hexacorallia), also known as stony corals, form rigid aragonite (calcium carbonate) skeletons. This group comprises species bearing solitary polyps (cup corals) and colonial corals that form large reefs or bio herms. In this study, only solitary cup corals were observed. The identifying characteristics of solitary cup corals are their short stature and rigid skeletal frame that forms a cup shape. This group includes species that recline on the seafloor in soft sediments and those that attach to hard substrates. *Desmophyllum dianthus* is larger than most reclining or free-living cold-water cup corals (growing to 10 cm in width), and often found on vertical rock walls or underneath ledges (Risk et al., 2002; Forsterra et al., 2005).

Antipatharians (Class Anthozoa: Subclass Ceriantipatharia), also known as black-wire corals, are identified by their rough, black proteinaceous spiny skeletons. They have numerous orange and red polyps surrounding the skeleton. This group of corals has several different morphologies; from long whips to large fans that appear very flat. Unlike octocorals, the polyps of these corals have only six tentacles and lack sclerites.

Each coral group contains species that have adapted to colonize either soft (e.g. mud or sandy sediments) or hard (e.g. gravel or bedrock) substrates. To securely anchor into soft sediments, corals have developed different structures. Some small gorgonians (e. g. *Acanella arbuscula*) have root like structures which anchor the colony securely into fine grained sediments. Sea pens (e. g. *Anthoptilum* sp.) have a muscular foot known as a peduncle, which digs into the loose grains but also allows for limited mobility to travel short distances (Williams, 1999). Hard substrate colonizing corals (e.g. large gorgonians) form broad encrusting hold-fasts that cement them to the substrate surface (Mortensen & Buhl-Mortensen, 2005). Functional groups can be comprised of species that colonize hard substrates and others that colonize soft substrates (Edinger et al., 2007a). Solitary scleractinians (cup corals) can colonize either hard (*Desmophyllum dianthus*) or soft (*Flabellum* spp.) substrates.

Whether inhabiting hard or soft substrates, it can be detrimental for corals to be removed from their attachment substrate or to become so large that the substrate is unable to support the colony. The grain size and sturdiness of the attachment substrate can be a contributing factor to how large a coral can grow. A lack of suitable substrate may limit the distribution of corals (Watanabe et al., 2009; Edinger et al., 2011; Baker et al., 2012).

1.1.2 Where do corals live?

CWC are found in all the world's oceans from the Arctic to the Southern Ocean (Freiwald et al., 2017). Many of these observations are from the continental shelf edges (Fossa et al., 2002; Yesson et al., 2012), seamounts (Davies & Guinotte, 2011), in submarine canyons (Brooke et al., 2016), and mid-ocean ridges (Mortensen et al., 2008). Continental shelf edges and seamounts are topographic highs in an otherwise flat abyssal plain and have been found to be biological hotspots for many marine species (Koslow et al., 2001). The large gorgonians species *Primnoa resedaeformis* and *Paragorgia arborea* have a global distribution and are concentrated on topographic highs such as continental margins and seamounts (Tendal, 1992; Bryan & Metaxas, 2006; Buhl-Mortensen et al., 2014). Beyond the continental shelf edge is the continental slope, which on average is a gently inclined seabed from 200 m to 2,000 m, sometimes with a mud veneer. Submarine canyons are often areas of high diversity that cross the shelf and act as conduits for sediment and organic particulates (Mortensen et al., 2006; Fernandez et al., 2017). Canyons and shelf-crossing troughs have favorable current regimes of hydrographically stable and nutrient-rich shelf water, with suitable substrate (Mortensen et al., 2006; Baker et al., 2012). Slopes with a recent glacial history have heterogeneous bottoms of several different substrate types such as hard substrates in the form of ice-rafted debris (IRD). Additionally, seafloor that has experienced glaciation provides fine scale topographic highs and suitable attachment substrate in the form of moraines, drumlins, eskers, and glacial till (Mortensen & Buhl-Mortensen, 2004; Edinger et al., 2011). These topographic highs and gentle slopes provide corals other environmental factors important for a suitable habitat.

1.2 Factors that influence cold-water coral distributions

Several factors influence CWC distribution including: biotic, oceanographic (e.g. temperature, and salinity), and geological (e.g. geomorphology and surficial geology) (Leverette & Metaxas, 2005; Bryan & Metaxas, 2007; Dolan et al., 2008). Currents, temperature, calcite/aragonite saturation, and substrate are all essential environmental factors that comprise suitable CWC habitat (Bryan & Metaxas, 2007; Davies et al., 2008).

For example, currents play a vital role in several aspects of coral life histories (i.e. food transportation, larval transportation/dispersal, oxygenation,). Marine snow sinks from the surface and move along the currents at depth where CWC use tentacles to grab the particles (Legendre & Michaud, 1999; Gardner et al., 2006). Several coral species colonize topographic highs to maximize the surface area in contact with these currents. In addition to transporting nutrients, currents play an important role in the coral reproduction cycle. CWC reproduce either by broadcast spawning (fertilization and development in the water column) or by brooding (egg fertilization within the parent colony). The larvae are carried in the water column by currents until they encounter a suitable substrate and attach. For corals that attach to hard substrates, these currents must be strong enough to prevent sediment build up but not so strong as to dislodge the corals (Bryan & Metaxas, 2006).

Temperature tolerance, in some locations can be a controlling factor for upper and lower vertical distributions (i.e. depth ranges). Most CWC species have a temperature tolerance range of 3 to 12 ºC, although the temperature ranges of individual species can vary widely. Temperature is correlated with depth, and the flow of warm waters can constrain the upper limits of some species, whereas food availability decreases with depth and can influence the lower limit (Mortensen et al., 2006).

Depth ranges can also be limited by water mass chemistry. Corals need water masses saturated in dissolved calcium carbonate (calcite or aragonite). Aragonite is more soluble than calcite and is used by several coral species to build their skeletons. However, aragonite saturated waters limit where CWC can colonize (Chung et al., 2003). The aragonite saturation horizon (ASH) is the depth at which the supply rate of aragonite equals the rate of dissolution. The ASH is currently relatively stable in the North Atlantic Ocean at > 2000 m. Studies predict that the ASH will shoal as water masses become undersaturated which will limit the depth corals can inhabit (Orr et al., 2005). Aragonite skeletons could be vulnerable to dissolution. CWC are sensitive to changes in currents, water chemistry, and at surface productivity.

While each coral species has a specific depth and temperature range tolerance (Roberts et al., 2006), most are limited in the types of substrate they can colonize. Coral larva demonstrate a settlement preference for certain hard substrates (Sun et al., 2010). Substrate availability is a variable that directly limits cold-water coral distribution (Watanabe et al., 2009). In the eastern and western North Atlantic region, the prevalence of glacial features such as shelf-crossing troughs, iceberg scours and drop stones provide hard substrate in otherwise muddy bottom-types (Piper, 1991; Freiwald, 1998; Fossa et al., 2002; Edinger et al., 2011). These features are hotspots or CWC settlement and harbor an abundance of other organisms. Despite the importance of substrate to the distribution of CWC, most predictive habitat models do not include surficial geology. Available datasets are sparse with the surficial geology is described at coarse scales (tens of kms).

CWC distribution is determined by the extent of suitable habitat, which is characterized by a combination of certain environmental factors present in each area. Areas of suitable habitat can be predicted in unexplored, remote locations by using models that include these environmental factors. The combination of factors can vary for each species: broad-scale bathymetry, temperatures and currents are known to be important explainers of broad scale distribution patterns of *Paragorgia arborea* and *Primnoa resedaeformis* (Buhl-Mortensen et al., 2014). However, other factors, (e.g. substrate and fine scale bathymetry) are more effective for habitat characterization and prediction at fine scales (Bryan & Metaxas, 2006; 2007; Bennecke & Metaxas, 2017).

1.3 Distributions of corals in Atlantic Canada

CWC are observed all along the eastern Canadian continental margin, from the Scotian Shelf in the south to the Arctic Ocean in the north (Breeze et al., 1997; Mortensen et al., 2006; Wareham et al., 2007; Edinger et al., 2007a, b; Wareham, 2009), and outside of the Canadian EEZ on the Flemish Cap (Murillo et al., 2010). To date, 60 species have been identified in Atlantic Canada. Many of these coral species co-occur tend to be highly clustered and are found below 200 m along the continental shelf edge (Wareham et al., 2007). However, along the continental margin some species are more likely to be found in different regions. For example, fisheries and scientific trawls (from Baffin Bay to Grand Banks) found Nephtheids soft corals were the only species found on the continental shelf at depths of < 174 m (Wareham et al., 2007). Other soft corals (*Anthomastus spp*.) were found at depths > 800 m on the continental slope (Wareham et al., 2007). Gorgonians have a similarly large spatial range and are found at similar depths (> 50 m) on the continental slope (Wareham et al., 2007).

Several species observed elsewhere in the North Atlantic Ocean are rare on the eastern Canadian continental margin (e.g. Antipatharians and reef forming scleractinians). The reef building coral *Lophelia pertusa* is considered an important deep-water biogenic habitat-builder and is widely distributed in the North Atlantic (Davies & Guinotte, 2011). Although habitat suitability models for *Lophelia pertusa* (based primarily on depth and temperature) categorize most of the Atlantic Canadian continental shelf waters as suitable habitat, there are only a few confirmed observations of the species in Nova Scotia waters, including the Stone Fence (Mortensen et al., 2006; Buhl-Mortensen et al., 2017), The Gully (Cogswell et al., 2009), and at Jordan Rocks in the Gulf of Maine (Gass & Willison, 2005).

Many coral location records come from specimens recovered in nets and bottom trawls from fisheries by-catch and scientific trawls (Breeze et al., 1997; Wareham, 2009). However, advancements in underwater technologies have allowed researchers to investigate areas that have either not undergone fishing activities or are not suitable for nets. By using advanced underwater technologies, researchers were able to make *in situ* observations of a *Keratoisis* sp. forest, which was not previously possible through traditional methods (Neves et al., 2014).

1.4 Benefits of using Remotely Operated Vehicles

Previous studies have used specimens collected in dredges or caught in nets as fishing by-catch (Freiwald et al., 2004; Wareham et al., 2007). This creates a bias in the data as samples are only collected in fishable areas. These methods cannot sample hard bottom-types easily (e.g. bedrock, boulders), and a heterogeneity of bottom-types is not included in many of these studies. In addition, bottom contact sampling methods can cause significant damage to the habitat and remove whole colonies. Any remaining corals are damaged, and reefs can be significantly reduced. This damage can affect other local organisms that utilize corals as habitat. Coral data collected with nets over a broad spatial scale lacks the specificity needed.

Nets and dredges are very coarse sampling methods that limit our understanding of the habitat and faunal distributions. Survey trawls can cover several kilometers, and corals found in the survey may represent a localized area instead of homogenous coverage over the whole track. Additionally, environmental factors important for CWC habitats are not sampled through nets and can change over a short distance. Surficial geology maps are traditionally created from grab sample, boxcore, and rock dredge samples, collected over several kilometers. These coarse sampling methods do not allow for the detailed description of CWC habitats needed for addressing growing conservation needs.

Advances in underwater technologies, including underwater positioning for georeferencing, have made it possible to study CWC habitats in finer detail and in less destructive ways.

Cameras that collect high definition video or still imagery can now be suspended below a vessel or on remotely operated vehicles (ROV). Cameras enable researchers to collect imagery data without contacting the seafloor. Video and still imagery are advantageous as they allow the whole habitat to be sampled (e.g. surficial geology, fauna) and left intact. This less destructive method allows for long-term, *in situ* studies with the same corals, and makes it possible for a wide array of research and conservation questions to be answered.

ROVs can operate in areas not suitable for net or boxcore and can sample a variety of different bottom-types. In addition to collecting biological and geological data, ROVs can be equipped with instruments (CTDs, water samplers, push cores) that collect other environmental data crucial for habitat characterization.

For this study, the ROV Remotely-Operated Platform for Ocean Science (ROPOS) was used to collect video and still imagery. This imagery allowed for the attachment substrate to be visually observed intact which is not always recovered with traditional sampling methods. The surficial geology is also described at fine scale along the ROV track, allowing for detailed description of the heterogeneous seafloor.

1.5 Ecological importance of cold-water corals

Though the existence of CWCs has been known for centuries, scientific and conservation interests have only recently increased. International organizations have issued directives to encourage member states to protect cold-water corals and their habitats (UNGA, 2007; FAO, 2009). Protection is a challenge for many nations as scientific knowledge is lacking, and questions remain concerning their distribution, habitats, and ecological role as habitat-structuring organisms (Roberts et al., 2006).

CWC can provide important ecosystem services, such as shelter and sustenance, to a wide variety of organisms including: fish (Baillon et al., 2012), crustaceans (Buhl-Mortensen & Mortensen, 2004) and other invertebrates (Buhl-Mortensen & Mortensen, 2005). Several studies have shown CWC reefs are areas with higher biodiversity than the surrounding seafloor (Henry & Roberts, 2007; Bongiorni et al., 2010). In addition to providing shelter, CWC are also preyed upon by other benthic fauna. Urchins use CWC for both shelter and sustenance, feeding on the polyps and skeletons of CWC, and retreating into the complex framework when benthic predators (e.g. fish and decapods) are present (Stevenson et al., 2014). CWC are also closely associated with highly valued commercial species such as the long-lived, deep-sea orange roughy (*Hoplostethus atlanticus*) (Doonan et al., 2015). In Eastern Canadian waters, there is evidence that some coral species (sea pens) may act as nurseries for some commercially important fish species (Redfish, *Sebastes* spp.) (Baillon et al., 2012). The removal or decline of CWC could have a detrimental effect on many benthic communities and species.

1.6 Threats to corals

Corals are susceptible to damage from a wide range of physical and chemical impacts. Physical impacts can come from anthropogenic activities in the ocean, such as fishing, and offshore resource exploration (Roberts et al., 2006). Fishing gear that contact the seafloor or drift freely in the water column can cause damage to corals (Roberts et al., 2000; Buhl-Mortensen, 2017). *Lophelia pertusa* is an important species for researchers and has been the focus of numerous studies due to its wide distribution, potential as a habitat builder, and its sensitivity to ocean acidification (Fossa et al., 2002; Davies et al., 2008; Lunden et al., 2013). *L. pertusa* is rare in Atlantic Canada (only two known sites) and vulnerable to fishing activities. The coral colonies at Stone Fence were reduced to rubble, most likely by bottom-trawl fishing gear, before they could be protected and studied (Friewald & Roberts, 2005; Cogswell et al., 2009; Buhl-Mortensen et al., 2017). These important habitat-forming organisms are particularly vulnerable and slow to recover from physical damage (Koslow et al., 2001; Risk et al., 2002; Hovland & Risk, 2003; Roberts et al., 2006; Sherwood & Edinger, 2009). In the early 19^{th} century, fishing trawls would frequently recover giant gorgonians that were several meters in height and (probably) thousands of years old. Recent recoveries in the same locations only found small gorgonians (< 1 m) only a few hundred years old (Risk et al, 1998). Offshore oil exploration and operations can also impact coral communities in several ways, such as increasing the likelihood of oil spills in coral habitat (Fisher et al., 2014) and drilling sludge covering coral colonies (Purser, 2015). For resource managers to properly protect these unique species and habitats, accurate maps of their distributions are needed.

The oceans are changing due to warming temperatures and ocean acidification due to increased CO_2 concentration in the atmosphere and these changes can have a negative impact on CWC, even in the deep-sea. Atmospheric carbon dioxide concentrations have been increasing, causing more carbon dioxide to be absorbed by the oceans. This in turn has decreased the pH of the ocean, causing more hydrogen ions to be available to react with carbonate ions, thus decreasing carbonate concentrations in the water column from the surface to the deep sea (Orr et al., 2005). As global ocean chemistry continues to change and become more acidic. Ocean acidification makes it increasingly energetically expensive for species (including plankton and corals) to form and maintain calcium carbonate skeletons. Some coral mounds in the Gulf of Mexico are already living in environmental conditions at the edge of their alkalinity and temperature tolerances (Georgian et al., 2015). With changing oceanographic conditions, coral communities and their food sources are under direct threat.

1.7 Summary

Cold-water corals are important biogenic habitats that provide food and shelter for other deep-sea organisms, but they are increasingly under threat from changing ocean conditions and increased anthropogenic activities. Efforts to protect them have increased over the decades but, available data are sparse and biased towards disturbed areas (e.g. fishing areas). There is a growing need to predict where suitable habitat will be in remote locations but, to make better models more information is needed on their life histories.

While it is known that attachment substrate is biologically important for CWC, studies have suggested that current spatial scales are insufficient for predictive modeling (Bryan & Metaxas, 2006). Traditional methods for describing surficial geology are coarse encompassing broad areas. ROVs allow for the collection of fine-scale, geo-referenced *in situ* geological data. The surficial geology observations will be described at increasingly greater spatial scales to determine the threshold at which a statistical significance is detected. The fine-scale, geo-referenced geological data will be combined with coral abundance to investigate CWC geological preferences on the Flemish Cap.

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2 Observations of the surifical geology on the flanks of the Flemish Cap, Northwest Atlanitc from ROV video imagery

2.1 Abstract

The Flemish Cap has unique surficial geological composition compared to other areas of the eastern Canadian continental shelf. The surficial geology was described at four locations on the flanks of the Flemish Cap using video imagery obtained by ROV. A total of 52 hours of video imagery over 15 km of seafloor were analyzed and geo-referenced to describe the surficial geology. The southern and eastern flanks are steep, with exposed granitic core and Quaternary sediments. The northern flank has a somewhat gentler slope with exposed sedimentary bedrock forming ledges. Abrupt outcrop changes from pink limestone to granite on the eastern tip could be evidence of previous faulting. A prominent 100-m high sedimentary wall extending for several meters was observed at 1300 m depth on the eastern tip. Igneous outcrops on the most southern site could be exposed Neoproterozoic core. These results offer some of the first in situ visual observations of the surficial geology of the southern, eastern and northern flanks of the Flemish Cap.

2.2 Introduction

The continental margin of eastern Canada has a unique geological history. The margin formed in the Mesozoic as the North Atlantic Ocean opened northeastwardly and completed with the widening of the Labrador/Greenland spreading edge in the Paleogene. Since formation, the margin has been shaped by several ice sheets and bears the morphological characteristics of repeat periods of glaciation (Piper, 1991). The Flemish Cap is a geologically distinct section of the eastern Canadian continental shelf.

The Flemish Cap is the western half of the Newfoundland and Iberia-Ireland conjugate margin. This conjugate margin is of great scientific interest as it is an excellent example of a magma-poor continental margin with hyperextension and upper mantle serpentinization (Sibuet et al., 2007). Recent video imagery surveys of the flanks have allowed for new geological descriptions and the collection of in situ samples.

Unlike traditional methods used to generate marine surficial geology maps, such as sub-bottom acoustic surveys and sediment coring, this study utilized high definition video imagery collected by a remotely operated vehicle (ROV). This imagery offers a unique opportunity to see features that are challenging to sample, and can ground truth previous interpretations of the geology of the Flemish Cap. This study offers fine-scale descriptions of the surficial geology observed at depth.

2.3 Geological Setting

The Flemish Cap is an isolated piece of continental crust located 600 km east of Newfoundland in the Northwestern Atlantic Ocean (Figure 2-1). To the west, it is separated from the Grand Banks of Newfoundland by the 1000 m deep Flemish Pass and the Orphan Basin to the north. The Cap is relatively shallow at 126 m below sea level, and is 75 km in diameter at the top, widening to approximately 200 km in diameter at the base (King et al., 1985). The central part of the Cap consists of a shallow basement Neoproterozoic granodiorite that is part of the Avalon Zone of the Appalachian Orogen (King et al., 1985; Funck et al., 2003; Gerlings et al., 2011). A thin veneer of outward dipping sedimentary strata of Cretaceous and Cenozoic sediments overlies the granodiorite core (King et al., 1985; Grant & McAlpine, 1990; Weitzman et al., 2014). The southern margin has steep slopes with numerous faults and tilted blocks (Welford, et al. 2010a, and b). Due to the complex history of the Flemish Cap, there is significant variability along its margin (Grant & McAlpine, 1990; Welford et al., 2010a, b).

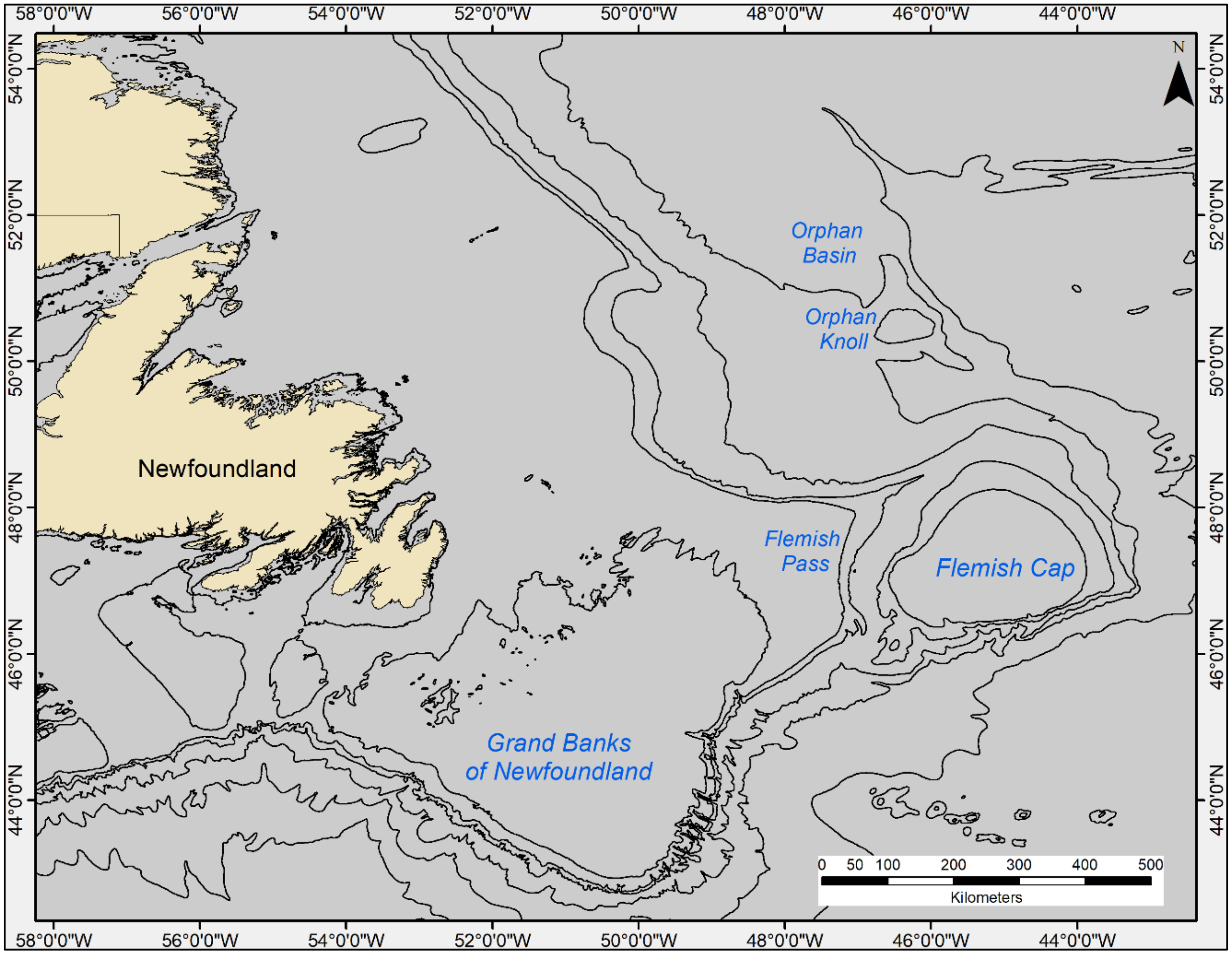

Figure 2-1 Location map of the Flemish Cap with respect to Newfoundland Grand Banks of Newfoundland Flemish Pass, Orphan Knoll, and the Orphan Basin.

The Flemish Cap margin formed as the North Atlantic Ocean opened northward during the Mesozoic (Srivastava & Tapscott, 1986). During the Aptian-Albian (~118 Ma), the southern Flemish Cap margin separated from the Galicia Bank located off the Iberian Peninsula, and the northern margin separated from the Goban Spur, part of the continental margin of Ireland (Srivastava & Verhoef, 1993). The margins rifted relatively quickly (10-20 My), forming a narrow transition between un-stretched continental crust and oceanic crust (Bassi et al., 1993). The average continental crust thickness on the Cap is 30-31 km to 6 km thickness over 45 km distance on the northeastern slope (Funck et al., 2003; Welford et al., 2010b). Hyperextension of the margins has resulted in numerous sections of faulted and rotated blocks (Welford et al., 2010a, b).

2.3.1 Conjugate Margins

The Flemish Cap forms conjugate margins with the Galicia Bank (Iberia) and the southern Flemish Cap flank, and the Goban Spur (Ireland) with the northern flank. While the Galicia Bank margin has been heavily studied, the Flemish Cap margin is only recently beginning to receive similar attention. Rifting between the Flemish Cap and the Galicia Bank began in the late Jurassic and continued into the Cretaceous (Grant & McAlpine, 1990; Hopper et al., 2006).

The rifting of the margins resulted in three crustal thinning zones: stretched continental crust, transition crust and oceanic crust. There is markedly less stretched continental crust on the southern Flemish Cap margin (~170 km; Welford et al., 2010a) than on the Galicia

Bank margin (300 km; Whitmarsh et al., 1996). Multiple rotated fault blocks are present on the continental slope (Welford et al., 2010a). The margin of thinned continental crust narrows from south to the northeast on the southern edge of the Cap.

Differing crustal thinning is likely due to asymmetrical separation between the Flemish Cap and Galicia Bank (Sibuet et al., 2007; Welford et al., 2010a). The asymmetrical rifting could be due to the Flemish Cap and Galicia Bank acting as micro-plates during the North American and Iberian plates separation (Sibuet et al., 2007).

As the North Atlantic Ocean continued to open northward, a second rifting phase occurred in the late Cretaceous, with a NE-SW extension separating the northern flank of the Flemish Cap and the Goban Spur (Tucholke et al., 1989; Hopper et al., 2006; Tucholke & Sibuet, 2007). It is proposed that rotation of the Flemish Cap occurred during rifting (Sibuet et al., 2007). This conjugate margin is largely extensional and defined into three crustal thinning zones (Welford et al., 2012).

In this asymmetrical conjugate margin, the thinning of the outboard margin is more abrupt on the Flemish Cap margin than on the Goban Spur margin (Welford et al., 2012). The Flemish Cap margin crust thins over a short distance of only 40 km from 32 km to 6 km (Gerlings et al., 2011). Additionally, within the transition zone, thin continental crust is observed throughout the Flemish Cap but not the Goban Spur (Gerlings et al., 2012).

The asymmetrical separation was present at all stages of rifting (Gerlings et al., 2012). Deep multichannel seismic collected on the northern Flemish Cap margin, clearly shows a wide region of highly thinned back-tilted (synrift) sediment packages above tilted faulted blocks (Gerlings et al., 2012).

The flanks of the Flemish Cap are extremely faulted, likely as a result from the opening of the North Atlantic. A strike-slip shearing zone follows the northeastern edge of the Flemish Cap along the -2000m contour (Welford et al., 2010b). It is hypothesized that the Flemish Cap rotated clockwise away from the region that is now the Orphan Basin, moving southeastward 200-300 km (Sibuet et al., 2007; Welford et al., 2010b).

2.3.2 Surficial Geology

Previous studies have described the Flemish Cap surficial geology above 500m as dominated by sand, boulders, and gravel (Weitzman et al., 2014) with the slopes covered mostly by mud (Grant & McAlpine, 1990). Sediments and ice-rafted detritus (IRD) are transported to the area by the Labrador Current and these sediments are similar to those found in the Orphan Basin and Labrador Slope.

There are regional variations of surficial sediments on the Flemish Cap. The northeastern flanks and a wide area on the southeastern and southern flanks are predominately covered in sand (Weitzman et al., 2014). In contrast, Holocene silts are most abundant on the northwestern flanks (Weitzman et al., 2014). The eastern and southern flanks exhibit winnowed sediments (Weitzman et al., 2014). Melt-out IRD are found in great number throughout the top of the Flemish Cap (Sen Gupta & Gupta, 1971; Weitzman et al., 2014).

The geomorphology of the eastern Canadian margin has been influenced by repeated glaciations (Piper, 1991). Ice sheets have extended out onto the continental margin, including the Grand Banks, and lower sea levels on to the Flemish Cap. During the last glacial maximum, the Flemish Cap was almost certainly submerged and had no glacial ice cover (Shaw et al., 2006). At the end of MIS 6, ice may have calved off the Flemish Cap, and melt water may be partially responsible for the canyons present on the southeastern flank (Stacey, 2011).

Seismic surveys have identified glacial tills on the inner Grand Banks (King & Sonnichsen, 1999) however, the Flemish Cap was likely ice-free during the last glacial maxima but, is supplied with ice reworked substrate from passing ice bergs in the form of drop stones (Shaw et al., 2006). Icebergs move south and west on the Labrador Current (Piper & Skene, 1998). Iceberg pits and scours have been found above 600 m on the shelf and upper slope (King et al., 1985; Parrot et al., 1990; Piper & Pereira, 1992). Icebergs reach the Flemish Cap in spring and early summer when temperatures at the top of the Cap are still dominated by cold polar currents (Stein, 1996).

2.3.3 Currents on the Flemish Cap

The Labrador Current (LC) is the main source of sediment and IRD transport to the Flemish Cap. From the north, the cold arctic waters of the Labrador Current (LC) and the Deep Western Boundary Current (DWBC) flow south along the continental margin. From the south the Gulf Stream and North Atlantic Current (NAC) bring warmer waters along the southeastern margin of the Cap. As the LC flows south, it divides into the inshore and offshore branches that follow different pathways (Stein et al., 1995). The inshore branch hugs the coastlines of Labrador and Newfoundland before joining the Cape Breton and Nova Scotia currents. The offshore branch splits directly north of 47ºN, with one branch flowing through the Flemish Pass, and the other flowing clockwise around the Flemish Cap (Stein, 2007; Mertens et al., 2014). The anti-cyclical current interacts with the NAC, causing eddies to form on the top and upwelling on the slopes of the Cap (Colbourne & Foote, 2000; Stein, 2007). A 200 km wide clockwise gyre forms seasonally at the top of the Cap with an average speed of 10 cm/s, and periodically the positions of the main currents shift bringing different water mass regimes to the area (Hill et al., 1973; Colbourne, 1993). The currents around the Cap change seasonally and there is an increase in meandering flows in the winter months when the average wind speed is higher (Kuldo et al., 1984).

2.4 Methods

In the summer of 2010, benthic surveys were conducted on the Flemish Cap (Figure 2-2) with the *CCGS Hudson* and the remotely operated vehicle (ROV), ROPOS (Remotely Operated Platform for Ocean Science) (CSSF, 2010). High-definition video of the seafloor was collected and analyzed to describe the surficial geology along the track. Green lasers set 10 cm apart were used for scale. On board, observations were recorded using the DFO proprietary software ClassAct Mapper (CAM; Benjamin, 2007). After the expeditions, videos were re-analyzed, and observations were geo-referenced with ROV positioning data. In addition to video imagery, geological samples were collected opportunistically.

2.4.1 Study Area

Four sites were surveyed on the southern, eastern, and northern slopes of the Flemish Cap (mission designation HUD2010029, Figure 2-3). Sites were selected based on reports of high sponge and coral occurrence, and interesting geological features (Table 2-1). However, these data were not specifically collected to address the goals of this study. Two dives were carried out on the southern flank to investigate two submarine canyons. The second canyon was chosen for the presence of a possible slump features (R1336) identified in multibeam bathymetry. Site R1337 traversed a fault scarp on the nose of the Flemish Cap, and site R1339 followed an up-slope track on the northern flank. A fifth survey was conducted to look for trawl marks and was excluded from this study.

Table 2-1 Hudson 2010 ROV sites with corresponding depth ranges, distance covered, total time on bottom, and site description.

Site	Date	Depth Range (m)	Length (km)	Bottom Time (hr)	Site Description	Region
R1335	12-Jul	875-1840	3.46	13.78	Canyon talweg	S
R1336	13-Jul	2224-2900	2.68	11.1	Canyon with possible slump	S
R1337	14-Jul	1020-2195	4.11	16.68	Faulted bedrock exposures	E
R1339	17-18 July	1363-2463	4.84	10.05	high sponge and coral by-catch area	N

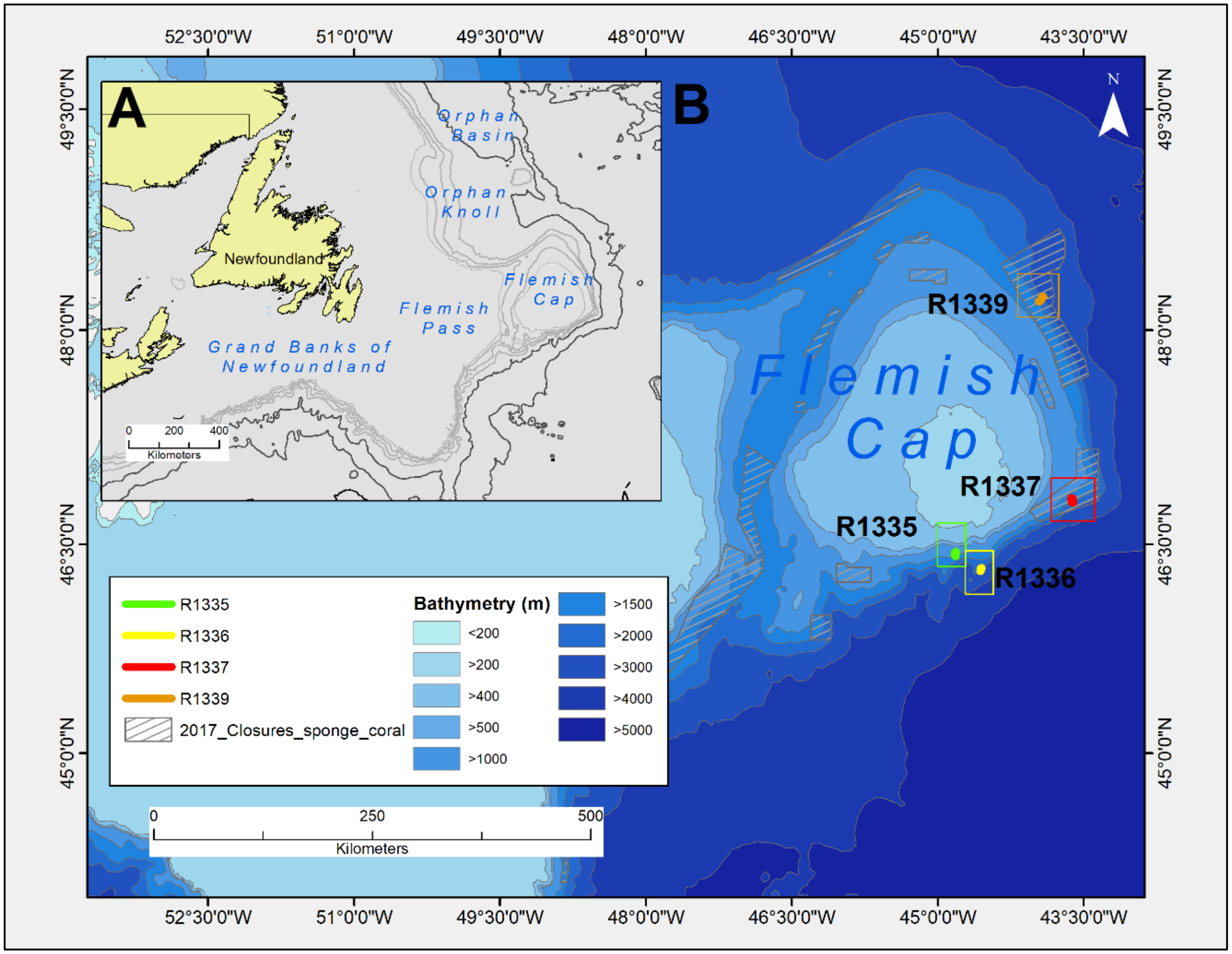

Figure 2-2 Location map of the Flemish Cap with respect to Newfoundland (A) and the five study sites (B). Lines represent ROV tracks: R1335 (green), R1336 (yellow), R1337 (red), R1339 (orange). Grey boundaries represent 2017 NAFO sponge and coral closures.

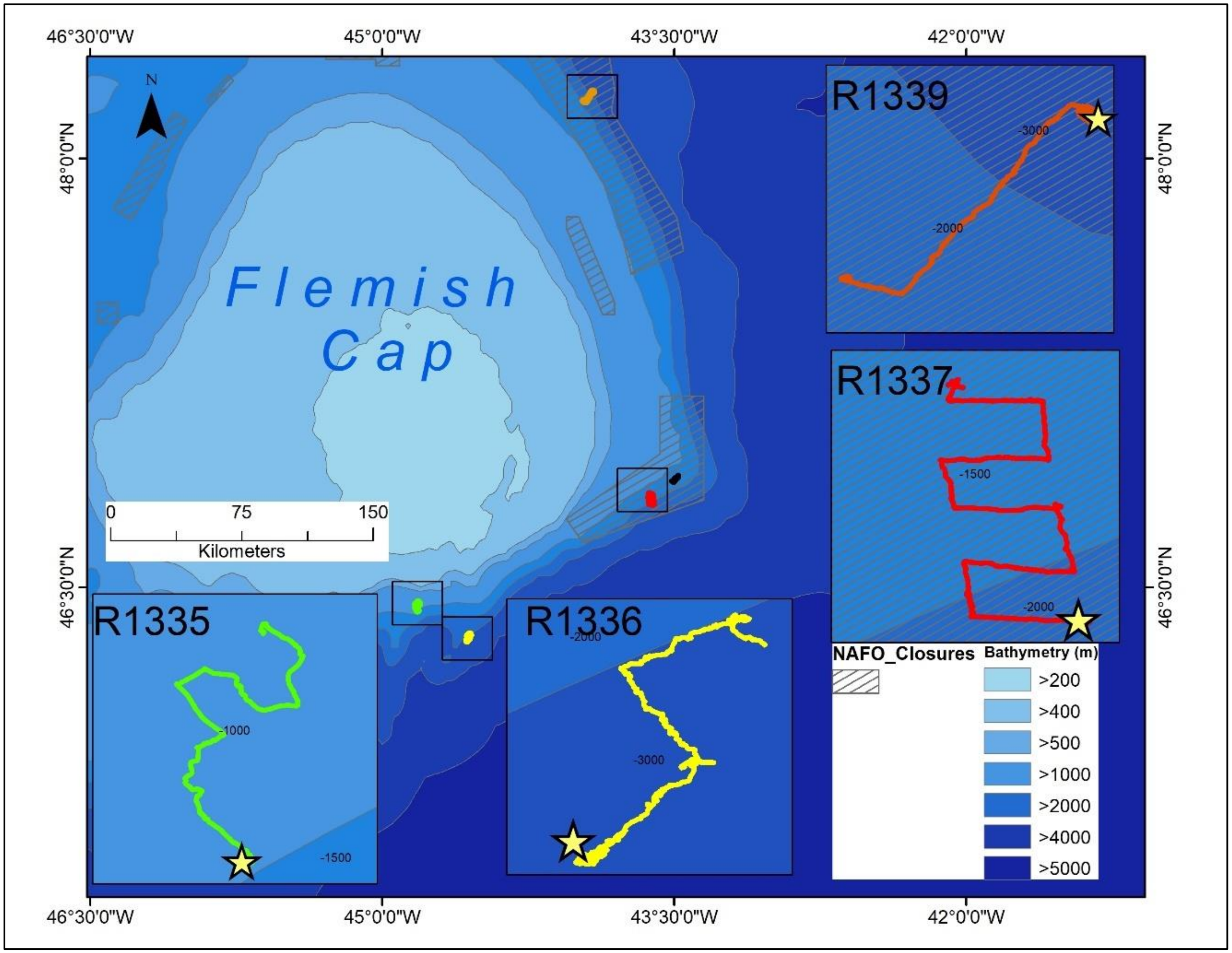

Figure 2-3 ROPOS ROV tracks for the four sites analyzed. Stars indicate the starting points for each track.

2.4.2 Video Analysis

The video imagery was analyzed to describe the surficial geology. The forward-looking camera on the ROPOS was used to determine grain size coverage, lithology, and sample selection. Grain size coverage was estimated visually and recorded in Class-Act Mapper at 1-second intervals for the duration of the video. These observations were referenced with location, and depth. Scaling lasers (set 10 cm apart) situated on the front of the ROV were used to determine grain size according to the Wentworth-Udden scale. It was not possible to distinguish sand from mud, which were combined as “fine grained”. The scaling lasers were not always sufficient to distinguish between cobble, and pebble which were combined as “gravel”. In addition to grain size, bedrock lithology was also identified, and verified from samples where possible. The 1-second interval grain size observations were mapped in ArcGIS (v. 10.5) and 100-m sections were described for surficial geology. The 100-m spatial scale was chosen to produce a geological description that was finer than traditional surficial geology descriptions.

2.4.3 Facies Description

Primary (most abundant) and secondary (second most abundant) grain sizes were determined at 1-second intervals recorded in CAM. Facies (surficial geology) were described from the primary and secondary grain sizes at 100-m spatial scales. For example, gravelly fine-grained facies consist of a primary substrate of gravel and a secondary substrate of fine grained for at a minimum of 75% of 1-second interval records. Notable features were recorded, such as bedrock walls or possible basalt dykes.

2.5 Results

2.5.1 Surficial Geology

Nine facies were described from 52 hours of video imagery based on grain size percent coverage and 18 grab samples (Table 2-2). The southern and eastern flanks of the Flemish Cap only have four different lithologies of exposed bedrock outcrops. The ROV ROPOS allowed for the characterization of facies not easily sampled by other methods (e.g. boxcores or van Veen grabs) used to describe surficial geology. Physical samples were collected opportunistically at various depths from each site (Figure 2-4). It also allowed for a nuanced surficial geological description at different spatial scales. For this study, facies are described at 100-m spatial scale. Block diagrams of each site and descriptions of the temporal distribution of facies from established regional stratigraphy are also presented.

Large sections of fine grained sediments and exposed bedrock outcrops of different lithologies were observed from ROPOS video imagery. Sedimentary outcrops were observed on three dives above 2450 m. Igneous outcrops were observed on two dives below 2050 m. Bedrock samples were taken from weakened sections of the outcrop where possible. Cobbles were sampled above 1050 m on the southern and eastern flanks. These consisted of various lithologies with striated surfaces clearly visible (Figure 2-5). Samples collected at deeper depths are described as possibly IRD, with no obvious indications of origin or not in proximity to an outcrop (Figure 2-5, Figure 2-6).

Table 2-2 Geology samples per site with source identified from the video and geology described from hand samples.

Site	Sample_ID	Latitude	Longitude	Depth (m)	Origin Identified from Video	Hand Specimen ID
R1335	HUD2010029_1335_11	46.426795	-44.82418833	1625	IRD	Epidotized Granite
	HUD2010029_1335_25	46.44838333	-44.815665	875	IRD	Limestone
	HUD2010029_1335_26	46.44840333	-44.81562833	875	IRD	Sandstone: Greywacke
	HUD2010029_1335_27	46.44840333	-44.81562833	875	IRD	Chert
	HUD2010029_1335_28	46.44859333	-44.81559167	875	IRD	Granodiorite
R1336	HUD2010029_1336_03	46.31277	-44.562455	2907	IRD	Granite
	HUD2010029_1336_08	46.31330167	-44.56178833	2885	likely bedrock,sampled from base of outcrop	Biotite Granite, granite, Avalonian/Paleoprotozoic
	HUD2010029_1336_09	46.31330167	-44.56178833	2885	likely bedrock,sampled from base of outcrop	Basalt: fine grained, porphyritic, non-glassy
	HUD2010029_1336_ 21	46.32848667	-44.56047167	2386	likely IRD	Granite
	HUD2010029_1336_29	46.33345	-44.54967833	2218	possible bedrock, likely IRD	Foliated pink granite
R1337	HUD2010029_1337_03	46.79852333	-43.62398333	2057	likely bedrock	Pink limestone
	HUD2010029_1337_04	46.799345	-43.62424833	2000	bedrock, sampled from jointed outcrop	Granodiorite, biotite
	HUD2010029_1337_06	46.804905	-43.62476333	1735	likely bedrock	Pink limestone
	HUD2010029_1337_08	46.81300167	-43.61207333	1571	likely bedrock,sampled from base of outcrop	Bedded limestone
	HUD2010029_1337_09	46.82810667	-43.62726833	1571	IRD	Granite
	HUD2010029_1337_15	46.82819833	-43.62724333	1029	IRD	Gneiss
	HUD2010029_1337_17	46.82819833	-43.62724333	1029	IRD	Granite
R1339	HUD2010029_1339_02	48.22845167	-43.92539167	2346	possible IRD	Foliated Granodiorite

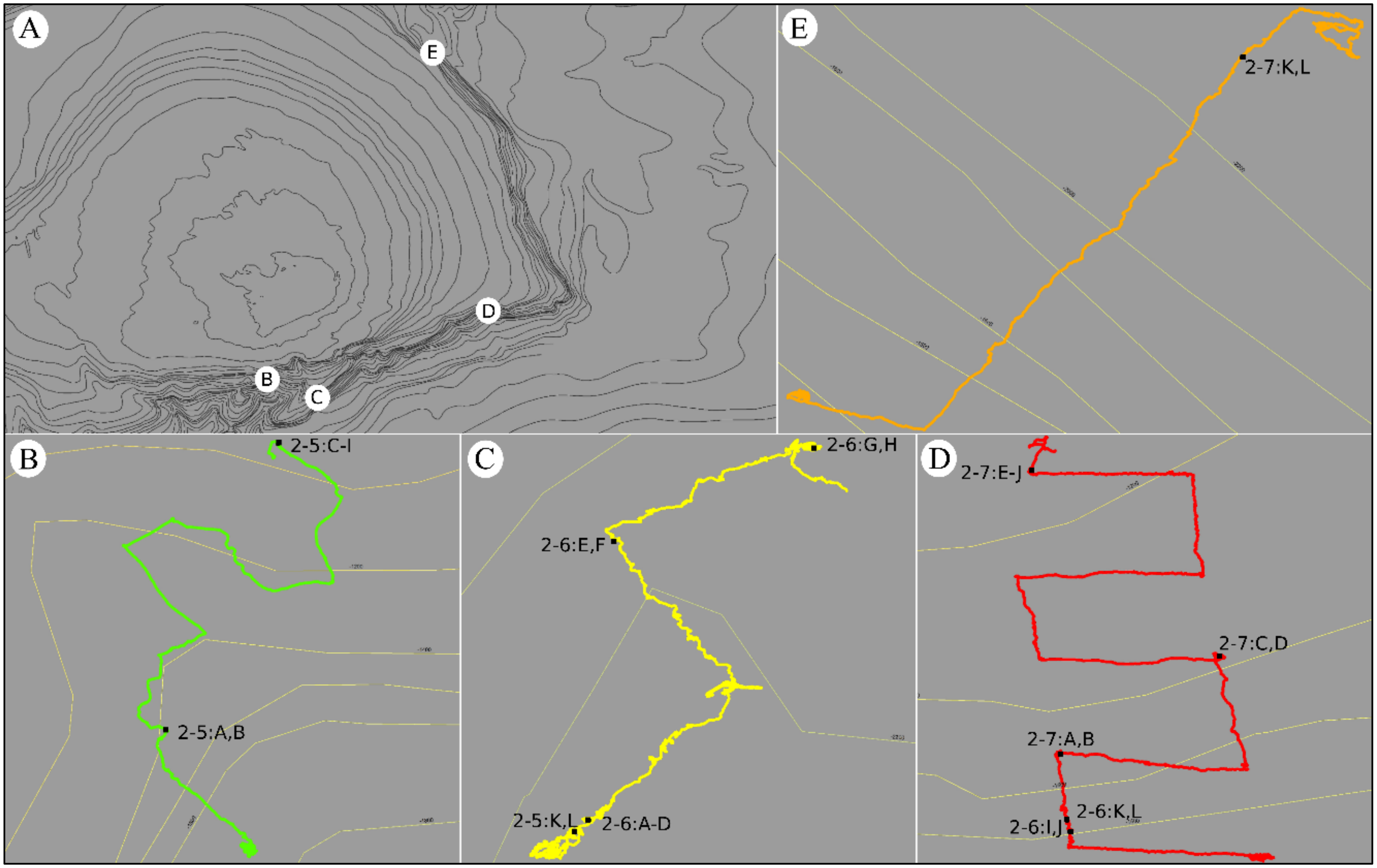

Figure 2-4 Locations of geological samples collected along each ROV track: R1335 (B), R1336 (C), R1337 (D), R1339 (E). Dots indicate location of sample collection with corresponding figure number and panel letter.

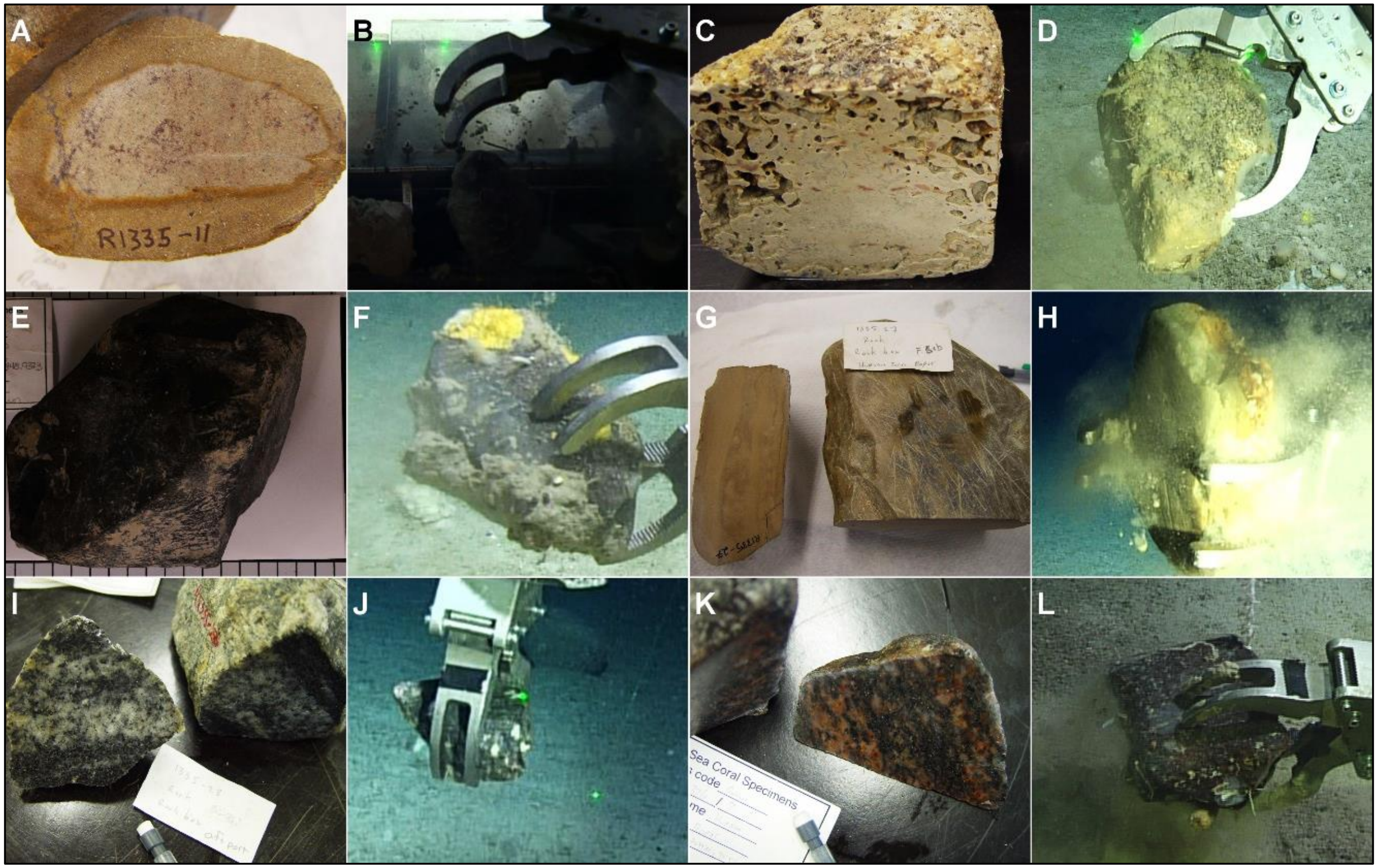

Figure 2-5 Recovered rock samples of 1335 both in lab and in situ images at the time of collection. Green scaling lasers are 10 cm apart. A) 2010029_1335_11, B) 2010029_1335_11 *in situ*, C) 2010029_1335_25, D) 2010029_1335_25 *in situ*, E)2010029_1335_26, F) 2010029_1335_26 *in situ*, G) 2010029_1335_27, H) 2010029_1335_27 *in situ*, I) 2010029_1335_28, J) 2010029_1335_28 *in situ*, K) 2010029_1336_03, L) 2010029_1336_03 *in situ.*

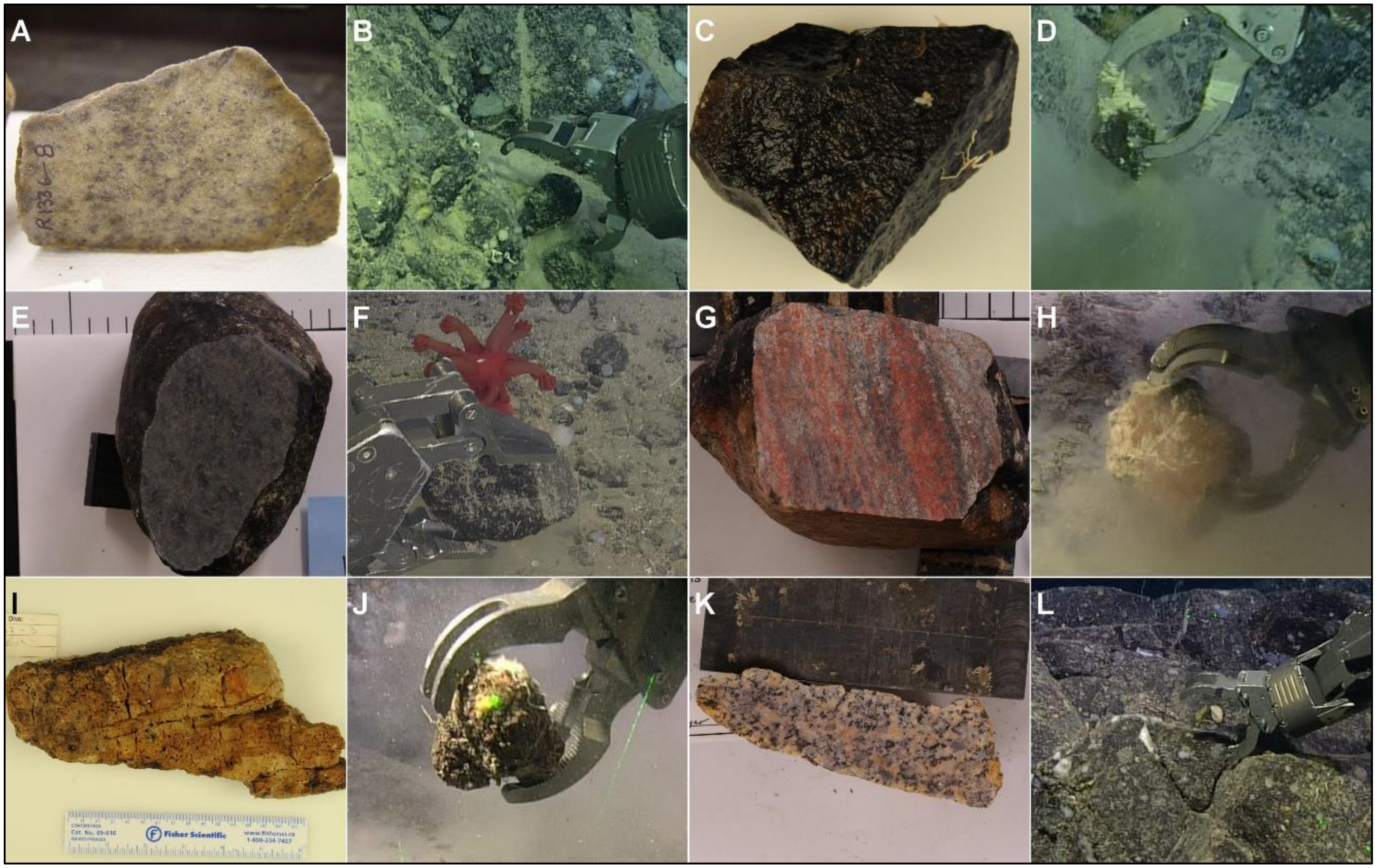

Figure 2-6 Recovered rock samples of R1336-R1337 of both in lab and in situ images at the time of collection. Green lasers are 10 cm apart. A) 2010029_1336_08, B) 2010029_1336_08 in situ, C) 2010029_1336_09, D) 2010029_1336_09 in situ, E) 2010029_1336_21, F) 2010029_1336_21 in situ, G) 2010029_1336_29, H) 2010029_1336_29 in situ, I) 2010029_1337_03, J) 2010029_1337_03 in situ, K) 2010029_1337_04, L) 2010029_1337_04 in situ.

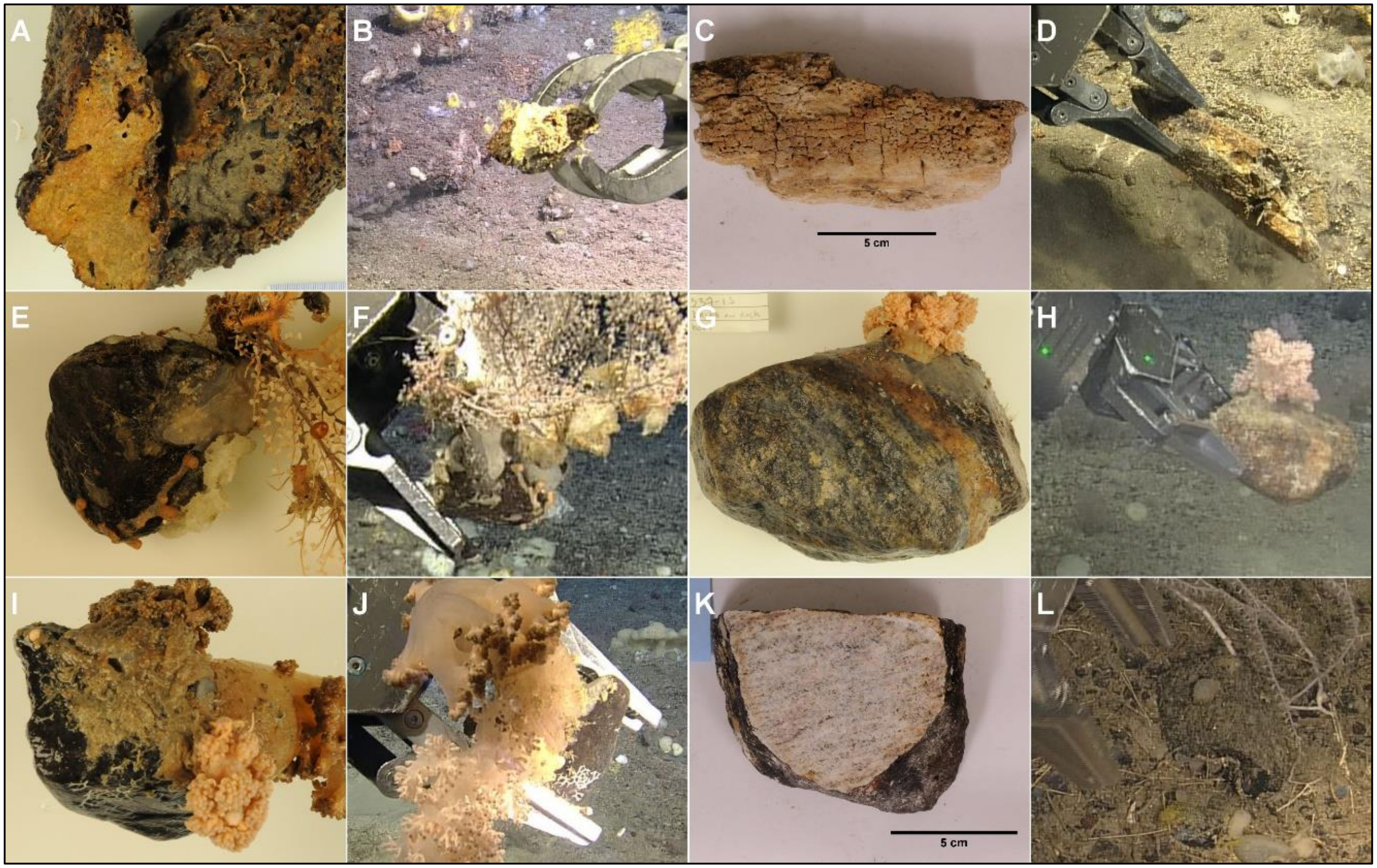

Figure 2-7 Recovered rock samples of R1337-R1339 of both in lab and in situ images at the time of collection. Green lasers are 10 cm apart. A) 2010029_1337_06, B) 2010029_1337_06 in situ, C) 2010029_1337_08, D) 2010029_1337_08 in situ, E) 2010029_1337_09, F) 2010029_1337_09 in situ, G) 2010029_1337_15, H) 2010029_1337_15 in situ, I) 2010029_1337_17, J) 2010029_1337_17 in situ, K) 2010029_1339_02, L) 2010029_1339_02 in situ.

2.5.1.1 Southern Flank

During mission planning, the southern flank was identified as an area of interest and further investigation. Site R1335 traversed the talweg of a small submarine canyon between 875 and 1840 m depth on the southern flank of the FC (Figure 2-3). Discontinuous sedimentary bedrock outcrops were interspersed between fine-grained facies (Figure 2-9). Sedimentary bedrock outcrops were relatively small and eroded into spires (Figure 2-8, A), except for one outcrop wall at 1400 m. Lithology was likely mudstone or sand stone. No bedrock samples were collected at this site. A total of four samples of igneous and sedimentary lithologies were collected above 900 m within a 5-meter area, which exhibited striations on their surfaces and classified as likely IRD (Figure 2-4; Table 2-2). These samples were collected to have a record of IRD in the area. Several different lithologies were represented including granite/granodiorite, and three different sedimentary lithologies: greywacke, silty sandstone, limestone (Figure 2-5). The fifth sample was granite/granodiorite and collected earlier in the transect at 1625 m.

To the east of R1335 at deeper depths, site R1336 was believed to be a canyon formed largely by slumping (Figure 2-3). This deeper site consisted of exposed granite bedrock and gravelly fine-grained facies (Figure 2-11). An exfoliated granitic outcrop was found at 2740 m, and a possible basalt dyke was present at 2745 m (Figure 2-8 B, C, D). A total of five rock samples were collected at four points along the transect (Figure 2-5, Figure 2-6, Table 2-2). Two angular igneous rocks were collected adjacent to a bedrock outcrop at 2885 m (Figure 2-6). As these were located adjacent to the outcrop and angular shape, the samples are likely locally-derived, rather than transported IRD. In contrast, the rounded coarse-grained granite cobble collected at 2218 m is likely IRD in origin.

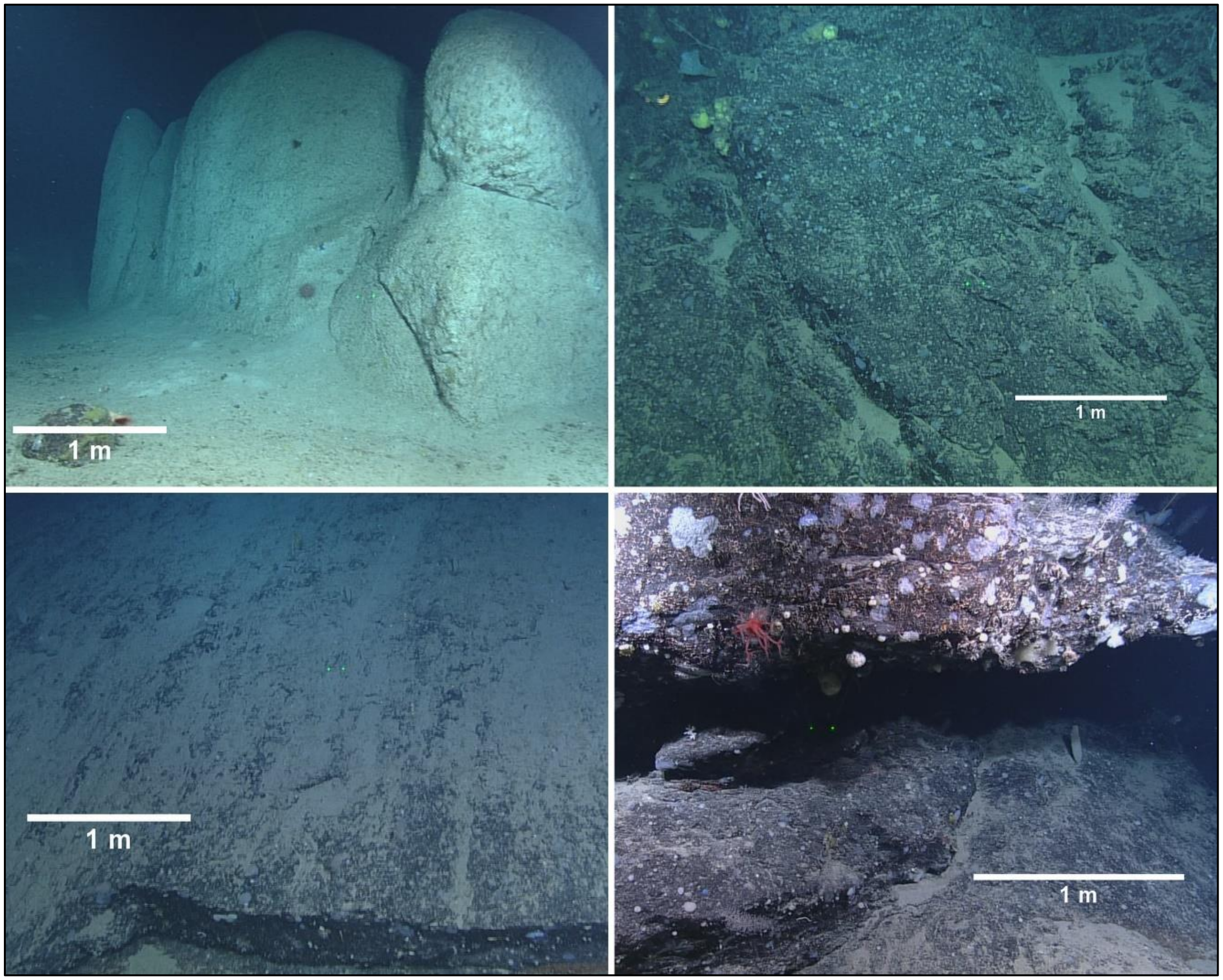

Figure 2-8 Surficial geology observed on two sites of the southern flank. A) R1335: Sedimentary outcrop (1690 m), B) R1336: Igneous outcrop (2893 m), C) R1336: Igneous outcrop (2740 m), D) R1336 Igneous outcrop (2745 m).

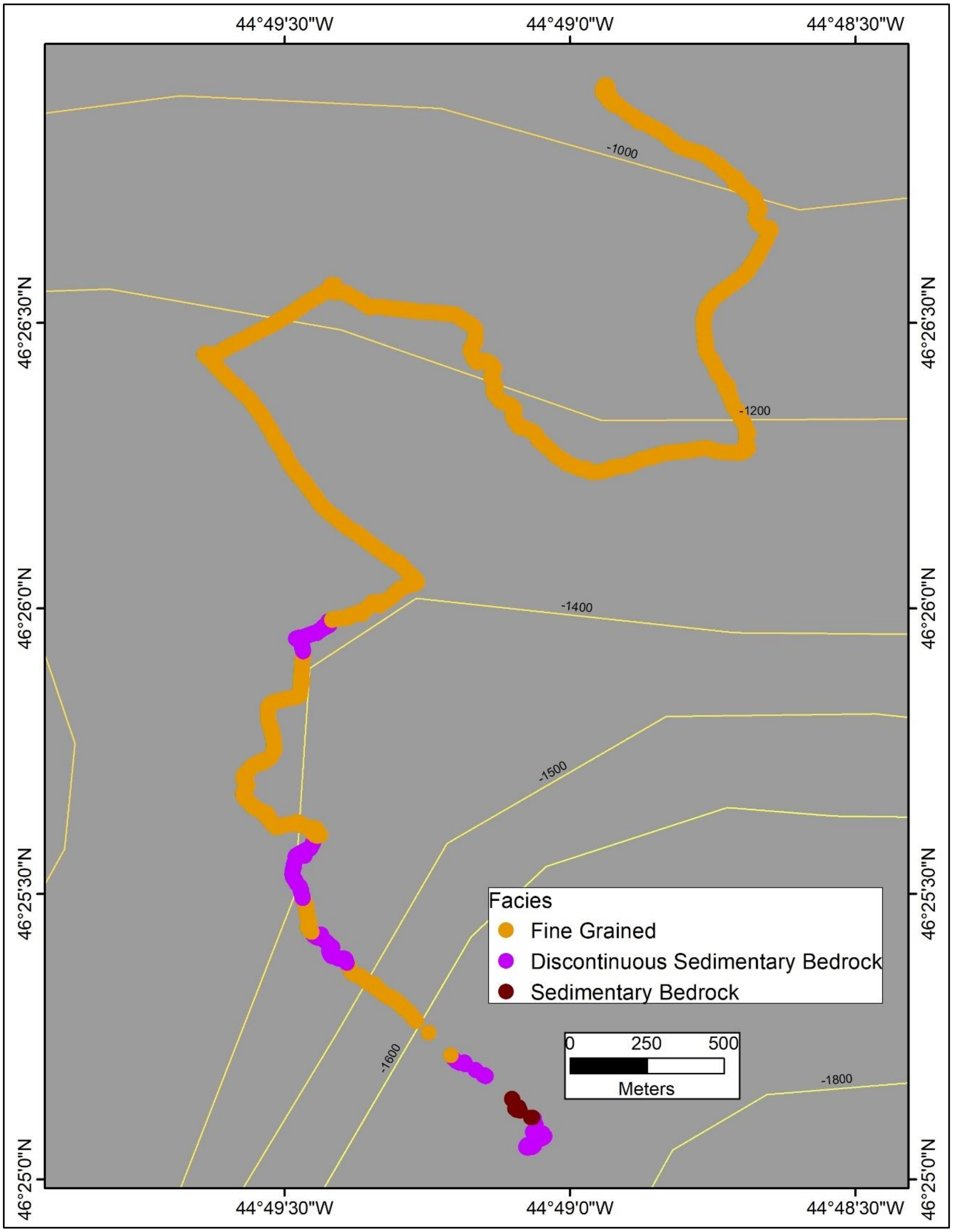

Figure 2-9 R1335 surficial geology facies described at 100 m sections.

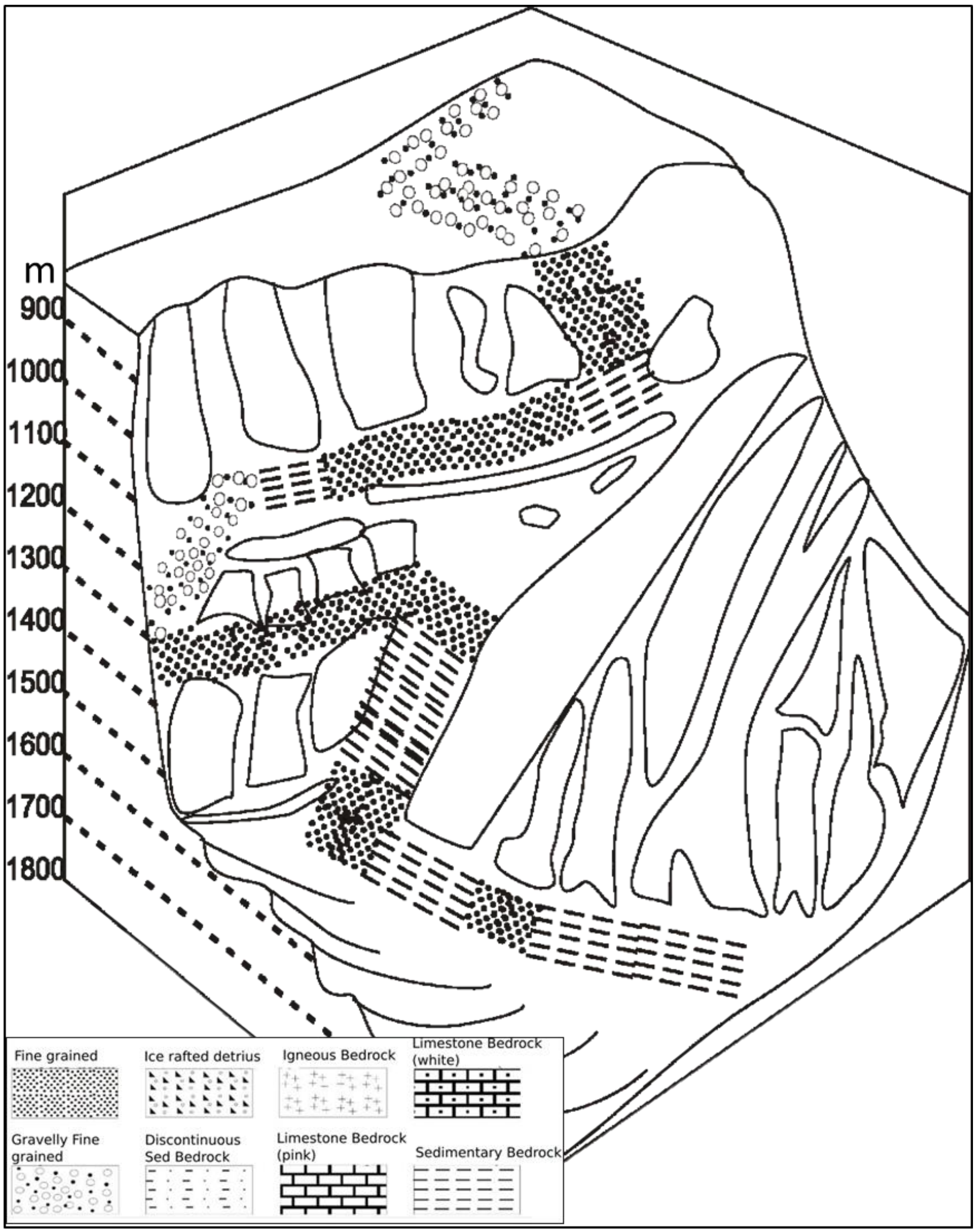

Figure 2-10 Site R1335 block diagram of the surficial geological facies described in 100 m sections by depth (m). Diagram terrain is based off publicly available bathymetric maps of the ROV track.

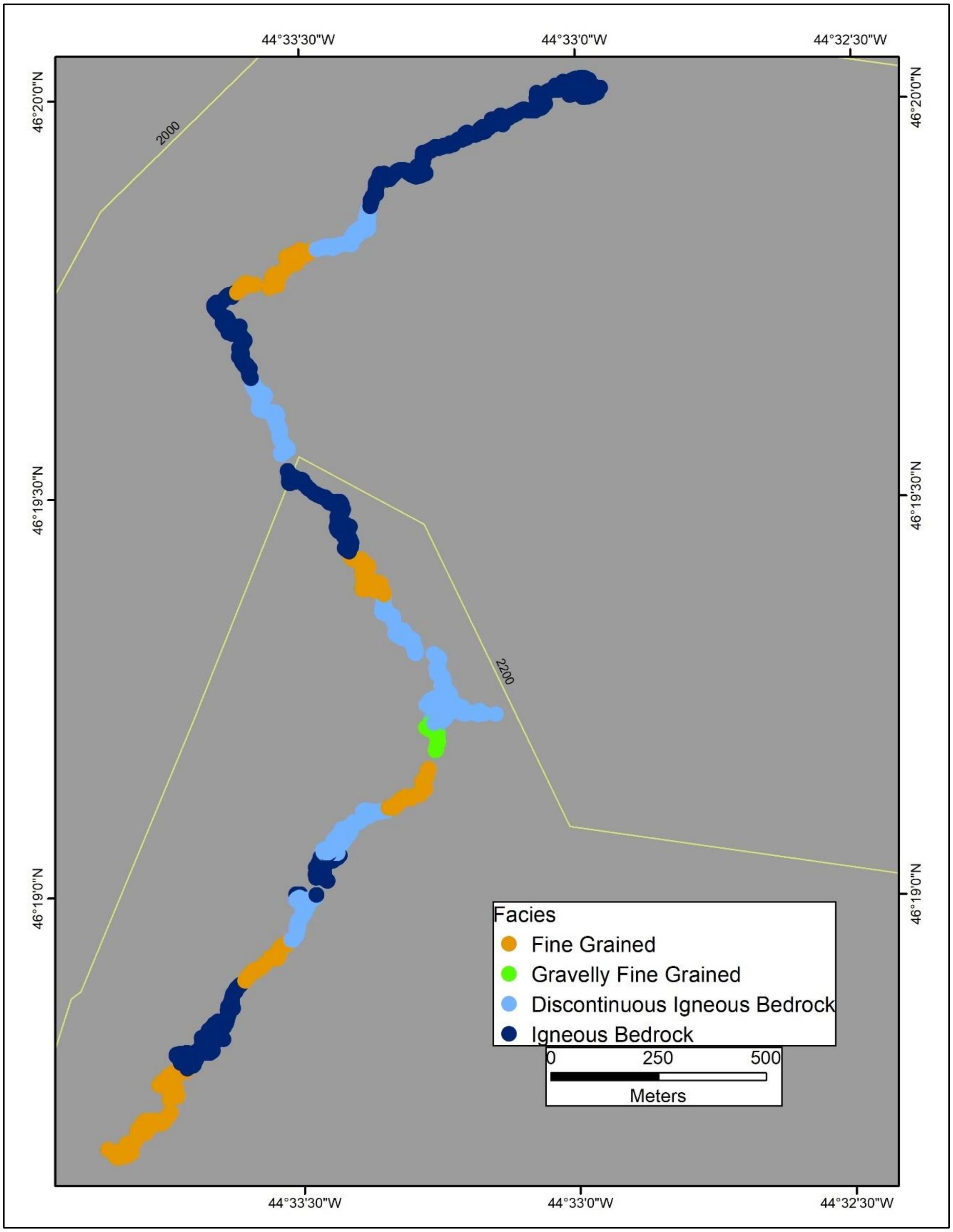

Figure 2-11 Site R1336 surficial geological facies described at 100 m sections.

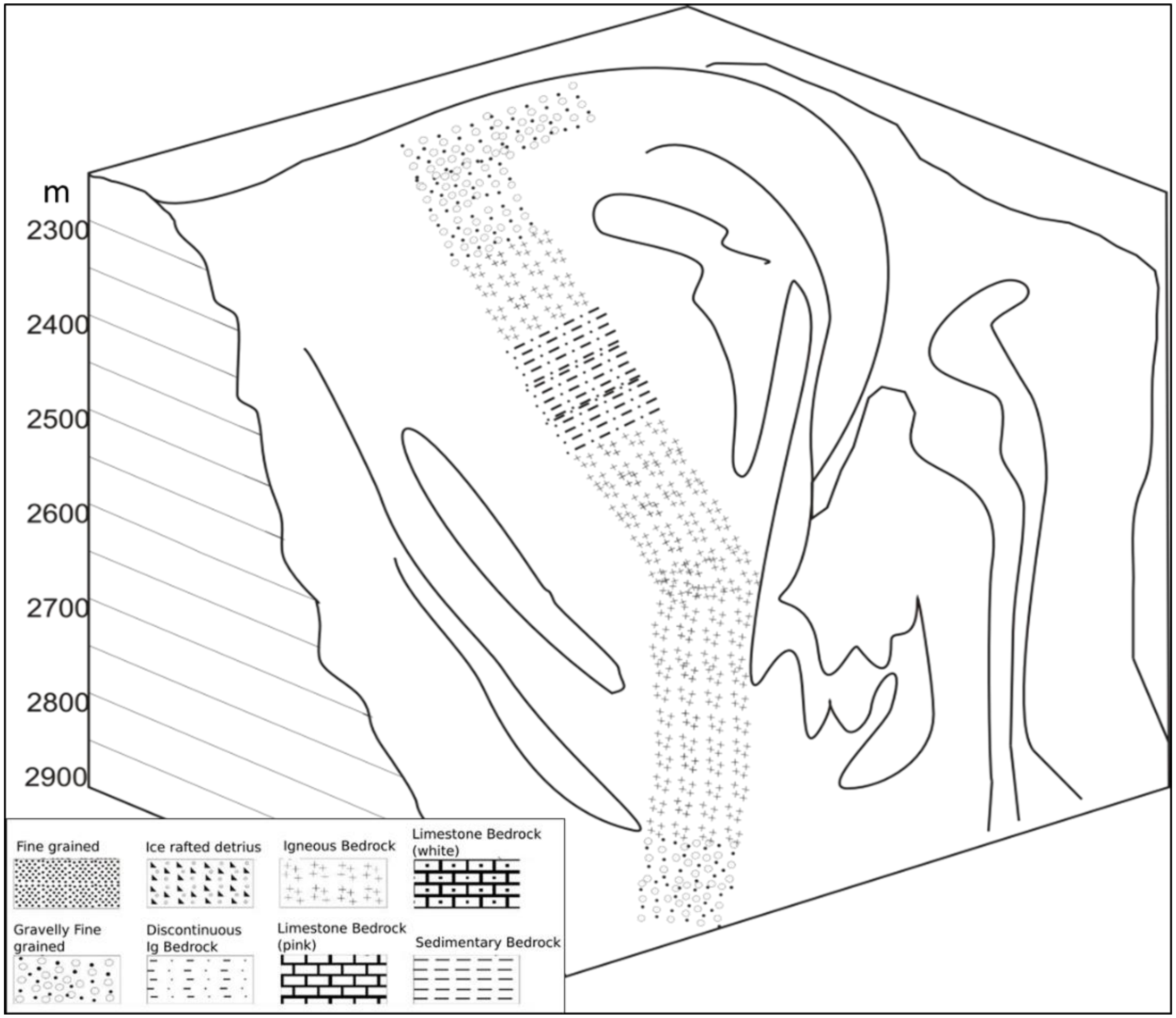

Figure 2-12 Site R1336 block diagram of the surficial geological facies described in 100 m sections by depth (m). Diagram terrain is based off publicly available bathymetric maps of the ROV track.

2.5.1.2 Eastern Flank

Site R1337, on the eastern flank, traversed a stepped bedrock slope (Figure 2-3). The transect starts at 2195 m depth, revealing discontinuously sedimentary bedrock outcrops, likely limestone. The bedrock lithology changes abruptly from limestone to granitic between 1800 m and 2200 m (Figure 2-14). Samples were collected at each of the three outcrops (Table 2-2). The first sample in the sequence is pink limestone collected at 2057 m (Figure 2-6). At 2050 m the lithology changes to a granodiorite (Figure 2-6, Figure 2-13). This is the only instance of igneous outcrop at this site. The last sample in this sequence at 1735 m was pink limestone (Figure 2-7). The rest of the ROV track consists of sedimentary bedrock outcrops interspersed with gravelly fine-grained sediments. At 1300 m depth, there is a prominent 100-m high sedimentary bedrock wall (Figure 2-13, B). Samples collected in the vicinity were white, chalky limestone (Figure 2-7). Granitic and gneiss cobbles, covered by a few centimeters of sediment, were collected at the end of this transect (Figure 2-7). These cobbles were sampled for the cold-water corals (Nephtheidae) attached to them. Several of these corals were present at the end of the transect indicating the presence of more sediment covered IRD.

Figure 2-13 Surficial geology observed on Flemish Cap: A) R1337: Granitic outcrop (2032 m), B) R1337: Limestone wall (1239 m), C) R1337: Sedimentary outcrop (m), D) R1339: sedimentary outcrop ledges (2381 m).

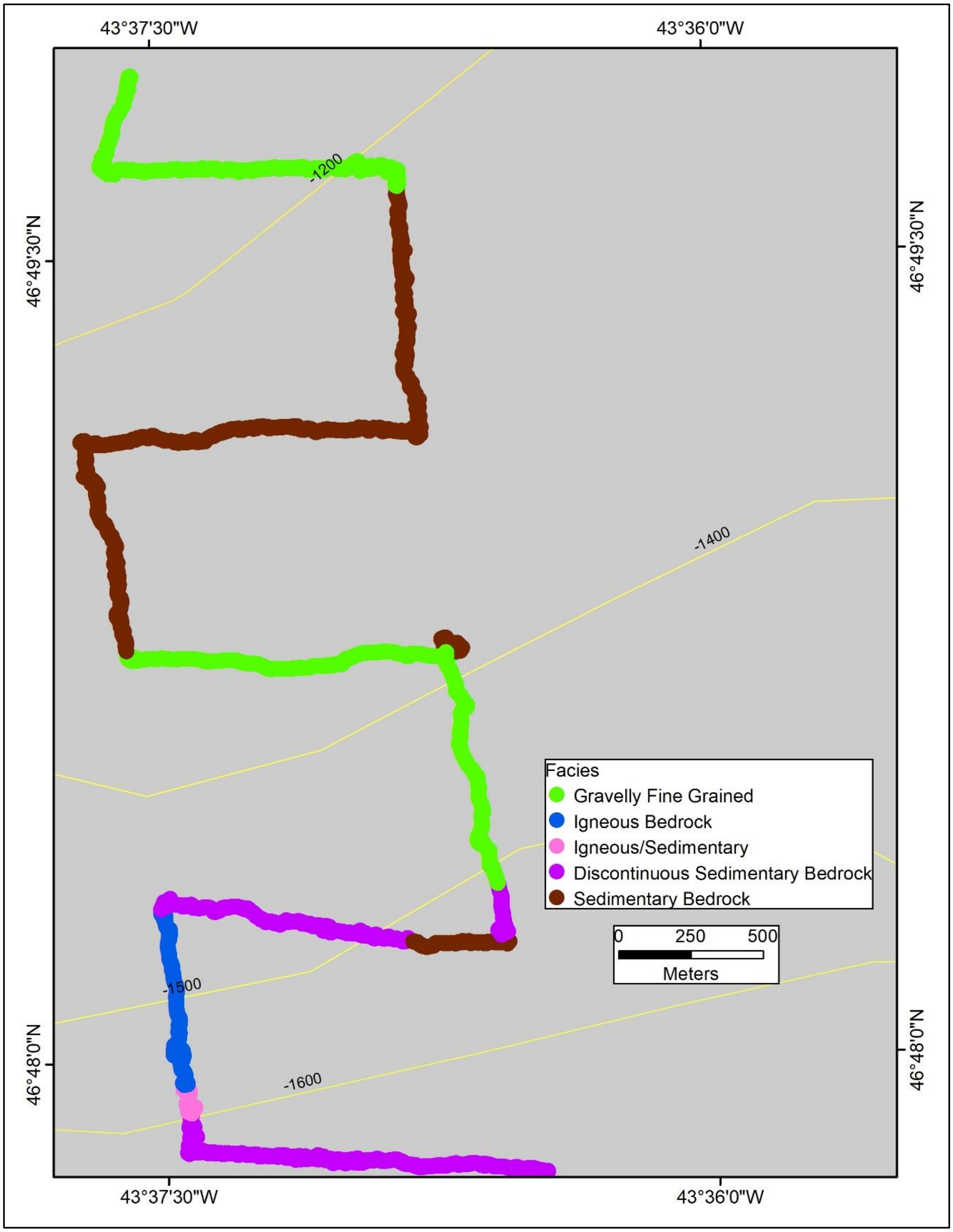

Figure 2-14 R1337 surficial geological facies described at 100 m sections.

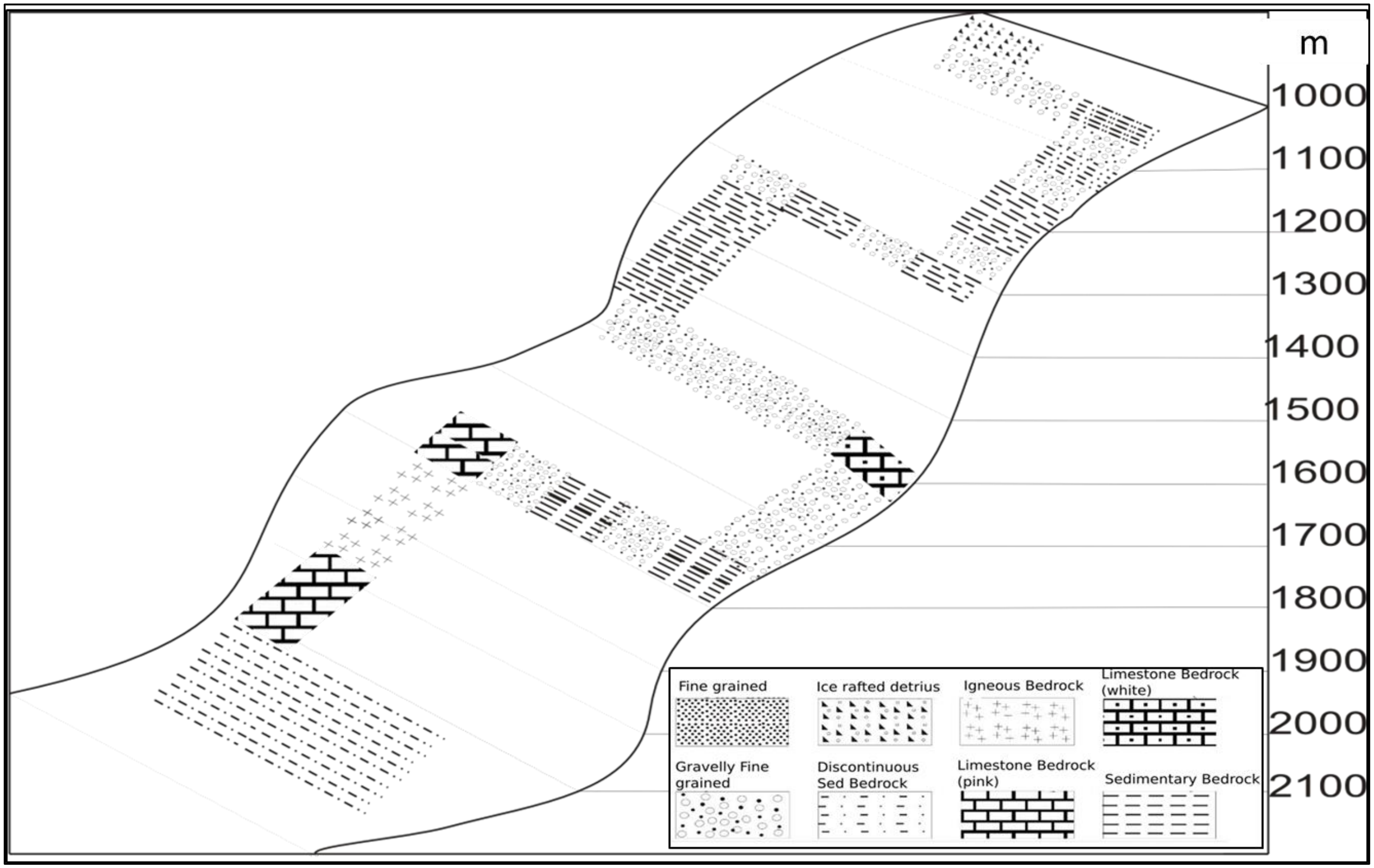

Figure 2-15 Site R1337 block diagram of the surficial geological facies described in 100 m sections by depth (m). Diagram terrain is based off publicly available bathymetric maps of the ROV track.

2.5.1.3 Northeastern Flank

The most northerly site (R1339) traversed the northern flank starting below 2400 m and ending above 1400 m (Figure 2-3). Only three facies were described on this site: sedimentary outcrop, fine grained sediments, and discontinuous sedimentary bedrock (Figure 2-16). Sedimentary outcrops were eroded into ledges and were exposed between 1800 m and 2400 m (Figure 2-13). The only rock sample was collected at 2346 m, consisted of foliated granite with quartz and plagioclase which is likely IRD in origin (Figure 2-7). Strong currents encountered at this site made maneuvering the ROV difficult.

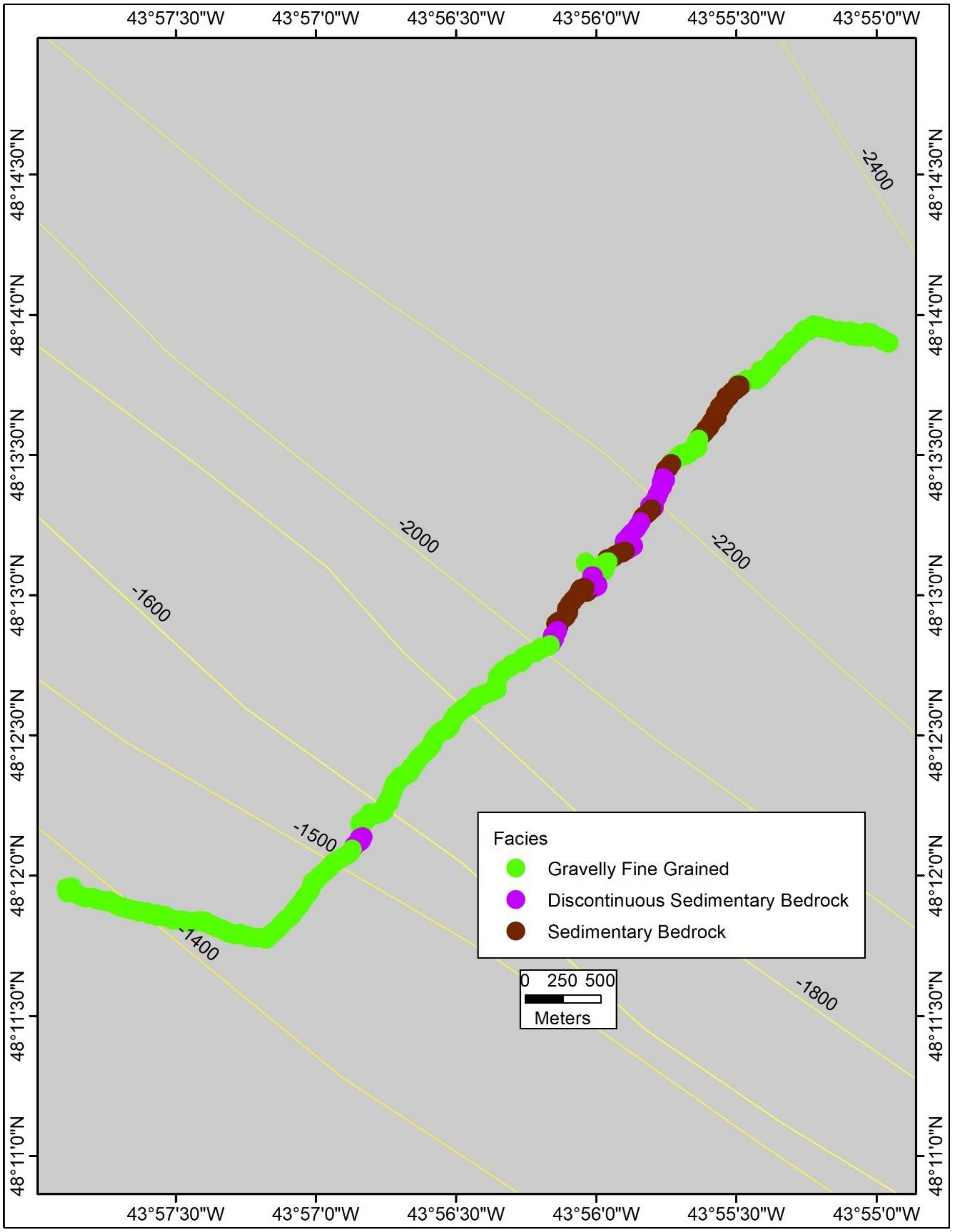

Figure 2-16 R1339 surficial geological facies described at 100 m sections.

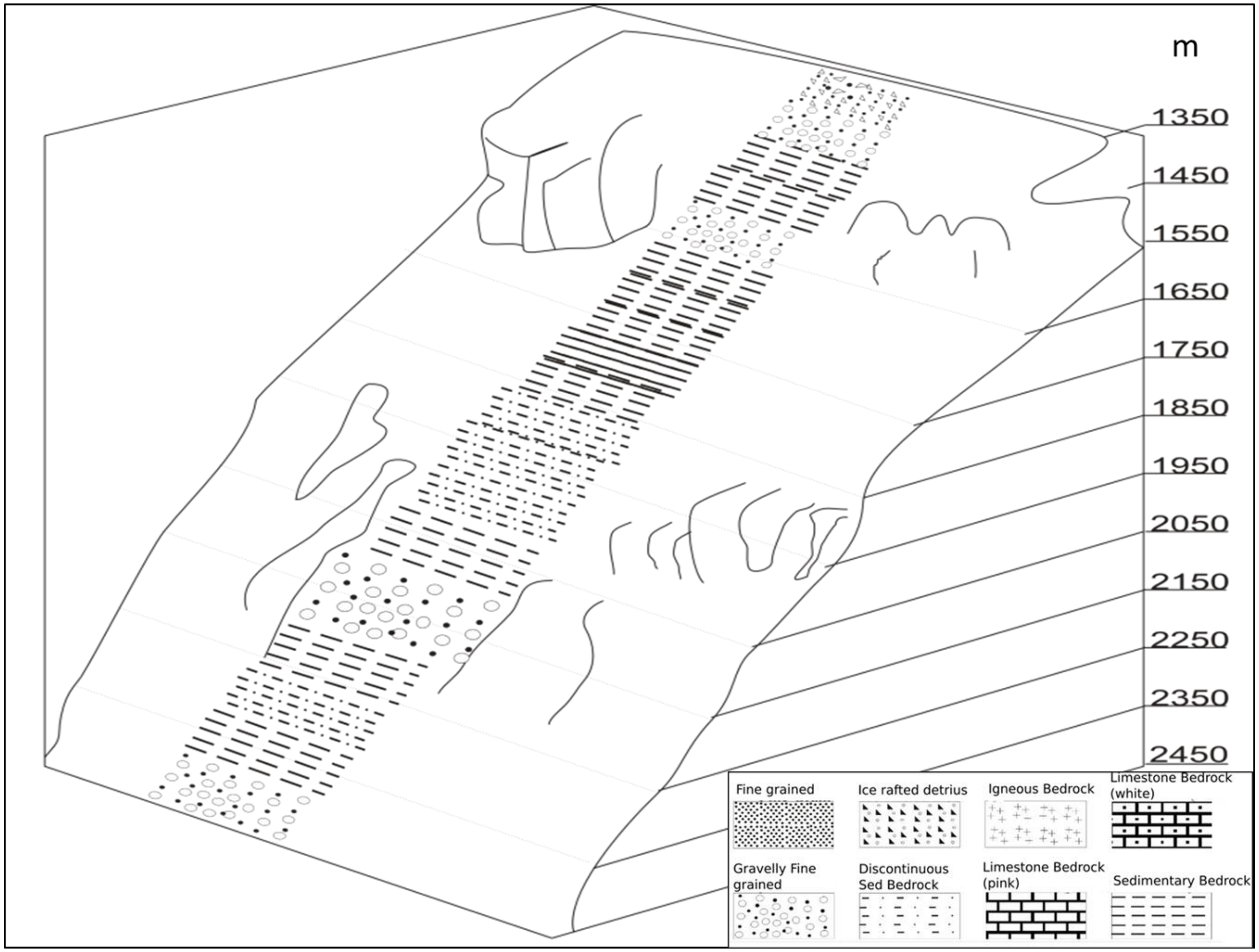

Figure 2-17 Site R1339 block diagram of the surficial geological facies described in 100 m sections by depth (m). Diagram terrain is based off publicly available bathymetric maps of the ROV track.

2.6 Discussion

2.6.1 Facies Interpretation

There were numerous areas of exposed bedrock comprising both igneous and sedimentary outcrops interspersed between finer grained surficial sediment facies. Sections of fine-grained unconsolidated sediment facies were observed on all dives and are interpreted as hemipelagic Holocene (MIS-1) and older glacial sediments with ice-rafted detritus, transported south by the Labrador Current. Sediments collected from industrial geophysical surveys and drilling for petroleum in the area from the northern flank area have been dated to the Neogene (Grant & McAlpine, 1990).

The origins of gravelly fine-grained facies could not be distinguished among eroded bedrock, winnowed sediments or melt-out from icebergs, and thus was broadly described as areas with ≥ 25% coverage of gravel, pebbles or cobbles. Large sections of fine-grained or gravelly fine-grained facies were present at all sites, and particularly R1335 of which fine grained sediments accounted for 94% of the survey track at 10 m intervals. The granite IRD found at sites R1335, R1336 and R1337 probably originated in either Greenland or Baffin Island (Piper & DeWolfe, 2003). IRD in the deep-water parts of the surveys could be from passing ice bergs or could have transported down slope from shallower depths. A maximum depth for possible IRD could not be determined from the available data.

Sedimentary outcrop facies were present between 1000-2400 m depth on three of the sites. Determining lithology from visual data based on erosion patterns and without adequate samples was difficult. Outcrops that could not be distinguished between: sandstone, mudstone or siltstone was grouped into sedimentary bedrock. No samples were collected from the sedimentary outcrops observed at R1335 but, from the weathering patterns observed are likely comprised of grain sizes smaller than sand (Figure 2-8).

Igneous outcrops were similarly difficult to visually identify to that of sedimentary outcrops. The successful collection of a sample of granite outcrop on R1337 may be representative of outcrops seen on R1336 at deeper depths but this is unconfirmed. The distribution of igneous outcrop facies differed from that of sedimentary outcrops in that they were only present on two sites and at deeper depths.

2.6.2 Geological Summary

The distribution of facies observed on the flanks of the Flemish Cap span the breadth of its geological history. The four video surveys were conducted in areas that have previously been described as stretched continental shelf between 875 m and 2900 m depth (Welford et al., 2010a, b). However, this study did not use any sub-bottom to correlate our findings with this. This includes areas of rotated blocks and faulting. Of the bedrock lithologies observed, igneous was observed deeper (2050-2900 m) and only on two sites while, sedimentary was observed on three sites at mid-slope to shallow depths (1075-2465 m).

Depth (m)	R1335		R1336		R1337		R1339	
	Lithology/Age	Diagram	Lithology/Age	Diagram	Lithology/Age	Diagram	Lithology/Age	Diagram
800	Boulders in fine grained matrix/Q		-	-	-	-	-	-
1000	fine grained/Q		-	-	gravelly fine grained/Q		-	-
1200	sedimentary bedrock outcrop/Cz		-	-	gravelly fine grained and sedimentary outcrops/Q		gravelly fine grained/Q	
1400	Discontinuous sedimentary outcrops/Cz		-	-	sedimentary outcrop wall/Cz		sedimentary outcrop ledges/Cz	
1600	sedimentary outcrop wall/Cz		-	-	sedimentary outcrop wall		gravelly fine grained/Q	
1800	Discontinuous sedimentary outcrops/Cz		-	-	chalky limestone outcrop wall/Cz		sedimentary outcrop ledges/Cz	
2000	-	-	-		Pink limestone and Granodiorite outcrop/ Paleozoic		sedimentary outcrop ledges/Cz	
2200	-	-	gravelly fine grained/Q		Pink limestone outcrop /Albian or Aptian		gravelly fine grained/Q	
2400	-	-	granodiorite or volcanics		Discontinuous sedimentary outcrops/Albian or Aptian		Discontinuous sedimentary outcrops	
2600	-	-	volcanics and gravelly fine grained		-	-	-	-
2800	-	-	granodiorite/ Paleozoic		-	-	-	-

Figure 2-18 Geological summary of the lithology and possible ages of facies per site.

2.6.2.1 Southern Flank

The observations on the southern flank consisted of two dives covering different depths and surficial geological facies (Figure 2-18). The shallower of the two sites (R1335) consisted of unconsolidated Quaternary sediments and eroded sedimentary bedrock outcrops. The sedimentary spire outcrops were unique and only observed at this site. These erosional patterns could be due to the lithology or current regime changes on this section of the FC. At site R1336 (in deeper depths), igneous outcrops were interspersed between unconsolidated sediments. The igneous outcrops differed from the outcrops on R1337 in terms of outcrop extent, coloration and mineral size. The amount of bedrock outcrops in the area could be due to the slow depositional rates in the area.

2.6.2.2 Eastern Flank

Site R1337 was the most heterogeneous bottom type of any of the sites surveyed and had a step-like geomorphology. A sharp contact is observed between 1700 and 2000 m depths as the bedrock outcrops transition from possibly Aptian-Albian, pink limestone, to massive-jointed granodiorite, and back to pink limestone outcrops (Sen Gupta & Gupta, 1971; Figure 2-6, Figure 2-7, Figure 2-18). Similarly, discontinuous sedimentary bedrock outcrops were revealed during the traverse, including a 100-m limestone wall between 1300-1400 m depth. The shallowest part of the video survey revealed gravelly fine-grained sediments with likely IRD.

2.6.2.3 Northeastern Flank

The northern flank has a more gradual slope than the eastern or southern flanks. Discontinuous sedimentary bedrock outcrops that formed ledges were observed along the length of the video survey. These ledges were small, being less than two meters in length and less than half a meter in width. This site is exposed to the Deep Western Boundary Current (DWBC) as it splits just above the FC and travels south along the continental edge (Mertens et al., 2014). No bedrock samples were collected at this site thus, outcrops were broadly classified as sedimentary. As with other surveys, Quaternary gravelly fine-grained facies were found at the shallowest depths at the end of the survey transect (Figure 2-18).

2.6.3 Identification of igneous facies

During the opening of the North Atlantic Ocean, there was less stretching and continental thinning on the Flemish Cap margin than the Goban Spur/Galicia Bank margins, probably due to its strong granitic core (Welford et al., 2010a, b). Granitic outcrops exposed at the surface were observed at depths below 1600 m on the southern and eastern flanks of the FC (Figure 2-8, Figure 2-13). However, similar massive and jointed bedrock outcrops have been observed in 143 m of water on the top of the Cap near the continental shelf edge (Pelletier, 1971). Sample Hud2010029_R1336_29 was collected at 2218 m and is similar to fine to medium-grained pink granodiorite drilled core samples (King et al., 1985). This sample was not taken directly from the outcrop, and its origin could not be confirmed visually. Other granitic core samples drilled on the FC at a depth of 146 m were light gray, and coarse grained (Pelletier, 1971).

At 2885 m depth, two different igneous samples were collected and are interpreted as possibly bedrock (Table 2-2). Both samples were sampled from the base of the adjacent outcrops but not sampled directly from them. Due to their angularity and proximity to the outcrops we have classified them as likely bedrock. These samples were not available for examination. Descriptions presented here are from available *in situ* imagery and descriptions made at the time of collection. HUD201009_1336_08 is a fine-grained biotite granite, HUD201009_R1336_09 consisted of a fine grained, porphyritic, non-glassy basalt. Further analysis will be needed of these igneous samples to confirm their origin.

2.6.4 Identification of sedimentary facies

Two limestone samples collected from outcrops at 1571 m and 2057 m depth on site R1337 represent different depositional environments that occurred at different times during the opening of the North Atlantic Ocean. The pink limestone found below and above the core granitic outcrop at 2000 m depth is probably shallow-water type limestone due to its coloration. It is similar to Aptian-Albian aged samples recovered on ODP Leg 210 or the fossiliferous limestone samples dredged from shallower depths on the southern flank (Sen Gupta & Gupta, 1971). The limestone sampled at 2057 m, is a chalky limestone that probably formed later in the ocean spreading, in a deep-water environment, possibly during the late Cretaceous (Figure 2-7).

The sedimentary bedrock observed on site R1335 is likely a mix of different sedimentary rock types including mudstone, limestone and sandstone, likely deposited during the Cretaceous (Figure 2-18). Dredge surveys in the area have returned fossiliferous limestone from 1480 m depth dated to the early to mid-Cretaceous (Sen Gupta & Grant, 1971). The sedimentary outcrops found below 2000 m on R1339 are probably Cretaceous and Palaeogene east coast sediments (King et al., 1985).

2.7 Conclusion

The complex geological history of the Flemish Cap is evident in the surficial geology seen in the video imagery surveys conducted at four sites on the southern, eastern and northern flanks. The video imagery shows there are large outcrops of basement core, as well as, sedimentary bedrock of Cretaceous age. ROV video imagery provides unique insight into the surficial geology of the Flemish Cap not previously captured from traditional survey methods (e.g. boxcores and VanVeens). Using ROV imagery could be a good source of geological information from other difficult to sample areas where other transects have been conducted.

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3 Distributional patterns of cold-water corals in relation to surficial geology on the Flemish Cap: Northwest Atlantic

3.1 Abstract

This study uses video imagery from ROV collected in 2010 to determine attachment substrate preference for CWC species and relate coral abundance to surficial geology at five spatial scales (10 m, 50 m, 100 m, 500 m, 1000 m). Attachment substrates were described by lithology and grain size. In total 30,310 coral colonies were observed throughout the entire depth range (875-2900 m); comprising 27 species. CWC species that colonize hard substrates did not have a grain size or lithology preference. *Anthomastus spp*. was the only species found on all grain sizes and both lithology types, across all depths. Two- way ANOSIM comparison of the five spatial scales across all depths showed significant results ($p<5\%$) for facies described at fine scales (10-100 m) but were not significant for broad scales (500-1000m). These observations highlight the importance of substrate and surficial geology in describing habitat at spatial scales less than 100 m.

3.2 Introduction

Cold-water corals (CWC) are long-lived, slow growing, sessile animals, which are particularly vulnerable to changes to their environments. They are vulnerable to environmental changes such as ocean acidification (Guinotte et al., 2006), and anthropogenic pressures (e.g. fishing, and oil and gas production) (Mortensen et al., 2005; Roberts et al., 2006; Edinger et al., 2007). Their long life-span and complex structures provide stable shelter, feeding sites, and habitat for deep sea fauna (Buhl-Mortensen et al., 2010), and are associated with higher species diversity than in surrounding areas (Ross & Quattrini, 2007). CWC are considered important habitats in need of protection and are classified by the United Nations General Assembly (UNGA) as Vulnerable Marine Ecosystems (VME) (UNGA Resolution 61/105). However, knowledge of CWC distributions is limited and often biased by research effort (Roberts et al., 2006). It is important to understand which factors most strongly influence CWC distribution to inform conservation measures. This study compares the relative importance of geological and oceanographic factors on distributions of cold-water corals on the Flemish Cap, NW Atlantic.

Cold-water coral research has focused on specific regions, particularly in the Northeastern Atlantic (Roberts et al., 2005). In the Northwest Atlantic, off eastern Canada, 36 coral species have been identified on the continental shelf and edge from Nunavut to Nova Scotia (Breeze et al., 1997; Mortensen et al., 2006; Wareham & Edinger, 2007; Edinger et al., 2007; Gilkinson & Edinger Eds., 2009). This includes several species of gorgonians (sea fans), antipatharians (black-wire corals), pennatulaceans (sea pens), scleractinians (stony corals) and alcyonaceans (soft corals). Exploration into the Canadian Arctic has extended our knowledge of the geographic range of some species, including that of the gorgonian *Keratoisis* sp. (Neves et al., 2014). CWC distribution data has come from fishing by-catch records, fishery observers, and scientific surveys, resulting in a distribution biased towards fishing effort (Gass & Willison, 2005; Wareham & Edinger, 2007; Edinger et al., 2007). Consequently, areas of the seafloor with relatively low fishing pressure have limited information on coral abundance and diversity. To predict where CWC might be in these under sampled areas, factors that describe CWC habitat are used. Environmental factors that are essential to CWC are more easily described over a larger region, which is useful for locating potential habitats in these non-fishing regions.

CWC species colonize habitats with specific environmental (Roberts *et al.*, 2009). Environmental variables are used as surrogates in models to predict CWC habitat distributions in areas where presence data is lacking (Bryan & Metaxas, 2007; Yesson, 2012). However, these models are only as good as the environmental surrogates used to create them, and often can produce maps that overestimate the availability of suitable habitat, which is not as useful for conservation planning. Often, a key component of CWC life histories that is not included in these models is attachment substrate, with hard substrates being particularly important to many species of interest (Bryan & Metaxas, 2007). At most depths worldwide, the seafloor comprises mostly of soft sediments (e.g. mud and sand) with hard substrates being rarer and usually found in shallow to mid-range water depths. Without the inclusion of attachment substrate preferences, predictive habitat maps tend to encompass large regions that do not necessarily accurately depict CWC ranges (Davies *et al*., 2008; Yesson, 2012). However, knowledge of local topography can pinpoint potential habitat more precisely (Brooke *et al*., 2014). Determining where hard substrate is in a given area, and in what form, could produce more accurate models. However, currently it is unclear what characteristics of hard substrates are preferred by each species.

Many CWC species need to colonize a form of hard surface, and the lack of a suitable substrate can limit their distribution or development. The bathymetric range and fine-scale spatial distribution of the large octocoral species *Paragorgia spp*. is limited by the availability of hard attachment substrate (Mortensen & Buhl-Mortensen, 2005; Watanabe *et al.*, 2009). While there is a degree of variety in soft substrates (i.e. the percent of sand or silt), hard substrates are more easily identified, and offer greater variability in type, shape and size. While some experimental studies have suggested a substrate type preference at the larval stage (Sun et al., 2009), it is unknown if CWC have a hard substrate type preference *in-situ* (e.g. sedimentary vs. igneous bedrock or boulders vs. bedrock).

The continental shelf of Atlantic Canada has an unique geological history and has numerous types of hard substrates beneficial for CWC recruitment. Corals have been found on the continental shelf, shelf edge, and slope from the Arctic to Nova Scotia (Wareham & Edinger, 2007). Less than 20% of the southern Atlantic Canada continental shelf is more than 200 m deep (Piper, 1991). The surficial geology mainly consists of gravel in the form of ice-rafted debris, glacial tills (Piper, 1991). In addition to glaciomarine depositional features such as moraines, CWC inhabit current swept cobbles and boulders, exposed bedrock outcrops, and semi-consolidated sediments (Edinger et al., 2011; Baker et al., 2012). The Flemish Cap (FC) is the eastern most point of the continental shelf. It is an area of known high CWC abundance and has designated NAFO closures (Murillo et al., 2011; Wareham & Edinger, 2007). This study used a remotely operate vehicle (ROV) to capture *in-situ* video of cold-water coral habitats on the flanks of the FC. Here we describe the distribution and abundance of CWC species, their attachment substrates, and the surficial geology at different scales.

3.3 Methods

3.3.1 Study Area

The FC is an isolated piece of continental margin located outside of Canada's economic exclusion zone (EEZ), east of the Grand Banks. The top of the cap is relatively shallow, 125 m depth, with has a 200-km radius, and steep eastern and southern flanks (Stein, 2007; Welford et al., 2010a, b). The cold, oxygenated polar waters, of the Labrador Current (LC) and Deep Western Boundary Current (DWBC) influence the study area (Stein, 2007; Mertens, et al., 2014). The FC has a unique and complex geological history compared to the rest of the Canadian continental shelf. It has a granodiorite core with Mesozoic and Cenozoic sediments overlaid (King et al., 1985). Faulting along the steeply sloping margins has resulted in the exposure of several different types of bedrock

(Welford et al., 2010a, b). Sites were selected based on interesting geological features, as well as, reports of high sponge and coral occurrence.

3.3.2 Video Surveys

Four dives were conducted on the FC aboard the CCGS Hudson from July 12-18th, 2010, using the remotely operated vehicle (ROV), ROPOS (Remotely Operated Platform for Ocean Science) (Table 3-1). Two were conducted on the southern margin, one on the eastern tip, and one on the northern margin (Figure 3-1). The two southern sites were selected based on geological features of interest, while the eastern and northern sites were chosen biased on high sponge and coral occurrence. These dives also occurred in NAFO coral and sponge closure. In total, 52 hours of ROPOS video were recorded covering 15 km over a depth range of 875 to 2900 m (Table 3-1). These surveys were not conducted for the purpose of this study. The remotely operated vehicle, ROPOS (Remotely Operated Platform for Ocean Science) was used to collect high-definition video with forward and downward looking cameras. Visibility at all sites extended for several meters in front of ROPOS. The ROPOS transects included survey sections and exploratory sections, beginning at the deepest depth moving upslope. Both transect types were analyzed for this survey, and there is variation in transect distances covered. Substrate, coral and other faunal observations were logged on board using ClassAct Mapper (CAM, Benjamin, 2007), and then reanalyzed after the cruise. Geological and biological samples were taken opportunistically.

Table 3-1 Hudson 2010 ROV sites with their corresponding depth range, distance covered, total time on bottom, and site description.

Site	Date	Depth Range (m)	Length (km)	Bottom Time (hr)	Site Description	Region
R1335	12-Jul	875-1840	3.46	13.78	Canyon talweg	S
R1336	13-Jul	2224-2900	2.68	11.1	Canyon with possible slump	S
R1337	14-Jul	1020-2195	4.11	16.68	Faulted bedrock exposures	E
R1339	17-18 July	1363-2463	4.84	10.05	high sponge and coral by-catch area	N

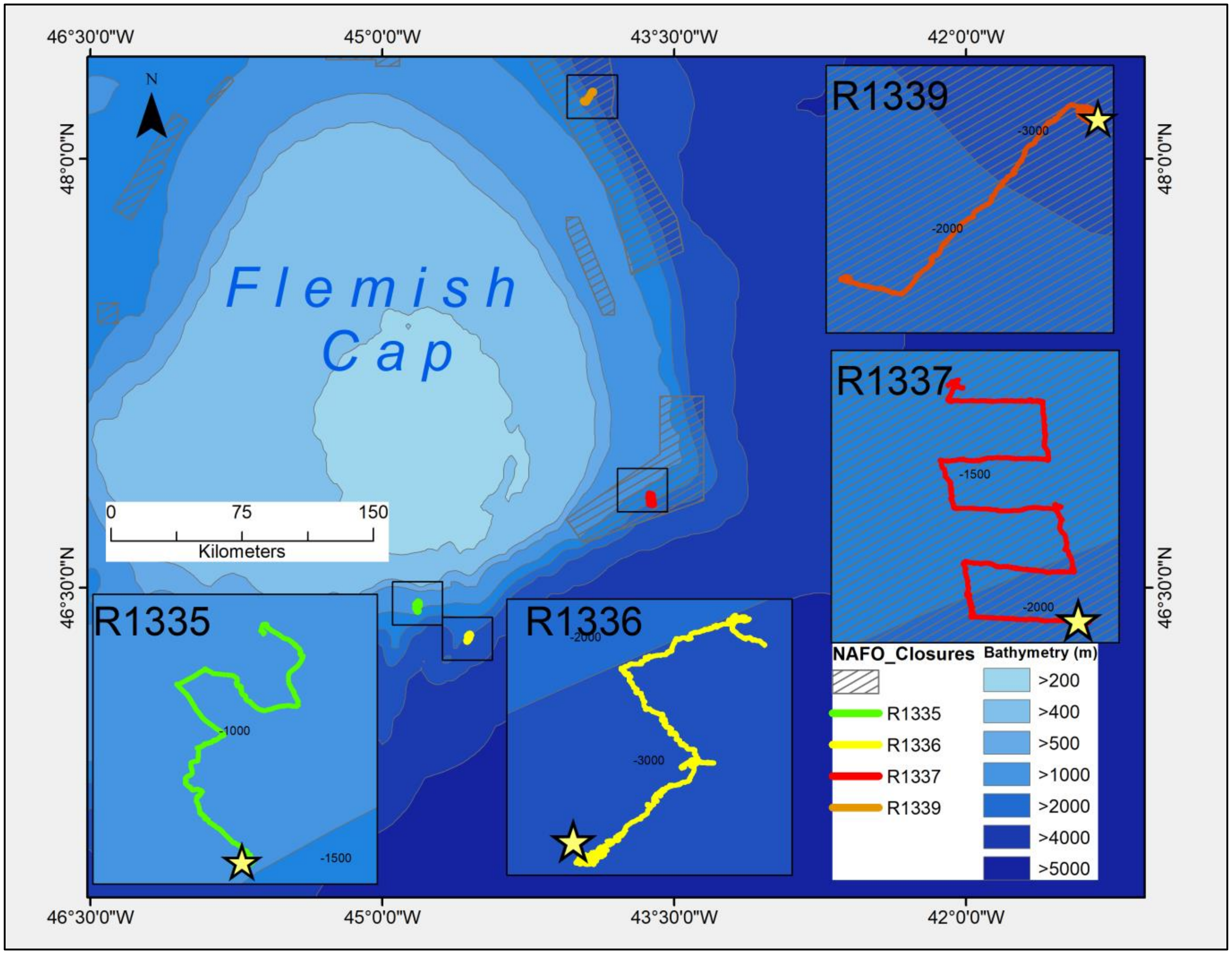

Figure 3-1 Locations of the four sites and the 2017 NAFO designated coral and sponge closures (grey polygons). Black boxes indicate sites in inserts. Stars indicate starting locations for each dive. C) Site R1335 on the southern flank (green), D) Site R1336 on the southern flank (yellow), E) Site R1337 on the eastern tip (red), F) Site R1339 on the northern flank (orange).

3.3.3 Video Analysis

Biological and geological observations from video imagery were geo-referenced with audio encoded data (e.g. coordinates, time, and depth). Grain size class (sand, gravel, boulder, and bedrock) percent coverage were recorded in time with the video in CAM. Front mounted scaling and referencing lasers, set 10 cm apart, were used to determine grain size according to the Wentworth-Udden scale (1952). Bedrock lithology was identified visually where possible and grouped into two categories, either sedimentary or igneous. Geological samples taken from the source bedrock were used to further describe the lithology, but these classifications were not used in the analysis. Corals were identified to the lowest possible taxonomic level and organized morphologically into one of seven functional groups (Edinger et al., 2007; Cogswell et al., 2009; Baker et al., 2012). Attachment substrate grain size and lithology (in the case of bedrock) were recorded for each coral when visible. Gravel, cobble, and pebbles were combined into gravel. Attachment substrate consisted of five grain sizes: fine grained (fg), gravel (g), boulder (bl), hard substrate (HS) and bedrock (Br, split into two lithologies). Grain sizes that could not be distinguished between classes (i.e. cobble vs. boulder) were classified as HS. Biogenic hard substrate (e.g. sponges) were not included in this analysis but observed at site R1339. Unknown attachment substrates were excluded from the analysis.

3.3.4 Surficial geology description

To describe the surficial geology observed on the FC, primary and secondary grain size percent coverage was determined from the video. These observations were recorded and geo-referenced at1 s intervals in CAM. Primary substrates were any grain size with ≥ 75% presence at the 1 s interval observation. Primary and secondary grain sizes were then classified into substrate classes for each 1s intervals. These 1 s interval substrate classes were then used to describe the surficial geological facies at increasing spatial scale (10 m, 50 m, 100 m, 500 m, 1000 m) along the ROV transects. These intervals were chosen to test the effect of increasingly coarser geological descriptions starting with fine scale (10 m) and increasing to broad scale (1000 m).

3.3.5 Statistical Analysis

Coral abundance at both the functional group and species level were analyzed to determine if there was statistical significance to attachment substrate type, depth, and facies at five spatial scales. To reduce the influence of abundant species, both the functional group and species abundance data underwent two transformations (fourth-root and presence/absence). Depths were binned into 200 m intervals for all analyses.

Relationships between the coral abundance and environmental variables selected were visualized first with non-metric multi-dimensional scaling (nMDS) to look for any obvious trends. To test the difference in coral assemblages between attachment substrate and facies across depth classes, a Bray-Curtis similarity matrix of each transformation was used to conduct a two-way analysis of similarity (ANOSIM). Similarity (and dissimilarity) between species within depth classes and facies was conducted using similarity of percentages (SIMPER) at all spatial scales. All statistical analysis was conducted in the statistical program Primer 6.0 (Clarke & Warwick, 2001).

3.4 Results

Each site had a unique assemblage of coral species (Table 3-2) and surficial geological facies (Table 3-8). The soft corals *Anthomastus* spp. were the most abundant coral observed overall (14,053), specifically at two sites (R1337, R1339). Site R1335 had the highest species richness for pennatulacean (5) and, R1339 had the highest number of large gorgonian species observed (9). Sedimentary bedrock outcrops were the most common bedrock type overall. Gravelly fine grains were the most abundant substrate within the 1275-1875 m depth range. Site R1337 had the most heterogeneous surficial geologies (Table 3-8) and the highest species richness (Table 3-2).

3.4.1 Coral occurrence and depth distribution

A total of 30,310 individual corals were recorded, comprising 27 species (Table 3-2). The most abundant corals were *Anthomastus* spp., Nephtheidae, *Primnoa* sp., and Isididae. One of most diverse functional groups was small gorgonian (8) (Table 3-2). There are several similar looking species of *Anthomastus* spp. and were all classified to the genus level. The family Nephtheidae are similarly difficult to differentiate from video imagery alone and were classified to the family level.

Anthomastus spp. was the most abundant CWC species observed, found on all dives and over a wide depth range (Figure 3-3). Rare corals observed included: *Swiftia* sp., *Narella* sp., pennatulaceans, and antipatharians. Corals were not uniformly distributed along the ROV tracks. Clustering occurred on specific geological features such as bedrock walls or erosional features such as sedimentary ledges. Key observations included a high abundance of *Primnoa* sp. (635) on a 100-m vertical sedimentary bedrock wall on site R1337 (Figure 3-8, C), as well as numerous Isididae fields on eroded sedimentary ledges on site R1339.

The westernmost transect (R1335) was 3.5 km long and traversed mainly soft sediments with sedimentary bedrock outcrops spread over approximately 1000 m depth range (Figure 3-1). This site had the most observations of pennatulaceans and the small gorgonian species *Acanella* sp., both of which colonize soft sediments (Figure 3-5). These species were observed at the shallower depths of the site, which also coincides with many of the fine-grained substrates (Figure 3-12). The deepest site (R1336) was also located on the southern flank but had a different coral assemblage and substrate types present with igneous bedrock outcrops and soft sediments present. Site R1337 was the eastern most site and crossed exposed igneous (igneous) and sedimentary (limestone) bedrock. This was the only instance of the two lithology types found at the same depth (and in direct contact), although no corals were observed on these outcrops. There were other several large sedimentary bedrock outcrops with coral colonies present at various depths along the survey transect. This site had the highest occurrence of soft corals, particularly *Anthomastus* spp. and Nephtheidae (Table 3-2, Figure 3-9). Isididae (probably *Keratoisis* sp.) were the most abundant CWC species observed on the northern most site R1339 (Table 3-2, Figure 3-11). These corals appeared to be inhabiting sedimentary ledges and weathered rocks. This site also had a high abundance of sponges, which co-occurred with the Isididae.

For functional group distributions, small gorgonians had the largest depth range and were found at the deepest depths (Figure 3-2). Large gorgonians and soft corals also exhibited a wide depth range. Antipatharians and pennatulaceans had more constrained depth ranges compared to other functional groups and over shallower depths (Figure 3-2). Each functional group was composed of species with differing depth preferences. Species depth distributions varied within functional groups, with several species found at only deeper depths (Figure 3-3). The deepest recorded species included *Lepidisis* sp., all the *Chrysogorgia* spp., and *Narella* cf *laxa*. Species also found mainly at deeper depths were *Bathypathes* sp., *Halipteris finmarchica*, *Narella* sp., and *Lepidisis* sp. *Anthomastus* spp. had the largest depth range of all the coral species identified (960 to 2930 m).

Table 3-2 Coral species observations by functional group per site with total distance (km) covered.

Functional Group	Species	Sites and distance (km)				Total
		R1335	R1336	R1337	R1339	
		3.46	2.68	4.11	4.84	
Antipatharian	Antipatharian sp.	3		2		5
	Bathypathes sp.		1		1	2
	Antipatharian (unknown)			1		1
Cup Coral	Cup Coral (unknown)	13	8	79		100
D. dianthus	*Desmophyllum dianthus*	17	8	5	1	31
Large Gorgonian	*Acanthogorgia* sp.	1		254	131	386
	Chrysogorgia sp. 1		5		51	56
	Paragorgia sp.			7		7
	Paramuricea spp.	2		98	56	156
	Primnoa sp.			735	3	738
	Isidids		29	37	9572	9638
	Lepidisis sp.		32		1	33
	Large Gorgonian (unknown)		8	21	1	30
Pennatulacean	*Anthoptilum grandiflorum*	8				8
	Halipteris finmarchica		1		1	2
	Pennatula sp.	2		3		5
	Pennatula sp. (bushy, orange)	1				1
	Pennatulacea (whip-like)	3				3
	Umbellula encrinus	1				1
Small Gorgonian	*Acanella* sp.	204		19	32	255
	Chrysogorgia cf. *agassizii*		287		3	290
	Chrysogorgia sp. 1			2		2
	Chrysogorgia sp. 2		2			2
	Corallium sp.			5	212	212
	Narella cf. *laxa*		2			2
	Parastenella sp.				2	2
	Swiftia sp.		1		12	13
	Small Gorgonian (unknown)		2	15	11	28
Soft Coral	*Anthomastus* spp.	34	75	12229	1715	14053
	Heteropolypus cf. insolitus	3			2	5
	Nephtheids		11	3954	246	4211
	Soft Coral (unknown)	1	1	25		27
Total		293	473	17496	12048	30310

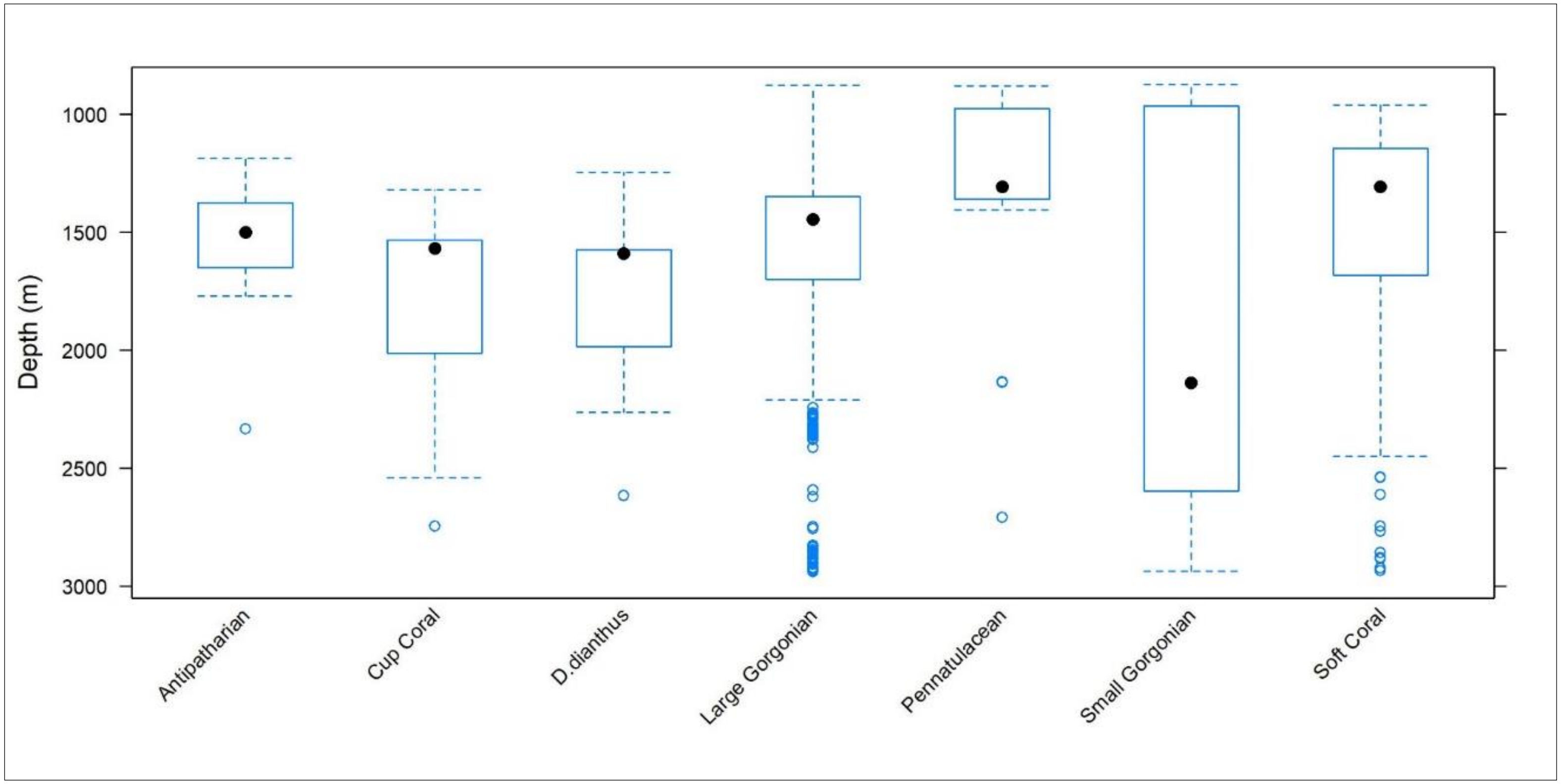

Figure 3-2 Boxplot of coral functional groups distribution by depth.

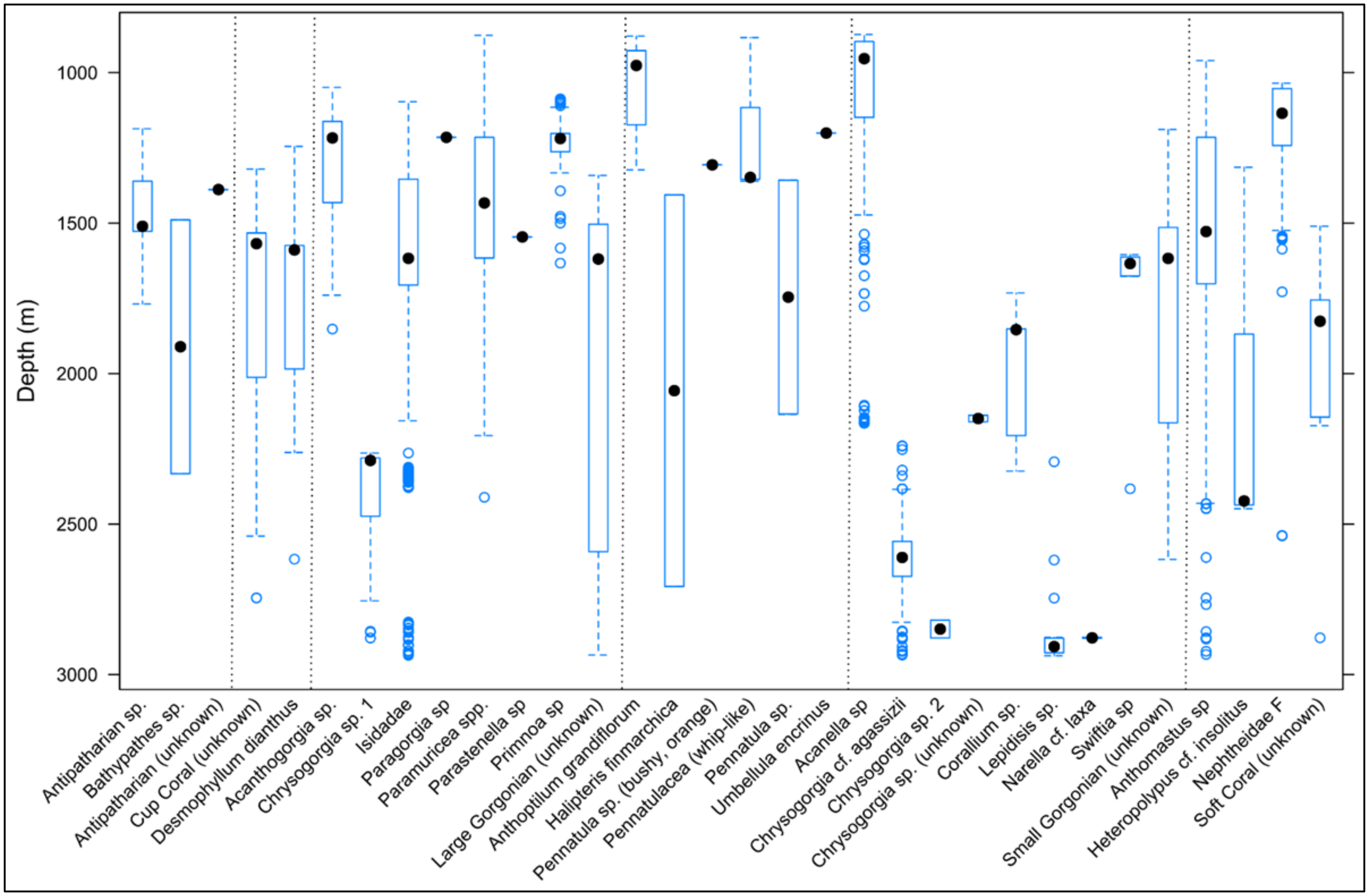

Figure 3-3 Boxplot of species distribution by depth and in order of functional group starting on the left: Antipatharians, Cup Corals, *Desmophyllum dianthus*, Large gorgonians Pennatulacean, Small Gorgonians, Soft Corals.

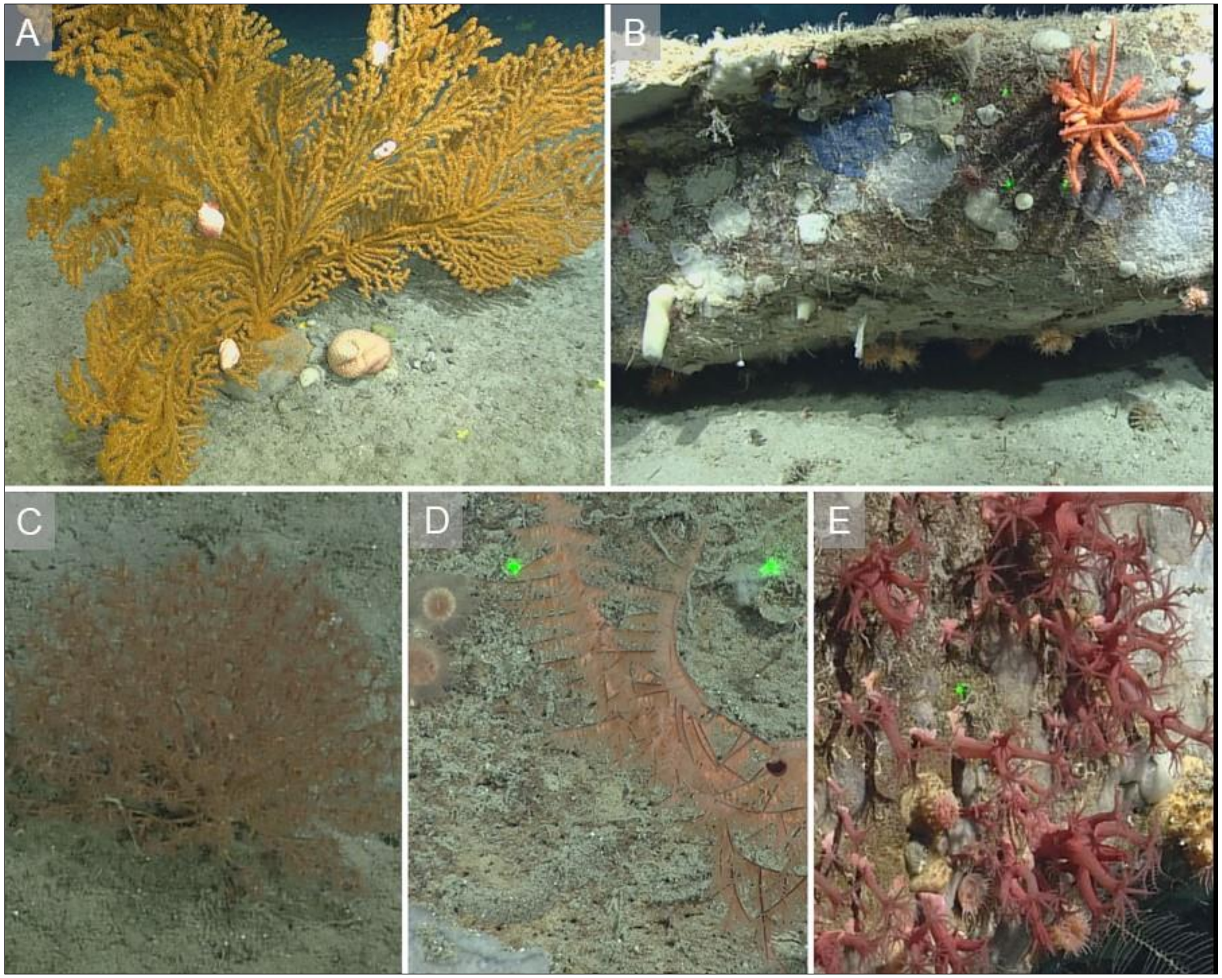

Figure 3-4 Corals observed at site R1335: A) *Paramuricea* spp., B) *Desmophyllum dianthus* under a piece of sedimentary bedrock, C) *Acanella* sp., D) *Bathypathes* sp. and cup corals, E) *Anthomastus* spp. Green lasers are 10 cm apart.

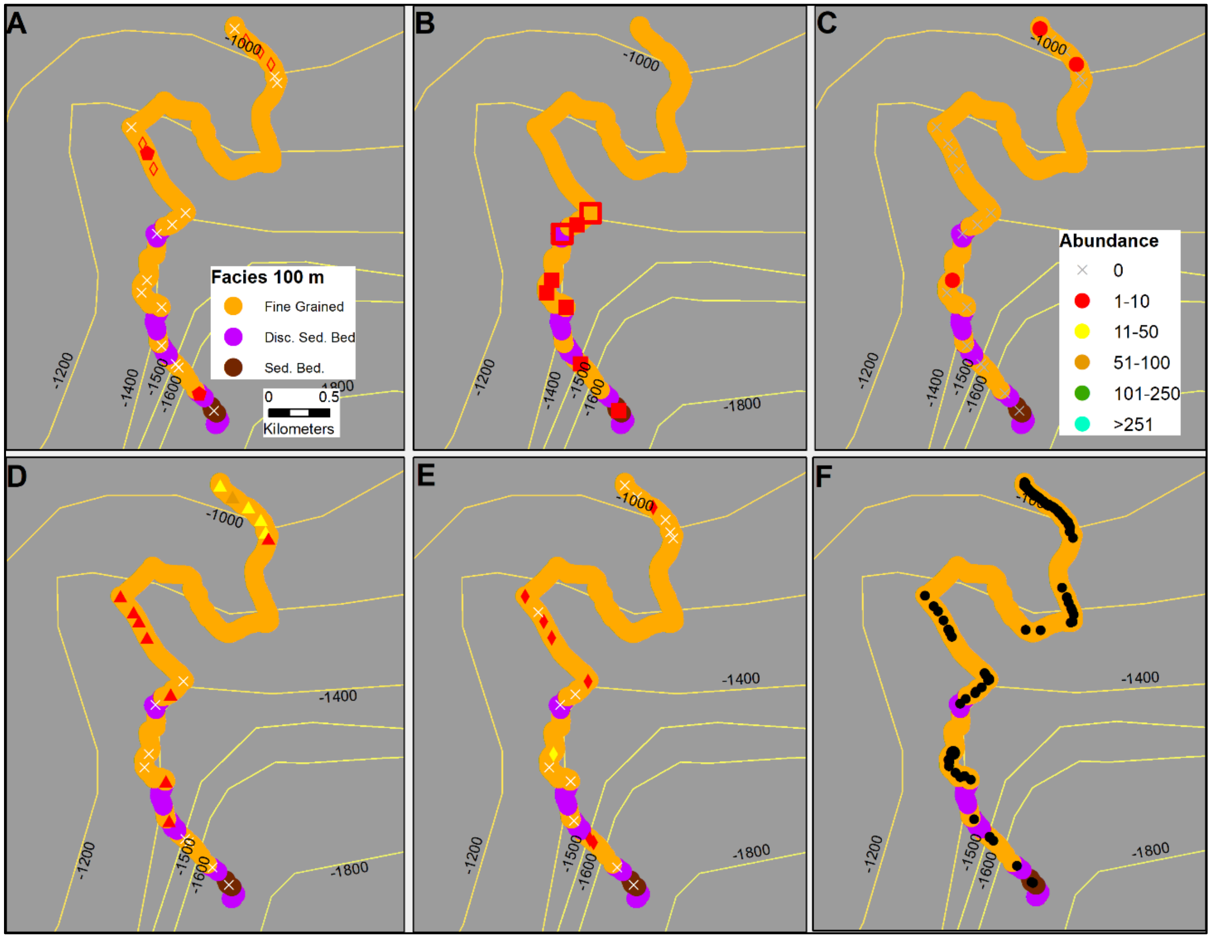

Figure 3-5 Site R1335 coral abundance per 100 m. Symbol color indicates abundance: 0 (grey X), 1-10 (red), 11-50 (yellow), 51-100 (orange), 101-250 (green), >250 (blue). Symbol shape indicates functional group: A) Antipatharian (pentagon) and Pennatulacean (open diamond), B) Cup Corals (open square) and *Desmophyllum dianthus* (solid square), C) Large Gorgonian (circle), D) Small gorgonian (triangle), E) Soft Coral (closed diamond), F) Coral presence at 1-second intervals (black dot).

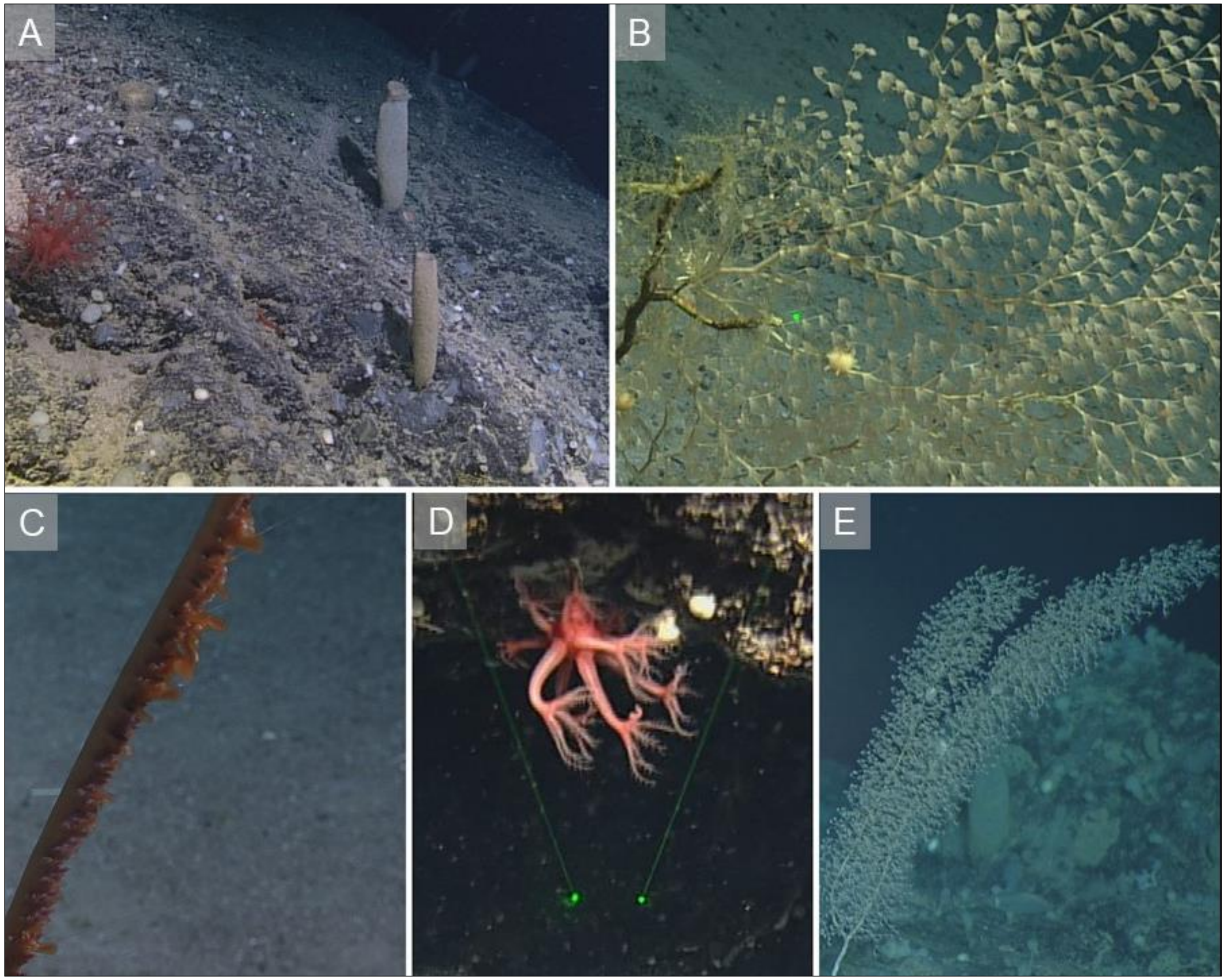

Figure 3-6 Corals observed at site R1336: A) *Anthomastus* spp., B) *Chrysogorgia* cf. *agassizii*, C) *Halipteris finmarchica*, D) *Anthomastus* spp., E) *Chrysogorgia* sp. 2. Green lasers are 10 cm apart.

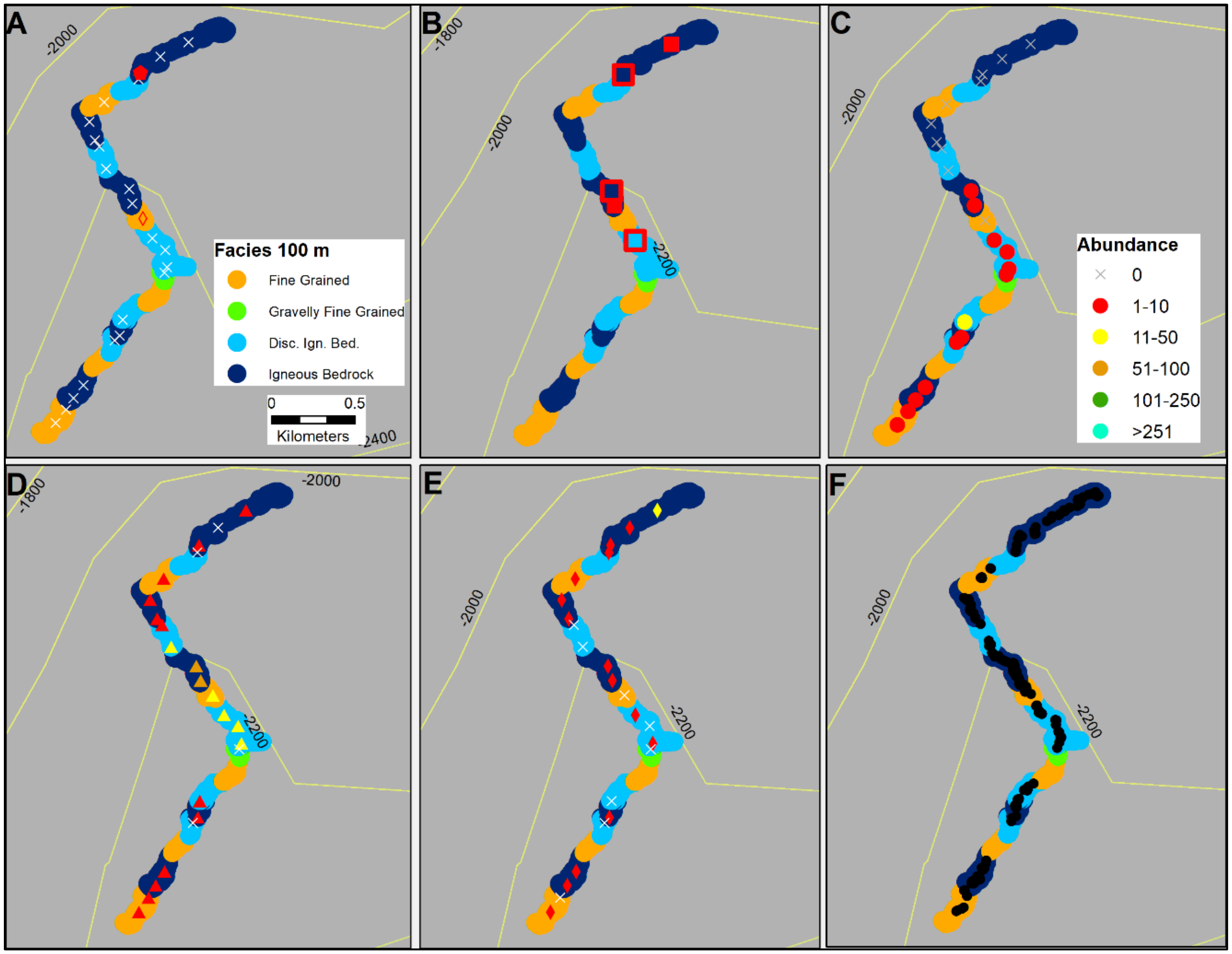

Figure 3-7 Site R1336 coral abundance per 100 m. Symbol color indicates abundance: 0 (grey X), 1-10 (red), 11-50 (yellow), 51-100 (orange), 101-250 (green), >250 (blue). Symbol shape indicates functional group: A) Antipatharian (pentagon) and Pennatulacean (open diamond), B) Cup Corals (open square) and *Desmophyllum dianthus* (solid square), C) Large Gorgonian (circle), D) Small gorgonian (triangle), E) Soft Coral (closed diamond), F) Coral presence at 1-second intervals (black dot).

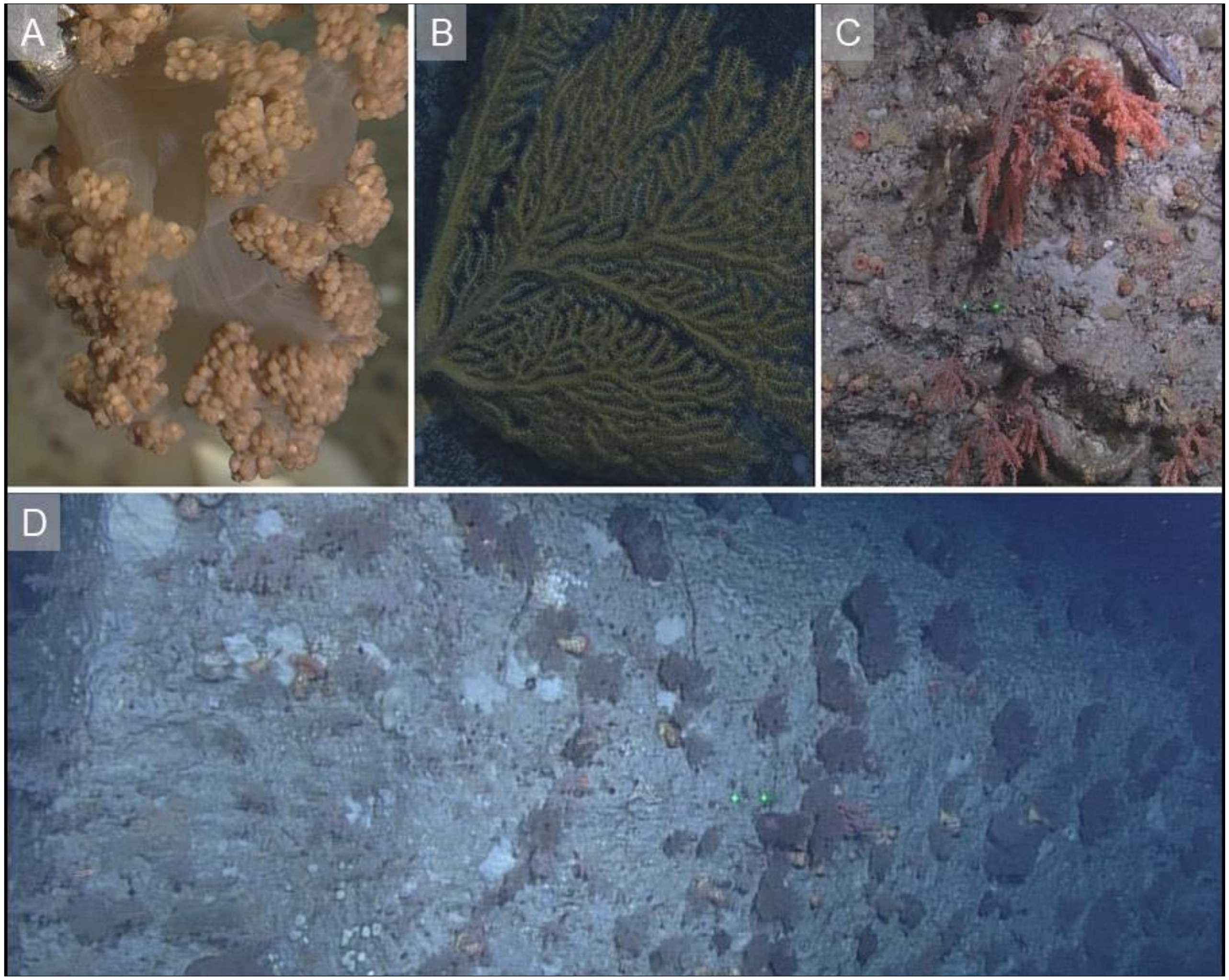

Figure 3-8 Corals observed at site R1337: A) Nephtheidae, B) *Paramuricea* spp., C) *Primnoa* sp., D) Nephtheidae on a sedimentary bedrock outcrop. Green lasers are 10 cm apart.

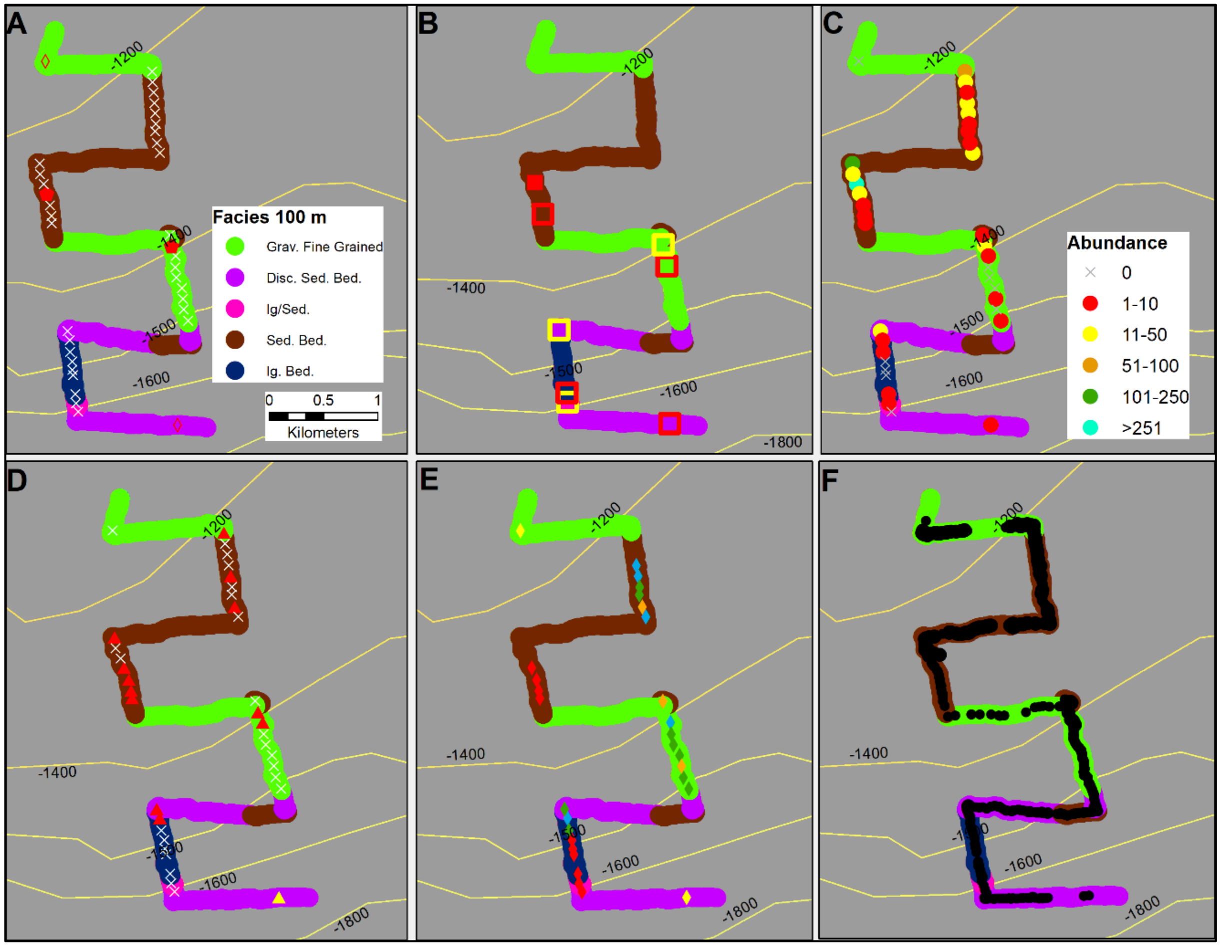

Figure 3-9 Site R1337 coral abundance per 100 m. Symbol color indicates abundance: 0 (grey X), 1-10 (red), 11-50 (yellow), 51-100 (orange), 101-250 (green), >250 (blue). Symbol shape indicates functional group: A) Antipatharian (pentagon) and Pennatulacean (open diamond), B) Cup Corals (open square) and *Desmophyllum dianthus* (solid square), C) Large Gorgonian (circle), D) Small gorgonian (triangle), E) Soft Coral (closed diamond), F) Coral presence at 1-second intervals (black dot).

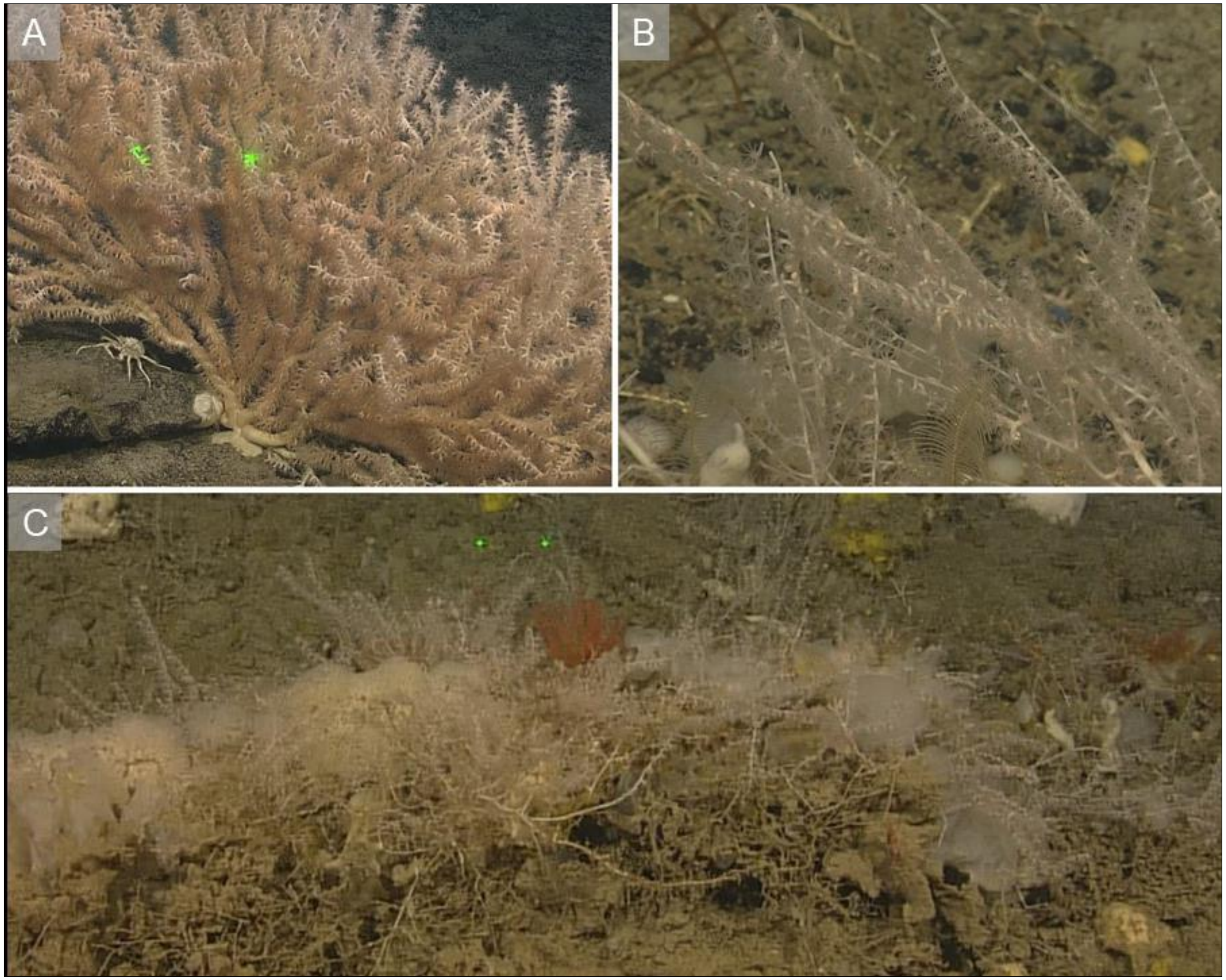

Figure 3-10 Corals observed at site R1339: A) *Paramuricea* spp., B) Isididae, C) Isididae and *Swiftia* sp. Green lasers are 10 cm apart.

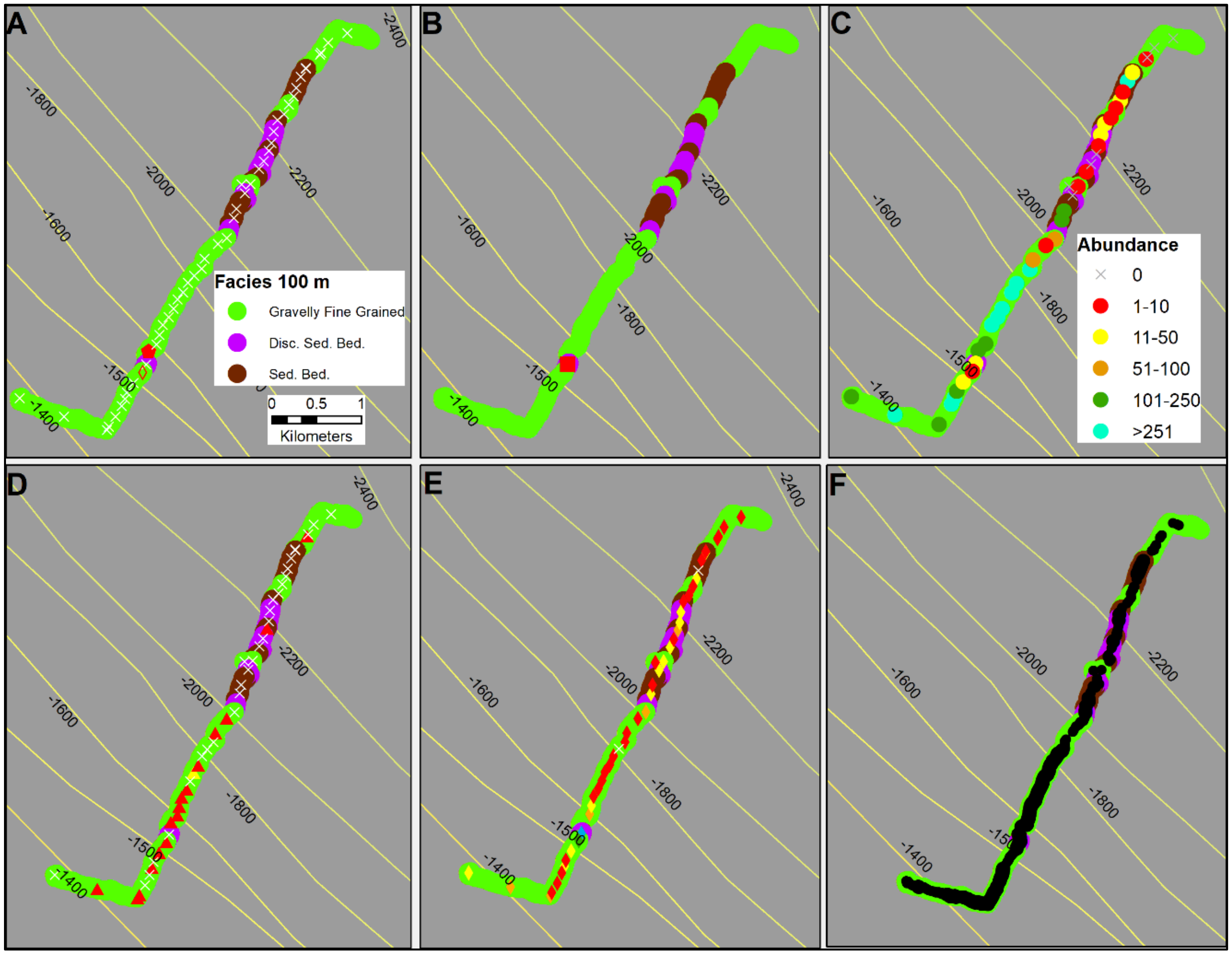

Figure 3-11 Site R1339 coral abundance per 100 m. Symbol color indicates abundance: 0 (grey X), 1-10 (red), 11-50 (yellow), 51-100 (orange), 101-250 (green), >250 (blue). Symbol shape indicates functional group: A) Antipatharian (pentagon) and Pennatulacean (open diamond), B) Cup Corals (open square) and *Desmophyllum dianthus* (solid square), C) Large Gorgonian (circle), D) Small gorgonian (triangle), E) Soft Coral (closed diamond), F) Coral presence at 1-second intervals (black dot).

3.4.2 Attachment Substrate

The functional groups soft coral, and small gorgonian are comprised of both hard and soft colonizing species (Figure 3-13, Figure 3-15). Pennatulacean, *D. dianthus*, and cup corals were limited to one type of attachment substrate. Large gorgonians, small gorgonians and soft corals were found on all five classes (bedrock being one class with two lithologies). Rare attachment substrates were biogenic in nature (other corals and sponges). Small gorgonians were found on either fine grained or larger grain size boulders or bedrock. Soft corals were the dominant coral group found on gravel. Many species were found on multiple grain-sizes but at different abundances. *Anthomastus* spp. was found on all grain sizes and lithologies at all depths (Figure 3-14) but was found in greater abundance on sedimentary bedrock outcrops and gravel (Figure 3-15).

Non-metric multi-dimensional scaling (nMDS) plots of the Bray-Curtis similarity index did not show any groupings of functional groups or species by depth or attachment grain size at either transformation (4^{th} root and presence/absence) (Figure 3-16, Figure 3-17). An ANOSIM 2-way comparison showed a significant difference between fine grained and hard substrate attachments for both functional groups and species at both transformations across all depth bins (Table 3-3, Table 3-4, Table 3-5, Table 3-6). There were also significant differences between sedimentary and igneous lithologies. Results from a 2-way SIMPER analysis accounting for 100% of the similarity for species (4^{th} root transformed) across all depth bins showed the highest similarity of gravel size attachment substrate at 83.38%, followed by fine grained (63%), igneous bedrock (60%) and sedimentary bedrock (49%) (Table 5-73).

The fourth-root transformation for both functional groups and species had higher R-statistical values than the presence/absence transformations for both ANOSIM and SIMPER analyses.

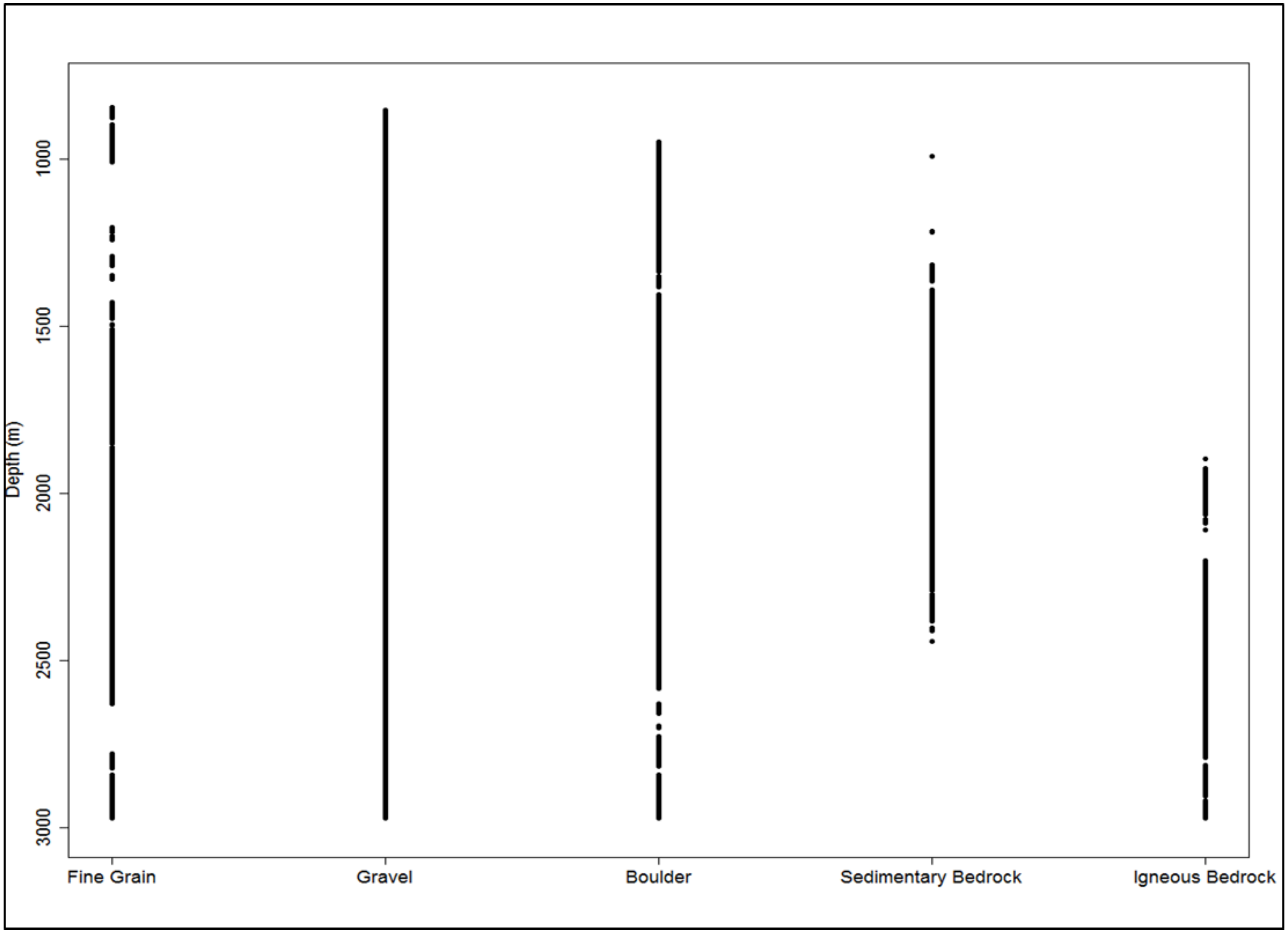

Figure 3-12 Grain size depth distribution for all sites. Each dot represents one observation.

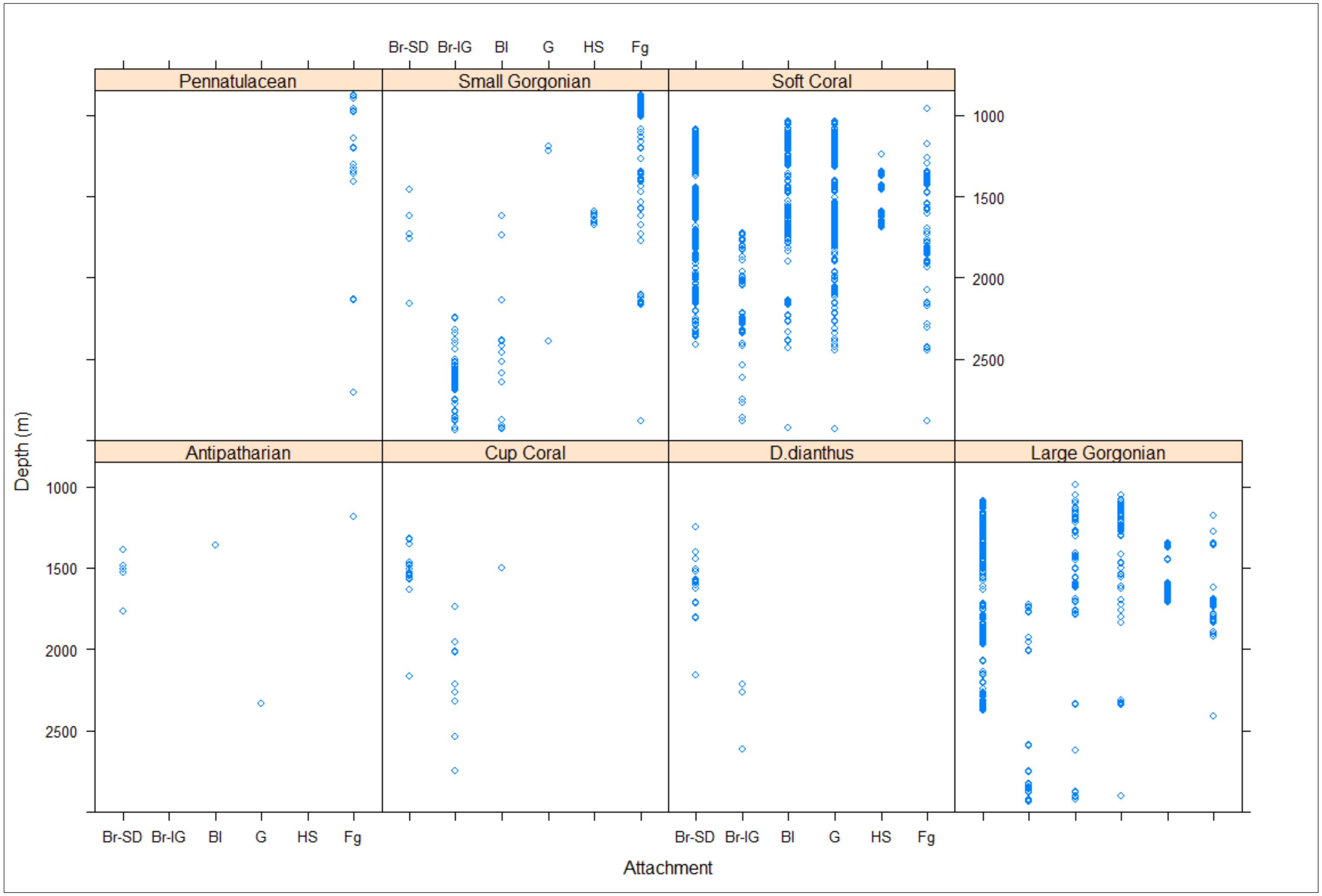

Figure 3-13 Depth distribution of observed attachment substrate per functional group. Observations are by decreasing grain size starting on the left: Sedimentary bedrock (Br-SD), Igneous bedrock (Br-IG), boulder (Bl), gravel (G), hard substrate (HS), fine grained (Fg).

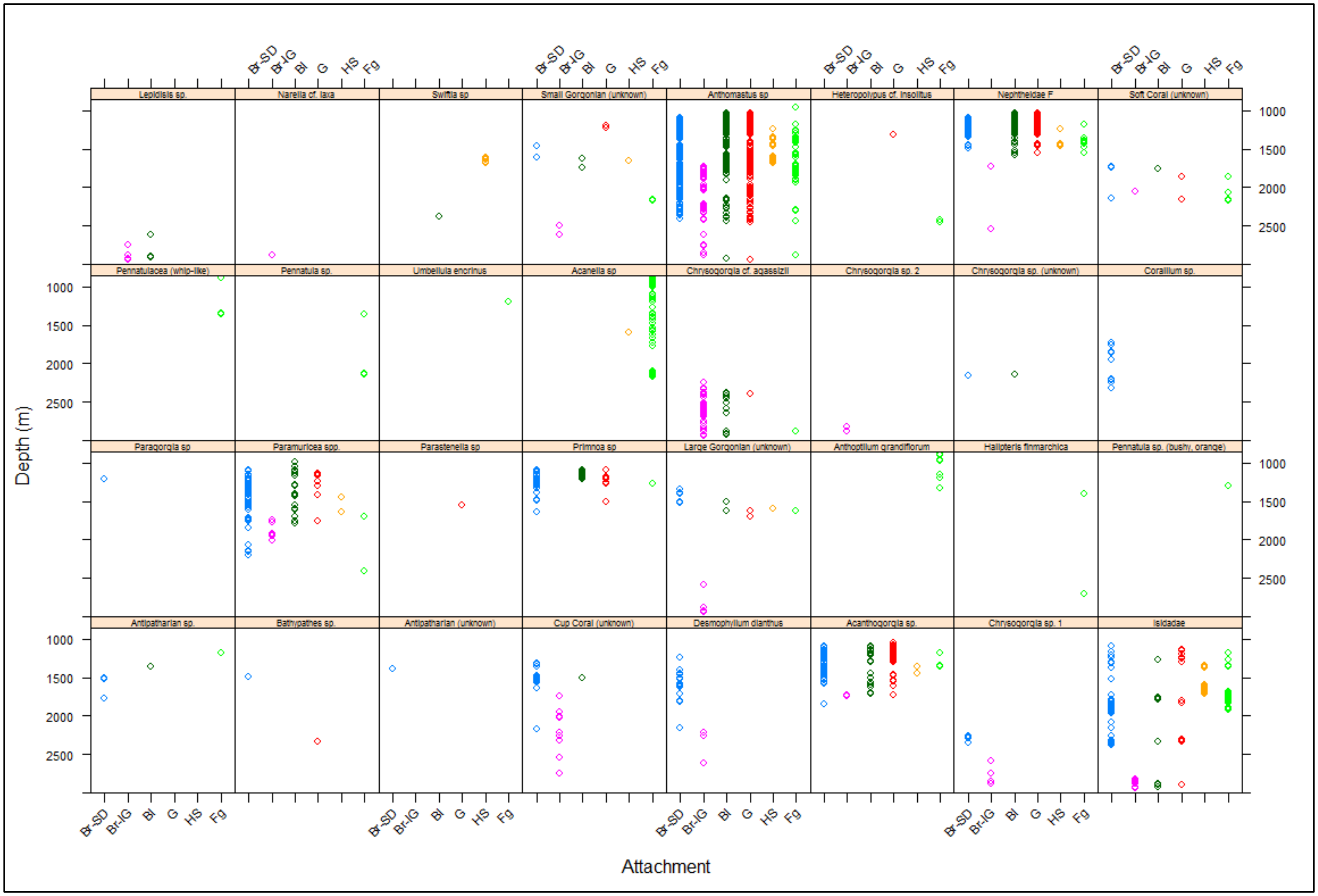

Figure 3-14 Depth distribution of observed attachment substrates per species grouped by Functional Group by decreasing grain size: Br-SD (blue), Br-IG (pink), Bl (dark green), G (red), HS (orange), Fg (light green).

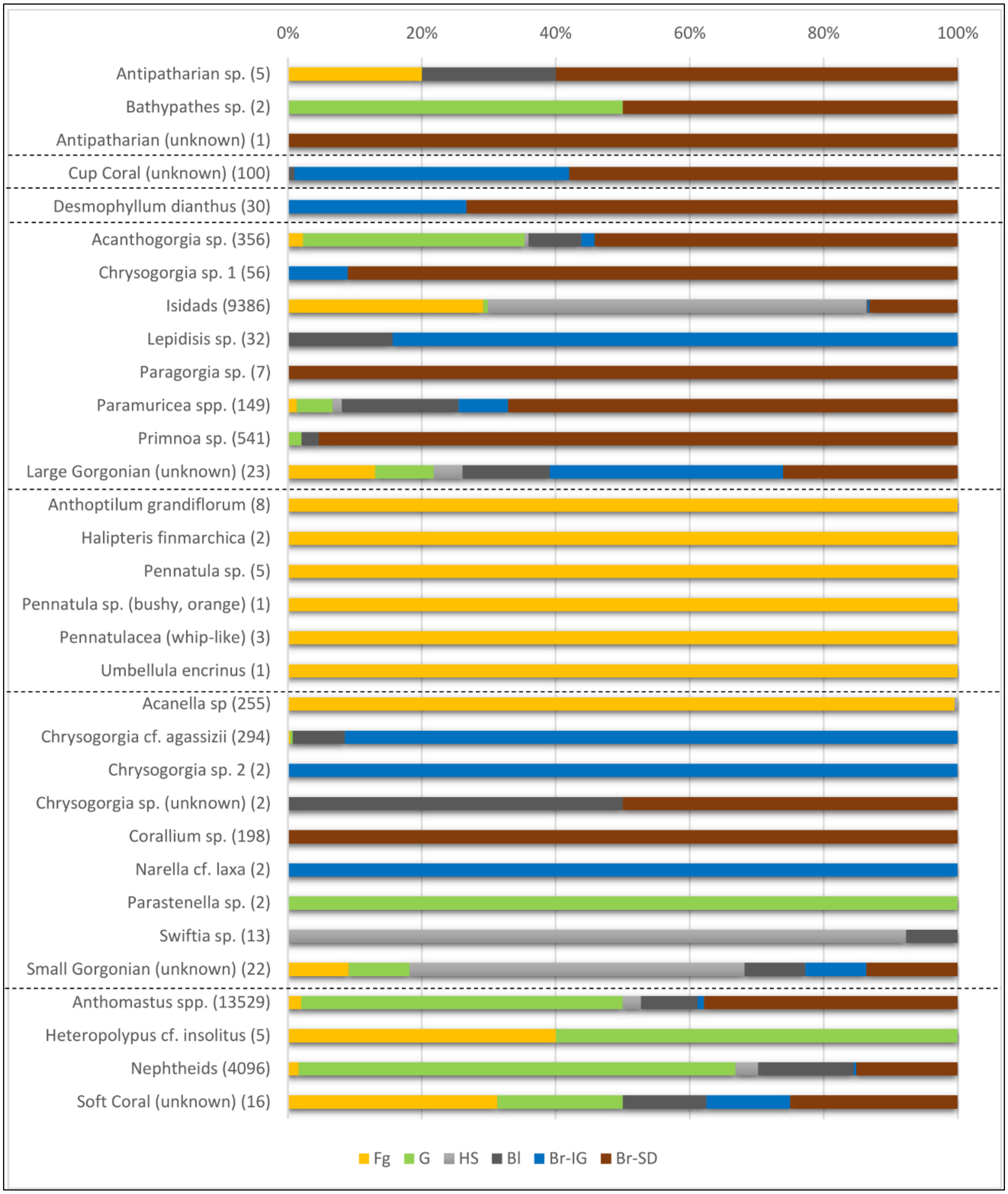

Figure 3-15 Attachment substrate size percent occurrence by species (count). Attachment substrate by increasing grain size: Fg (yellow), G (green), HS (grey), Bl (dark grey), Br-IG (Blue), Br-SD (brown).

Table 3-3 Results from pairwise ANOSIM between attachment grain size across all depths for all functional group abundance (4rt transformed). The sample statistic (global R) was ρ=0.412 at a significance level of 0.1%. The R statistic for each pairwise test is shown to the left of the grey divide with corresponding significance levels (%) on the right.

Attachment	Fg	G	Bl	HS	BR-SD	BR-IG
Fg	-	0.1	0.1	0.1	0.1	0.1
G	0.695	-	0.1	0.1	0.1	0.1
Bl	0.555	0.128	-	0.1	0.1	0.1
HS	0.326	0.955	0.846	-	0.1	0.1
BR-SD	0.343	0.306	0.032	0.66	-	0.1
BR-IG	0.395	0.541	0.38	0.809	0.435	-

Table 3-4 Results from pairwise ANOSIM between attachment grain size across all depths for all functional group abundance (P/A transformed). The sample statistic (global R) was ρ=0.363 at a significance level of 0.1%. The R statistic for each pairwise test is shown to the left of the grey divide with corresponding significance levels (%) on the right.

Attachment	Fg	G	Bl	HS	BR-SD	BR-IG
Fg	-	0.1	0.1	0.1	0.1	0.1
G	0.659	-	0.1	0.1	0.1	0.1
Bl	0.455	0.073	-	0.1	0.1	0.1
HS	0.292	0.934	0.75	-	0.1	0.1
BR-SD	0.245	0.296	0.039	0.552	-	0.1
BR-IG	0.363	0.438	0.301	0.702	0.354	-

Table 3-5 Results from pairwise ANOSIM between attachment grain size across all depths for all species abundance (4rt transformed). The sample statistic (global R) was ρ=0.424 at a significance level of 0.1%. The R statistic for each pairwise test is shown to the left of the grey divide with corresponding significance levels (%) on the right.

Attachment	Fg	G	Bl	HS	BR-SD	BR-IG
Fg	-	0.1	0.1	0.1	0.1	0.1
G	0.723	-	0.1	0.1	0.1	0.1
Bl	0.642	0.109	-	0.1	0.1	0.1
HS	0.32	0.957	0.875	-	0.1	0.1
BR-SD	0.461	0.287	0.04	0.732	-	0.1
BR-IG	0.494	0.53	0.39	0.854	0.399	-

Table 3-6 Results from pairwise ANOSIM between attachment grain size across all depths for all species abundance (P/A transformed). The sample statistic (global R) was ρ=0.394 at a significance level of 0.1%. The R statistic for each pairwise test is shown to the left of the grey divide with corresponding significance levels (%) on the right.

Attachment	Fg	G	Bl	HS	BR-SD	BR-IG
Fg	-	0.1	0.1	0.1	0.1	0.1
G	0.713	-	0.1	0.1	0.1	0.1
Bl	0.617	0.059	-	0.1	0.5	0.1
HS	0.291	0.947	0.85	-	0.1	0.1
BR-SD	0.422	0.275	0.025	0.701	-	0.1
BR-IG	0.502	0.47	0.365	0.852	0.348	-

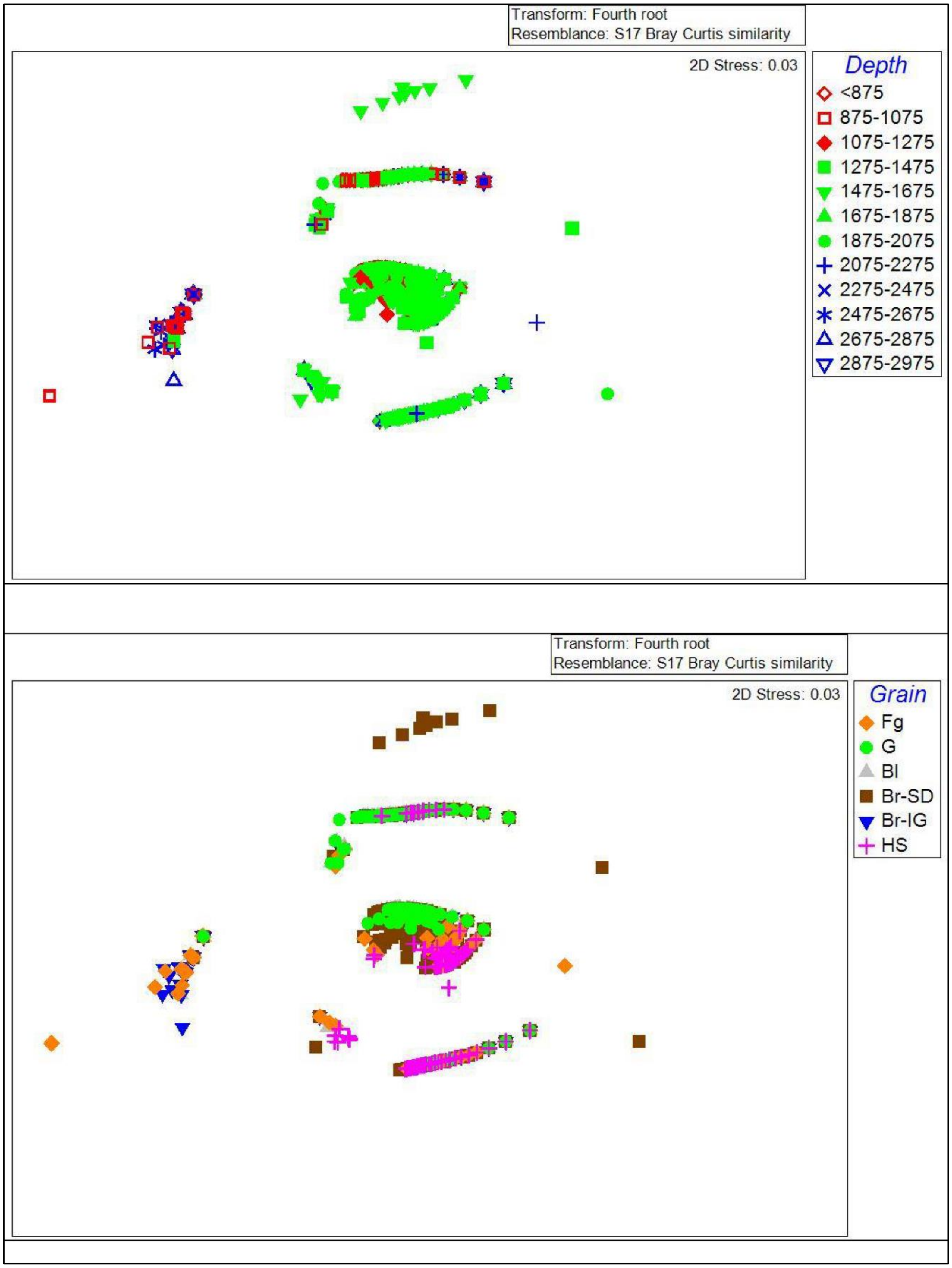

Figure 3-16 A non-metric multi-dimensional scaling (nMDS) plot of a Bray-Curtis similarity index between depth and attachment grain size for functional groups with a 4th root transformation.

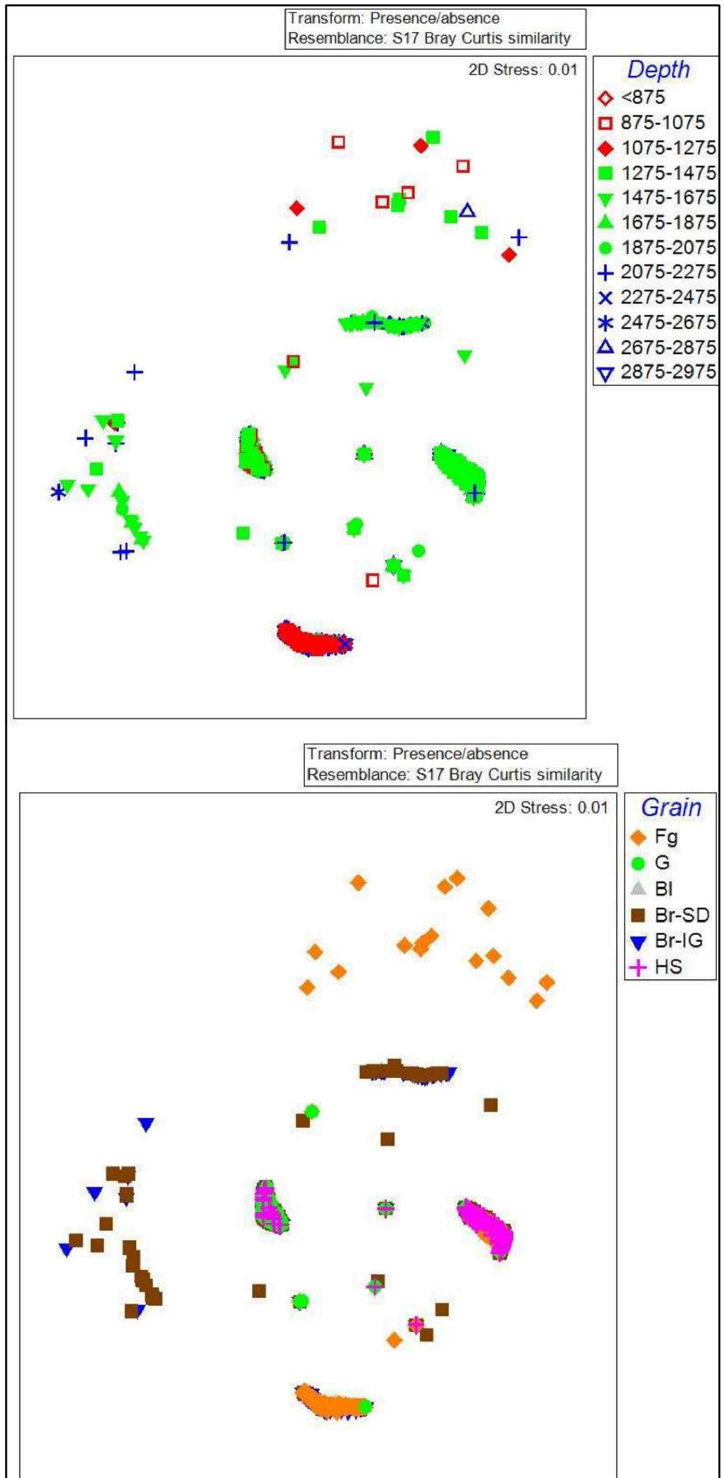

Figure 3-17 A non-metric multi-dimensional scaling (nMDS) plot of a Bray-Curtis similarity index between depth and attachment grain size for functional groups with a presence/absence transformation.

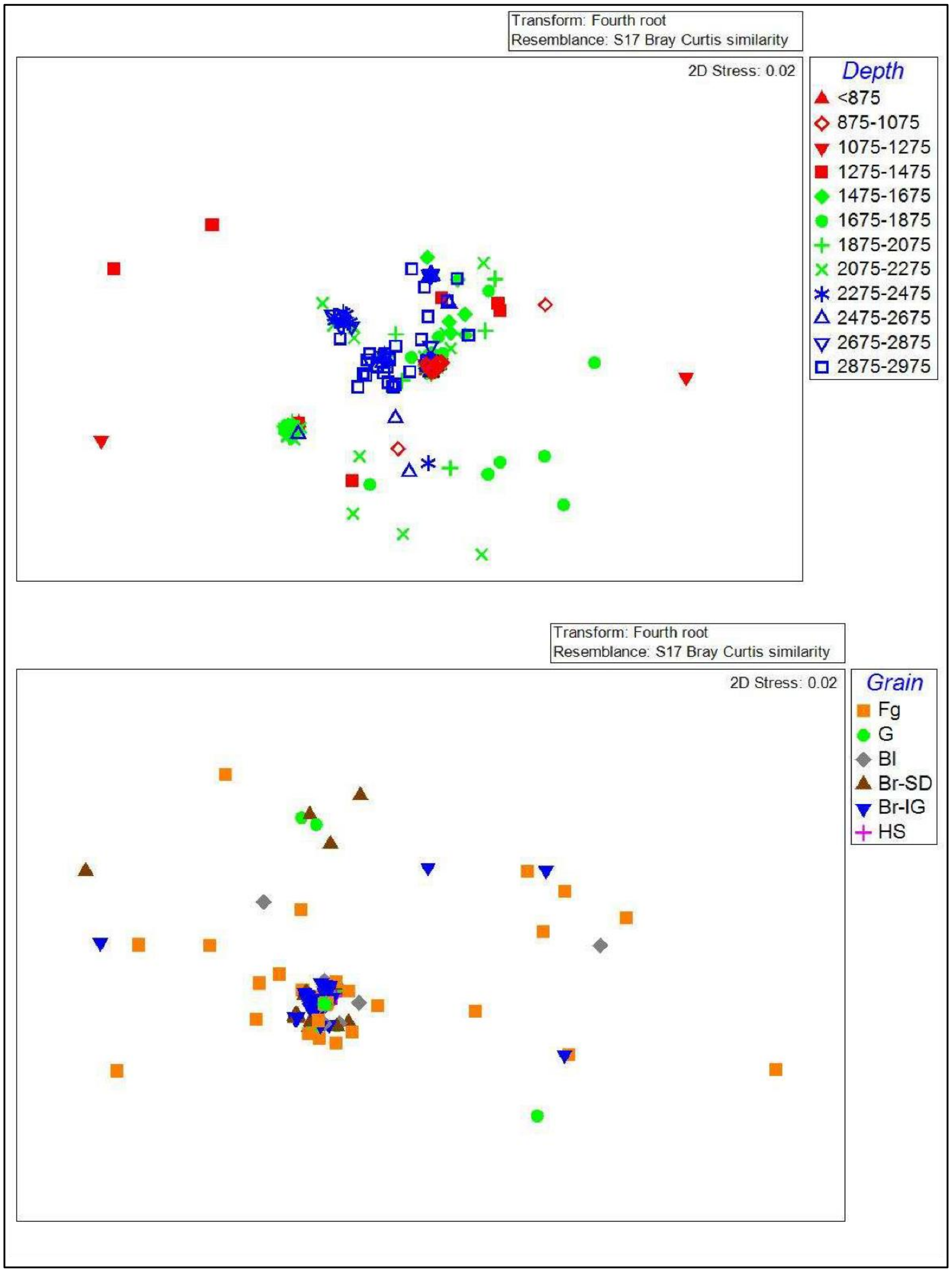

Figure 3-18 A non-metric multi-dimensional scaling (nMDS) plot of a Bray-Curtis similarity index between depth and attachment grain size for species with a 4th root transformation.

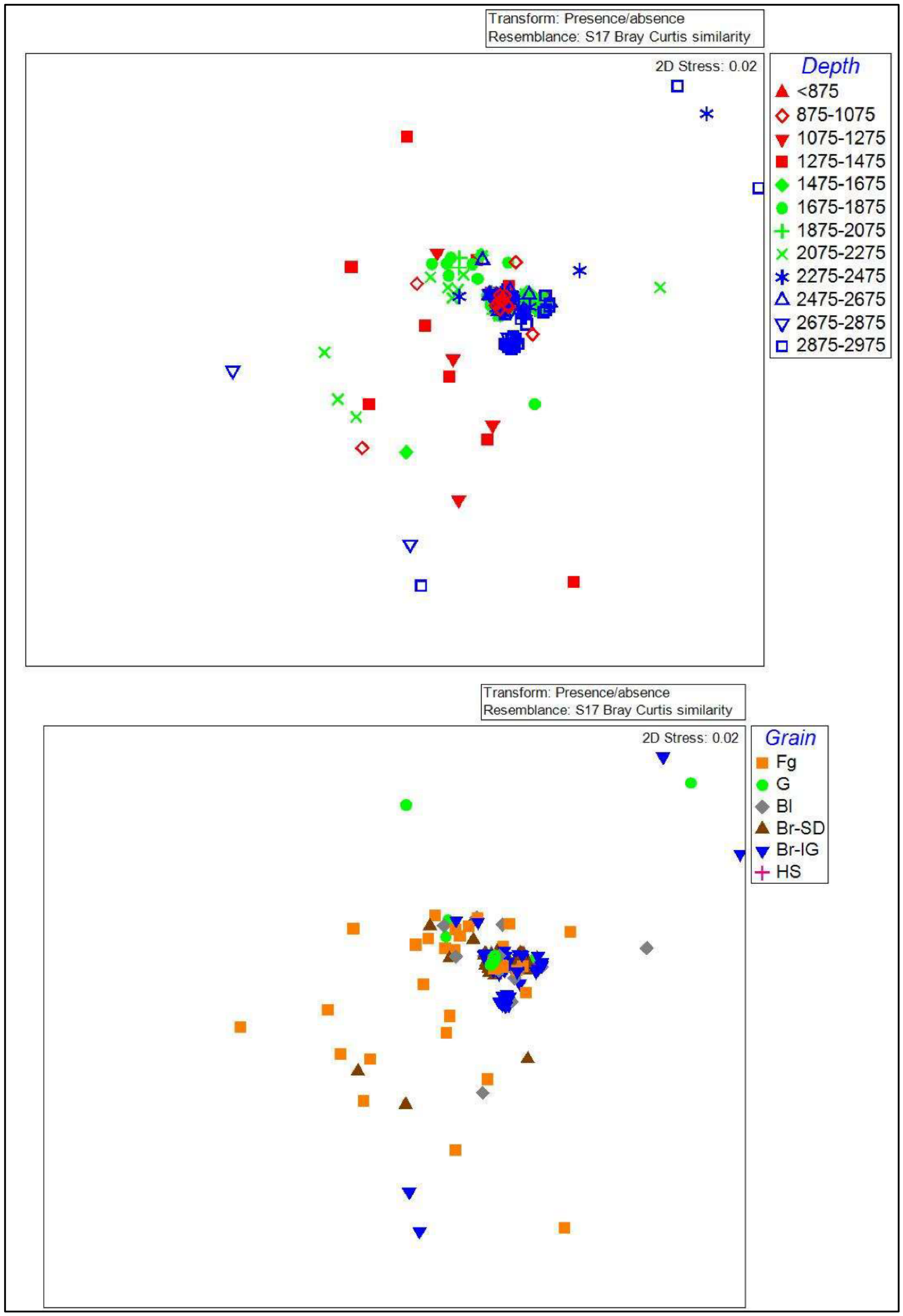

Figure 3-19 A non-metric multi-dimensional scaling (nMDS) plot of a Bray-Curtis similarity index between depth and attachment grain size for species with a presence/absence transformation.

3.4.3 Surficial Geology

Each site covered different depth ranges and surficial geologies. Additionally, the geomorphology differed between sites allowing for a diverse combination of facies to be present. R1335 is dominated by fine grained facies with sedimentary bedrock outcrops (Figure 3-24). Sedimentary outcrops were present at depths >1200 m, with isolated outcrops at 1500 m (Figure 3-20). As the spatial scale that the facies were described increased, adjacent sections described as gravelly fine grained or sedimentary bedrock at fine scales were classified as discontinuous sedimentary bedrock at broader scales (500 and 1000 m). At 1000 m (the broadest scale examined) the surficial geology of R1335 is described as homogenous fine-grained facies, with all descriptions of hard substrate eliminated. Sedimentary outcrops probably consisted of consolidated mudstone.

The southeastern canyon site (R1336) had five facies, including boulder which was only found at this site. Igneous outcrops are found throughout the transect but, most notably at depths greater than 2600 m (Figure 3-21). As facies were described at scales >100 m intervals, boulder, gravelly fine grained and fine-grained facies disappear (Figure 3-25). Igneous and discontinuous igneous bedrock facies were found at all scales, but their apparent extent increased with scale.

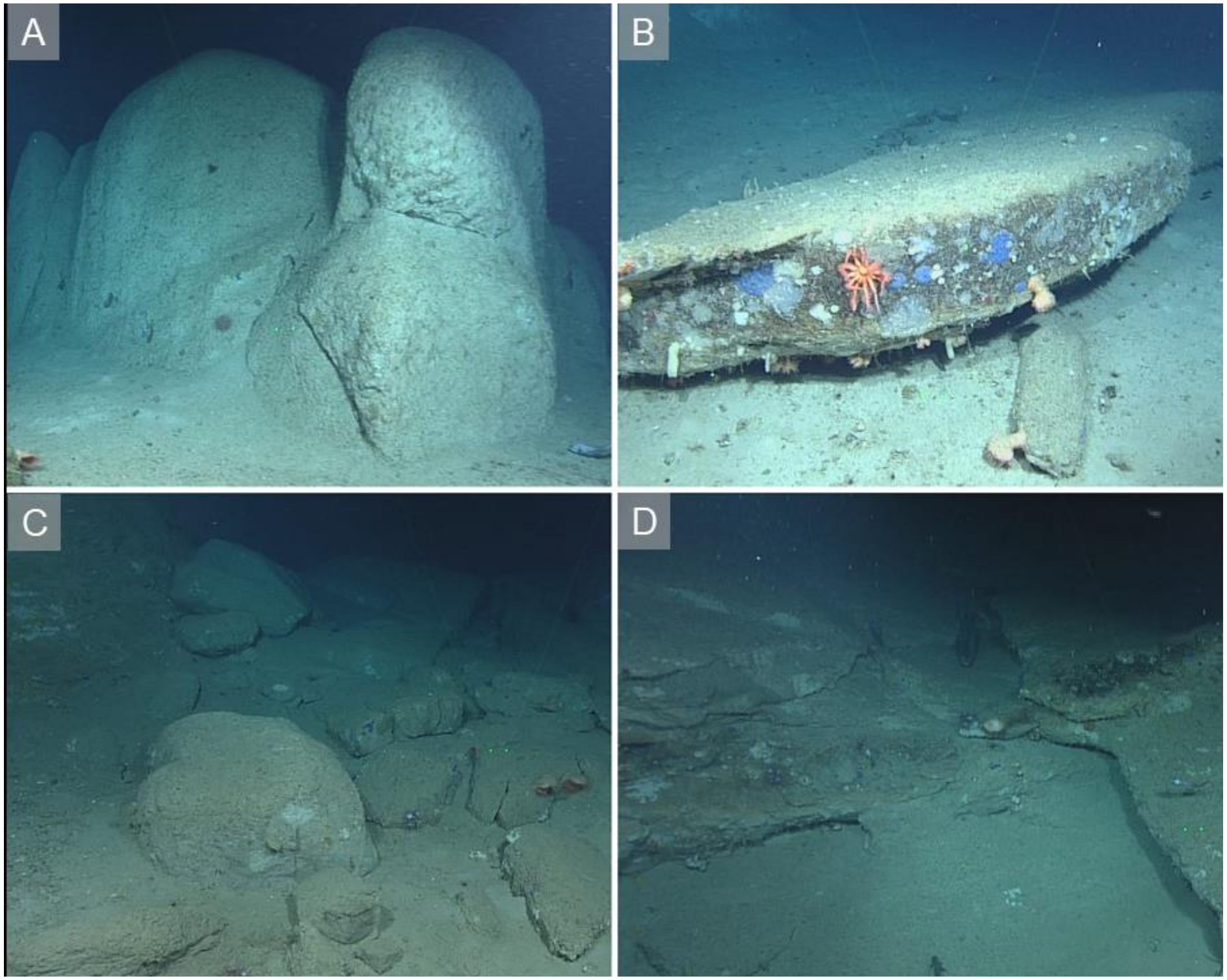

Figure 3-20 Examples of the surficial geology observed on site R1335: A) sedimentary bedrock outcrop, B) sedimentary bedrock slab, C) weathered sedimentary bedrock, D) eroded sedimentary bedrock wall. Green lasers are 10 cm apart.

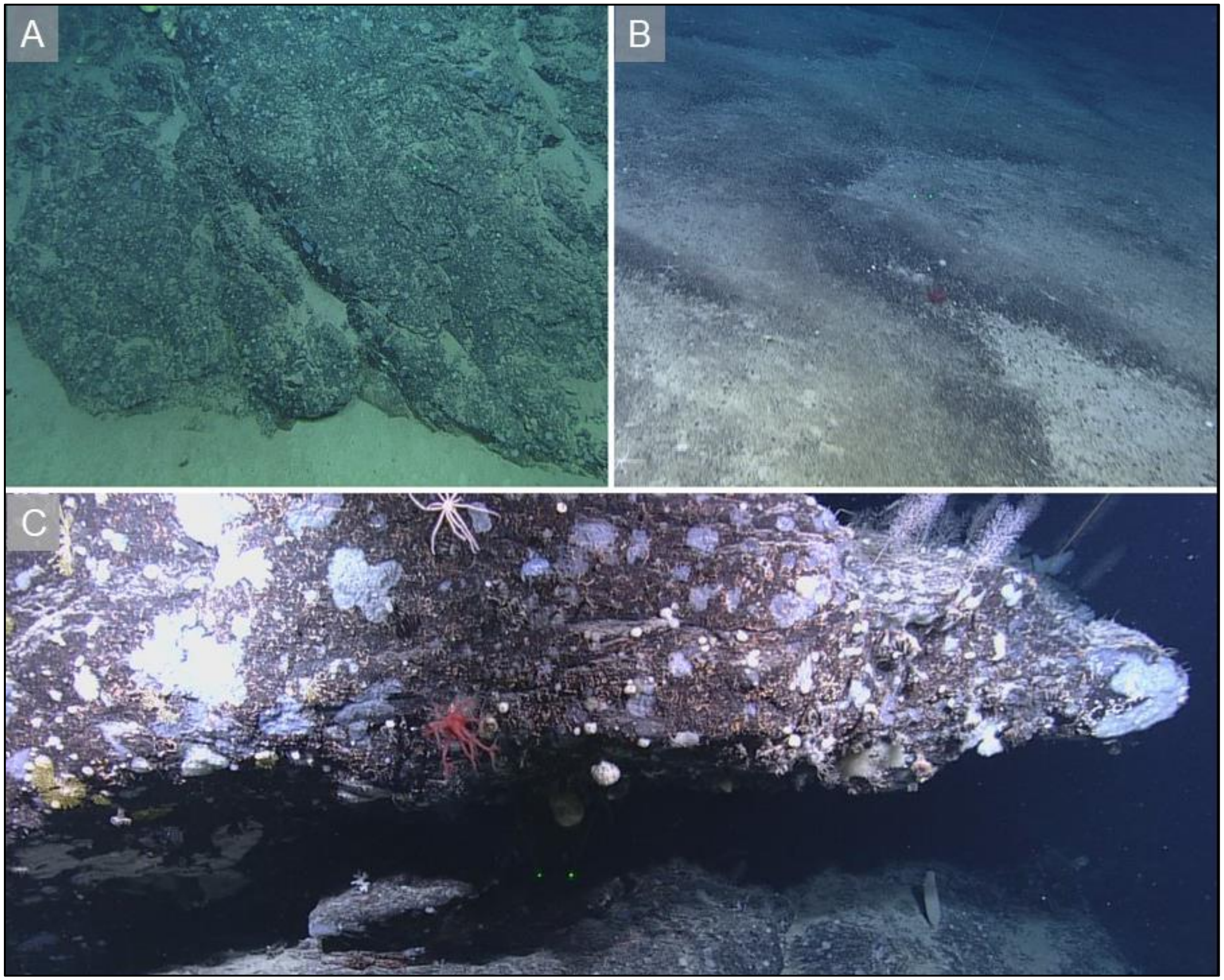

Figure 3-21 Examples of the surficial geology observed on site R1336: A) igneous bedrock outcrop, B) gravelly fine-grained sediments, C) igneous bedrock outcrop with benthic species. Green lasers are 10 cm apart.

The easternmost site (R1337) had the most heterogeneous surficial geology and the most described facies at all spatial scales with six (10 m) to four (1000 m) (Figure 3-26). There was a greater variety of facies at depths > 1600 m, while facies < 1600 m consisted of primarily gravelly fine grained or sedimentary bedrock outcrops. Sedimentary outcrops were found throughout the transect likely mudstone and limestone (Figure 3-22). At 1800-2000 m depth the ROV crossed an inferred fault line where igneous and sedimentary outcrops were found side-by-side. A 100-m sedimentary bedrock wall is a key feature of this site and is located at approximately 1300 m depth (Figure 3-8).

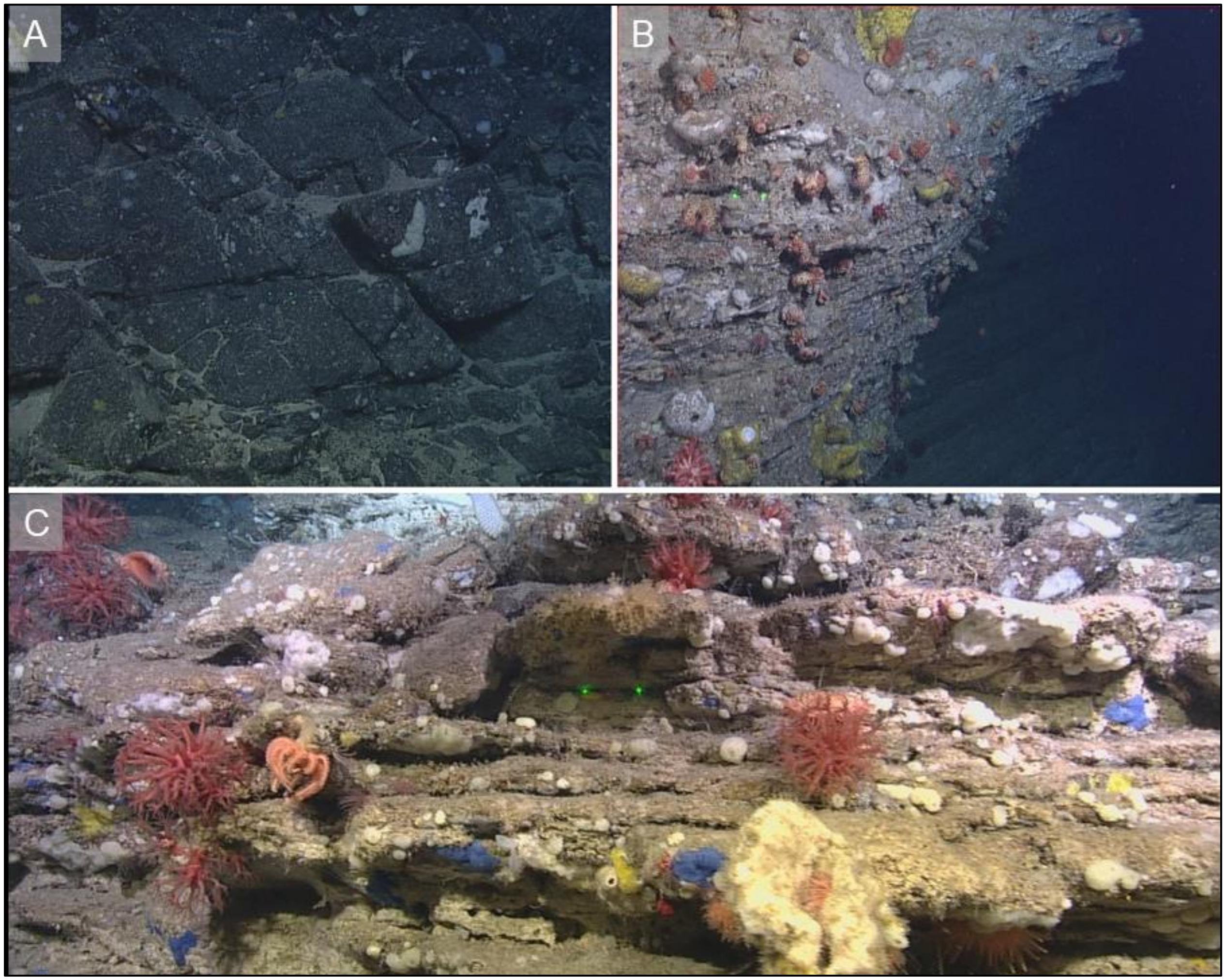

Figure 3-22 Examples of the surficial geology observed on site R1337: A) jointed igneous bedrock outcrop, B) sedimentary bedrock wall, C) sedimentary bedrock outcrop with benthic species. Green lasers are 10 cm apart.

R1339 was a 4.8 km long transect moving up slope that had distinctive ledges formed by sedimentary bedrock outcrops. Facies found shallower than 1900 m were the more diverse than those found at other depths with gravelly fine grained, sedimentary outcrops, and discontinuous sedimentary bedrock present (Figure 3-23). As spatial scale increased, sedimentary bedrock facies are replaced with discontinuous sedimentary bedrock facies (Figure 3-27).

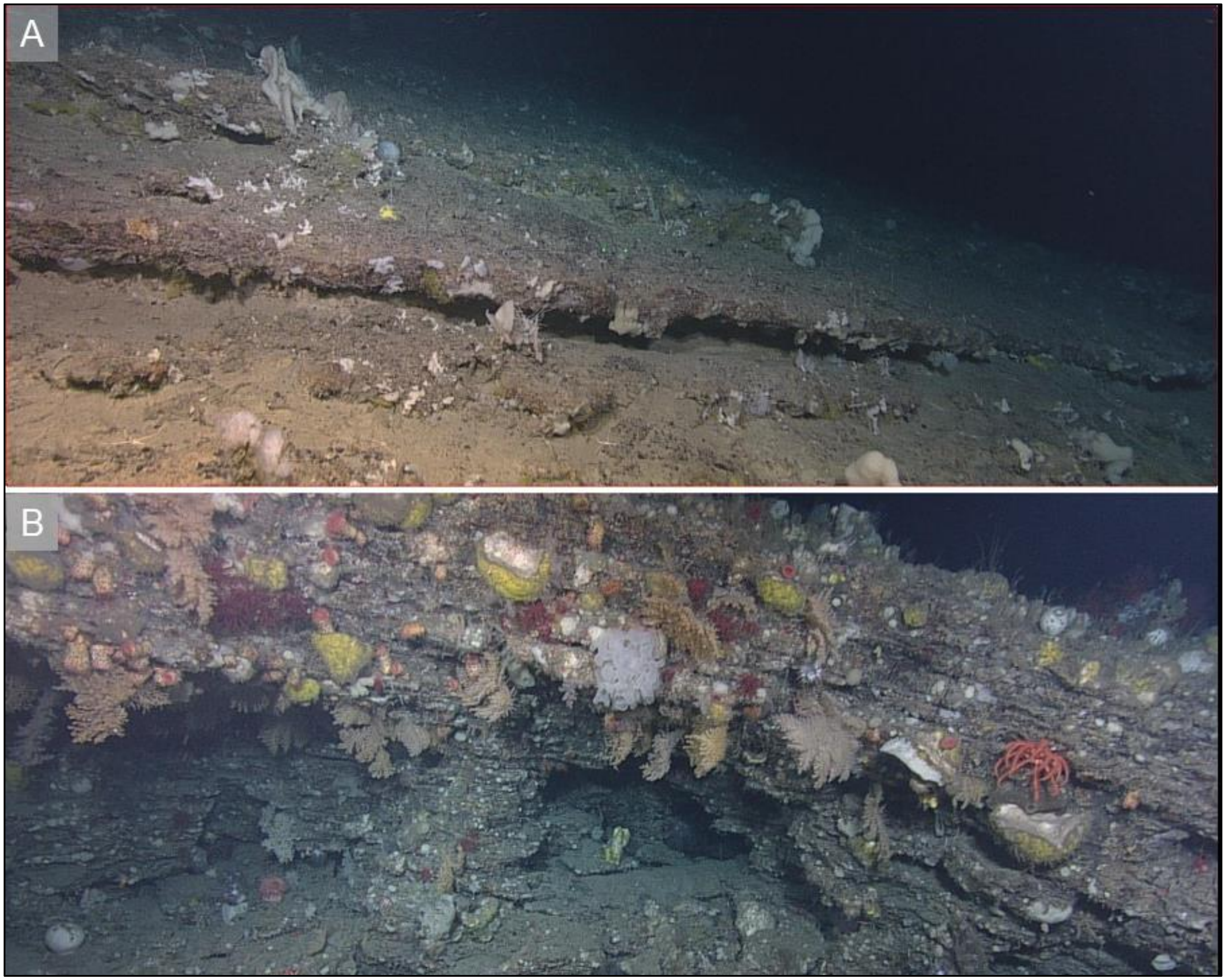

Figure 3-23 Examples of the surficial geology observed on site R1339: A) sedimentary bedrock ledges, B) sedimentary bedrock outcrop.

Table 3-7 Facies observed with labels, descriptions, and possible lithologies.

Facies	Label	Description	Lithologies
Fine grained	Fg	sand and mud	
Gravelly fine grained	Gfg	>25% gravel and cobble coverage in a sand or mud matrix	all
Boulder	Bl	100% boulder coverage	all
Discontinuous Sedimentary Bedrock	Dsb	small sedimentary bedrock outcrops in a sand or mud matrix	Limestone, mudstone
Discontinuous Igneous Bedrock	Dib	small igneous bedrock outcrops	Granodiorite, basalt
Igneous/Sedimentary bedrock interface	I/S	sedimentary and igneous bedrock outcrops	Limestone, granodiorite
Sedimentary bedrock	Sd	sedimentary bedrock outcrops	Limestone, mudstone
Igneous bedrock	Id	igneous bedrock outcrops	Granodiorite, basalt

3.4.4 Facies

The surficial geology was described visually from the primary and secondary substrate at five spatial scales for each ROV transect. From video imagery, eight surficial geology facies were described: fine grained (Fg), gravelly fine grained (Gfg), boulder (Bl), discontinuous sedimentary bedrock (Dsb), discontinuous igneous bedrock (Dib), igneous/sedimentary bedrock (I/S), sedimentary bedrock (Sd) and igneous bedrock (Ig) (Table 3-7). Facies were evenly distributed between depths or sites (Table 3-8). Ig outcrops were generally deeper with Sd outcrops found mid-slope. Sedimentary bedrock was found at three of the dives in various forms such as bedrock outcrop, vertical walls, and terraces. Igneous bedrock outcrops were recorded at only two sites (Table 3-8). Geological samples collected opportunistically *in-situ*, were used to describe the lithology. Outcrops that did not have samples collected from them were classified as sedimentary or igneous from visual characteristics.

Facies were more diverse at depths >1475 m with eight facies described. At depths <1475 m, smaller grain sizes (Fg and Gfg) were more common. Gravelly fine grained was the most abundant facies at depths 1475-2075 m (Table 3-8). Geological grab samples collected at the end of R1337 (1029 m) were covered in striations, probably caused by ice induced transportation, and are likely ice-rafted detritus (IRD). Other grab samples that were not bedrock could not be identified as native or IRD, and thus origin was not included in the analysis. The most common facies described on the flanks were Gfg and Sd.

Table 3-8 Number of facies found per site at 10-m scale per 200 m depth bin with totals for each facies.

Depth (m)	Facies	R1335 (3.46)	R1336 (2.68)	R1337 (4.11)	R1339 (4.84)	Total
875-1075	Fg	35		-		35
	Gfg	-		13		13
	Bl	-		-		0
	Dsb	-		-		0
	Dib	-		-		0
	I/S	-		-		0
	Sd	-		-		0
	Id	-		-		0
1075-1275	Fg	12		-		12
	Gfg	-		3		3
	Bl	-		-		0
	Dsb	-		-		0
	Dib	-		-		0
	I/S	-		-		0
	Sd	-		67		67
	Id	-		-		0
1275-1475	Fg	12		-	-	12
	Gfg	-		-	55	55
	Bl	-		-	-	0
	Dsb	1		-	-	1
	Dib	-		-	-	0
	I/S	-		-	-	0
	Sd	3		22	2	27
	Id	-		-	-	0
1475-1675	Fg	7		-	-	7
	Gfg	-		35	61	96
	Bl	-		-	-	0
	Dsb	1		3	-	4
	Dib	-		-	-	0
	I/S	-		-	-	0
	Sd	2		15	2	19
	Id	-		-	-	0
1675-1875	Fg	1		-	-	1
	Gfg	-		49	53	102
	Bl	-		-	-	0
	Dsb	-		2	-	2
	Dib	-		3	-	3
	I/S	-		2	-	2
	Sd	5		6	6	17
	Id	-		11	-	11

Depth (m)	Facies	R1335 (3.46)	R1336 (2.68)	R1337 (4.11)	R1339 (4.84)	Total
1875-2075	Fg			-	-	0
	Gfg			-	1	1
	Bl			-	-	0
	Dsb			-	3	3
	Dib			-	-	0
	I/S			-	-	0
	Sd			1	29	30
	Id			12	-	12
2075-2275	Fg		-	-	-	0
	Gfg		-	-	10	10
	Bl		-	-	-	0
	Dsb		-	6	6	12
	Dib		1	-	-	1
	I/S		-	-	-	0
	Sd		-	2	20	22
	Id		4	-	-	4
2275-2475	Fg		4		-	4
	Gfg		-		14	14
	Bl		-		-	0
	Dsb		-		1	1
	Dib		3		-	3
	I/S		-		-	0
	Sd		-		25	25
	Id		20		-	20
2475-2675	Fg		4			4
	Gfg		-			0
	Bl		-			0
	Dsb		-			0
	Dib		4			4
	I/S		-			0
	Sd		-			0
	Id		18			18
2675-2950	Fg		8			8
	Gfg		1			1
	Bl		1			1
	Dsb		-			0
	Dib		7			7
	I/S		-			0
	Sd		-			0
	Id		22			22

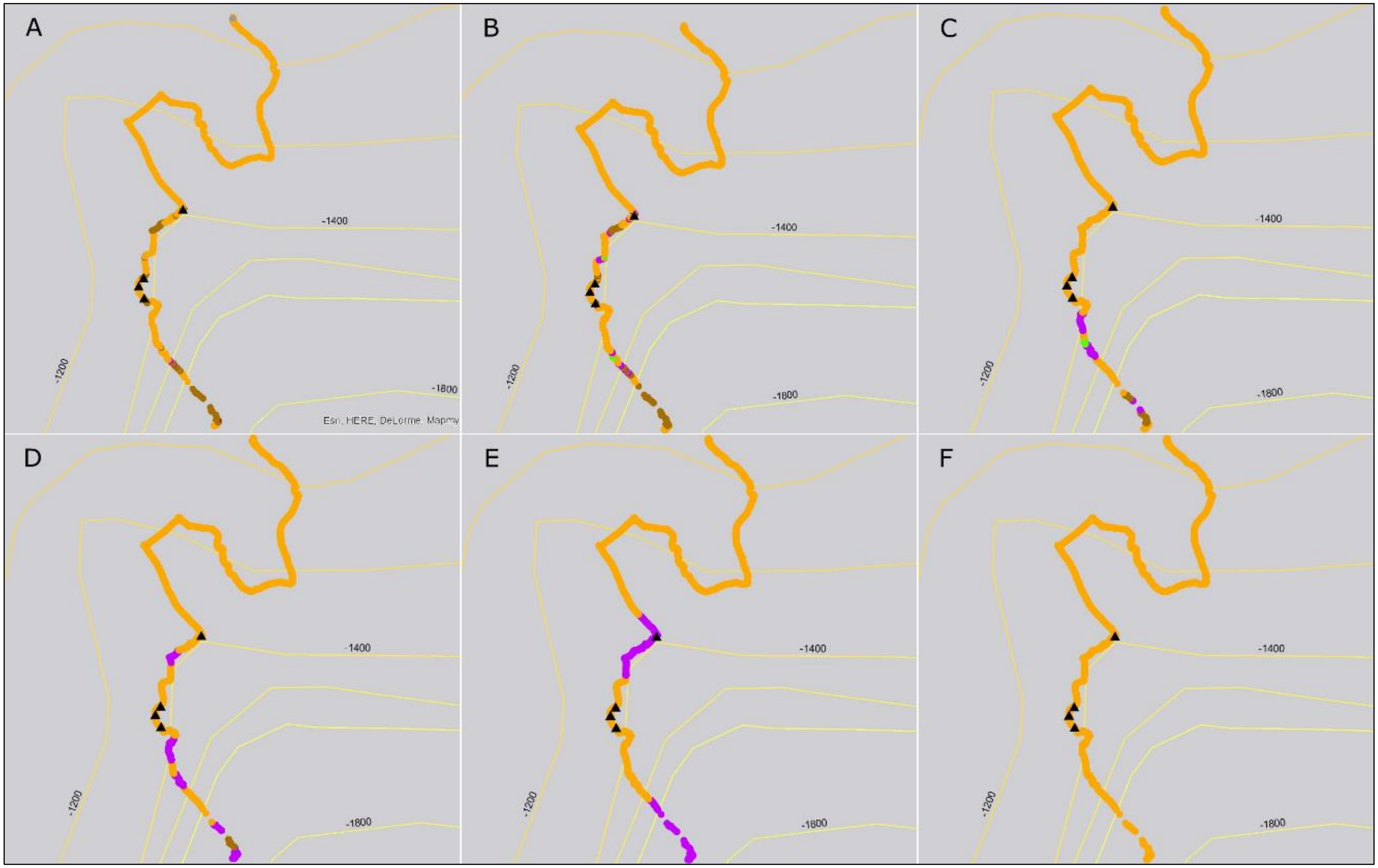

Figure 3-24 Site R1335 facies described at increasing spatial scale: A) 1 m, B) 10 m, C) 50 m, D) 100 m, E) 500 m, F) 1000 m. Colors indicate facies type: Fg (orange), Gfg (green), Dsb (purple), Sd (brown). Triangles represent morphological features of note.

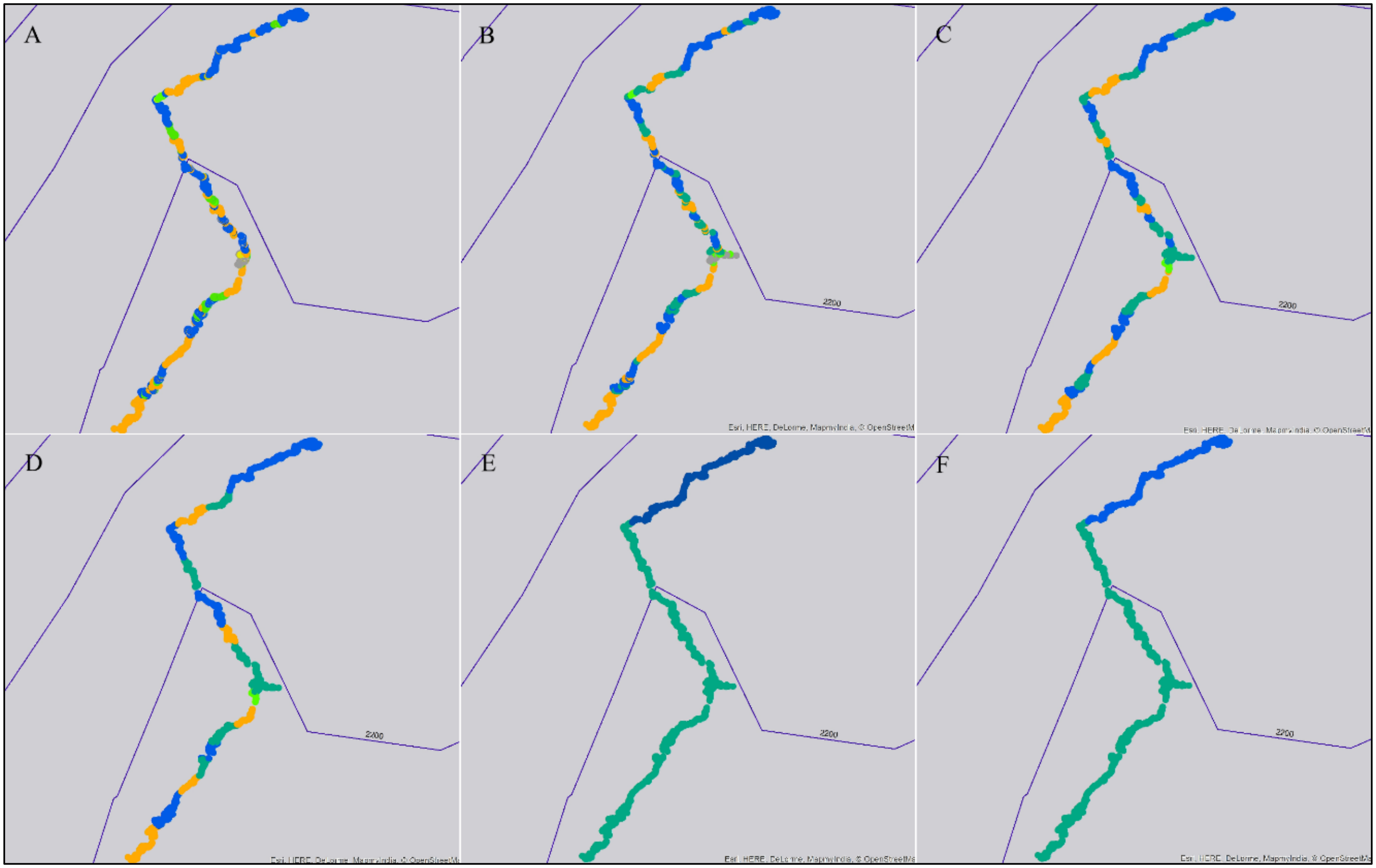

Figure 3-25 Site R1336 facies described at increasing spatial scale: A) 1 m, B) 10 m, C) 50 m, D) 100 m, E) 500 m, F) 1000 m. Colors indicate facies type: Fg (orange), Gfg (green), Bl (grey), Dib (teal), Ig (blue).

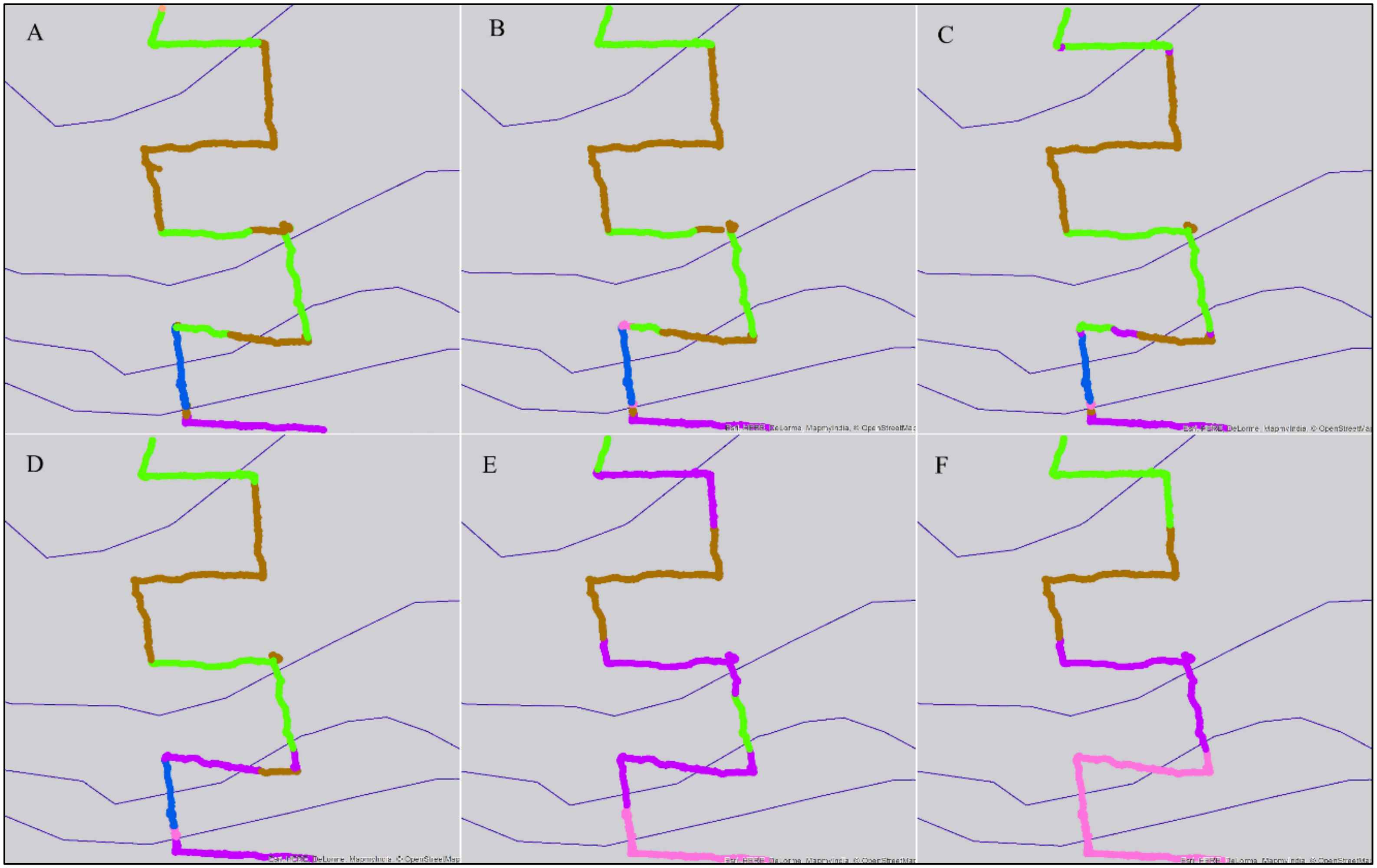

Figure 3-26 Site R1337 facies described at increasing spatial scale: A) 1 m, B) 10 m, C) 50 m, D) 100 m, E) 500 m, F) 1000 m. Colors indicate facies type: Gfg (green), Dsb (purple), I/S (pink), Sd (brown), Ig (blue).

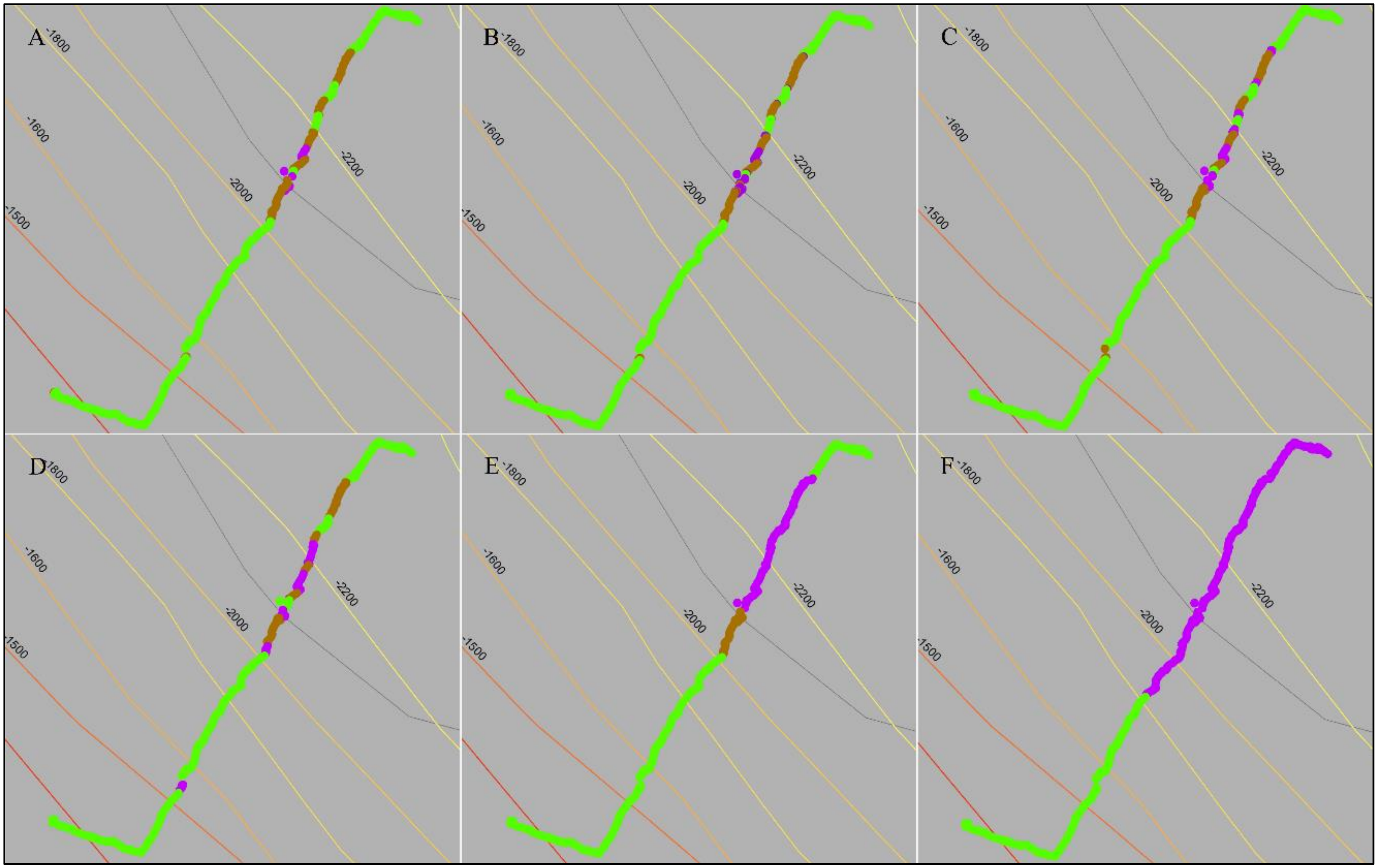

Figure 3-27 Site R1339 facies described at increasing spatial scale: A) 1 m, B) 10 m, C) 50 m, D) 100 m, E) 500 m, F) 1000 m. Colors indicate facies type: Gfg (green), Dsb (purple), Sd (brown).

3.4.5 Spatial Scale

Surficial geology was described across the ROV transect at 10 m, 50 m, 100 m, 500 m, and 1000 m intervals, resulting in eight different facies types (Table 3-7). The only example of a boulder facies was observed at 10 m scale on R1336 (Table 3-8). Fine grained facies were the predominant facies at all scale levels at only one site (R1335). As spatial scale increases, hard substrates are no longer detected, and the site is coarsely described as fine-grained substrate. To test the difference between facies at each spatial scale across all depths, a pairwise 2-way ANOSIM analysis was conducted for both functional groups and species at two different transformations. Overall there was no statistical difference between facies at the coarser spatial scales 500 m and 1000 m ($p>0.5$) for functional groups (Table 3-9) or species (Table 3-10) for either transformation. While depth was also significant at finer spatial scales, there was more difference between facies at those same scales.

At finer spatial scales (10 m, 50 m), Ig and Sd were statistically different for functional groups and species for both transformations. At 100 m spatial scale there is not a statistical difference for species data fourth-root transform. Gfg facies were statistically different from Fg facies for both taxonomic levels and both transformations.

Table 3-9 Two-way ANOSIM global R statistics and percent significance levels (%) for depth and facies across all spatial scales for functional groups. A) 4th root transformation and, B) presence/absence.

A	FG_4rt			
Scale	Depth		Facies	
	Gobal R	Sig Lev %	Gobal R	Sig Lev %
Grain	0.332	0.1	0.412	0.1
10m	0.256	0.1	0.39	0.1
50m	0.321	0.1	0.415	0.1
100m	0.345	0.1	0.367	0.1
500m	-0.017	54.7	0.128	30.6
1000m	-0.6	91.7	0.125	53.6

B	FG_PA			
Scale	Depth		Facies	
	Gobal R	Sig Lev %	Gobal R	Sig Lev %
Grain	0.17	0.1	0.363	0.1
10m	0.136	0.1	0.326	0.1
50m	0.171	0.1	0.343	0.1
100m	0.22	0.1	0.312	0.1
500m	0.012	46.1	0.039	39.5
1000m	-0.6	91.7	-0.563	93.6

Table 3-10 Two-way ANOSIM global R statistics and percent significance levels (%) for depth and facies across all spatial scales for all species. A) 4th root transformation and, B) presence/absence.

A	SP_4rt			
Scale	Depth		Facies	
	Gobal R	Sig Lev %	Gobal R	Sig Lev %
Grain	0.377	0.1	0.424	0.1
10m	0.312	0.1	0.434	0.1
50m	0.344	0.1	0.491	0.1
100m	0.362	0.1	0.442	0.1
500m	0.077	36.8	0.249	16.5
1000m	-0.2	72.2	0.5	20

B	SP_PA			
Scale	Depth		Facies	
	Gobal R	Sig Lev %	Gobal R	Sig Lev %
Grain	0.322	0.1	0.394	0.1
10m	0.264	0.1	0.4	0.1
50m	0.279	0.1	0.48	0.1
100m	0.303	0.1	0.399	0.1
500m	0.188	21.8	0.066	35.2
1000m	-0.3	75	-0.125	66.7

Table 3-11 Results from pairwise ANOSIM between facies described at 10 m spatial scale across all depths for all functional group abundance (4rt transformed). The sample statistic (global R) was ρ=0.39 at a significance level of 0.1%. The R statistic for each pairwise test is shown to the left of the grey divide with corresponding significance levels reported as percent on the right.

Facies 10m	Fg	Gfg	Bl	Dsb	Dib	Sd	Id
Fg	-	0.1	33.3	3.8	70.9	0.1	25.9
Gfg	0.669	-	NA	0.3	8.6	0.1	5.2
Bl	1	NA	-	NA	83.3	NA	100
Dsb	0.307	0.307	NA	-	35.1	0.1	1.1
Dib	-0.07	0.184	-0.36	0.044	-	0.1	20.9
Sd	0.875	0.225	NA	0.326	0.823	-	0.1
Id	0.065	0.077	-0.333	0.257	0.057	0.501	-

Table 3-12 Results from pairwise ANOSIM between facies described at 50 m spatial scale across all depths for all functional group abundance (4rt transformed). The sample statistic (global R) was ρ=0.415 at a significance level of 0.1%. The R statistic for each pairwise test is shown to the left of the grey divide with corresponding significance levels reported as percent on the right.

Facies 50m	Fg	Gfg	Bl	Dsb	Dib	Sd	Ig
Fg	-	0.1	2.4	20.3	NA	0.1	44.8
Gfg	0.632	-	1.4	27.3	NA	1.1	17.8
Bl	0.72	0.532	-	13.3	60	21	0.2
Dsb	0.187	0.079	0.429	-	NA	0.8	29.3
Dib	NA	NA	-0.125	NA	-	16.7	33.3
Sd	0.878	0.208	0.109	0.675	1	-	0.1
Ig	0.012	0.086	0.459	0.042	0.1	0.614	-

Table 3-13 Results from pairwise ANOSIM between facies described at 100 m spatial scale across all depths for all functional group abundance (4rt transformed). The sample statistic (global R) was ρ=0.367 at a significance level of 0.1%. The R statistic for each pairwise test is shown to the left of the grey divide with corresponding significance levels reported as percent on the right.

Facies 100m	Fg	Gfg	Bl	Dsb	Dib	Sd	Ig
Fg	-	0.3	76.7	25	NA	0.1	52.5
Gfg	0.577	-	31.6	27	NA	7.9	34.6
Bl	-0.248	0.061	-	NA	33.3	54.8	76
Dsb	0.358	0.237	NA	-	NA	13.3	5.2
Dib	NA	NA	1	NA	-	33.3	100
Sd	0.844	0.194	-0.023	0.554	1	-	1.1
Ig	-0.062	0.023	-0.146	0.373	-0.556	0.599	-

Table 3-14 Results from pairwise ANOSIM between facies described at 500 m spatial scale across all depths for all functional group abundance (4rt transformed). The sample statistic (global R) was ρ=0.128 and a significance level of 30.6%. The R statistic for each pairwise test is shown to the left of the grey divide with corresponding significance levels reported as percent on the right.

Facies 500m	Fg	Gfg	Bl	Dsb	Dib	Sd	Ig
Fg	-	11.1	37	NA	NA	11.1	NA
Gfg	0.837	-	55.6	NA	NA	88.9	NA
Bl	0.137	0	-	NA	NA	88.9	NA
Dsb	NA	NA	NA	-	NA	NA	NA
Dib	NA	NA	NA	NA	-	NA	NA
Sd	1	-0.5	-0.5	NA	NA	-	NA
Ig	NA	NA	NA	NA	NA	NA	-

Table 3-15 Results from pairwise ANOSIM between facies described at 1000 m spatial scale across all depths for all functional group abundance (4rt transformed). The sample statistic (global R) was ρ=0.125 and a significance level of 53.6%. The R statistic for each pairwise test is shown to the left of the grey divide with corresponding significance levels reported as percent on the right.

Facies 1000m	Fg	Gfg	Bl	Dsb	Dib	Sd	Ig
Fg	-	NA	66.7	NA	100	NA	NA
Gfg	NA	-	NA	NA	NA	NA	NA
Bl	0.5	NA	-	NA	66.7	NA	NA
Dsb	NA	NA	NA	-	NA	NA	NA
Dib	-1	NA	0	NA	-	NA	NA
Sd	NA	NA	NA	NA	NA	-	NA
Ig	NA	NA	NA	NA	NA	NA	-

Table 3-16 Results from pairwise ANOSIM between facies described at 10 m spatial scale across all depths for all functional group abundance (P/A transformed). The sample statistic (global R) was ρ=0.326 at a significance level of 0.1%. The R statistic for each pairwise test is shown to the left of the grey divide with corresponding significance levels reported as percent on the right.

Facies 10m	Fg	Gfg	Bl	Dsb	Dib	Sd	Ig
Fg	-	0.1	50	6.3	60.9	0.1	32.2
Gfg	0.653	-	NA	0.4	4.4	0.1	77.7
Bl	-0.111	NA	-	NA	100	NA	100
Dsb	0.178	0.27	NA	-	0.1	1	0.6
Dib	-0.038	0.217	-0.3	0.112	-	0.1	26.8
Sd	0.861	0.13	NA	0.207	0.778	-	0.1
Ig	0.041	-0.033	-0.333	0.273	0.047	0.421	-

Table 3-17 Results from pairwise ANOSIM between facies described at 50 m spatial scale across all depths for all functional group abundance (P/A transformed). The sample statistic (global R) was ρ=0.343 at a significance level of 0.1%. The R statistic for each pairwise test is shown to the left of the grey divide with corresponding significance levels reported as percent on the right.

Facies 50m	Fg	Gfg	Bl	Dsb	Dib	Sd	Ig
Fg	-	0.1	4.8	17.5	NA	0.1	30.4
Gfg	0.541	-	4	8.1	NA	11.1	51.1
Bl	0.685	0.481	-	20	100	29.7	1.2
Dsb	0.2	0.188	0.25	-	NA	0.8	20.4
Dib	NA	NA	-0.25	NA	-	16.7	50
Sd	0.827	0.095	0.055	0.663	1	-	0.1
Ig	0.083	-0.028	0.35	0.072	0.12	0.532	-

Table 3-18 Results from pairwise ANOSIM between facies described at 100 m spatial scale across all depths for all functional group abundance (P/At transformed). The sample statistic (global R) was ρ=0.312 at a significance level of 0.1%. The R statistic for each pairwise test is shown to the left of the grey divide with corresponding significance levels reported as percent on the right.

Facies 100m	Fg	Gfg	Bl	Dsb	Dib	Sd	Ig
Fg	-	0.2	86.7	25	NA	0.1	74
Gfg	0.526	-	21.7	33.3	NA	36.7	32.9
Bl	-0.312	0.161	-	NA	66.7	45.2	92
Dsb	0.358	0.202	NA	-	NA	13.3	4
Dib	NA	NA	0	NA	-	33.3	100
Sd	0.804	0.027	-0.025	0.643	1	-	1.8
Ig	-0.194	0.041	-0.25	0.38	-0.556	0.521	-

Table 3-19 Results from pairwise ANOSIM between facies described at 500 m spatial scale across all depths for all functional group abundance (P/A transformed). The sample statistic (global R) was ρ=0.0.039 and a significance level of 39.5%. The R statistic for each pairwise test is shown to the left of the grey divide with corresponding significance levels reported as percent on the right.

Facies 500m	Fg	Gfg	Bl	Dsb	Dib	Sd	Ig
Fg	-	66.7	63	NA	NA	66.7	NA
Gfg	0.174	-	33.3	NA	NA	77.8	NA
Bl	-0.113	0.313	-	NA	NA	88.9	NA
Dsb	NA	NA	NA	-	NA	NA	NA
Dib	NA	NA	NA	NA	-	NA	NA
Sd	0	-0.25	-0.5	NA	NA	-	NA
Ig	NA	NA	NA	NA	NA	NA	-

Table 3-20 Results from pairwise ANOSIM between facies described at 1000 m spatial scale across all depths for all functional group abundance (P/A transformed). The sample statistic (global R) was ρ=0.563 and a significance level of 93.6%. The R statistic for each pairwise test is shown to the left of the grey divide with corresponding significance levels reported as percent on the right.

Facies 1000m	Fg	Gfg	Bl	Dsb	Dib	Sd	Ig
Fg	-	NA	100	NA	100	NA	NA
Gfg	NA	-	NA	NA	NA	NA	NA
Bl	-0.5	NA	-	NA	NA	NA	NA
Dsb	NA	NA	NA	-	NA	100	NA
Dib	-1	NA	NA	NA	-	NA	NA
Sd	NA	NA	NA	NA	-0.5	-	NA
Ig	NA	NA	NA	NA	NA	NA	-

Table 3-21 Results from pairwise ANOSIM between facies described at 10 m spatial scale across all depths for all species abundance (4rt transformed). The sample statistic (global R) was ρ=0.434 at a significance level of 0.1%. The R statistic for each pairwise test is shown to the left of the grey divide with corresponding significance levels reported as percent on the right.

Facies 10m	Fg	Gfg	Bl	Dsb	Dib	Sd	Ig
Fg	-	0.1	33.3	3.8	72.1	0.1	23.4
Gfg	0.608	-	NA	0.2	25.8	0.1	4
Bl	1	NA	-	NA	50	NA	100
Dsb	0.308	0.457	NA	-	42.9	0.1	0.2
Dib	-0.073	0.12	-0.16	-0.019	-	0.1	22.9
Sd	0.836	0.349	NA	0.298	0.594	-	0.1
Ig	0.072	0.104	-0.417	0.35	0.06	0.444	-

Table 3-22 Results from pairwise ANOSIM between facies described at 50 m spatial scale across all depths for all species abundance (4rt transformed). The sample statistic (global R) was ρ=0.491 at a significance level of 0.1%. The R statistic for each pairwise test is shown to the left of the grey divide with corresponding significance levels reported as percent on the right.

Facies 50m	Fg	Gfg	Bl	Dsb	Dib	Sd	Ig
Fg	-	0.1	9.5	31.1	NA	0.1	15.5
Gfg	0.669	-	0.6	NA	NA	0.1	10.8
Bl	0.531	0.518	-	26.7	20	22.5	0.7
Dsb	0.081	0.05	0.214	-	33.4	1.6	48.6
Dib	NA	NA	1	NA	-	16.7	16.7
Sd	0.823	0.412	0.077	0.456	1	-	0.1
Ig	0.156	0.135	0.436	-0.002	0.9	0.662	-

Table 3-23 Results from pairwise ANOSIM between facies described at 100 m spatial scale across all depths for all species abundance (4rt transformed). The sample statistic (global R) was ρ=0.442 at a significance level of 0.1%. The R statistic for each pairwise test is shown to the left of the grey divide with corresponding significance levels reported as percent on the right.

Facies 100m	Fg	Gfg	Bl	Dsb	Dib	Sd	Ig
Fg	-	0.2	96.7	66.7	NA	0.1	34.7
Gfg	0.604	-	8.8	33.3	NA	0.1	19.3
Bl	-0.563	0.189	-	NA	33.3	47.6	49
Dsb	0.013	0.055	NA	-	NA	20	32.5
Dib	NA	NA	1	NA	-	33.3	100
Sd	0.846	0.406	0.003	0.286	1	-	NA
Ig	0.182	0.111	-0.021	0.14	-0.556	NA	-

Table 3-24 Results from pairwise ANOSIM between facies described at 500 m spatial scale across all depths for all species abundance (4rt transformed). The sample statistic (global R) was ρ=0.249 and a significance level of 16.5%. The R statistic for each pairwise test is shown to the left of the grey divide with corresponding significance levels reported as percent on the right.

Facies 500m	Fg	Gfg	Bl	Dsb	Dib	Sd	Ig
Fg	-	11.1	33.3	NA	NA	11.1	NA
Gfg	0.837	-	22.2	NA	NA	88.9	NA
Bl	0.258	0.25	-	NA	NA	66.7	NA
Dsb	NA	NA	NA	-	NA	NA	NA
Dib	NA	NA	NA	NA	-	NA	NA
Sd	1	-0.5	0	NA	NA	-	NA
Ig	NA	NA	NA	NA	NA	NA	-

Table 3-25 Results from pairwise ANOSIM between facies described at 1000 m spatial scale across all depths for all species abundance (4rt transformed). The sample statistic (global R) was ρ=0.5 and a significance level of 20%. The R statistic for each pairwise test is shown to the left of the grey divide with corresponding significance levels reported as percent on the right.

Facies 1000m	Fg	Gfg	Bl	Dsb	Dib	Sd	Ig
Fg	-	NA	33.3	NA	33.3	NA	NA
Gfg	NA	-	NA	NA	NA	NA	NA
Bl	0.75	NA	-	NA	66.7	NA	NA
Dsb	NA	NA	NA	-	NA	NA	NA
Dib	1	NA	0	NA	-	NA	NA
Sd	NA	NA	NA	NA	NA	-	NA
Ig	NA	NA	NA	NA	NA	NA	-

Table 3-26 Results from pairwise ANOSIM between facies described at 10 m spatial scale across all depths for all species abundance (P/A transformed). The sample statistic (global R) was ρ=0.394 at a significance level of 0.1%. The R statistic for each pairwise test is shown to the left of the grey divide with corresponding significance levels reported as percent on the right.

Facies 10m	Fg	Gfg	Bl	Dsb	Dib	Sd	Ig
Fg	-	0.1	33.3	11.9	76.3	0.1	23.6
Gfg	0.6	-	NA	0.1	25	0.1	40.2
Bl	1	NA	-	NA	66.7	NA	100
Dsb	0.199	0.465	NA	-	32.5	0.7	0.1
Dib	-0.086	0.116	-0.06	0.067	-	0.1	NA
Sd	0.804	0.324	NA	0.196	0.567	-	0.1
Ig	0.076	0.007	-0.5	0.359	NA	0.39	-

Table 3-27 Results from pairwise ANOSIM between facies described at 50 m spatial scale across all depths for all species abundance (P/A transformed). The sample statistic (global R) was ρ=0.4 at a significance level of 0.1%. The R statistic for each pairwise test is shown to the left of the grey divide with corresponding significance levels reported as percent on the right.

Facies 50m	Fg	Gfg	Bl	Dsb	Dib	Sd	Ig
Fg	-	0.1	9.5	29.2	NA	0.1	14.8
Gfg	0.662	-	3.7	15.3	NA	0.1	32.7
Bl	0.474	0.458	-	46.7	20	32	2.7
Dsb	0.105	0.154	0.107	-	NA	1.6	35.5
Dib	NA	NA	1	NA	-	16.7	16.7
Sd	0.816	0.432	0.042	0.481	1	-	0.1
Ig	0.172	0.055	0.318	0.02	0.9	0.644	-

Table 3-28 Results from pairwise ANOSIM between facies described at 100 m spatial scale across all depths for all species abundance (P/A transformed). The sample statistic (global R) was ρ=0.399 at a significance level of 0.1%. The R statistic for each pairwise test is shown to the left of the grey divide with corresponding significance levels reported as percent on the right.

Facies 100m	Fg	Gfg	Bl	Dsb	Dib	Sd	Ig
Fg	-	0.3	96.7	58.3	NA	0.1	35
Gfg	0.519	-	5.1	28.6	NA	1.5	24.2
Bl	-0.563	0.324	-	NA	66.7	42.9	90
Dsb	0.011	0.109	NA	-	NA	13.3	34.1
Dib	NA	NA	0	NA	-	33.3	100
Sd	0.89	0.276	0.007	0.339	1	-	0.3
Ig	0.12	0.132	-0.208	0.09	-0.667	0.573	-

Table 3-29 Results from pairwise ANOSIM between facies described at 500 m spatial scale across all depths for all species abundance (P/A transformed). The sample statistic (global R) was ρ=0.066 and a significance level of 35.2%. The R statistic for each pairwise test is shown to the left of the grey divide with corresponding significance levels reported as percent on the right.

Facies 500m	Fg	Gfg	Bl	Dsb	Dib	Sd	Ig
Fg	-	33.3	70.4	NA	NA	33.3	NA
Gfg	0.348	-	11.1	NA	NA	100	NA
Bl	-0.077	0.5	-	NA	NA	66.7	NA
Dsb	NA	NA	NA	-	NA	NA	NA
Dib	NA	NA	NA	NA	-	NA	NA
Sd	0.5	-1	0	NA	NA	-	NA
Ig	NA	NA	NA	NA	NA	NA	-

Table 3-30 Results from pairwise ANOSIM between facies described at 1000 m spatial scale across all depths for all species abundance (P/A transformed). The sample statistic (global R) was ρ=0.125 and a significance level of 66.7%. The R statistic for each pairwise test is shown to the left of the grey divide with corresponding significance levels reported as percent on the right.

Facies 1000m	Fg	Gfg	Bl	Dsb	Dib	Sd	Ig
Fg	-	NA	66.7	66.7	NA	NA	NA
Gfg	NA	-	NA	NA	NA	NA	NA
Bl	NA	NA	-	NA	NA	NA	NA
Dsb	0	NA	NA	-	NA	NA	NA
Dib	NA	NA	-1	NA	-	NA	100
Sd	NA	NA	NA	NA	NA	-	NA
Ig	0	NA	NA	NA	NA	NA	-

3.5 Discussion

The flanks of the Flemish Cap support a diverse assemblage of CWC and habitats. No two regions were the same in terms of surficial geology or CWC composition. Hard substrates that can be a limited resource on the seafloor were present in various grain sizes and lithologies. Hard bottom in the form of gravel to bedrock outcrops is essential for several species of CWC and, their absence can limit coral distribution.

3.5.1 Coral occurrence and depth distributions

In all 27 species were observed from ROV video imagery at four sites on the Flemish Cap. This is comparable to the number of taxa found by other studies in the area that used mainly trawl data (Wareham & Edinger, 2007; Murillo et al., 2011). CWC were mainly found mid-slope at 1075-1875 m depth due to the abundance of soft corals, primarily *Anthomastus* spp.

Anthomastus spp. was the most abundant species and found on all attachment types and facies across all depth bins. Murillo *et al*. (2011) found soft corals to be the most common CWC due to the presence of nephtheid species and to a lesser extent *Anthomastus* spp. These corals were found mainly on the shelf break and slope between 600-900 m, Nephtheid species were found <2000 m and >1000 m. *Anthomastus* spp. were one of the main contributors to depth bin similarity at depths between 1000 m and 2400 m. *Anthomastus* spp. and Nephtheidae have been previously reported on the top of the FC (Wareham & Edinger, 2007, Murillo et al., 2011). This study shows that they have a large depth range over several different bottom-types. *Acanella* sp. was the dominant species at 875-1075 m depth which was only found on fine grained and gravelly fine-grained facies (Figure 3-15).

Anticline currents present on the FC allow for equal access for coral polyps to available suitable substrate. However instead of a homogenous distribution of corals there were distinct areas of coral assemblages. This could be the result of the proximity of source populations, substrate preference, competition, and local current regimes/upwelling, as well as, depth. *Acanella arbuscular* is a broadcast spawner and not transported widely in upper water column which could account for the distribution observed during this study (Beazley et al., 2011). Species that have been known to occur at deeper depths such as *Chrysogorgia* cf. *agassizii* were found only in the deeper areas (Figure 3-3).

When large gorgonians were observed attached to igneous bedrock outcrops they were commonly found on the exposed top of the outcrop. Sedimentary bedrock outcrops were found shallower and often as walls or ledges on slopes with a sediment veneer on top.

Corals found on sedimentary bedrock outcrops attached perpendicularly to the exposed wall face. Additionally, sections with greater erosion resistance had a higher density of coral colonization than the surrounding bedrock outcrop. Coral clustering was not observed on igneous bedrock outcrop. This difference could reflect the different current regimes found at those depths. Strong currents were encountered on the northern slope site (R1339) resulting in the ROV contacting the slope several times over the transect length.

3.5.2 Attachment Substrate

Attachment substrate is a key factor in CWC life history, and has been classified as either one of two types, hard or soft. While there is variation in the types of soft substrates (i.e. the percent of sand or silt), different hard substrate types are more easily identified and offer greater variability in lithology, shape and size. Taxa that do attach to hard substrates may exhibited preferences for grain size and orientation to better survive currents and sedimentation.

Different types of both hard and soft substrates are present on the cap and were observed during this study. However, only hard substrate is examined in further detail. Hard substrates were available throughout the depth range, of varying lithology. Igneous bedrock outcrops were found deeper than sedimentary bedrock outcrops, and at only two sites. Sedimentary bedrock displayed different geomorphology (walls, ledges, and pinnacles) owing to the different erosion and faulting patterns found on the FC.

Sedimentary bedrock that consisted of more erosion resistant strata (cemented conglomerate) had a higher abundance of coral than more eroded areas. Differing erosion patterns in lithologies allow for differing attachment anchors to exploit surface roughness. Sedimentary bedrock surfaces that are susceptible to erosion create a more abrasive and pitted surface for corals to attach. Very fine grained sedimentary bedrock lithologies (i.e. mudstone) were less suitable for colonization. Igneous outcrops such as granite and basalts are smoother and provide less surface roughness for a strong hold.

It has been assumed that CWC will colonize the largest grain size available probably due to the amount of surface area exposed and ability to support large colonies (Baker *et al*., 2008). Functional groups colonize all grain sizes throughout their depth ranges (Figure 3-14). Most species are found attached to only one substrate type throughout the depth range, except for several large gorgonians (*Acanthogorgia* sp., Isididae sp., *Paramuricea* spp. and, *Primnoa* sp.) and soft coral species (*Anthomastus* spp. and, Nephtheidae) which attach to several grain sizes (Figure 3-14). Nephtheids were found on fine grained facies but attached to IRDs that had been covered with a sediment veneer (R1337). The attachment substrate was only determined when the corals were collected for further analysis. Nephtheid growth rate may have outpaced the sedimentation rate at the top of the FC which may not be possible for other CWC. Other studies have found Nephtheid growing atop granodiorite outcrops at 143 m water depth on top of the Cap (Pellitier, 1971).

When large gorgonians were observed attached to igneous bedrock outcrops, they were commonly found on the exposed top of the outcrop. Sedimentary bedrock outcrops were found shallower and often as continuous walls on slopes with sediment veneer on top. Corals found on sedimentary bedrock outcrops attached parallel to the exposed wall face. Additionally, conglomerates with less erosion had a higher density of coral colonization than adjacent bedrock outcrop. Coral clustering was not observed on igneous bedrock outcrop. This could be due to substrate surface conditions or local current regimes.

It is unclear if the Isididae taxa observed on the northern slope (R1339) were attached to the sedimentary bedrock ledges, sponges or the fine-grained substrate. Currents in the area made ROV navigation and operation difficult: when moving up slope the ROV was forcibly pushed into the slope. Other studies in Atlantic Canada have found *Keratoisis* sp. at shallow depths on boulders and cobbles (Baker et al., 2008), as well as in areas where the hard substrate now has a veneer of muddy sediments (Neves et al., 2014).

Solitary cup coral species can colonize either hard or soft substrates, but only species that attach to hard substrate were observed (with one record of a solitary cup coral on soft sediment). *Desmophyllum dianthus* cup corals were found under bedrock outcrop overhangs (Figure 3-4) and ledges which have been observed in several other studies (Forsterra et al., 2005; Dolan et al., 2008). Colonial scleractinians were not observed despite the availability of hard substrate and predicted suitable habitat (Davies et al., 2008).

3.5.3 Facies

Facies were not uniformly distributed between dives or depths. Igneous bedrock facies were found mainly at deeper depths on two dives and boulder facies was found on only one site (Table 3-8). Facies comprised of sedimentary bedrock outcrops had a higher abundance of coral due to presence of *Anthomastus* spp. (Figure 3-15). *Anthomastus* spp. was the most important contributing taxa to the average similarity for six of the eight facies. It was not abundant on facies with igneous bedrock, but these facies were found at deeper depths that could be outside of the taxa's optimal depth range. However, *Anthomastus* spp. was the only CWC found in any great abundance at the igneous/sedimentary bedrock facies. Soft coral and small gorgonian functional groups contained species adapted to both hard and soft substrates, and thus the effect of facies on functional group distributions is not as significant as on species distribution. Also, while some facies could be described as "fine grained", this does not exclude the presence of hard substrate. Areas described as bedrock outcrop do not exclude the presence of fine grained sediments.

3.5.4 Spatial Scale

Studies that derive environmental surrogates from coarse bathymetric data, did not find substrate to be significant (Davies & Guinotte, 2011). When substrate is described at finer scales or localized to a single feature (canyon, seamount), it is an important surrogate and a contributing factor to coral distribution (Brooke & Ross, 2014). Depth and hard substrate are two key factors driving CWC distribution on the Flemish Cap. Finding the scale that best preserves the relationship between coral and substrate is important for conservation efforts.

As the description interval increases from 10 m to 1000 m, the number of facies per site decreased. This made the surface more homogenous and less detailed. From ANOSIM analysis sedimentary bedrock facies were significantly different from fine grained facies at fine scales for both species and functional groups at both transformations (10 m, 50 m, and 100 m). At broad scales (500 m, 1000 m), no facies were significantly different from each other at the functional group level or species level for either transformation. Thus, when substrate is described at scales greater than 500 m, scale there is no relationship between cold-water coral species and substrate detected. Available substrate data sets are often described too coarsely for effective habitat mapping.

Spatial scale is a key consideration when comparing environmental factors and CWC distribution, particularly concerning surficial geology. As surficial geology was described at greater spatial scales, the classification becomes more homogenous, and important substrate is no longer detected. Thus, corals that colonize hard substrates are present in areas described mainly as fine-grained sediments due to the lack of detailed description. While sedimentary bedrock outcrops were present on R1335, these outcrops are not sufficiently abundant to be described at 1000 m spatial scale (Figure 3-24). Habitat suitability models that use only environmental factors (no substrate) described at broad spatial scales over predicted the suitability of a region which many not reflect the actual locations of a species. Fine scale changes in topography (that could drive species distribution) can be lost as spatial scale is increased (Lecours et al., 2015). Davies & Guinotte (2011) predicted a mostly continuous habitat range on the eastern United States' continental slope for the hard substrate colonizing reef-building coral *Lophelia petrusa,* but most of the slope is fine grained sediments. Brooke and Ross (2014) used local geological knowledge to only target areas with suitable substrata, primarily in submarine canyons, and found the first record of *L. petrusa* off North Carolina. If surficial geology maps were produced at scales that account for more of the available hard substrate in a region, then predictive models would be more focused on regions of suitable substrata.

3.6 Conclusion

Coral species distributions on the flanks of the Flemish Cap were not solely driven by one specific environmental factor. Many species did not follow a specific depth pattern or adhere to only one attachment substrate type. When facies were described at increasingly coarser scales, the substrate appeared homogenous and there was no relationship with coral detected. When surficial geology is described at coarse scales, only the primary substrate is being described, which is not necessarily important descriptor for CWC habitat (Bennecke and Metaxas, 2017).

Current geological maps are constructed at such a coarse scale that they are insufficient for use in species distribution models. Traditional survey methods such as trawls and geological coring do not provide enough information to capture the whole context of an area. ROV obtained data provides the fine scale needed to produce model quality substrate information.

This study shows that attachment substrate is important for functional groups generally and species specifically and, that the surrounding surficial geology is important at fine scales. Presence-only datasets for species and functional groups will show a relationship with substrate but only when described at fine spatial scales. Substrates should be described at scales finer than 100 m for species distribution models.

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4 General Conclusions

Pervious studies and fishing activities have offered insight into the distribution, biology, ecology and general habitat preferences of the deep-sea taxa off Newfoundland and Labrador. However, there is still much we do not know. Distributions of CWC beyond fishing capabilities are of interest to future research and protection as new technologies allow for further exploitation of the benthos. The data collected on the 2010 research cruise (used for the analysis of this thesis) confirmed many observations obtained from traditional trawl surveys and offered new insight into coral habitat preference and distributions previously unknown.

The Flemish Cap provides diverse habitats for several CWC species. The 2010 research cruise allowed some of the first *in situ* surveys of the species and habitats found at depth on its flanks. Video imagery from four dives, spanning depths of 875 m to 2900 m offered rarely seen detail of the surficial geology of the flanks, and attachment substrate of CWC.

From surveying 15 km of seafloor, I identified 30,310 coral colonies, comprising 27 species, that spanned all observed depths and surficial geologies. This study continues previous work done in the area by increasing the depth investigated, and with minimally destructive technologies (i.e. ROV) so these corals can be re-visited for future studies. The original analysis did not include bathymetry. Bathymetry and bathymetrically derived variables have been used to describe and predict coral distribution. Inclusion of these variables described at appropriate scales will offer further insight into the relationship between corals and surficial geology across all other variables.

While not specifically examined in this thesis, the difference lithology properties could also be a significant factor in CWC colonization patterns. Sedimentary lithologies (particularly carbonates as this thesis has observed) modify and bio-erode more readily that igneous rocks, and thus have more complex, pitted surfaces which may offer better points of attachment. However, these surfaces should be sufficiently resistant to erosion to allow for corals to grow and not be removed easily. Igneous outcrops, such as granite and basalts, have a comparatively smoother surface, and potential offer less roughness to create a firm anchor.

Additionally, the angle to which the surface is exposed may also influence coral habitation. Sedimentary bedrock outcrops were often found with a sediment veneer on the top leaving the sides exposed for corals to colonize. For example, *Primnoa* spp. were found in high abundance on the side of a 100-m vertical sedimentary wall. Other instances of coral colonization of sedimentary bedrock outcrops also saw corals attached at all angles and on all surfaces, but with fewer found on the top. In contrast, corals found on igneous bedrock outcrops, generally attached to the uppermost flat surface of the outcrop.

Examining the relationship between CWC and surficial geology was more statistically significant at the species level. The functional group level has added complexity when looking at this relationship as several groups are not comprised of only hard substrate inhabitation species. For example, the functional group “cup corals” has hard substrate colonizing species such as *Javania calleti*. however, it also contains the sediment dwelling *Flabellum alabastrum*. Even functional groups that almost exclusively inhabit sediments have exceptions. For instance, not all sea pens exclusively colonize soft sediments. Some species of *Anthoptilum* sp. use a sucker-like expansion of the peduncle to inhabit hard surfaces (Williams, 2011). Species specific distribution prediction studies should consider including surficial geology at fine scales into their models.

4.1 Applications for species distribution modeling

Insights from this research have applications in species distribution modeling (SDM), which can be informative tools for conservation management (Brown et al., 2012; Yesson et al., 2012, Guijarro et al., 2016; Gullage et al., 2016). SDM combine taxonomic data with the environmental conditions found at those locations and predict where else those species are most likely to occur by looking for similar conditions over a larger unexplored area. Environmental conditions, such as depth, slope, and temperature, that have been described over coarse spatial scales (> 1000 m) and used as surrogates to predict suitable coral habitat distributions (Bryan & Metaxas, 2006; Dolan et al., 2008; Davies & Guinotte, 2011). However, as seen in this research and other studies, surficial geology is not a suitable predictor at coarse scales, as some ecologically important geological features occur over 10s of meters (Brooke et al., 2016; Bennecke & Metaxas, 2017).

The results from this thesis also highlight the need for more research in areas with complex geomorphology and at greater depths beyond “fishable areas” in Newfoundland and Labrador. I propose two main directions for future research:

-More fine scale (10s of meters) multibeam bathymetry surveys to be conducted in areas of interest.

-Refine existing and future habitat suitability models and species distribution models with geological data described at finer scales.

Hard substrate types (e.g. bedrock outcrops, boulders, etc.) do not often extend for several kilometers, and are more often only exposed at the surface for a few meters. Depending on the sedimentation rates and depth in an area of interest, suitable surficial geology may be ephemeral with exposure only lasting long enough for CWC to colonize them (as observed in Chapter 4 of soft corals colonizing IRDs). Thus, surficial geology maps have a short shelf life for SDM use in areas of high currents and over large spatial scales are not useful for detecting smaller bedrock outcrops or gravel patches.

Accuracy of SDM can be improved upon further through the combined use of environmental variables described at various spatial scales. As environmental variables can affect species distribution at different spatial scales a combination of the most appropriate surrogates per species could be more effective in modeling. More accurate models are more effective as management aids in the formation of conservation.

4.2 Progress in coral protection in Canada

With the signing of the *Oceans Act*, Canada became one of the first countries in the world to adopt legislation for ocean management. The Act is focused on conserving, protecting and developing the oceans sustainably through integrated ecosystem-based management. In 2010, Canada agreed to protect 10 percent of its marine environment by 2020 (CBD). To fulfill this international agreement, the development of a national system of marine protected areas (MPAs) that will protect unique habitats and areas of biodiversity is proceeding.

Canada has jurisdiction of sedentary species on its continental shelf thus, areas beyond the Canadian EEZ but part of the continental shelf, such as the Flemish Cap, are also of interest for federal protection. To date, governmental agencies and NAFO have designated several closures to protect coral and sponges on the continental shelf including the Flemish Cap. Bottom contact fishing gear (e.g. trawls) is prohibited within these areas. The goal is to protect the high diversity and abundance of coral and sponge species within the closed area. This thesis shows the importance of looking at other areas on the Flemish Cap as potential closures.

The Canadian Government has an invested interest in the conservation and protection of corals and sponges as both are unique habitats and areas of biodiversity. These sessile organisms act as nurseries, refugia and spawning and breeding grounds for many benthic species and are key to sustainable fisheries management (DFO, 2010b; Baillon et al., 2012; Baker et al., 2012a; Baker et al., 2012b).

At the end of 2016 only 0.96% (55000 km^2) of Canada's coastal and marine environment (within the EEZ) have some form of limited use regulations in place for conservation (ECCC, 2017), but by the end of October 2017, a total of 5% now has conservation designations (DFO, 2017). This goal was reached in part by the newly established St

Ann’s Bank MPA in eastern Canada (Gulf of St. Lawrence), the Tallurutiup Imanga/Lancaster Sound MPA in Nunavut (Arctic Ocean), and by long-term fishery closures for sea pens established in the Gulf of St. Lawrence and NAFO 3O closure. However, the protections afforded to the current conservation areas do not exclude all forms of use, and the level of protection are part of ongoing debate. To reach the 10 percent protection goal by 2020, conservation and resource managers will need to depend on guidance from scientific research which will rely on advanced technologies and improved distribution predictions from SDM.

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5 Appendix

5.1 Non-metric multi-dimensional scaling plots (nMDS)

This section includes the nMDS plots of a Bray-Curtis similarity index for depth and substrate at different spatial scales for functional groups and species with two transformations (4^{th} root and presence/absence).

5.1.1 Functional Groups abundance data fourth root transformed

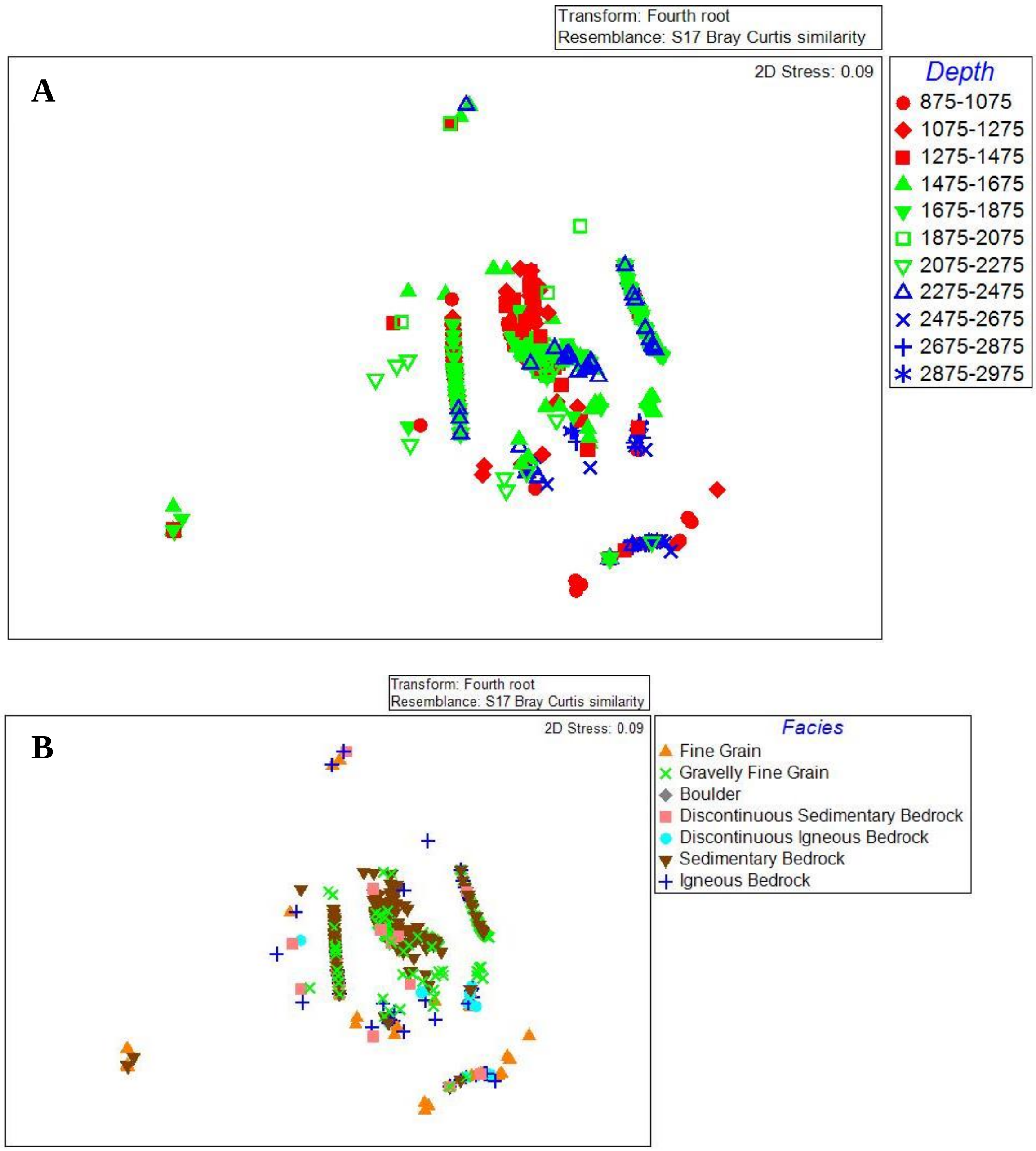


Figure 5-1 A non-metric multi-dimensional scaling (nMDS) plot of a Bray-Curtis similarity index of depth (A) and facies at 10 m scale (B) for functional groups with a 4th root transformation.

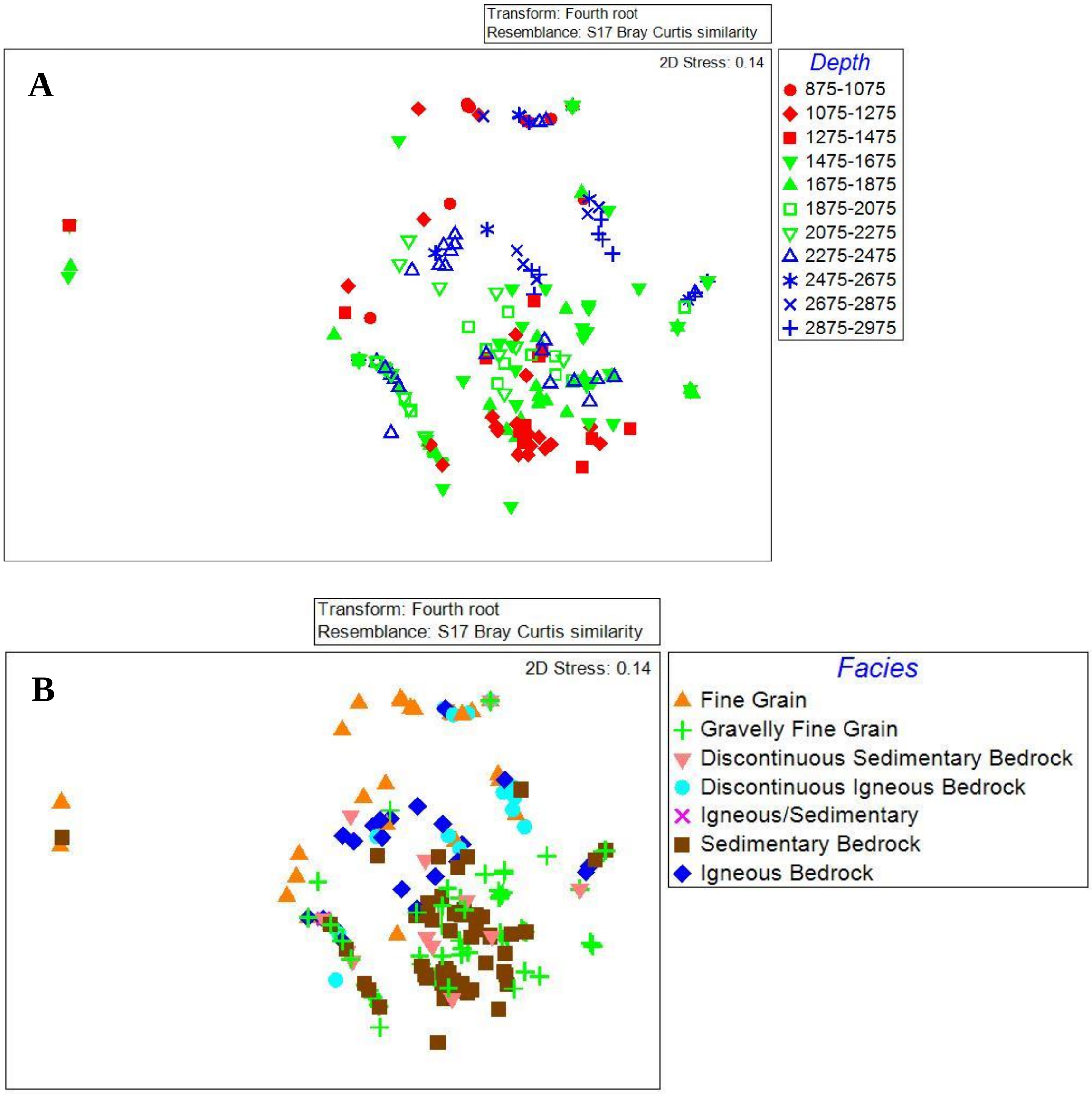


Figure 5-2 A non-metric multi-dimensional scaling (nMDS) plot of a Bray-Curtis similarity index of depth (A) and facies at 50 m scale (B) for functional groups with a 4th root transformation.

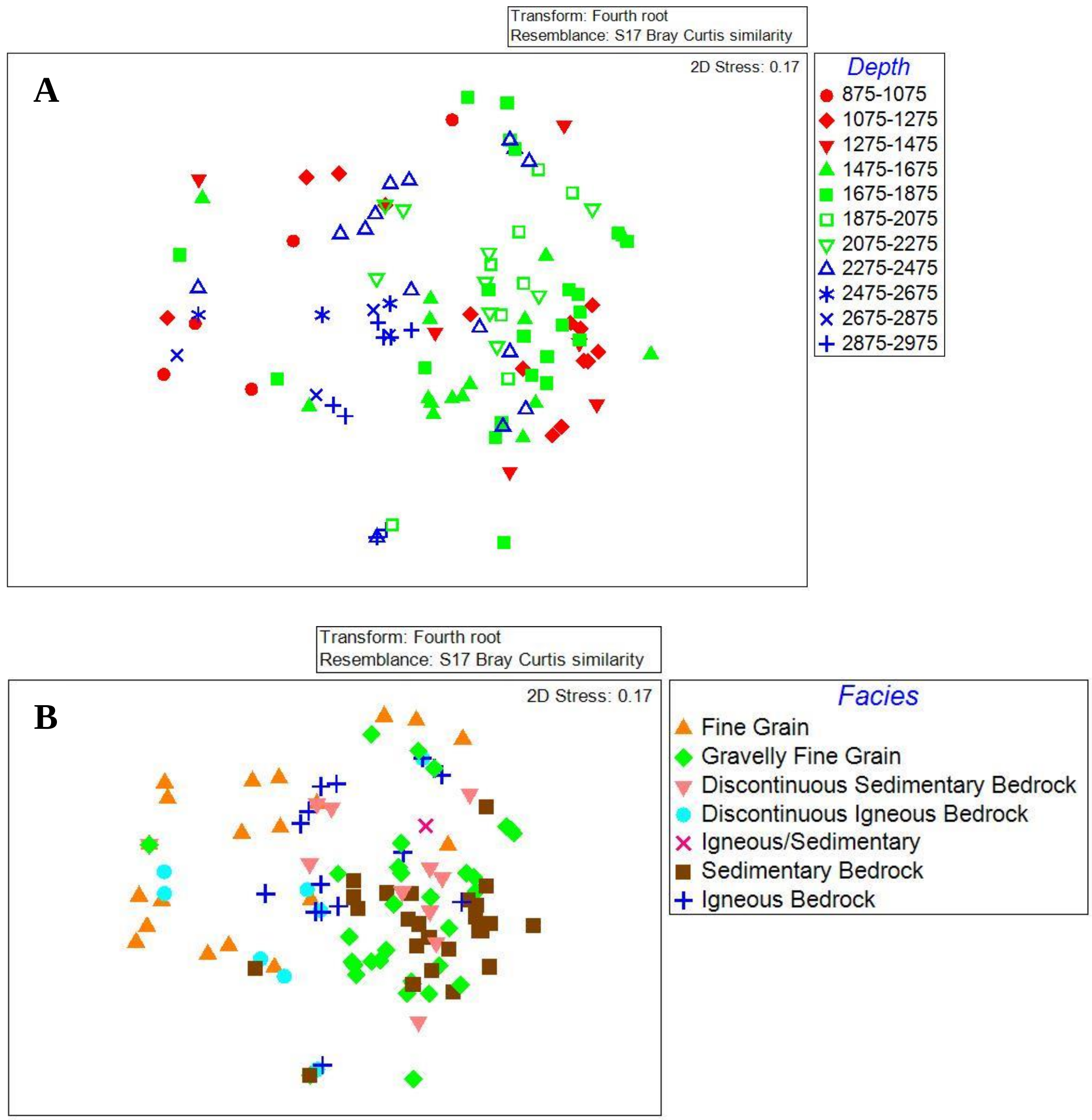


Figure 5-3 A non-metric multi-dimensional scaling (nMDS) plot of a Bray-Curtis similarity index of depth (A) and facies at 100 m scale (B) for functional groups with a 4th root transformation.

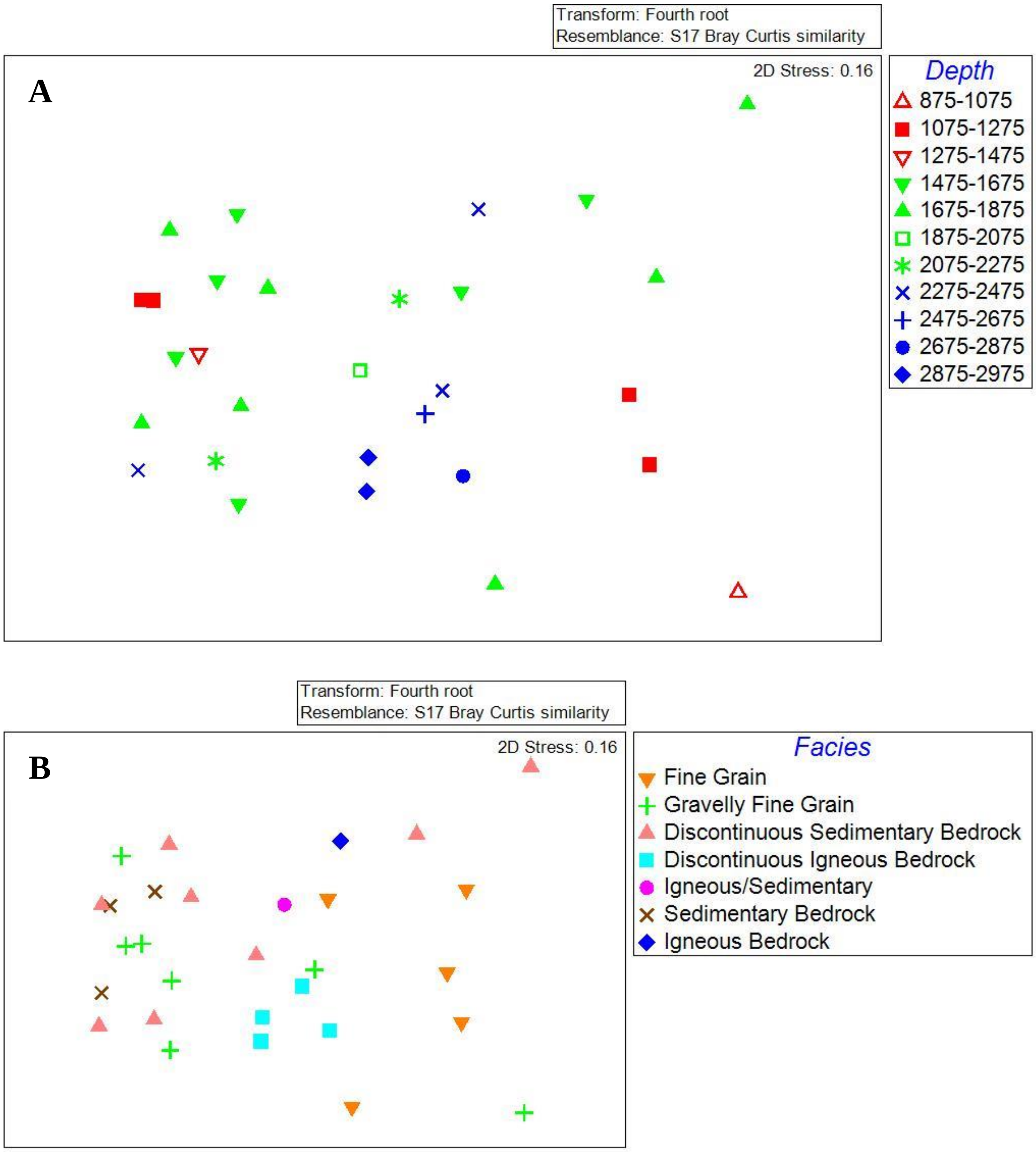


Figure 5-4 A non-metric multi-dimensional scaling (nMDS) plot of a Bray-Curtis similarity index of depth (A) and facies at 500 m scale (B) for functional groups with a 4th root transformation.

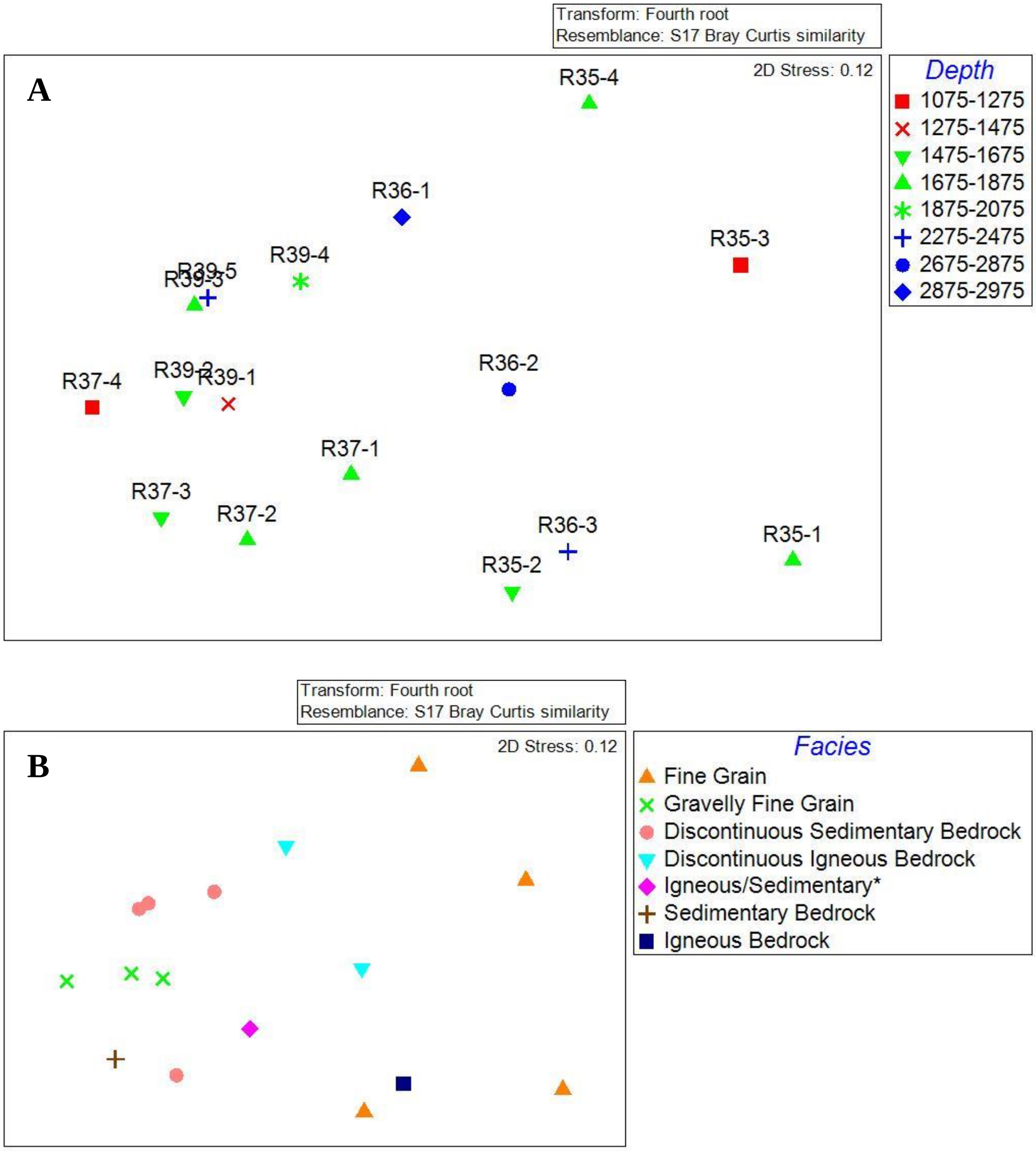


Figure 5-5 A non-metric multi-dimensional scaling (nMDS) plot of a Bray-Curtis similarity index of depth (A) and facies at 1000 m scale (B) for functional groups with a 4th root transformation.

5.1.2 Functional Groups abundance data presence/absence transformed

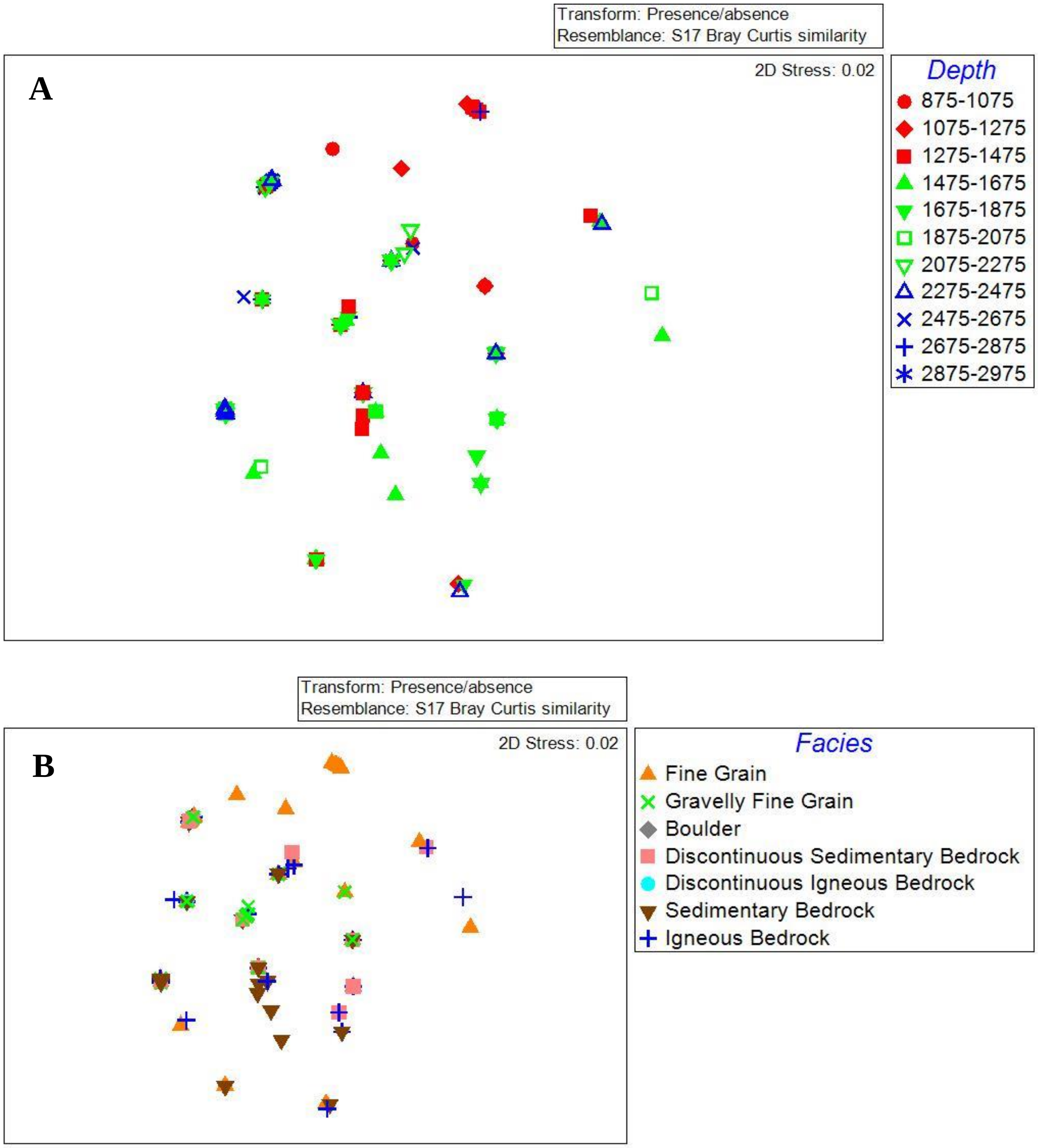


Figure 5-6 A non-metric multi-dimensional scaling (nMDS) plot of a Bray-Curtis similarity index of depth (A) and facies at 10 m scale (B) for functional groups with a presence/absence transformation.

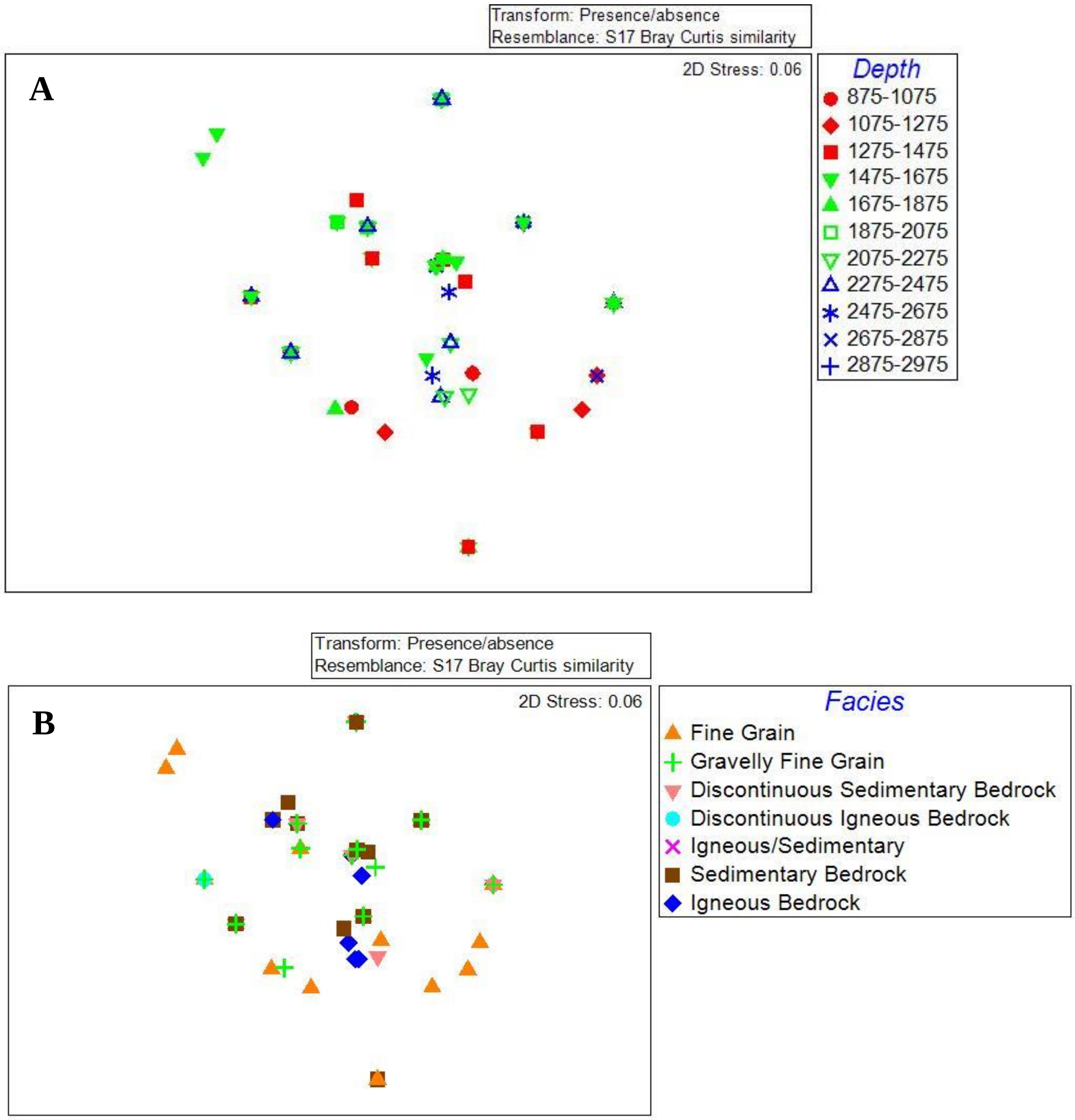


Figure 5-7 A non-metric multi-dimensional scaling (nMDS) plot of a Bray-Curtis similarity index of depth (A) and facies at 50 m scale (B) for functional groups with a presence/absence transformation.

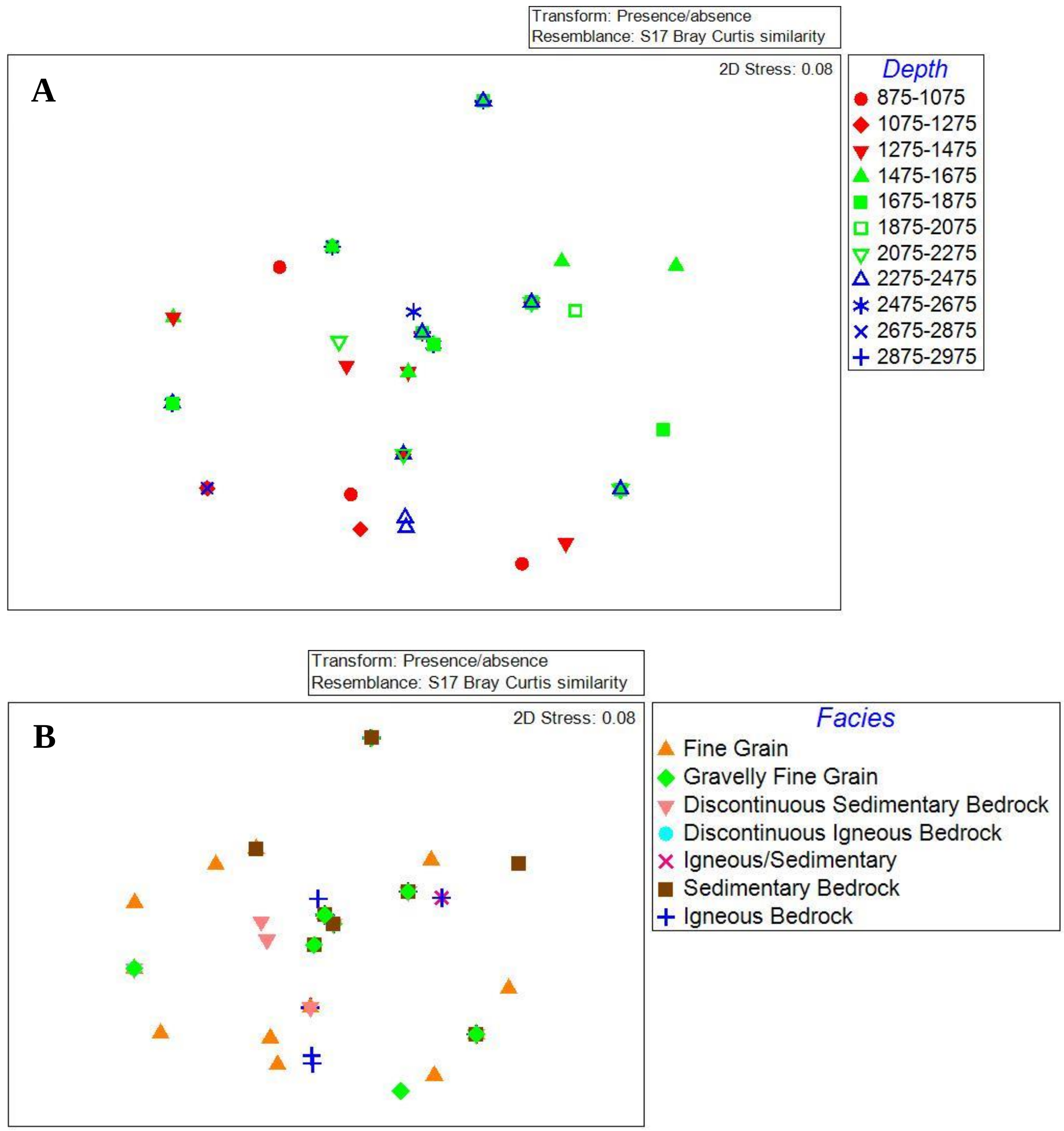


Figure 5-8 A non-metric multi-dimensional scaling (nMDS) plot of a Bray-Curtis similarity index of depth (A) and facies at 100 m scale (B) for functional groups with a presence/absence transformation.

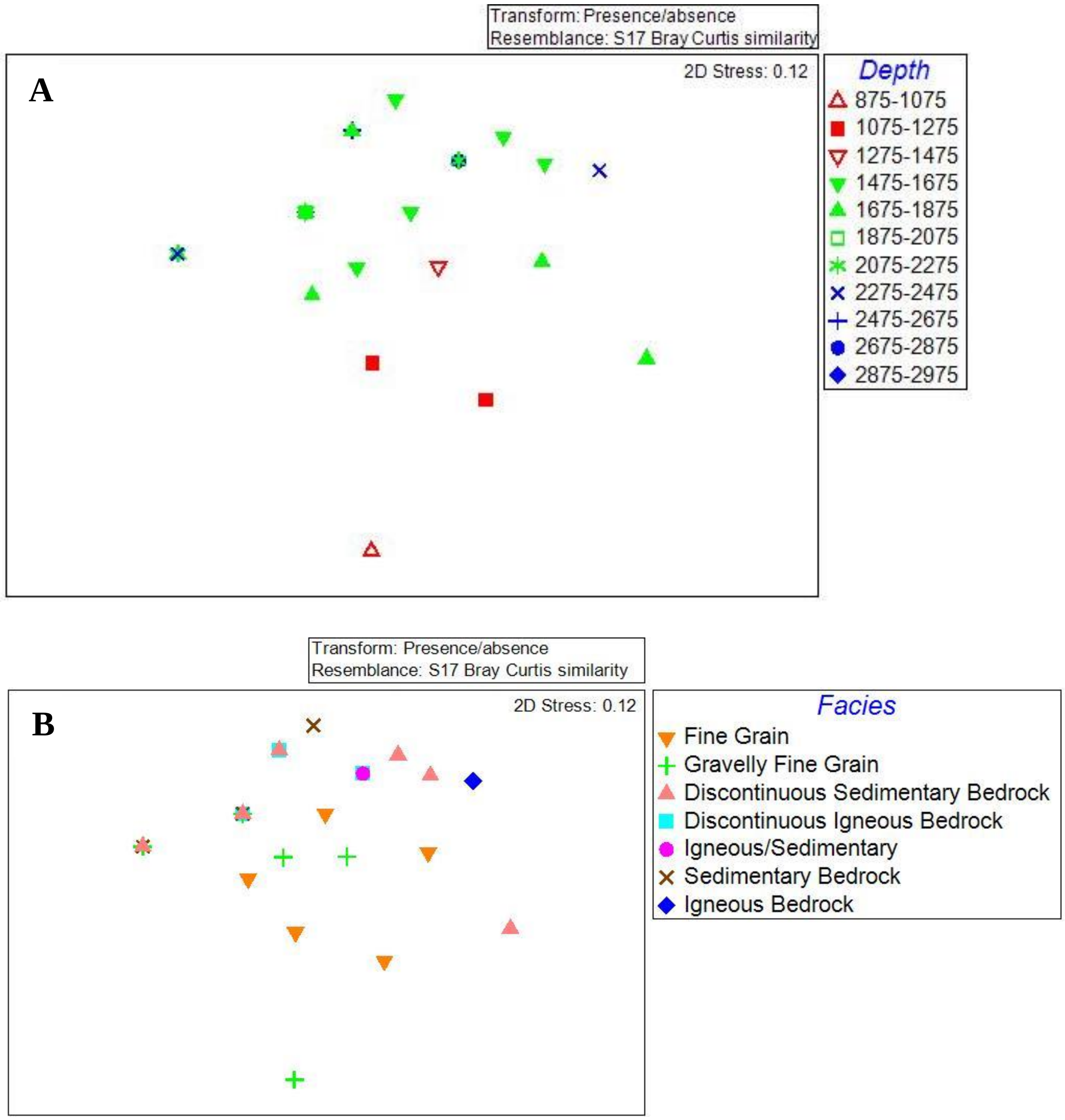


Figure 5-9 A non-metric multi-dimensional scaling (nMDS) plot of a Bray-Curtis similarity index of depth (A) and facies at 500 m scale (B) for functional groups with a presence/absence transformation.

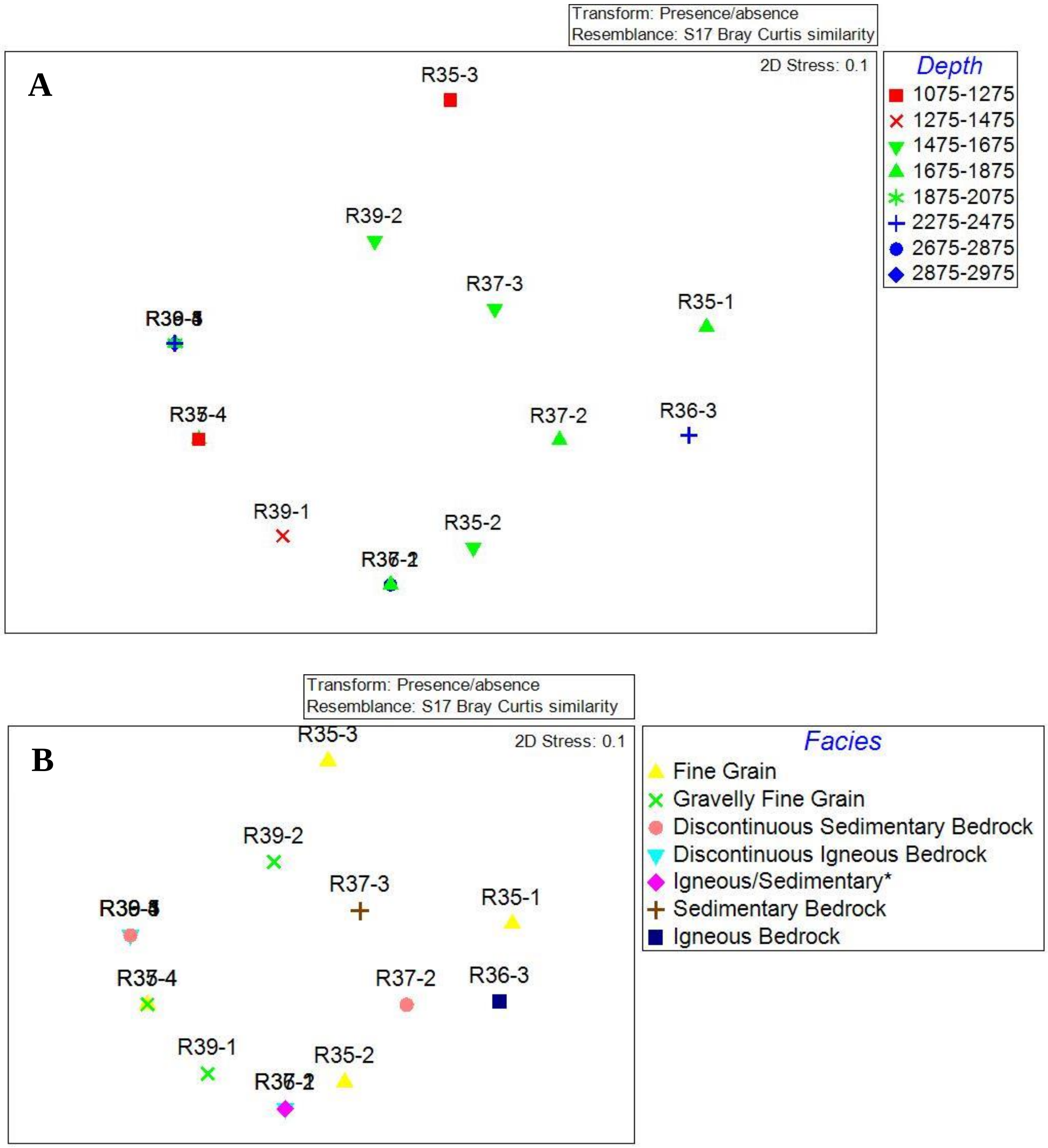


Figure 5-10 A non-metric multi-dimensional scaling (nMDS) plot of a Bray-Curtis similarity index of depth (A) and facies at 1000 m scale (B) for functional groups with a presence/absence transformation.

5.1.3 Species abundance data fourth root transformed

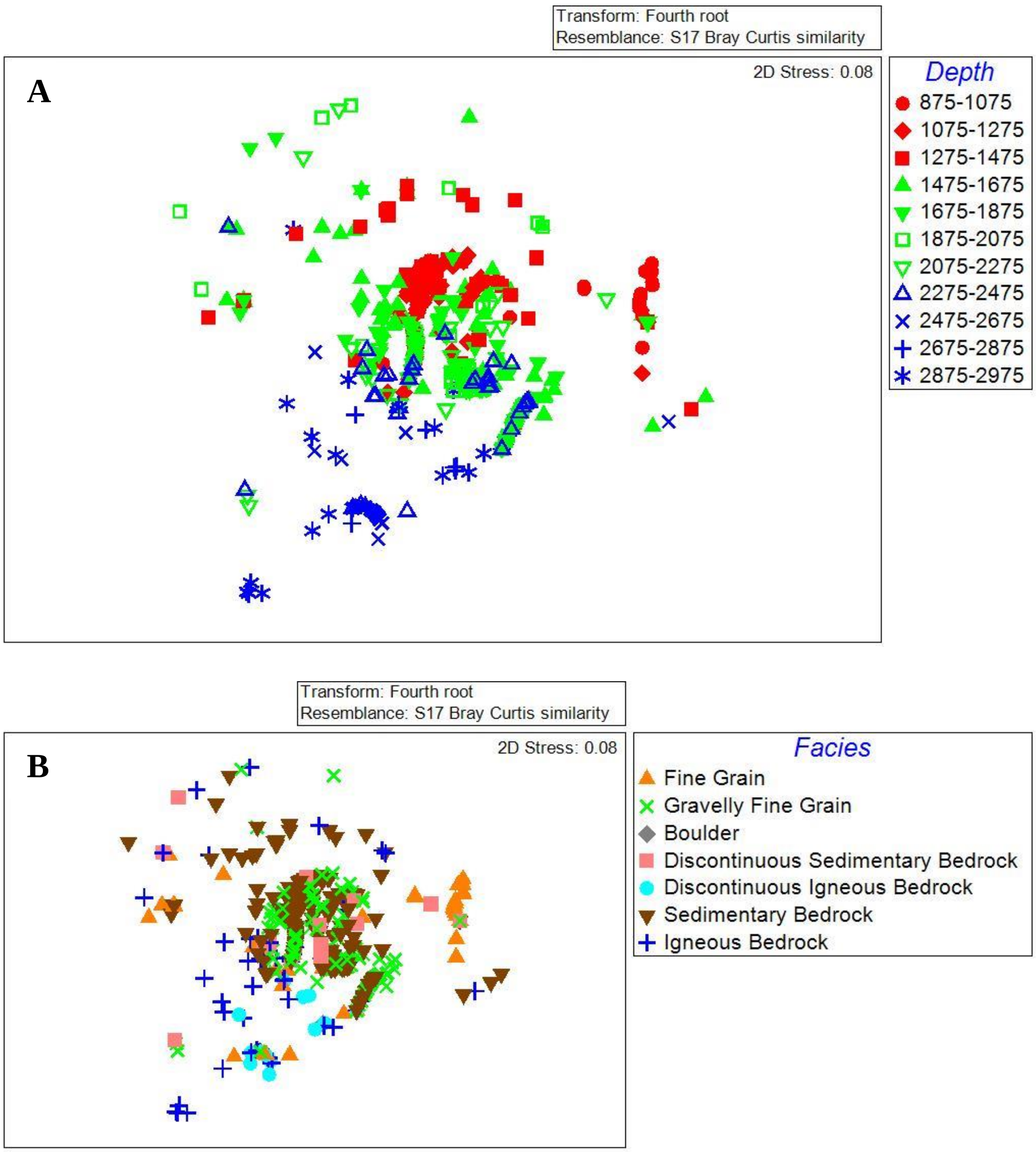


Figure 5-11 A non-metric multi-dimensional scaling (nMDS) plot of a Bray-Curtis similarity index of depth (A) and facies at 10 m scale (B) for species abundance data with a 4^{th} root transformation.

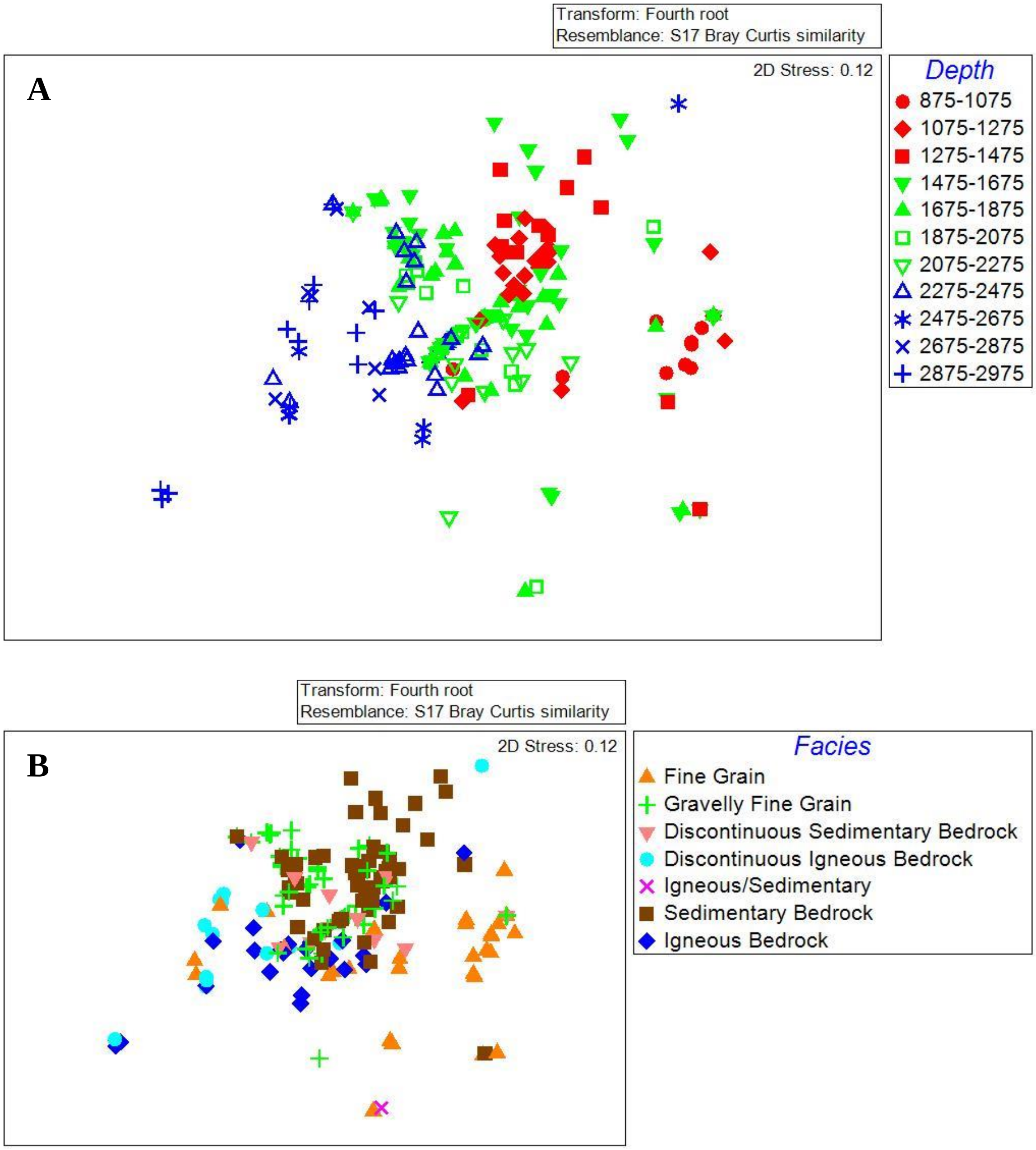
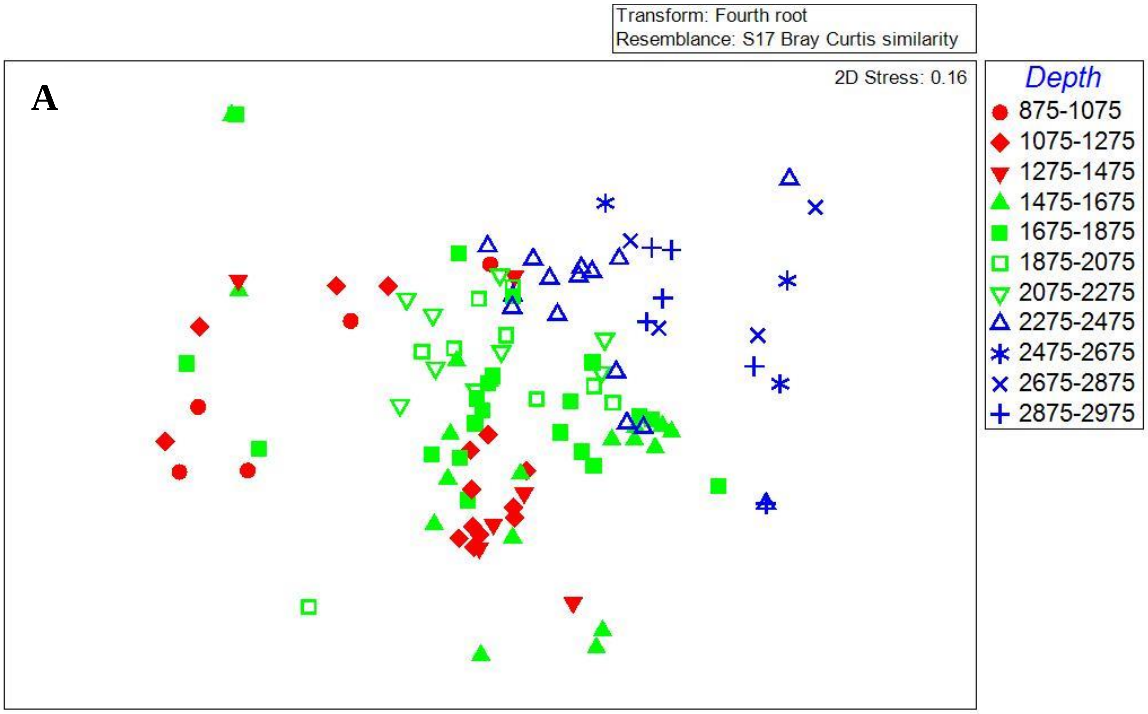


Figure 5-12 A non-metric multi-dimensional scaling (nMDS) plot of a Bray-Curtis similarity index of depth (A) and facies at 50 m scale (B) for species with a 4th root transformation.



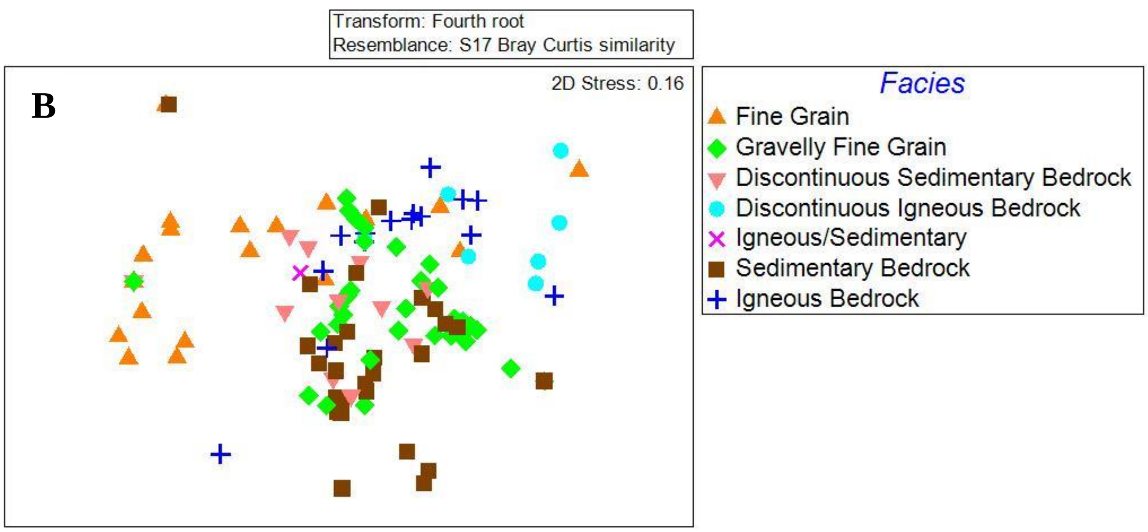


Figure 5-13 A non-metric multi-dimensional scaling (nMDS) plot of a Bray-Curtis similarity index of depth (A) and facies at 100 m scale (B) for species with a 4th root transformation.

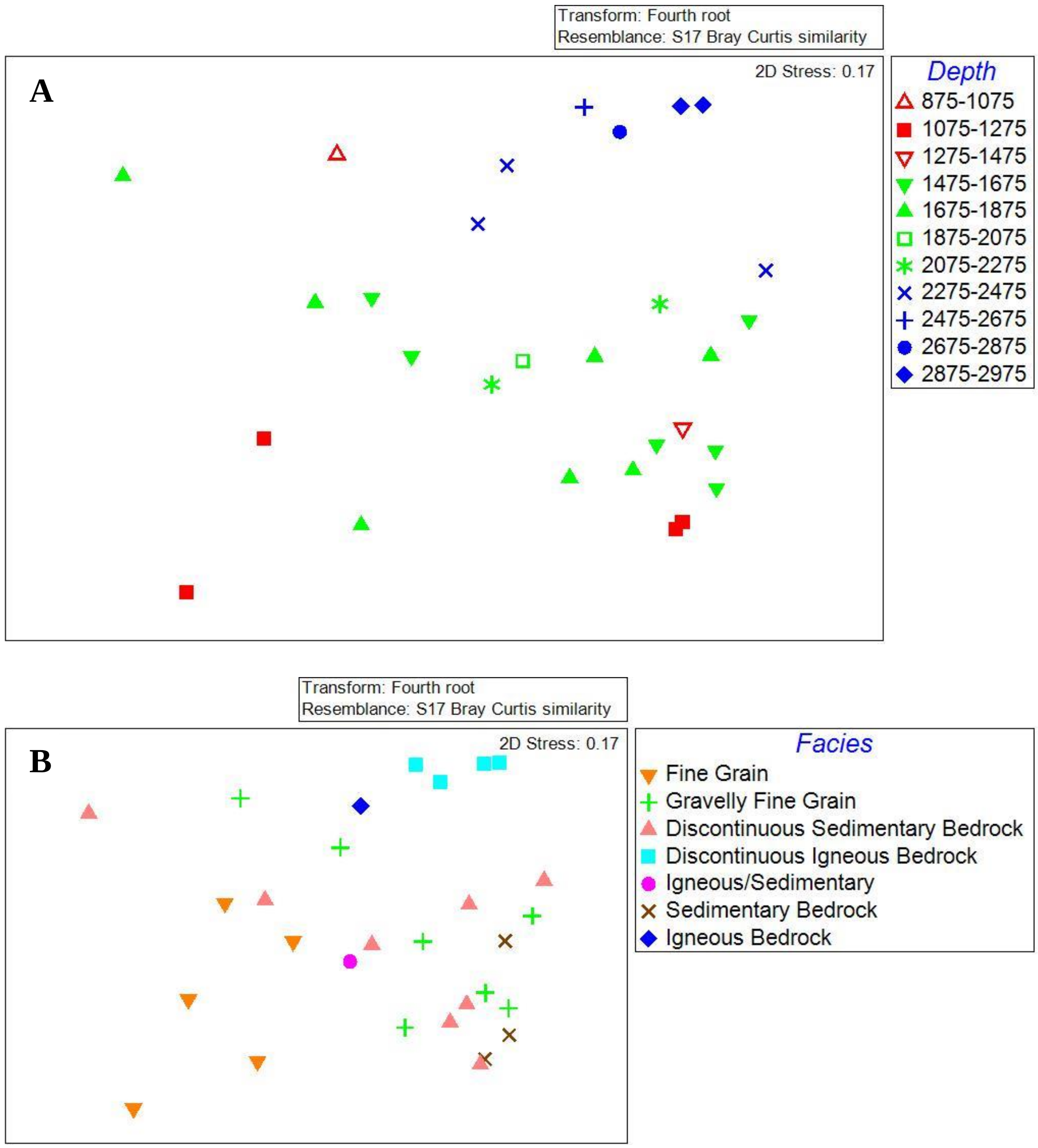


Figure 5-14 A non-metric multi-dimensional scaling (nMDS) plot of a Bray-Curtis similarity index of depth (A) and facies at 500 m scale (B) for species with a 4th root transformation.

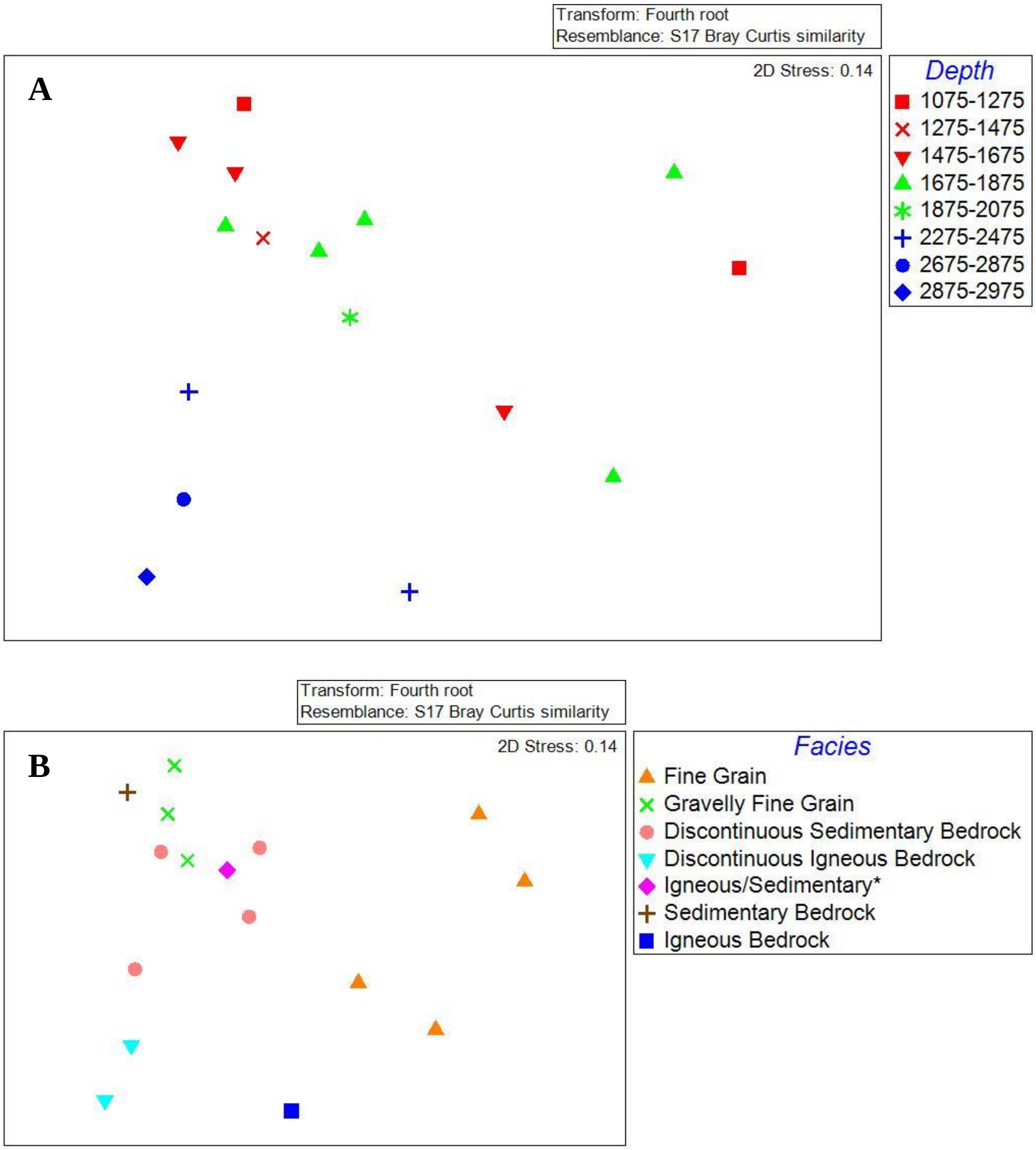


Figure 5-15 A non-metric multi-dimensional scaling (nMDS) plot of a Bray-Curtis similarity index of depth (A) and facies at 1000 m scale (B) for species with a 4th root transformation.

5.1.4 Species abundance data presence/absence transformed

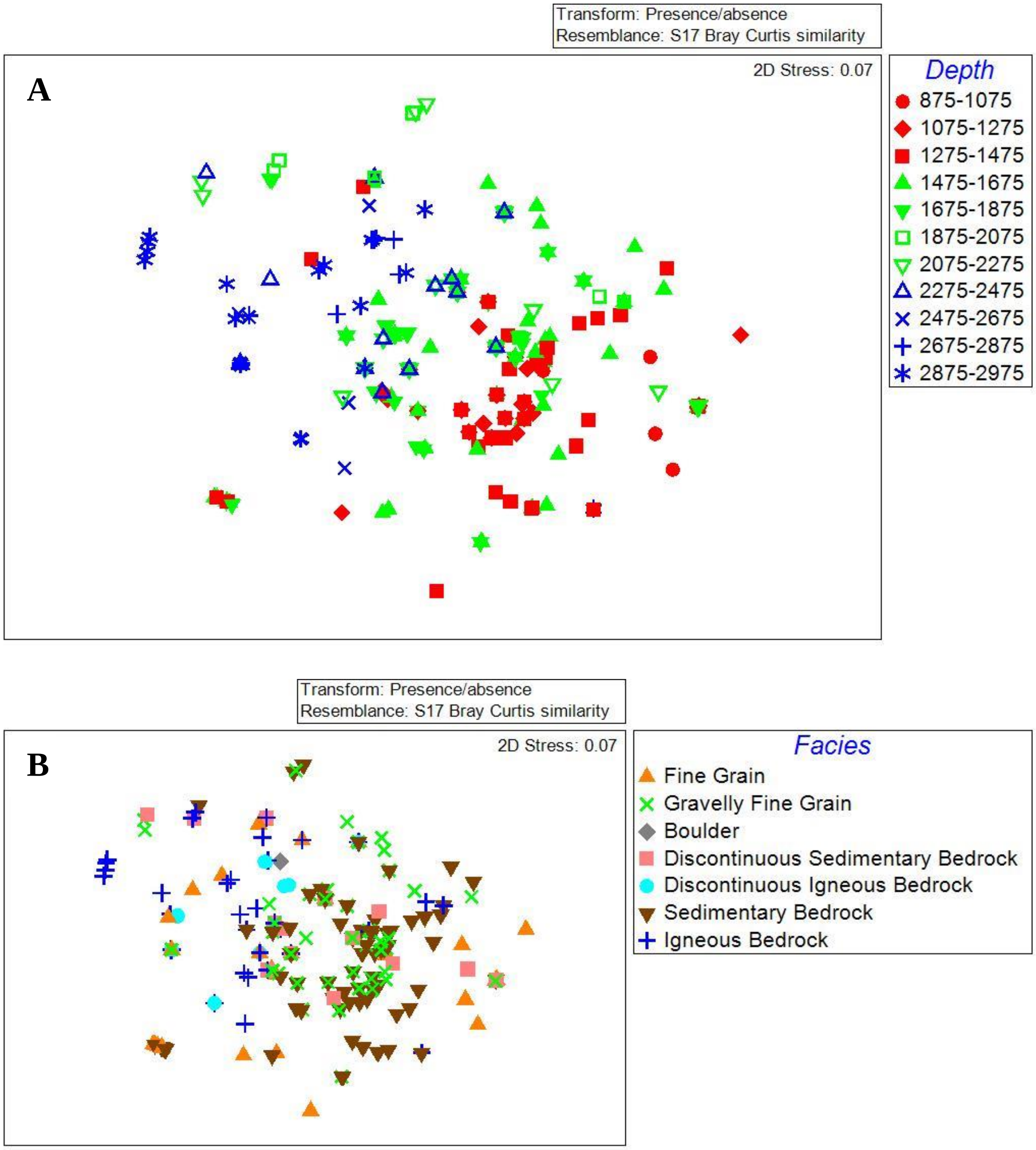
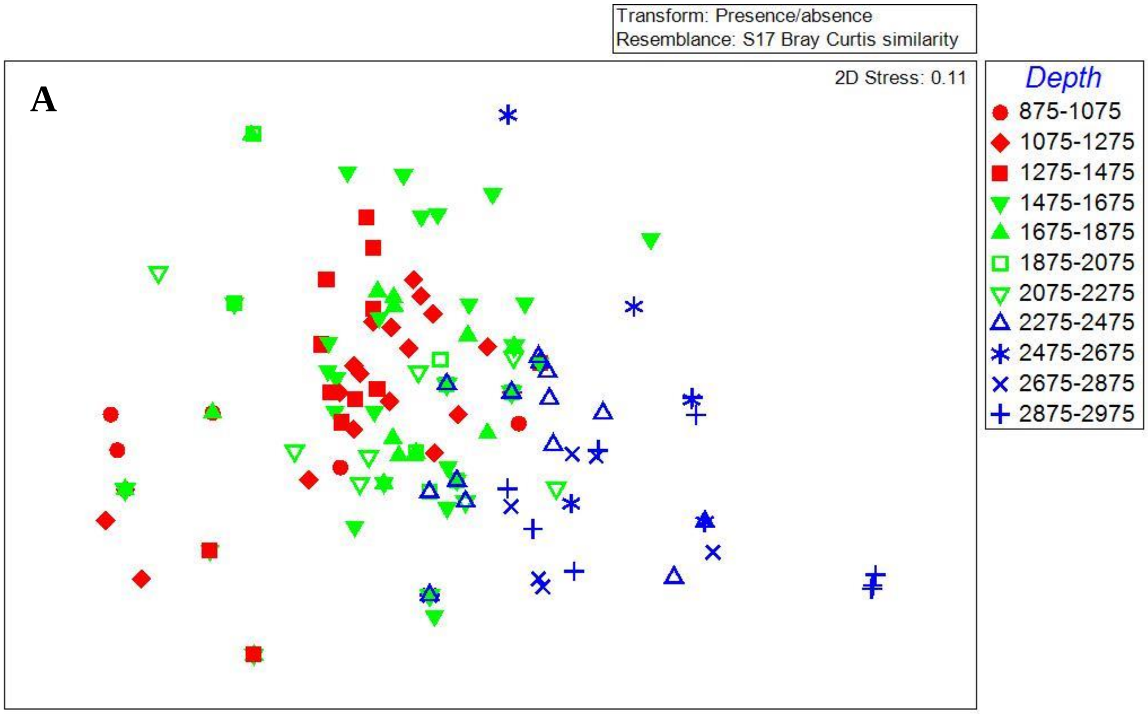


Figure 5-16 A non-metric multi-dimensional scaling (nMDS) plot of a Bray-Curtis similarity index of depth (A) and facies at 10 m scale (B) for species with a presence/absence transformation.



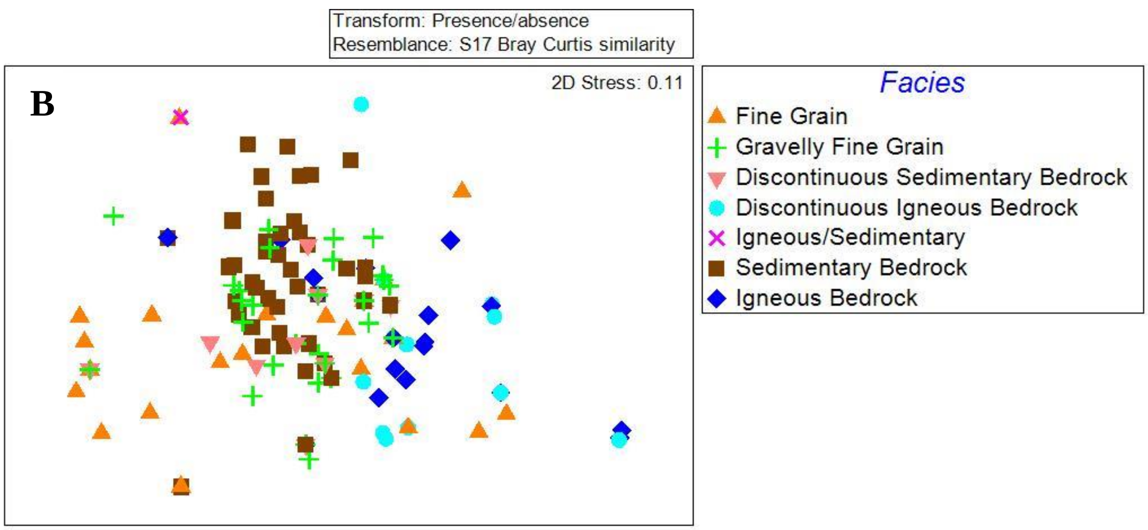


Figure 5-17 A non-metric multi-dimensional scaling (nMDS) plot of a Bray-Curtis similarity index of depth (A) and facies at 50 m scale (B) for species with a presence/absence transformation.

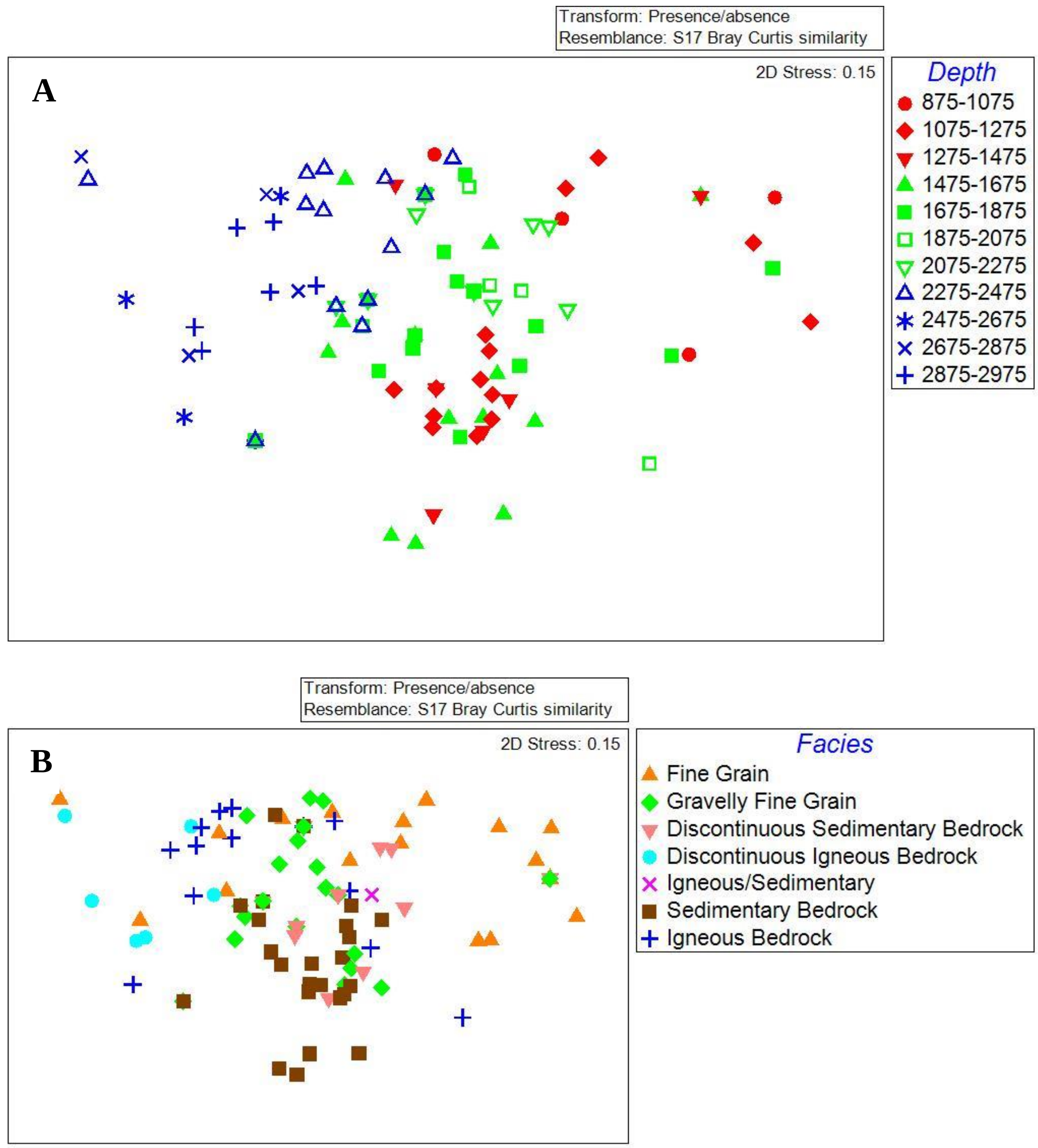


Figure 5-18 A non-metric multi-dimensional scaling (nMDS) plot of a Bray-Curtis similarity index of depth (A) and facies at 100 m scale (B) for species with a presence/absence transformation.

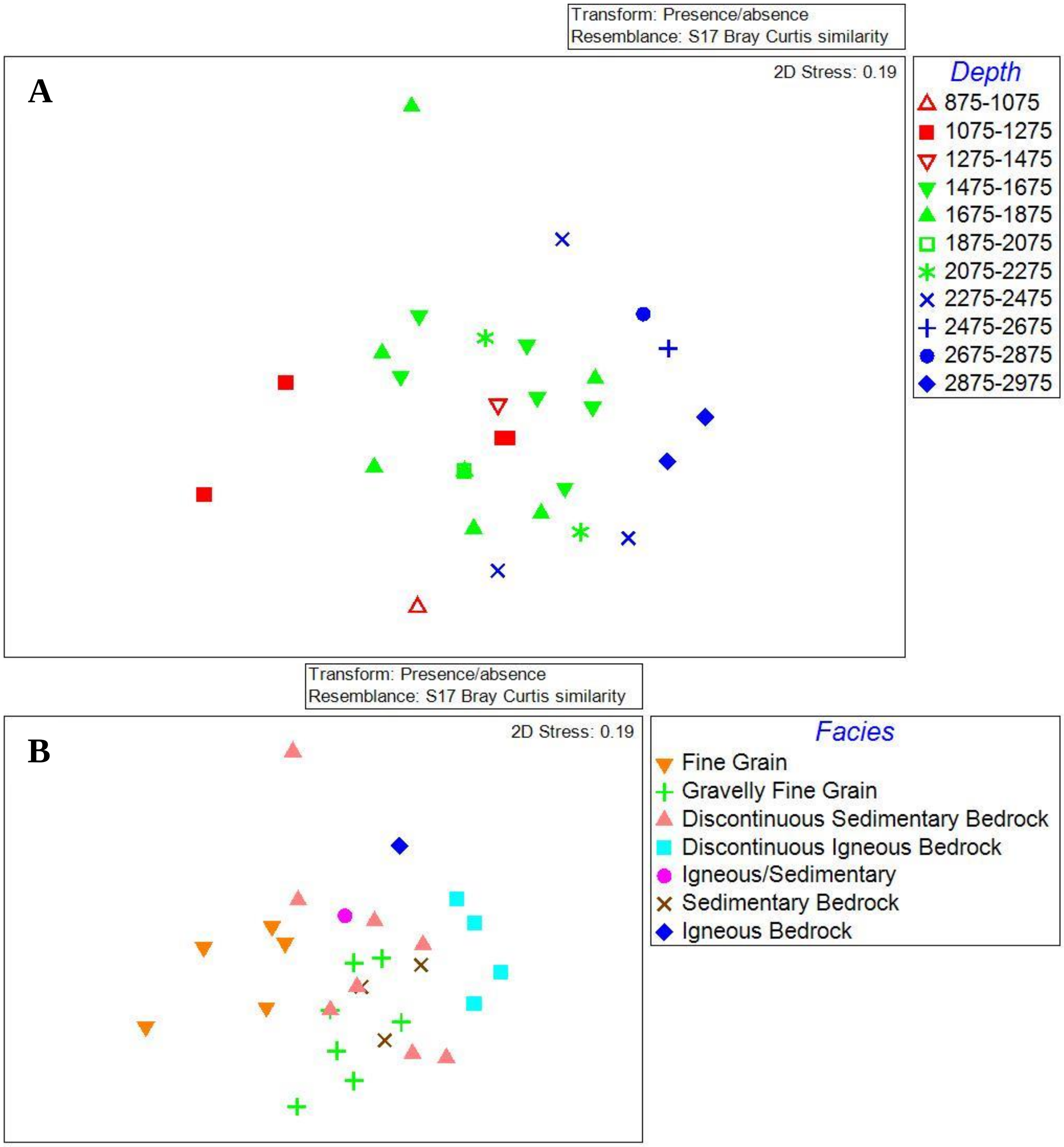


Figure 5-19 A non-metric multi-dimensional scaling (nMDS) plot of a Bray-Curtis similarity index of depth (A) and facies at 500 m scale (B) for species with a presence/absence transformation.

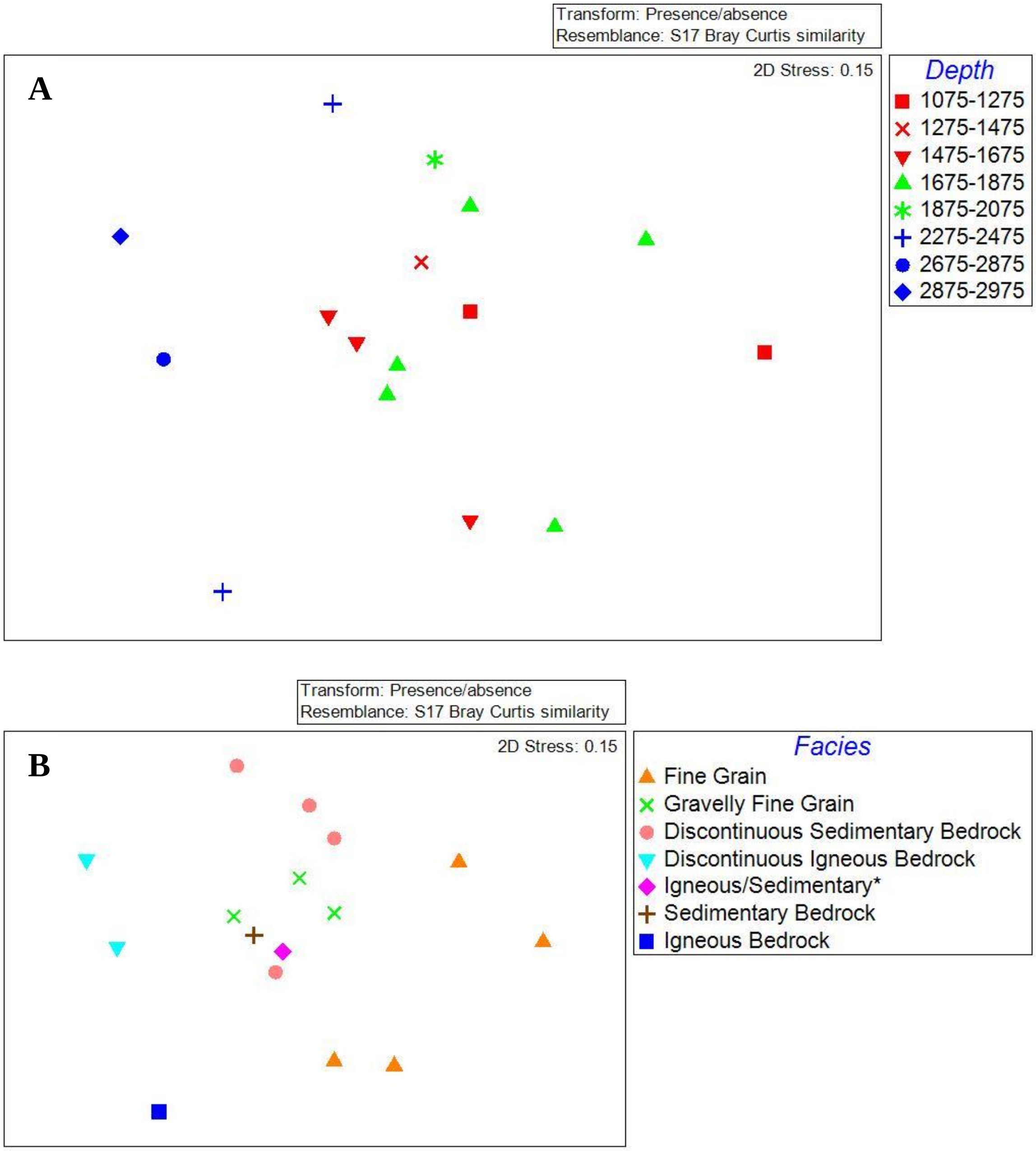


Figure 5-20 A non-metric multi-dimensional scaling (nMDS) plot of a Bray-Curtis similarity index of depth (A) and facies at 1000 m scale (B) for species with a presence/absence transformation.

5.2 ANOSIM Results

In this section are the ANOSIM analysis for depth and substrate at different spatial scales for functional groups and species with two transformations (4^{th} root and presence/absence).

5.2.1 Functional Groups abundance data fourth root transformed

Table 5-1 Results of pairwise tests from 2-way ANOSIM between depth groups across all grain sizes for functional groups with a 4th root transformation at attachment grain size.

TESTS FOR DIFFERENCES BETWEEN Depth GROUPS
(across all Grain groups)
Global Test
Sample statistic (Global R): 0.332
Significance level of sample statistic: 0.1%
Number of permutations: 999 (Random sample from a large number)
Number of permuted statistics greater than or equal to Global R: 0

Pairwise Tests

Depth Grain	R Statistic	Significance Level	Possible Permutati	Actual Permutati	Number >=
1675-1875, 1475-1675	0.093	0.1	Very large	999	0
1675-1875, 1275-1475	0.378	0.1	Very large	999	0
1675-1875, 1075-1275	0.606	0.1	Very large	999	0
1675-1875, 1875-2075	0.401	0.1	Very large	999	0
1675-1875, 2075-2275	0.014	35	Very large	999	349
1675-1875, 2275-2475	0.429	0.1	Very large	999	0
1675-1875, 2475-2675	0.798	0.1	Very large	999	0
1675-1875, 2675-2875	0.574	0.1	Very large	999	0
1675-1875, 2875-2975	0.646	0.1	Very large	999	0
1675-1875, 875-1075	0.714	0.1	Very large	999	0
1675-1875, <875	0.549	0.1	464256	999	0
1475-1675, 1275-1475	0.365	0.1	Very large	999	0
1475-1675, 1075-1275	0.211	0.1	Very large	999	0
1475-1675, 1875-2075	0.142	0.1	Very large	999	0
1475-1675, 2075-2275	0.019	26.9	Very large	999	268
1475-1675, 2275-2475	0.464	0.1	Very large	999	0
1475-1675, 2475-2675	0.793	0.1	4.81E+08	999	0
1475-1675, 2675-2875	0.821	0.2	2240	999	1
1475-1675, 2875-2975	0.629	0.1	Very large	999	0
1475-1675, 875-1075	0.504	0.1	Very large	999	0
1475-1675, <875	0.566	3.3	3328	999	32
1275-1475, 1075-1275	0.555	0.1	Very large	999	0
1275-1475, 1875-2075	0.113	0.3	Very large	999	2
1275-1475, 2075-2275	0.682	0.1	Very large	999	0
1275-1475, 2275-2475	0.435	0.1	Very large	999	0
1275-1475, 2475-2675	0.905	0.1	575757	999	0
1275-1475, 2675-2875	0.773	0.2	12425	999	1
1275-1475, 2875-2975	0.661	0.1	Very large	999	0
1275-1475, 875-1075	0.742	0.1	Very large	999	0
1275-1475, <875	0.541	5.8	25205	999	57
1075-1275, 1875-2075	-0.011	87.4	Very large	999	873
1075-1275, 2075-2275	0.423	0.1	Very large	999	0
1075-1275, 2275-2475	0.733	0.1	Very large	999	0
1075-1275, 2475-2675	0.994	0.1	9657648	999	0
1075-1275, 2675-2875	0.897	0.8	756	756	6
1075-1275, 2875-2975	0.828	0.1	Very large	999	0

Depth Grain	R Statistic	Significance Level	Possible Permutati	Actual Permutati	Number >=
1075-1275, 875-1075	0.141	0.6	Very large	999	5
1075-1275, <875	0.963	0.5	1968	999	4
1875-2075, 2075-2275	0.231	0.1	Very large	999	0
1875-2075, 2275-2475	0.541	0.1	Very large	999	0
1875-2075, 2475-2675	0.809	0.1	Very large	999	0
1875-2075, 2675-2875	0.501	0.1	Very large	999	0
1875-2075, 2875-2975	0.773	0.1	Very large	999	0
1875-2075, 875-1075	0.092	0.4	Very large	999	3
1875-2075, <875	0.749	0.1	110490	999	0
2075-2275, 2275-2475	0.518	0.1	Very large	999	0
2075-2275, 2475-2675	0.592	0.1	Very large	999	0
2075-2275, 2675-2875	0.337	0.1	Very large	999	0
2075-2275, 2875-2975	0.369	0.1	Very large	999	0
2075-2275, 875-1075	0.227	0.2	Very large	999	1
2075-2275, <875	0.513	1	30008	999	9
2275-2475, 2475-2675	0.259	0.2	Very large	999	1
2275-2475, 2675-2875	0.12	0.3	Very large	999	2
2275-2475, 2875-2975	0.237	0.1	Very large	999	0
2275-2475, 875-1075	0.893	0.1	Very large	999	0
2275-2475, <875	0.696	1.6	13920	999	15
2475-2675, 2675-2875	0.267	0.1	Very large	999	0
2475-2675, 2875-2975	0.393	0.1	Very large	999	0
2475-2675, 875-1075	0.942	0.1	1712304	999	0
2475-2675, <875	-0.208	100	131	131	131
2675-2875, 2875-2975	0.081	0.8	Very large	999	7
2675-2875, 875-1075	0.911	0.2	6688	999	1
2675-2875, <875	-0.167	79.1	43	43	34
2875-2975, 875-1075	0.622	0.1	Very large	999	0
2875-2975, <875	0.05	44.9	138	138	62
875-1075, <875	0.927	1.3	152	152	2

Table 5-2 Results of pairwise tests from 2-way ANOSIM between facies groups across all depths for functional groups with a 4th root transformation at attachment grain size.

TESTS FOR DIFFERENCES BETWEEN Grain GROUPS
(across all Depth groups)
Global Test
Sample statistic (Global R): 0.412
Significance level of sample statistic: 0.1%
Number of permutations: 999 (Random sample from a large number)
Number of permuted statistics greater than or equal to Global R: 0

Pairwise Tests

Facies Grain	R Statistic	Significance Level	Possible Permutati	Actual Permutati	Number >=
Bl, Br-SD	0.032	0.1	Very large	999	0
Bl, G	0.128	0.1	Very large	999	0
Br-SD, G	0.306	0.1	Very large	999	0
Fg, HS	0.326	0.1	Very large	999	0
Br-SD, Fg	0.343	0.1	Very large	999	0
Bl, Br-IG	0.38	0.1	Very large	999	0
Br-IG, Fg	0.395	0.1	Very large	999	0
Br-IG, Br-SD	0.435	0.1	Very large	999	0
Br-IG, G	0.541	0.1	Very large	999	0
Bl, Fg	0.555	0.1	Very large	999	0
Br-SD, HS	0.66	0.1	Very large	999	0
Fg, G	0.695	0.1	Very large	999	0
Br-IG, HS	0.809	0.1	Very large	999	0
Bl, HS	0.846	0.1	Very large	999	0
G, HS	0.955	0.1	Very large	999	0

Table 5-3 Results of pairwise tests from 2-way ANOSIM between depth groups across all Facies for functional groups with a 4th root transformation at 10m scale.

TESTS FOR DIFFERENCES BETWEEN Depth GROUPS
(across all Facies groups)
Global Test Sample statistic (Global R): 0.256
Significance level of sample statistic: 0.1%
Number of permutations: 999 (Random sample from a large number)
Number of permuted statistics greater than or equal to Global R: 0

Depth 10m Groups	R Statistic	Significance Level %	Possible Permutations	Actual Permutations	Number >= Observed
1475-1675, 1675-1875	0.031	0.4	Very large	999	3
1475-1675, 1275-1475	0.112	6.6	Very large	999	65
1475-1675, 1075-1275	0.582	0.1	Very large	999	0
1475-1675, 875-1075	0.536	0.1	Very large	999	0
1475-1675, 2675-2875	0.312	12.7	55	55	7
1475-1675, 2475-2675	0.321	40	10	10	4
1475-1675, 2875-2975	0.229	6.9	216216	999	68
1475-1675, 2275-2475	0.214	0.2	Very large	999	1
1475-1675, 2075-2275	0.221	0.1	Very large	999	0
1475-1675, 1875-2075	0.314	0.1	Very large	999	0
1675-1875, 1275-1475	0.025	29.7	Very large	999	296
1675-1875, 1075-1275	0.354	0.1	Very large	999	0
1675-1875, 875-1075	0.194	2.8	242535	999	27
1675-1875, 2675-2875	0.993	0.2	5460	999	1
1675-1875, 2475-2675	0.98	0.1	51895935	999	0
1675-1875, 2875-2975	0.319	0.4	Very large	999	3
1675-1875, 2275-2475	0.067	7.8	Very large	999	77
1675-1875, 2075-2275	0.082	2.3	Very large	999	22
1675-1875, 1875-2075	0.174	0.2	Very large	999	1
1275-1475, 1075-1275	0.306	0.1	Very large	999	0
1275-1475, 875-1075	0.985	0.1	11240970	999	0
1275-1475, 2675-2875	0.455	4.8	21	21	1
1275-1475, 2475-2675	0.4	33.3	6	6	2
1275-1475, 2875-2975	0.445	0.6	630	630	4
1275-1475, 2275-2475	0.245	0.1	Very large	999	0
1275-1475, 2075-2275	0.221	0.2	Very large	999	1
1275-1475, 1875-2075	0.085	1.4	Very large	999	13
1075-1275, 875-1075	0.336	1.4	322241140	999	13
1075-1275, 2675-2875	-0.058	50	36	36	18
1075-1275, 2475-2675	-0.048	50	8	8	4
1075-1275, 2875-2975	0.39	1.4	3168	999	13
1075-1275, 2275-2475	0.817	0.1	Very large	999	0
1075-1275, 2075-2275	0.521	0.1	Very large	999	0
1075-1275, 1875-2075	0.66	0.1	Very large	999	0
875-1075, 2675-2875	-0.283	97.7	703	703	687
875-1075, 2475-2675	-0.204	62.2	37	37	23
875-1075, 2875-2975	0.669	0.1	2248194	999	0
875-1075, 2275-2475	0.557	0.6	7128420	999	5
875-1075, 2075-2275	0.299	7.6	171	171	13

Depth 10m Groups	R Statistic	Significance Level %	Possible Permutations	Actual Permutations	Number >= Observed
2675-2875, 2475-2675	0.673	0.1	2262330	999	0
2675-2875, 2875-2975	-0.029	54.6	8096760	999	545
2675-2875, 2275-2475	0.623	0.3	73638180	999	2
2675-2875, 2075-2275	0.92	0.3	1260	999	2
2675-2875, 1875-2075	0.154	6.6	2380	999	65
2475-2675, 2875-2975	0.613	0.1	Very large	999	0
2475-2675, 2275-2475	0.597	0.1	Very large	999	0
2475-2675, 2075-2275	0.845	0.1	504735	999	0
2475-2675, 1875-2075	0.783	0.1	119759850	999	0
2875-2975, 2275-2475	0.527	0.1	Very large	999	0
2875-2975, 2075-2275	0.499	0.1	4186080	999	0
2875-2975, 1875-2075	0.226	0.8	20058300	999	7
2275-2475, 2075-2275	0.41	0.1	Very large	999	0
2275-2475, 1875-2075	0.178	0.1	Very large	999	0
2075-2275, 1875-2075	0.317	0.1	Very large	999	0

Failed Pairwise Tests

Groups	Error
875-1075, 1875-2075	roups too small

Table 5-4 Results of pairwise tests from 2-way ANOSIM between facies at 10m scale groups across all depths for functional groups with a 4th root transformation.

TESTS FOR DIFFERENCES BETWEEN Facies GROUPS
(across all Depth groups)
Global Test
Sample statistic (Global R): 0.39
Significance level of sample statistic: 0.1%
Number of permutations: 999 (Random sample from a large number)
Number of permuted statistics greater than or equal to Global R: 0
Pairwise Tests

Facies 10m	R Statistic	Significance Level %	Possible Permutations	Actual Permutations	Number >= Observed
Fine Grain, Sedimentary Bedrock	0.875	0.1	Very large	999	0
Fine Grain, Discontinuous Sedimentary Bedrock	0.307	3.8	25200	999	37
Fine Grain, Boulder	1	33.3	3	3	1
Fine Grain, Discontinuous Igneous Bedrock	-0.07	70.9	2778300	999	708
Fine Grain, Igneous Bedrock	0.065	25.9	Very large	999	258
Fine Grain, Gravelly Fine Grain	0.669	0.1	Very large	999	0
Sedimentary Bedrock, Discontinuous Sedimentary Bedrock	0.326	0.1	Very large	999	0
Sedimentary Bedrock, Discontinuous Igneous Bedrock	0.823	0.1	5920200	999	0
Sedimentary Bedrock, Igneous Bedrock	0.501	0.1	Very large	999	0
Sedimentary Bedrock, Gravelly Fine Grain	0.225	0.1	Very large	999	0
Discontinuous Sedimentary Bedrock, Discontinuous Igneous Bedroc	0.044	35.1	77	77	27
Discontinuous Sedimentary Bedrock, Igneous Bedrock	0.257	1.1	Very large	999	10
Discontinuous Sedimentary Bedrock, Gravelly Fine Grain	0.307	0.3	Very large	999	2
Boulder, Discontinuous Igneous Bedrock	-0.36	83.3	6	6	5
Boulder, Igneous Bedrock	-0.333	100	5	5	5
Discontinuous Igneous Bedrock, Igneous Bedrock	0.057	20.9	Very large	999	208
Discontinuous Igneous Bedrock, Gravelly Fine Grain	0.184	8.6	1336608	999	85
Igneous Bedrock, Gravelly Fine Grain	0.077	5.2	Very large	999	51

Failed Pairwise Tests

Groups	Error
Sedimentary Bedrock, Boulder	roups too small
Discontinuous Sedimentary Bedrock, Boulder	roups too small
Boulder, Gravelly Fine Grain	roups too small

Table 5-5 Results of pairwise tests from 2-way ANOSIM between depth groups across all facies at 50m scale for functional groups with a 4th root transformation.

TESTS FOR DIFFERENCES BETWEEN Depth GROUPS
(across all Facies groups)
Global Test
Sample statistic (Global R): 0.321
Significance level of sample statistic: 0.1%
Number of permutations: 999 (Random sample from a large number)
Number of permuted statistics greater than or equal to Global R: 0

Pairwise Tests

Depth 50m	R Statistic	Significance Level %	Possible Permutations	Actual Permutations	Number >= Observed
1675-1875, 1475-1675	0.071	4	Very large	999	39
1675-1875, 1275-1475	0.086	23.6	15810795	999	235
1675-1875, 1075-1275	0.311	2.8	57513456	999	27
1675-1875, 875-1075	0.432	4	5720	999	39
1675-1875, 2875-2975	0.392	2.8	32760	999	27
1675-1875, 2675-2875	0.727	2.4	84	84	2
1675-1875, 2475-2675	0.944	0.8	126	126	1
1675-1875, 2275-2475	0.117	12.8	Very large	999	127
1675-1875, 2075-2275	0.19	5.3	Very large	999	52
1675-1875, 1875-2075	0.324	4.1	2063880	999	40
1475-1675, 1275-1475	0.207	6.9	372972600	999	68
1475-1675, 1075-1275	0.64	0.1	Very large	999	0
1475-1675, 875-1075	0.767	0.1	115115	999	0
1475-1675, 2875-2975	0.699	0.2	644	644	1
1475-1675, 2675-2875	0.889	14.3	7	7	1
1475-1675, 2275-2475	0.428	0.2	Very large	999	1
1475-1675, 2075-2275	0.504	0.1	519497550	999	0
1475-1675, 1875-2075	0.492	0.7	29601	999	6
1275-1475, 1075-1275	0.409	0.2	681392250	999	1
1275-1475, 875-1075	0.924	0.1	2145	999	0
1275-1475, 2875-2975	0.476	8.9	45	45	4
1275-1475, 2675-2875	0.5	40	5	5	2
1275-1475, 2275-2475	0.397	0.3	540540	999	2
1275-1475, 2075-2275	0.398	0.3	135135	999	2
1275-1475, 1875-2075	0.001	38.2	3861	999	381
1075-1275, 875-1075	0.306	1.1	5005	999	10
1075-1275, 2875-2975	0.521	3.6	28	28	1
1075-1275, 2675-2875	-0.2	71.4	7	7	5
1075-1275, 2275-2475	0.811	0.1	15484392	999	0
1075-1275, 2075-2275	0.741	0.1	14536368	999	0
1075-1275, 1875-2075	0.814	0.1	131670	999	0
875-1075, 2875-2975	0.586	1.8	55	55	1
875-1075, 2675-2875	-0.222	80	10	10	8
875-1075, 2275-2475	0.09	31.7	385	385	122
875-1075, 2075-2275	-0.02	50	6	6	3
2875-2975, 2675-2875	0.023	45.5	2205	999	454

Depth 50m	R Statistic	Significance Level %	Possible Permutations	Actual Permutations	Number >= Observed
2875-2975, 2475-2675	0.486	0.3	4410	999	2
2875-2975, 2275-2475	0.507	0.1	339570	999	0
2875-2975, 2075-2275	0.19	27.8	36	36	10
2875-2975, 1875-2075	-0.07	62.7	126	126	79
2675-2875, 2475-2675	0.621	0.8	525	525	4
2675-2875, 2275-2475	0.607	0.3	2940	999	2
2675-2875, 2075-2275	0	66.7	3	3	2
2675-2875, 1875-2075	0	47.6	21	21	10
2475-2675, 2275-2475	0.549	0.3	7350	999	2
2475-2675, 2075-2275	0.25	20	5	5	1
2475-2675, 1875-2075	0.709	0.8	126	126	1
2275-2475, 2075-2275	0.194	2.7	71717184	999	26
2275-2475, 1875-2075	0.315	0.4	6112260	999	3
2075-2275, 1875-2075	0.178	6.5	5987520	999	64

Failed Pairwise Tests

Groups	Error
1475-1675, 2475-2675	roups too small
1275-1475, 2475-2675	roups too small
1075-1275, 2475-2675	roups too small
875-1075, 2475-2675	roups too small
875-1075, 1875-2075	roups too small

Table 5-6 Results of pairwise tests from 2-way ANOSIM between facies groups at 50m across all depths for functional groups with a 4th root transformation.

TESTS FOR DIFFERENCES BETWEEN Facies GROUPS
(across all Depth groups)
Global Test
Sample statistic (Global R): 0.415
Significance level of sample statistic: 0.1%
Number of permutations: 999 (Random sample from a large number)
Number of permuted statistics greater than or equal to Global R: 0
Pairwise Tests

Facies 50m	R Statistic	Significance Level %	Possible Permutations	Actual Permutations	Number >= Observed
Fine Grain, Discontinuous Sedimentary Bedrock	0.72	2.4	84	84	2
Fine Grain, Sedimentary Bedrock	0.878	0.1	Very large	999	0
Fine Grain, Igneous Bedrock	0.012	44.8	98784	999	447
Fine Grain, Discontinuous Igneous Bedrock	0.187	20.3	1125	999	202
Fine Grain, Gravelly Fine Grain	0.632	0.1	Very large	999	0
Discontinuous Sedimentary Bedrock, Sedimentary Bedrock	0.109	21	490377888	999	209
Discontinuous Sedimentary Bedrock, Igneous Bedrock	0.459	0.2	148176	999	1
Discontinuous Sedimentary Bedrock, Discontinuous Igneous Bedrock	0.429	13.3	15	15	2
Discontinuous Sedimentary Bedrock, Gravelly Fine Grain	0.532	1.4	1681680	999	13
Discontinuous Sedimentary Bedrock, Igneous/Sedimentary	-0.125	60	5	5	3
Sedimentary Bedrock, Igneous Bedrock	0.614	0.1	58677696	999	0
Sedimentary Bedrock, Discontinuous Igneous Bedrock	0.675	0.8	126	126	1
Sedimentary Bedrock, Gravelly Fine Grain	0.208	1.1	Very large	999	10
Sedimentary Bedrock, Igneous/Sedimentary	1	16.7	6	6	1
Igneous Bedrock, Discontinuous Igneous Bedrock	0.042	29.3	13891500	999	292
Igneous Bedrock, Gravelly Fine Grain	0.086	17.8	Very large	999	177
Igneous Bedrock, Igneous/Sedimentary	0.1	33.3	6	6	2
Discontinuous Igneous Bedrock, Gravelly Fine Grain	0.079	27.3	1050	999	272

Failed Pairwise Tests

Groups	Error
Fine Grain, Igneous/Sedimentary	Groups too small
Discontinuous Igneous Bedrock, Igneous/Sedimentary	Groups too small
Gravelly Fine Grain, Igneous/Sedimentary	Groups too small

Table 5-7 Results of pairwise tests from 2-way ANOSIM between depth groups at 100m scale across all facies for functional groups with a 4th root transformation.

TESTS FOR DIFFERENCES BETWEEN Depth GROUPS
(across all Facies groups)
Global Test
Sample statistic (Global R): 0.345
Significance level of sample statistic: 0.1%
Number of permutations: 999 (Random sample from a large number)
Number of permuted statistics greater than or equal to Global R: 0

Pairwise Tests

Depth 100m	R Statistic	Significance Level	Possible Permutati	Actual Permutati	Number >=
1475-1675, 1275-1475	-0.067	54.3	105	105	57
1475-1675, 1075-1275	0.611	0.2	128700	999	1
1475-1675, 875-1075	0.874	0.4	252	252	1
1475-1675, 1675-1875	0.121	4.2	2.03E+08	999	41
1475-1675, 2875-2975	0.885	5.6	36	36	2
1475-1675, 2675-2875	0	66.7	3	3	2
1475-1675, 2275-2475	0.64	0.1	458640	999	0
1475-1675, 2075-2275	0.623	2.6	1170	999	25
1475-1675, 1875-2075	0.727	3.9	180	180	7
1275-1475, 1075-1275	0.255	11.7	3300	999	116
1275-1475, 875-1075	0.727	4.8	21	21	1
1275-1475, 1675-1875	-0.242	84	400	400	336
1275-1475, 2875-2975	0.125	66.7	3	3	2
1275-1475, 2675-2875	-0.5	100	3	3	3
1275-1475, 2275-2475	0.061	38.1	105	105	40
1275-1475, 2075-2275	0.501	10	60	60	6
1275-1475, 1875-2075	0.26	26.7	30	30	8
1075-1275, 875-1075	0.363	5.6	126	126	7
1075-1275, 1675-1875	0.154	17.5	25025	999	174
1075-1275, 2875-2975	0.75	6.7	15	15	1
1075-1275, 2675-2875	0.417	40	5	5	2
1075-1275, 2275-2475	0.768	0.1	21450	999	0
1075-1275, 2075-2275	0.809	0.6	165	165	1
1075-1275, 1875-2075	0.814	1.8	55	55	1
875-1075, 1675-1875	0.385	8.5	728	728	62
875-1075, 2875-2975	0.545	9.5	21	21	2
875-1075, 2675-2875	-0.64	100	6	6	6
875-1075, 2275-2475	0.08	44.4	36	36	16
875-1075, 2075-2275	1	33.3	3	3	1
1675-1875, 2875-2975	0.392	8.3	1300	999	82
1675-1875, 2675-2875	-0.111	100	4	4	4
1675-1875, 2475-2675	0.75	33.3	3	3	1
1675-1875, 2275-2475	0.174	8.3	7796880	999	82
1675-1875, 2075-2275	-0.031	46.4	15288	999	463
1675-1875, 1875-2075	0.179	19.3	3900	999	192
2875-2975, 2675-2875	0.462	6.7	30	30	2

Depth 100m	R Statistic	Significance Level	Possible Permutati	Actual Permutati	Number >=
2875-2975, 2475-2675	1	3.3	30	30	1
2875-2975, 2275-2475	0.496	0.8	3024	999	7
2875-2975, 2075-2275	1	33.3	3	3	1
2875-2975, 1875-2075	0.296	10	10	10	1
2675-2875, 2475-2675	0.778	25	4	4	1
2675-2875, 2275-2475	0.542	10	10	10	1
2475-2675, 2275-2475	0.456	7.9	63	63	5
2475-2675, 1875-2075	0.25	30	10	10	3
2275-2475, 2075-2275	-0.146	73.3	315	315	231
2275-2475, 1875-2075	0.05	35.3	5040	999	352
2075-2275, 1875-2075	-0.192	74.1	189	189	140

Failed Pairwise Tests

Groups	Error
1475-1675, 2475-2675	Groups too small
1275-1475, 2475-2675	Groups too small
1075-1275, 2475-2675	Groups too small
875-1075, 2475-2675	Groups too small
875-1075, 1875-2075	Groups too small
2675-2875, 2075-2275	Groups too small
2675-2875, 1875-2075	Groups too small
2475-2675, 2075-2275	Groups too small

Table 5-8 Results of pairwise tests from 2-way ANOSIM between facies groups at 100m across all depths for functional groups with a 4th root transformation.

TESTS FOR DIFFERENCES BETWEEN Facies GROUPS
(across all Depth groups)
Global Test
Sample statistic (Global R): 0.367
Significance level of sample statistic: 0.1%
Number of permutations: 999 (Random sample from a large number)
Number of permuted statistics greater than or equal to Global R: 0
Pairwise Tests

Facies 100m	R Statistic	Significance Level	Possible Permutati	Actual Permutati	Number >=
Fine Grain, Discontinuous Sedimentary Bedrock	-0.248	76.7	30	30	23
Fine Grain, Gravelly Fine Grain	0.577	0.3	19164600	999	2
Fine Grain, Discontinuous Igneous Bedrock	0.358	25	36	36	9
Fine Grain, Igneous Bedrock	-0.062	52.5	600	600	315
Fine Grain, Sedimentary Bedrock	0.844	0.1	5362500	999	0
Discontinuous Sedimentary Bedrock, Gravelly Fine Grain	0.061	31.6	28665	999	315
Discontinuous Sedimentary Bedrock, Igneous Bedrock	-0.146	76	100	100	76
Discontinuous Sedimentary Bedrock, Sedimentary Bedrock	-0.023	54.8	2520	999	547
Discontinuous Sedimentary Bedrock, Igneous/Sedimentary	1	33.3	3	3	1
Gravelly Fine Grain, Discontinuous Igneous Bedrock	0.237	27	63	63	17
Gravelly Fine Grain, Igneous Bedrock	0.023	34.6	183456	999	345
Gravelly Fine Grain, Sedimentary Bedrock	0.194	7.9	Very large	999	78
Discontinuous Igneous Bedrock, Igneous Bedrock	0.373	5.2	630	630	33
Discontinuous Igneous Bedrock, Sedimentary Bedrock	0.554	13.3	15	15	2
Igneous Bedrock, Sedimentary Bedrock	0.599	1.1	3780	999	10
Igneous Bedrock, Igneous/Sedimentary	-0.556	100	4	4	4
Sedimentary Bedrock, Igneous/Sedimentary	1	33.3	3	3	1

Failed Pairwise Tests

Groups	Error
Fine Grain, Igneous/Sedimentary	Groups too small
Discontinuous Sedimentary Bedrock, Discontinuous Igneous Bedro	Groups too small
Gravelly Fine Grain, Igneous/Sedimentary	Groups too small
Discontinuous Igneous Bedrock, Igneous/Sedimentary	Groups too small

Table 5-9 Results of pairwise tests from 2-way ANOSIM between depth groups at 500m scale across all facies for functional groups with a 4th root transformation.

TESTS FOR DIFFERENCES BETWEEN Depth GROUPS
(across all Facies groups)
Global Test
Sample statistic (Global R): -0.017
Significance level of sample statistic: 54.7%
Number of permutations: 999 (Random sample from 1984500)
Number of permuted statistics greater than or equal to Global R: 546

Pairwise Tests

Depth 500m	R Statistic	Significance Level	Possible Permutati	Actual Permutati	Number >=
1675-1875, 1475-1675	-0.408	92.6	27	27	25
1675-1875, 1075-1275	-0.326	77.8	9	9	7
1675-1875, 2275-2475	-1	100	9	9	9
1675-1875, 2075-2275	-1	100	3	3	3
1675-1875, 875-1075	1	33.3	3	3	1
1675-1875, 1275-1475	-1	100	3	3	3
1675-1875, 1875-2075	-1	100	3	3	3
1475-1675, 1075-1275	0.5	33.3	9	9	3
1475-1675, 2275-2475	0.5	33.3	9	9	3
1475-1675, 2075-2275	1	33.3	3	3	1
1475-1675, 875-1075	1	33.3	3	3	1
1475-1675, 1275-1475	0	66.7	3	3	2
1475-1675, 1875-2075	0	66.7	3	3	2
2875-2975, 2675-2875	1	33.3	3	3	1
2875-2975, 2475-2675	1	33.3	3	3	1

Failed Pairwise Tests

Groups	Error
1675-1875, 2875-2975	Groups too small
1675-1875, 2675-2875	Groups too small
1675-1875, 2475-2675	Groups too small
1475-1675, 2875-2975	Groups too small
1475-1675, 2675-2875	Groups too small
1475-1675, 2475-2675	Groups too small
1075-1275, 2875-2975	Groups too small
1075-1275, 2675-2875	Groups too small
1075-1275, 2475-2675	Groups too small
1075-1275, 2275-2475	Groups too small
1075-1275, 2075-2275	Groups too small
1075-1275, 875-1075	Groups too small
1075-1275, 1275-1475	Groups too small
1075-1275, 1875-2075	Groups too small
2875-2975, 2275-2475	Groups too small
2875-2975, 2075-2275	Groups too small
2875-2975, 875-1075	Groups too small
2875-2975, 1275-1475	Groups too small

Failed Pairwise Tests	
Groups	Error
2875-2975, 1875-2075	Groups too small
2675-2875, 2475-2675	Groups too small
2675-2875, 2275-2475	Groups too small
2675-2875, 2075-2275	Groups too small
2675-2875, 875-1075	Groups too small
2675-2875, 1275-1475	Groups too small
2675-2875, 1875-2075	Groups too small
2475-2675, 2275-2475	Groups too small
2475-2675, 2075-2275	Groups too small
2475-2675, 875-1075	Groups too small
2475-2675, 1275-1475	Groups too small
2475-2675, 1875-2075	Groups too small
2275-2475, 2075-2275	Groups too small
2275-2475, 875-1075	Groups too small
2275-2475, 1275-1475	Groups too small
2275-2475, 1875-2075	Groups too small
2075-2275, 875-1075	Groups too small
2075-2275, 1275-1475	Groups too small
2075-2275, 1875-2075	Groups too small
875-1075, 1275-1475	Groups too small
875-1075, 1875-2075	Groups too small
1275-1475, 1875-2075	Groups too small

Table 5-10 Results of pairwise tests from 2-way ANOSIM between facies groups at 500m across all depths for functional groups with a 4th root transformation.

TESTS FOR DIFFERENCES BETWEEN Facies GROUPS
(across all Depth groups)
Global Test
Sample statistic (Global R): 0.128
Significance level of sample statistic: 30.6%
Number of permutations: 999 (Random sample from 28350)
Number of permuted statistics greater than or equal to Global R: 305

Pairwise Tests

Facies 500m	R Statistic	Significance Level	Possible Permutati	Actual Permutati	Number >=
Discontinuous Sedimentary Bedrock, Fine Grain	0.137	37	27	27	10
Discontinuous Sedimentary Bedrock, Gravelly Fine Grain	0	55.6	9	9	5
Discontinuous Sedimentary Bedrock, Sedimentary Bedrock	-0.5	88.9	9	9	8
Fine Grain, Gravelly Fine Grain	0.837	11.1	9	9	1
Fine Grain, Sedimentary Bedrock	1	11.1	9	9	1
Gravelly Fine Grain, Sedimentary Bedrock	-0.5	88.9	9	9	8

Failed Pairwise Tests	
Groups	Error
Discontinuous Sedimentary Bedrock, Discontinuous Igneous Bedrock	Groups too small
Discontinuous Sedimentary Bedrock, Igneous Bedrock	Groups too small
Discontinuous Sedimentary Bedrock, Igneous/Sedimentary	Groups too small
Fine Grain, Discontinuous Igneous Bedrock	Groups too small
Fine Grain, Igneous Bedrock	Groups too small
Fine Grain, Igneous/Sedimentary	Groups too small
Discontinuous Igneous Bedrock, Igneous Bedrock	Groups too small
Discontinuous Igneous Bedrock, Igneous/Sedimentary	Groups too small
Discontinuous Igneous Bedrock, Gravelly Fine Grain	Groups too small
Discontinuous Igneous Bedrock, Sedimentary Bedrock	Groups too small
Igneous Bedrock, Igneous/Sedimentary	Groups too small
Igneous Bedrock, Gravelly Fine Grain	Groups too small
Igneous Bedrock, Sedimentary Bedrock	Groups too small
Igneous/Sedimentary, Gravelly Fine Grain	Groups too small
Igneous/Sedimentary, Sedimentary Bedrock	Groups too small

Table 5-11 Results of pairwise tests from 2-way ANOSIM between depth groups at 1000m scale across all facies for functional groups with a 4th root transformation.

TESTS FOR DIFFERENCES BETWEEN Depth GROUPS
(across all Facies groups)
Global Test
Sample statistic (Global R): -0.6
Significance level of sample statistic: 91.7%
Number of permutations: 36 (All possible permutations)
Number of permuted statistics greater than or equal to Global R: 33

Pairwise Tests

Depth 1000m	R Statistic	Significance Level	Possible Permutati	Actual Permutati	Number >=
1675-1875, 1475-1675	-1	100	3	3	3
1675-1875, 1075-1275	-1	100	3	3	3
1675-1875, 2275-2475	0	66.7	3	3	2
1675-1875, 1875-2075	0	66.7	3	3	2

Failed Pairwise Tests

Groups	Error
1675-1875, 2875-2975	Groups too small
1675-1875, 2675-2875	Groups too small
1675-1875, 1275-1475	Groups too small
1475-1675, 1075-1275	Groups too small
1475-1675, 2875-2975	Groups too small
1475-1675, 2675-2875	Groups too small
1475-1675, 2275-2475	Groups too small
1475-1675, 1275-1475	Groups too small
1475-1675, 1875-2075	Groups too small
1075-1275, 2875-2975	Groups too small
1075-1275, 2675-2875	Groups too small
1075-1275, 2275-2475	Groups too small
1075-1275, 1275-1475	Groups too small
1075-1275, 1875-2075	Groups too small
2875-2975, 2675-2875	Groups too small
2875-2975, 2275-2475	Groups too small
2875-2975, 1275-1475	Groups too small
2875-2975, 1875-2075	Groups too small
2675-2875, 2275-2475	Groups too small
2675-2875, 1275-1475	Groups too small
2675-2875, 1875-2075	Groups too small
2275-2475, 1275-1475	Groups too small
2275-2475, 1875-2075	Groups too small
1275-1475, 1875-2075	Groups too small

Table 5-12 Results of pairwise tests from 2-way ANOSIM between facies groups at 1000m across all depths for functional groups with a 4th root transformation.

TESTS FOR DIFFERENCES BETWEEN Facies GROUPS (across all Depth groups)
Global Test
Sample statistic (Global R): 0.125
Significance level of sample statistic: 53.3%
Number of permutations: 15 (All possible permutations)
Number of permuted statistics greater than or equal to Global R: 8
Pairwise Tests

Facies 1000m	R Statistic	Significance Level	Possible Permutati	Actual Permutati	Number >=
Fine Grain, Igneous/Sedimentary*	-1	100	3	3	3
Fine Grain, Discontinuous Sedimentary Bedrock	0.5	66.7	3	3	2
Igneous/Sedimentary*, Discontinuous Sedimentary Bedrock	0	66.7	3	3	2

Failed Pairwise Tests

Groups	Error
Fine Grain, Discontinuous Igneous Bedrock	Groups too small
Fine Grain, Igneous Bedrock	Groups too small
Fine Grain, Sedimentary Bedrock	Groups too small
Fine Grain, Gravelly Fine Grain	Groups too small
Discontinuous Igneous Bedrock, Igneous Bedrock	Groups too small
Discontinuous Igneous Bedrock, Igneous/Sedimentary*	Groups too small
Discontinuous Igneous Bedrock, Discontinuous Sedimentary Bedrock	Groups too small
Discontinuous Igneous Bedrock, Sedimentary Bedrock	Groups too small
Discontinuous Igneous Bedrock, Gravelly Fine Grain	Groups too small
Igneous Bedrock, Igneous/Sedimentary*	Groups too small
Igneous Bedrock, Discontinuous Sedimentary Bedrock	Groups too small
Igneous Bedrock, Sedimentary Bedrock	Groups too small
Igneous Bedrock, Gravelly Fine Grain	Groups too small
Igneous/Sedimentary*, Sedimentary Bedrock	Groups too small
Igneous/Sedimentary*, Gravelly Fine Grain	Groups too small
Discontinuous Sedimentary Bedrock, Sedimentary Bedrock	Groups too small
Discontinuous Sedimentary Bedrock, Gravelly Fine Grain	Groups too small
Sedimentary Bedrock, Gravelly Fine Grain	Groups too small

5.2.2 Functional Groups abundance data presence/absence transformed

Table 5-13 Results of pairwise tests from 2-way ANOSIM between depth groups across all grain sizes for functional groups with a presence/absence transformation.

TESTS FOR DIFFERENCES BETWEEN Depth GROUPS
(across all Grain groups)
Global Test
Sample statistic (Global R): 0.17
Significance level of sample statistic: 0.1%
Number of permutations: 999 (Random sample from a large number)
Number of permuted statistics greater than or equal to Global R: 0

Pairwise Tests

Depth Grain	R Statistic	Significance Level	Possible Permutati	Actual Permutati	Number >=
1675-1875, 1475-1675	0.029	0.4	Very large	999	3
1675-1875, 1275-1475	0.081	0.1	Very large	999	0
1675-1875, 1075-1275	0.128	0.1	Very large	999	0
1675-1875, 1875-2075	0.042	0.1	Very large	999	0
1675-1875, 2075-2275	0.066	1.6	Very large	999	15
1675-1875, 2275-2475	0.459	0.1	Very large	999	0
1675-1875, 2475-2675	0.798	0.1	Very large	999	0
1675-1875, 2675-2875	0.579	0.1	Very large	999	0
1675-1875, 2875-2975	0.669	0.1	Very large	999	0
1675-1875, 875-1075	0.076	0.1	Very large	999	0
1675-1875, <875	0.578	0.3	464256	999	2
1475-1675, 1275-1475	0.308	0.1	Very large	999	0
1475-1675, 1075-1275	0.047	0.1	Very large	999	0
1475-1675, 1875-2075	0.023	0.1	Very large	999	0
1475-1675, 2075-2275	-0.012	64.2	Very large	999	641
1475-1675, 2275-2475	0.423	0.1	Very large	999	0
1475-1675, 2475-2675	0.805	0.1	4.81E+08	999	0
1475-1675, 2675-2875	0.821	0.2	2240	999	1
1475-1675, 2875-2975	0.643	0.1	Very large	999	0
1475-1675, 875-1075	0.224	0.1	Very large	999	0
1475-1675, <875	0.571	6.4	3328	999	63
1275-1475, 1075-1275	0.54	0.1	Very large	999	0
1275-1475, 1875-2075	0.11	0.1	Very large	999	0
1275-1475, 2075-2275	0.672	0.1	Very large	999	0
1275-1475, 2275-2475	0.35	0.2	Very large	999	1
1275-1475, 2475-2675	0.887	0.1	575757	999	0
1275-1475, 2675-2875	0.779	0.2	12425	999	1
1275-1475, 2875-2975	0.622	0.1	Very large	999	0
1275-1475, 875-1075	0.743	0.1	Very large	999	0
1275-1475, <875	0.519	4.3	25205	999	42
1075-1275, 1875-2075	0.001	40.9	Very large	999	408
1075-1275, 2075-2275	0.053	4.7	Very large	999	46
1075-1275, 2275-2475	0.465	0.1	Very large	999	0
1075-1275, 2475-2675	0.952	0.1	9657648	999	0
1075-1275, 2675-2875	0.886	0.8	756	756	6
1075-1275, 2875-2975	0.619	0.1	Very large	999	0

Depth Grain	R Statistic	Significance Level	Possible Permutati	Actual Permutati	Number >=
1075-1275, 875-1075	0.16	0.1	Very large	999	0
1075-1275, <875	0.963	0.2	1968	999	1
1875-2075, 2075-2275	-0.004	50.5	Very large	999	504
1875-2075, 2275-2475	0.376	0.1	Very large	999	0
1875-2075, 2475-2675	0.808	0.1	Very large	999	0
1875-2075, 2675-2875	0.509	0.1	Very large	999	0
1875-2075, 2875-2975	0.665	0.1	Very large	999	0
1875-2075, 875-1075	0.12	0.1	Very large	999	0
1875-2075, <875	0.749	0.2	110490	999	1
2075-2275, 2275-2475	0.433	0.1	Very large	999	0
2075-2275, 2475-2675	0.61	0.1	Very large	999	0
2075-2275, 2675-2875	0.338	0.1	Very large	999	0
2075-2275, 2875-2975	0.384	0.1	Very large	999	0
2075-2275, 875-1075	0.151	0.5	Very large	999	4
2075-2275, <875	0.517	1	30008	999	9
2275-2475, 2475-2675	0.291	0.1	Very large	999	0
2275-2475, 2675-2875	0.109	0.9	Very large	999	8
2275-2475, 2875-2975	0.253	0.1	Very large	999	0
2275-2475, 875-1075	0.783	0.1	Very large	999	0
2275-2475, <875	0.703	1.9	13920	999	18
2475-2675, 2675-2875	0.213	0.1	Very large	999	0
2475-2675, 2875-2975	0.426	0.1	Very large	999	0
2475-2675, 875-1075	0.945	0.1	1712304	999	0
2475-2675, <875	-0.098	100	131	131	131
2675-2875, 2875-2975	0.077	0.5	Very large	999	4
2675-2875, 875-1075	0.917	0.3	6688	999	2
2675-2875, <875	-0.171	100	43	43	43
2875-2975, 875-1075	0.563	0.2	Very large	999	1
2875-2975, <875	0.118	41.3	138	138	57
875-1075, <875	0.929	1.3	152	152	2

Table 5-14 Results of pairwise tests from 2-way ANOSIM between grain sizes groups across all depths for functional groups with a presence/absence transformation.

TESTS FOR DIFFERENCES BETWEEN Grain GROUPS
(across all Depth groups)
Global Test
Sample statistic (Global R): 0.363
Significance level of sample statistic: 0.1%
Number of permutations: 999 (Random sample from a large number)
Number of permuted statistics greater than or equal to Global R: 0

Pairwise Tests

Facies Grain	R Statistic	Significance Level	Possible Permutations	Actual Permutati	Number >=
Bl, Br-IG	0.301	0.1	Very large	999	0
Bl, Br-SD	0.039	0.1	Very large	999	0
Bl, Fg	0.455	0.1	Very large	999	0
Bl, G	0.073	0.1	Very large	999	0
Bl, HS	0.75	0.1	Very large	999	0
Br-IG, Br-SD	0.354	0.1	Very large	999	0
Br-IG, Fg	0.363	0.1	Very large	999	0
Br-IG, G	0.438	0.1	Very large	999	0
Br-IG, HS	0.702	0.1	Very large	999	0
Br-SD, Fg	0.245	0.1	Very large	999	0
Br-SD, G	0.296	0.1	Very large	999	0
Br-SD, HS	0.552	0.1	Very large	999	0
Fg, G	0.659	0.1	Very large	999	0
Fg, HS	0.292	0.1	Very large	999	0
G, HS	0.934	0.1	Very large	999	0

Table 5-15 Results of pairwise tests from 2-way ANOSIM between depth groups at 10m across all facies for functional groups with a presence/absence transformation.

TESTS FOR DIFFERENCES BETWEEN Depth GROUPS
(across all Facies groups)
Global Test
Sample statistic (Global R): 0.136
Significance level of sample statistic: 0.1%
Number of permutations: 999 (Random sample from a large number)
Number of permuted statistics greater than or equal to Global R: 0

Pairwise Tests

Depth 10m	R Statistic	Significance Level	Possible Permutati	Actual Permutati	Number >=
1475-1675, 1675-1875	0.018	2.1	Very large	999	20
1475-1675, 1275-1475	-0.036	71.2	Very large	999	711
1475-1675, 1075-1275	0.359	0.1	Very large	999	0
1475-1675, 875-1075	0.481	0.1	Very large	999	0
1475-1675, 2675-2875	0.327	9.1	220	220	20
1475-1675, 2475-2675	0.29	40	10	10	4
1475-1675, 2875-2975	0.016	41	216216	999	409
1475-1675, 2275-2475	0.083	5.4	Very large	999	53
1475-1675, 2075-2275	0.058	4.4	Very large	999	43
1475-1675, 1875-2075	0.26	0.1	Very large	999	0
1675-1875, 1275-1475	-0.024	63.6	Very large	999	635
1675-1875, 1075-1275	0.138	0.2	Very large	999	1
1675-1875, 875-1075	0.117	6.7	242535	999	66
1675-1875, 2675-2875	0.954	0.1	7280	999	0
1675-1875, 2475-2675	0.965	0.1	51895935	999	0
1675-1875, 2875-2975	0.243	1.6	Very large	999	15
1675-1875, 2275-2475	0	40.5	Very large	999	404
1675-1875, 2075-2275	-0.006	49.3	Very large	999	492
1675-1875, 1875-2075	0.098	1.3	Very large	999	12
1275-1475, 1075-1275	0.143	0.1	Very large	999	0
1275-1475, 875-1075	0.929	0.1	Very large	999	0
1275-1475, 2675-2875	0.123	18.2	220	220	40
1275-1475, 2475-2675	0.278	20	10	10	2
1275-1475, 2875-2975	0.346	0.1	10010	999	0
1275-1475, 2275-2475	0.051	13.6	Very large	999	135
1275-1475, 2075-2275	0.181	0.1	Very large	999	0
1275-1475, 1875-2075	0.001	42.4	Very large	999	423
1075-1275, 875-1075	0.414	0.1	Very large	999	0
1075-1275, 2675-2875	-0.12	82.3	220	220	181
1075-1275, 2475-2675	-0.185	90	10	10	9
1075-1275, 2875-2975	0.245	2.5	8008	999	24
1075-1275, 2275-2475	0.321	0.1	Very large	999	0
1075-1275, 2075-2275	0.071	4.6	Very large	999	45
1075-1275, 1875-2075	0.211	0.1	Very large	999	0
875-1075, 2675-2875	0.202	17.8	9139	999	177
875-1075, 2475-2675	-0.162	100	37	37	37

Depth 10m	R Statistic	Significance Level	Possible Permutati	Actual Permutati	Number >=
875-1075, 2875-2975	0.665	0.1	2248194	999	0
875-1075, 2275-2475	0.575	0.4	7128420	999	3
875-1075, 2075-2275	0.054	47.4	171	171	81
2675-2875, 2475-2675	0.696	0.2	3016440	999	1
2675-2875, 2875-2975	-0.042	57.2	21591360	999	571
2675-2875, 2275-2475	0.536	0.3	2.05E+08	999	2
2675-2875, 2075-2275	0.874	0.1	1260	999	0
2675-2875, 1875-2075	0.142	6.4	2380	999	63
2475-2675, 2875-2975	0.567	0.1	Very large	999	0
2475-2675, 2275-2475	0.494	0.1	Very large	999	0
2475-2675, 2075-2275	0.806	0.1	504735	999	0
2475-2675, 1875-2075	0.77	0.1	1.2E+08	999	0
2875-2975, 2275-2475	0.495	0.1	Very large	999	0
2875-2975, 2075-2275	0.499	0.1	4186080	999	0
2875-2975, 1875-2075	0.219	0.8	20058300	999	7
2275-2475, 2075-2275	0.298	0.1	Very large	999	0
2275-2475, 1875-2075	0.076	1.3	Very large	999	12
2075-2275, 1875-2075	0.309	0.1	Very large	999	0

Failed Pairwise Tests

Groups	Error
875-1075, 1875-2075	Groups too small

Table 5-16 Results of pairwise tests from 2-way ANOSIM between facies groups at 10m across all depths for functional groups with a presence/absence transformation.

TESTS FOR DIFFERENCES BETWEEN Depth GROUPS
(across all Facies groups)
TESTS FOR DIFFERENCES BETWEEN Facies GROUPS (across all Depth groups)
Global Test
Sample statistic (Global R): 0.326
Significance level of sample statistic: 0.1%
Number of permutations: 999 (Random sample from a large number)
Number of permuted statistics greater than or equal to Global R: 0
Pairwise Tests

Facies 10m	R Statistic	Significance Level	Possible Permutations	Actual Permutati	Number >=
Fine Grain, Sedimentary Bedrock	0.861	0.1	Very large	999	0
Fine Grain, Discontinuous Sedimentary Bedrock	0.178	6.3	82500	999	62
Fine Grain, Boulder	-0.111	50	4	4	2
Fine Grain, Discontinuous Igneous Bedrock	-0.038	60.9	7408800	999	608
Fine Grain, Igneous Bedrock	0.041	32.2	Very large	999	321
Fine Grain, Gravelly Fine Grain	0.653	0.1	Very large	999	0
Sedimentary Bedrock, Discontinuous Sedimentary Bedrock	0.207	1	Very large	999	9
Sedimentary Bedrock, Discontinuous Igneous Bedrock	0.778	0.1	5920200	999	0
Sedimentary Bedrock, Igneous Bedrock	0.421	0.1	Very large	999	0
Sedimentary Bedrock, Gravelly Fine Grain	0.13	0.1	Very large	999	0
Discontinuous Sedimentary Bedrock, Discontinuous Igneous Bedrock	0.112	31.2	77	77	24
Discontinuous Sedimentary Bedrock, Igneous Bedrock	0.273	0.6	Very large	999	5
Discontinuous Sedimentary Bedrock, Gravelly Fine Grain	0.27	0.4	Very large	999	3
Boulder, Discontinuous Igneous Bedrock	-0.3	100	6	6	6
Boulder, Igneous Bedrock	-0.333	100	5	5	5
Discontinuous Igneous Bedrock, Igneous Bedrock	0.047	26.8	Very large	999	267
Discontinuous Igneous Bedrock, Gravelly Fine Grain	0.217	4.4	1336608	999	43
Igneous Bedrock, Gravelly Fine Grain	-0.033	77.7	Very large	999	776

Failed Pairwise Tests

Groups	Error
Sedimentary Bedrock, Boulder	Groups too small
Discontinuous Sedimentary Bedrock, Boulder	Groups too small
Boulder, Gravelly Fine Grain	Groups too small

Table 5-17 Results of pairwise tests from 2-way ANOSIM between depth groups at 50m across all facies for functional groups with a presence/absence transformation.

TESTS FOR DIFFERENCES BETWEEN Depth GROUPS
(across all Facies groups)
Global Test
Sample statistic (Global R): 0.171
Significance level of sample statistic: 0.1%
Number of permutations: 999 (Random sample from a large number)
Number of permuted statistics greater than or equal to Global R: 0

Pairwise Tests

Depth 50m	R Statistic	Significance Level	Possible Permutati	Actual Permutati	Number >= Observed
1675-1875, 1475-1675	0.073	2.2	Very large	999	21
1675-1875, 1275-1475	0.161	12.3	25297272	999	122
1675-1875, 1075-1275	0.064	26.6	57513456	999	265
1675-1875, 875-1075	0.518	3.1	5720	999	30
1675-1875, 2875-2975	0.241	7.4	32760	999	73
1675-1875, 2675-2875	0.713	2.4	84	84	2
1675-1875, 2475-2675	0.847	0.8	126	126	1
1675-1875, 2275-2475	-0.018	54.1	Very large	999	540
1675-1875, 2075-2275	0.021	38.7	Very large	999	386
1675-1875, 1875-2075	0.068	25.5	2063880	999	254
1475-1675, 1275-1475	0.169	14.9	Very large	999	148
1475-1675, 1075-1275	0.32	0.6	Very large	999	5
1475-1675, 875-1075	0.727	0.1	559130	999	0
1475-1675, 2875-2975	0.489	5.7	1035	999	56
1475-1675, 2675-2875	0.491	11.1	9	9	1
1475-1675, 2275-2475	0.166	7	Very large	999	69
1475-1675, 2075-2275	0.304	1.4	5.19E+08	999	13
1475-1675, 1875-2075	0.246	13.3	29601	999	132
1275-1475, 1075-1275	0.033	29.8	Very large	999	297
1275-1475, 875-1075	0.728	0.2	6006	999	1
1275-1475, 2875-2975	0.239	12.7	63	63	8
1275-1475, 2675-2875	0.28	16.7	6	6	1
1275-1475, 2275-2475	0.126	11.3	756756	999	112
1275-1475, 2075-2275	0.406	0.3	135135	999	2
1275-1475, 1875-2075	-0.07	77.3	3861	999	772
1075-1275, 875-1075	0.054	27.9	5005	999	278
1075-1275, 2875-2975	0.417	7.1	28	28	2
1075-1275, 2675-2875	-0.378	100	7	7	7
1075-1275, 2275-2475	0.009	39.5	15484392	999	394
1075-1275, 2075-2275	0.327	1	14536368	999	9
1075-1275, 1875-2075	-0.159	87.4	131670	999	873
875-1075, 2875-2975	0.483	5.5	55	55	3
875-1075, 2675-2875	-0.164	100	10	10	10
875-1075, 2275-2475	0.163	22.6	385	385	87
875-1075, 2075-2275	0.22	33.3	6	6	2
2875-2975, 2675-2875	0.035	45.3	2205	999	452

Depth 50m	R Statistic	Significance Level	Possible Permutati	Actual Permutati	Number >= Observed
2875-2975, 2475-2675	0.321	2	4410	999	19
2875-2975, 2275-2475	0.475	0.1	339570	999	0
2875-2975, 2075-2275	0.24	11.1	36	36	4
2875-2975, 1875-2075	-0.08	61.9	126	126	78
2675-2875, 2475-2675	0.539	1.7	525	525	9
2675-2875, 2275-2475	0.564	0.2	2940	999	1
2675-2875, 2075-2275	0	66.7	3	3	2
2675-2875, 1875-2075	-0.018	52.4	21	21	11
2475-2675, 2275-2475	0.296	2.8	7350	999	27
2475-2675, 2075-2275	-0.083	60	5	5	3
2475-2675, 1875-2075	0.466	1.6	126	126	2
2275-2475, 2075-2275	0.058	23.9	71717184	999	238
2275-2475, 1875-2075	0.192	2.6	6112260	999	25
2075-2275, 1875-2075	0.167	7.9	5987520	999	78

Failed Pairwise Tests

Groups	Error
1475-1675, 2475-2675	Groups too small
1275-1475, 2475-2675	Groups too small
1075-1275, 2475-2675	Groups too small
875-1075, 2475-2675	Groups too small
875-1075, 1875-2075	Groups too small

Table 5-18 Results of pairwise tests from 2-way ANOSIM between facies groups at 50m across all depths for functional groups with a presence/absence transformation.

TESTS FOR DIFFERENCES BETWEEN Facies GROUPS
(across all Depth groups)
Global Test
Sample statistic (Global R): 0.343
Significance level of sample statistic: 0.1%
Number of permutations: 999 (Random sample from a large number)
Number of permuted statistics greater than or equal to Global R: 0

Pairwise Tests

Facies 50m	R Statistic	Significance Level	Possible Permutati	Actual Permutati	Number >= Observed
Fine Grain, Discontinuous Sedimentary Bedrock	0.685	4.8	84	84	4
Fine Grain, Sedimentary Bedrock	0.827	0.1	Very large	999	0
Fine Grain, Igneous Bedrock	0.083	30.4	98784	999	303
Fine Grain, Discontinuous Igneous Bedrock	0.2	17.5	1125	999	174
Fine Grain, Gravelly Fine Grain	0.541	0.1	Very large	999	0
Discontinuous Sedimentary Bedrock, Sedimentary Bedrock	0.055	29.7	4.9E+08	999	296
Discontinuous Sedimentary Bedrock, Igneous Bedrock	0.35	1.2	148176	999	11
Discontinuous Sedimentary Bedrock, Discontinuous Igneous Bedrock	0.25	20	15	15	3
Discontinuous Sedimentary Bedrock, Gravelly Fine Grain	0.481	4	1681680	999	39
Discontinuous Sedimentary Bedrock, Igneous/Sedimentary	-0.25	100	5	5	5
Sedimentary Bedrock, Igneous Bedrock	0.532	0.1	58677696	999	0
Sedimentary Bedrock, Discontinuous Igneous Bedrock	0.663	0.8	126	126	1
Sedimentary Bedrock, Gravelly Fine Grain	0.095	11.1	Very large	999	110
Sedimentary Bedrock, Igneous/Sedimentary	1	16.7	6	6	1
Igneous Bedrock, Discontinuous Igneous Bedrock	0.072	20.4	13891500	999	203
Igneous Bedrock, Gravelly Fine Grain	-0.028	51.1	Very large	999	510
Igneous Bedrock, Igneous/Sedimentary	0.12	50	6	6	3
Discontinuous Igneous Bedrock, Gravelly Fine Grain	0.188	8.1	1050	999	80

Failed Pairwise Tests

Groups	Error
Fine Grain, Igneous/Sedimentary	Groups too small
Discontinuous Igneous Bedrock, Igneous/Sedimentary	Groups too small
Gravelly Fine Grain, Igneous/Sedimentary	Groups too small

Table 5-19 Results of pairwise tests from 2-way ANOSIM between depth groups at 100m across all facies for functional groups with a presence/absence transformation.

TESTS FOR DIFFERENCES BETWEEN Depth GROUPS
(across all Facies groups)
Global Test
Sample statistic (Global R): 0.22
Significance level of sample statistic: 0.1%
Number of permutations: 999 (Random sample from a large number)
Number of permuted statistics greater than or equal to Global R: 0

Pairwise Tests

Depth 100m	R Statistic	Significance Level	Possible Permutati	Actual Permutati	Number >= Observed
1475-1675, 1275-1475	0.011	48.6	105	105	51
1475-1675, 1075-1275	0.278	11.6	128700	999	115
1475-1675, 875-1075	0.862	0.4	252	252	1
1475-1675, 1675-1875	0.213	0.4	2.03E+08	999	3
1475-1675, 2875-2975	0.803	11.1	36	36	4
1475-1675, 2675-2875	0	66.7	3	3	2
1475-1675, 2275-2475	0.39	1	458640	999	9
1475-1675, 2075-2275	0.382	7.3	1170	999	72
1475-1675, 1875-2075	0.601	6.7	180	180	12
1275-1475, 1075-1275	0.155	14	3300	999	139
1275-1475, 875-1075	0.618	4.8	21	21	1
1275-1475, 1675-1875	-0.227	82	400	400	328
1275-1475, 2875-2975	0.125	66.7	3	3	2
1275-1475, 2675-2875	-0.5	100	3	3	3
1275-1475, 2275-2475	-0.099	90.5	105	105	95
1275-1475, 2075-2275	-0.408	95	60	60	57
1275-1475, 1875-2075	0.059	46.7	30	30	14
1075-1275, 875-1075	0.091	25.4	126	126	32
1075-1275, 1675-1875	-0.022	42.7	25025	999	426
1075-1275, 2875-2975	0.696	6.7	15	15	1
1075-1275, 2675-2875	0	60	5	5	3
1075-1275, 2275-2475	0.104	21.3	21450	999	212
1075-1275, 2075-2275	0.409	9.7	165	165	16
1075-1275, 1875-2075	-0.153	100	55	55	55
875-1075, 1675-1875	0.547	8	728	728	58
875-1075, 2875-2975	0.336	19	21	21	4
875-1075, 2675-2875	-0.46	100	6	6	6
875-1075, 2275-2475	0.28	16.7	36	36	6
875-1075, 2075-2275	1	33.3	3	3	1
1675-1875, 2875-2975	0.312	13.4	1300	999	133
1675-1875, 2675-2875	0.111	50	4	4	2
1675-1875, 2475-2675	0.75	33.3	3	3	1
1675-1875, 2275-2475	0.062	24.1	7796880	999	240
1675-1875, 2075-2275	-0.264	96.7	15288	999	966
1675-1875, 1875-2075	0.112	39.7	3900	999	396
2875-2975, 2675-2875	0.428	13.3	30	30	4

Depth 100m	R Statistic	Significance Level	Possible Permutati	Actual Permutati	Number >= Observed
2875-2975, 2475-2675	0.5	6.7	30	30	2
2875-2975, 2275-2475	0.443	0.9	3024	999	8
2875-2975, 2075-2275	1	33.3	3	3	1
2875-2975, 1875-2075	0.222	10	10	10	1
2675-2875, 2475-2675	0.889	25	4	4	1
2675-2875, 2275-2475	0.5	10	10	10	1
2475-2675, 2275-2475	0.033	52.4	63	63	33
2475-2675, 1875-2075	0.083	40	10	10	4
2275-2475, 2075-2275	0.013	48.6	315	315	153
2275-2475, 1875-2075	0.092	29.8	5040	999	297
2075-2275, 1875-2075	-0.103	61.9	189	189	117

Failed Pairwise Tests

Groups	Error
1475-1675, 2475-2675	Groups too small
1275-1475, 2475-2675	Groups too small
1075-1275, 2475-2675	Groups too small
875-1075, 2475-2675	Groups too small
875-1075, 1875-2075	Groups too small
2675-2875, 2075-2275	Groups too small
2675-2875, 1875-2075	Groups too small
2475-2675, 2075-2275	Groups too small

Table 5-20 Results of pairwise tests from 2-way ANOSIM between facies groups at 100m across all depths for functional groups with a presence/absence transformation.

TESTS FOR DIFFERENCES BETWEEN Depth GROUPS
(across all Facies groups)
TESTS FOR DIFFERENCES BETWEEN Facies GROUPS (across all Depth groups)
Global Test
Sample statistic (Global R): 0.312
Significance level of sample statistic: 0.1%
Number of permutations: 999 (Random sample from a large number)
Number of permuted statistics greater than or equal to Global R: 0
Pairwise Tests

Facies 100m	R Statistic	Significance Level	Possible Permutati	Actual Permutati	Number >= Observed
Fine Grain, Discontinuous Sedimentary Bedrock	-0.312	86.7	30	30	26
Fine Grain, Gravelly Fine Grain	0.526	0.2	19164600	999	1
Fine Grain, Discontinuous Igneous Bedrock	0.358	25	36	36	9
Fine Grain, Igneous Bedrock	-0.194	74	600	600	444
Fine Grain, Sedimentary Bedrock	0.804	0.1	5362500	999	0
Discontinuous Sedimentary Bedrock, Gravelly Fine Grain	0.161	21.7	28665	999	216
Discontinuous Sedimentary Bedrock, Igneous Bedrock	-0.25	92	100	100	92
Discontinuous Sedimentary Bedrock, Sedimentary Bedrock	-0.025	45.2	2520	999	451
Discontinuous Sedimentary Bedrock, Igneous/Sedimentary	0	66.7	3	3	2
Gravelly Fine Grain, Discontinuous Igneous Bedrock	0.202	33.3	63	63	21
Gravelly Fine Grain, Igneous Bedrock	0.041	32.9	183456	999	328
Gravelly Fine Grain, Sedimentary Bedrock	0.027	36.7	Very large	999	366
Discontinuous Igneous Bedrock, Igneous Bedrock	0.38	4	630	630	25
Discontinuous Igneous Bedrock, Sedimentary Bedrock	0.643	13.3	15	15	2
Igneous Bedrock, Sedimentary Bedrock	0.521	1.8	3780	999	17
Igneous Bedrock, Igneous/Sedimentary	-0.556	100	4	4	4
Sedimentary Bedrock, Igneous/Sedimentary	1	33.3	3	3	1

Failed Pairwise Tests

Groups	Error
Fine Grain, Igneous/Sedimentary	Groups too small
Discontinuous Sedimentary Bedrock, Discontinuous Igneous Bedrock	Groups too small
Gravelly Fine Grain, Igneous/Sedimentary	Groups too small
Discontinuous Igneous Bedrock, Igneous/Sedimentary	Groups too small

Table 5-21 Results of pairwise tests from 2-way ANOSIM between depth groups at 500m across all facies for functional groups with a presence/absence transformation.

TESTS FOR DIFFERENCES BETWEEN Depth GROUPS
(across all Facies groups)
Global Test
Sample statistic (Global R): 0.012
Significance level of sample statistic: 46.1%
Number of permutations: 999 (Random sample from 850500)
Number of permuted statistics greater than or equal to Global R: 460

Pairwise Tests

Depth 500m	R Statistic	Significance Level	Possible Permutati	Actual Permutati	Number >= Observed
1675-1875, 1475-1675	-0.26	100	27	27	27
1675-1875, 1075-1275	-0.674	100	9	9	9
1675-1875, 2275-2475	-0.75	100	9	9	9
1675-1875, 2075-2275	-1	100	3	3	3
1675-1875, 1275-1475	1	33.3	3	3	1
1675-1875, 1875-2075	-1	100	3	3	3
1475-1675, 1075-1275	0.75	22.2	9	9	2
1475-1675, 2275-2475	0.25	44.4	9	9	4
1475-1675, 2075-2275	1	33.3	3	3	1
1475-1675, 1275-1475	1	33.3	3	3	1
1475-1675, 1875-2075	1	33.3	3	3	1
2875-2975, 2675-2875	1	33.3	3	3	1
2875-2975, 2475-2675	1	33.3	3	3	1

Failed Pairwise Tests

Groups	Error
1675-1875, 2875-2975	Groups too small
1675-1875, 2675-2875	Groups too small
1675-1875, 2475-2675	Groups too small
1475-1675, 2875-2975	Groups too small
1475-1675, 2675-2875	Groups too small
1475-1675, 2475-2675	Groups too small
1075-1275, 2875-2975	Groups too small
1075-1275, 2675-2875	Groups too small
1075-1275, 2475-2675	Groups too small
1075-1275, 2275-2475	Groups too small
1075-1275, 2075-2275	Groups too small
1075-1275, 1275-1475	Groups too small
1075-1275, 1875-2075	Groups too small
2875-2975, 2275-2475	Groups too small
2875-2975, 2075-2275	Groups too small
2875-2975, 1275-1475	Groups too small
2875-2975, 1875-2075	Groups too small
2675-2875, 2475-2675	Groups too small
2675-2875, 2275-2475	Groups too small
2675-2875, 2075-2275	Groups too small

Failed Pairwise Tests	
Groups	Error
2675-2875, 1275-1475	Groups too small
2675-2875, 1875-2075	Groups too small
2475-2675, 2275-2475	Groups too small
2475-2675, 2075-2275	Groups too small
2475-2675, 1275-1475	Groups too small
2475-2675, 1875-2075	Groups too small
2275-2475, 2075-2275	Groups too small
2275-2475, 1275-1475	Groups too small
2275-2475, 1875-2075	Groups too small
2075-2275, 1275-1475	Groups too small
2075-2275, 1875-2075	Groups too small
1275-1475, 1875-2075	Groups too small

Table 5-22 Results of pairwise tests from 2-way ANOSIM between facies groups at 500m across all depths for functional groups with a presence/absence transformation.

TESTS FOR DIFFERENCES BETWEEN Facies GROUPS
(across all Depth groups)
Global Test
Sample statistic (Global R): 0.039
Significance level of sample statistic: 39.5%
Number of permutations: 999 (Random sample from 28350)
Number of permuted statistics greater than or equal to Global R: 394
Pairwise Tests

Facies 500m	R Statistic	Significance Level	Possible Permutati	Actual Permutati	Number >=
Discontinuous Sedimentary Bedrock, Fine Grain	-0.113	63	27	27	17
Discontinuous Sedimentary Bedrock, Gravelly Fine Grain	0.313	33.3	9	9	3
Discontinuous Sedimentary Bedrock, Sedimentary Bedrock	-0.5	88.9	9	9	8
Fine Grain, Gravelly Fine Grain	0.174	66.7	9	9	6
Fine Grain, Sedimentary Bedrock	0	66.7	9	9	6
Gravelly Fine Grain, Sedimentary Bedrock	-0.25	77.8	9	9	7

Failed Pairwise Tests

Groups	Error
Discontinuous Sedimentary Bedrock, Discontinuous Igneous Bedrock	Groups too small
Discontinuous Sedimentary Bedrock, Igneous Bedrock	Groups too small
Discontinuous Sedimentary Bedrock, Igneous/Sedimentary	Groups too small
Fine Grain, Discontinuous Igneous Bedrock	Groups too small
Fine Grain, Igneous Bedrock	Groups too small
Fine Grain, Igneous/Sedimentary	Groups too small
Discontinuous Igneous Bedrock, Igneous Bedrock	Groups too small
Discontinuous Igneous Bedrock, Igneous/Sedimentary	Groups too small
Discontinuous Igneous Bedrock, Gravelly Fine Grain	Groups too small
Discontinuous Igneous Bedrock, Sedimentary Bedrock	Groups too small
Igneous Bedrock, Igneous/Sedimentary	Groups too small
Igneous Bedrock, Gravelly Fine Grain	Groups too small
Igneous Bedrock, Sedimentary Bedrock	Groups too small
Igneous/Sedimentary, Gravelly Fine Grain	Groups too small
Igneous/Sedimentary, Sedimentary Bedrock	Groups too small

Table 5-23 Results of pairwise tests from 2-way ANOSIM between depth groups at 1000m across all facies for functional groups with a presence/absence transformation.

TESTS FOR DIFFERENCES BETWEEN Depth GROUPS
(across all Facies groups)
Global Test
Sample statistic (Global R): -0.6
Significance level of sample statistic: 91.7%
Number of permutations: 36 (All possible permutations)
Number of permuted statistics greater than or equal to Global R: 33

Pairwise Tests

Depth 1000m	R Statistic	Significance Level	Possible Permutati	Actual Permutati	Number >= Observed
1675-1875, 1475-1675	-1	100	3	3	3
1675-1875, 1075-1275	-1	100	3	3	3
1675-1875, 2275-2475	-0.5	100	3	3	3
1675-1875, 1875-2075	-0.5	100	3	3	3

Failed Pairwise Tests

Groups	Error
1675-1875, 2875-2975	Groups too small
1675-1875, 2675-2875	Groups too small
1675-1875, 1275-1475	Groups too small
1475-1675, 1075-1275	Groups too small
1475-1675, 2875-2975	Groups too small
1475-1675, 2675-2875	Groups too small
1475-1675, 2275-2475	Groups too small
1475-1675, 1275-1475	Groups too small
1475-1675, 1875-2075	Groups too small
1075-1275, 2875-2975	Groups too small
1075-1275, 2675-2875	Groups too small
1075-1275, 2275-2475	Groups too small
1075-1275, 1275-1475	Groups too small
1075-1275, 1875-2075	Groups too small
2875-2975, 2675-2875	Groups too small
2875-2975, 2275-2475	Groups too small
2875-2975, 1275-1475	Groups too small
2875-2975, 1875-2075	Groups too small
2675-2875, 2275-2475	Groups too small
2675-2875, 1275-1475	Groups too small
2675-2875, 1875-2075	Groups too small
2275-2475, 1275-1475	Groups too small
2275-2475, 1875-2075	Groups too small
1275-1475, 1875-2075	Groups too small

Table 5-24 Results of pairwise tests from 2-way ANOSIM between facies groups at 1000m across all depths for functional groups with a presence/absence transformation.

TESTS FOR DIFFERENCES BETWEEN Facies GROUPS (across all Depth groups)
Global Test
Sample statistic (Global R): -0.563
Significance level of sample statistic: 93.3%
Number of permutations: 15 (All possible permutations)
Number of permuted statistics greater than or equal to Global R: 14
Pairwise Tests

Facies 1000m	R Statistic	Significance Level	Possible Permutati	Actual Permutati	Number >= Observed
Fine Grain, Igneous/Sedimentary*	-1	100	3	3	3
Fine Grain, Discontinuous Sedimentary Bedrock	-0.5	100	3	3	3
Igneous/Sedimentary*, Discontinuous Sedimentary Bedrock	-0.5	100	3	3	3

Failed Pairwise Tests

Groups	Error
Fine Grain, Discontinuous Igneous Bedrock	Groups too small
Fine Grain, Igneous Bedrock	Groups too small
Fine Grain, Sedimentary Bedrock	Groups too small
Fine Grain, Gravelly Fine Grain	Groups too small
Discontinuous Igneous Bedrock, Igneous Bedrock	Groups too small
Discontinuous Igneous Bedrock, Igneous/Sedimentary*	Groups too small
Discontinuous Igneous Bedrock, Discontinuous Sedimentary Bedrock	Groups too small
Discontinuous Igneous Bedrock, Sedimentary Bedrock	Groups too small
Discontinuous Igneous Bedrock, Gravelly Fine Grain	Groups too small
Igneous Bedrock, Igneous/Sedimentary*	Groups too small
Igneous Bedrock, Discontinuous Sedimentary Bedrock	Groups too small
Igneous Bedrock, Sedimentary Bedrock	Groups too small
Igneous Bedrock, Gravelly Fine Grain	Groups too small
Igneous/Sedimentary*, Sedimentary Bedrock	Groups too small
Igneous/Sedimentary*, Gravelly Fine Grain	Groups too small
Discontinuous Sedimentary Bedrock, Sedimentary Bedrock	Groups too small
Discontinuous Sedimentary Bedrock, Gravelly Fine Grain	Groups too small
Sedimentary Bedrock, Gravelly Fine Grain	Groups too small

5.2.3 Species abundance data fourth root transformed

Table 5-25 Results of pairwise tests from 2-way ANOSIM between depth groups across all attachment grain size for species with a 4th root transformation.

TESTS FOR DIFFERENCES BETWEEN Depth GROUPS
(across all Grain groups)
Global Test
Sample statistic (Global R): 0.377
Significance level of sample statistic: 0.1%
Number of permutations: 999 (Random sample from a large number)
Number of permuted statistics greater than or equal to Global R: 0

Pairwise Tests

Depth Grain	R Statistic	Significance Level	Possible Permutation	Actual Permutati	Number >= Observed
<875, 1075-1275	0.953	0.3	1968	999	2
<875, 1275-1475	0.554	7.9	25205	999	78
<875, 1475-1675	0.555	5.8	3328	999	57
<875, 1675-1875	0.493	0.8	464256	999	7
<875, 1875-2075	0.667	0.2	110490	999	1
<875, 2075-2275	0.473	0.7	30008	999	6
<875, 2275-2475	0.523	1.8	13920	999	17
<875, 2475-2675	-0.215	100	131	131	131
<875, 2675-2875	-0.216	79.1	43	43	34
<875, 2875-2975	-0.067	60.9	138	138	84
<875, 875-1075	0.927	2	152	152	3
1075-1275, 1275-1475	0.546	0.1	Very large	999	0
1075-1275, 1475-1675	0.304	0.1	Very large	999	0
1075-1275, 1675-1875	0.675	0.1	Very large	999	0
1075-1275, 1875-2075	-0.011	88.8	Very large	999	887
1075-1275, 2075-2275	0.343	0.1	Very large	999	0
1075-1275, 2275-2475	0.732	0.1	Very large	999	0
1075-1275, 2475-2675	0.985	0.1	9657648	999	0
1075-1275, 2675-2875	0.914	0.5	756	756	4
1075-1275, 2875-2975	0.779	0.1	Very large	999	0
1075-1275, 875-1075	0.211	0.1	Very large	999	0
1275-1475, 1475-1675	0.416	0.1	Very large	999	0
1275-1475, 1675-1875	0.427	0.1	Very large	999	0
1275-1475, 1875-2075	0.126	0.4	Very large	999	3
1275-1475, 2075-2275	0.695	0.1	Very large	999	0
1275-1475, 2275-2475	0.634	0.1	Very large	999	0
1275-1475, 2475-2675	0.902	0.1	575757	999	0
1275-1475, 2675-2875	0.778	0.1	12425	999	0
1275-1475, 2875-2975	0.675	0.1	Very large	999	0
1275-1475, 875-1075	0.736	0.1	Very large	999	0
1475-1675, 1675-1875	0.098	0.1	Very large	999	0
1475-1675, 1875-2075	0.2	0.1	Very large	999	0
1475-1675, 2075-2275	0.032	16.1	Very large	999	160
1475-1675, 2275-2475	0.482	0.1	Very large	999	0
1475-1675, 2475-2675	0.8	0.1	481008528	999	0
1475-1675, 2675-2875	0.793	0.1	2240	999	0

Depth Grain	R Statistic	Significan ce Level	Possible Permutation	Actual Permutati	Number >= Observed
1475-1675, 2875-2975	0.682	0.1	Very large	999	0
1475-1675, 875-1075	0.751	0.1	Very large	999	0
1675-1875, 1875-2075	0.469	0.1	Very large	999	0
1675-1875, 2075-2275	0.055	10.7	Very large	999	106
1675-1875, 2275-2475	0.432	0.1	Very large	999	0
1675-1875, 2475-2675	0.804	0.1	Very large	999	0
1675-1875, 2675-2875	0.566	0.1	Very large	999	0
1675-1875, 2875-2975	0.65	0.1	Very large	999	0
1675-1875, 875-1075	0.919	0.1	Very large	999	0
1875-2075, 2075-2275	0.186	0.1	Very large	999	0
1875-2075, 2275-2475	0.517	0.1	Very large	999	0
1875-2075, 2475-2675	0.803	0.1	Very large	999	0
1875-2075, 2675-2875	0.501	0.1	Very large	999	0
1875-2075, 2875-2975	0.754	0.1	Very large	999	0
1875-2075, 875-1075	0.102	0.1	Very large	999	0
2075-2275, 2275-2475	0.456	0.1	Very large	999	0
2075-2275, 2475-2675	0.603	0.1	Very large	999	0
2075-2275, 2675-2875	0.285	0.1	Very large	999	0
2075-2275, 2875-2975	0.268	0.1	Very large	999	0
2075-2275, 875-1075	0.341	0.1	Very large	999	0
2275-2475, 2475-2675	0.269	0.1	Very large	999	0
2275-2475, 2675-2875	0.078	1.6	Very large	999	15
2275-2475, 2875-2975	0.124	0.1	Very large	999	0
2275-2475, 875-1075	0.913	0.1	Very large	999	0
2475-2675, 2675-2875	0.27	0.1	Very large	999	0
2475-2675, 2875-2975	0.427	0.1	Very large	999	0
2475-2675, 875-1075	0.951	0.1	1712304	999	0
2675-2875, 2875-2975	0.118	0.1	Very large	999	0
2675-2875, 875-1075	0.939	0.1	6688	999	0
2875-2975, 875-1075	0.922	0.1	Very large	999	0

Table 5-26 Results of pairwise tests from 2-way ANOSIM between attachment grain size groups across all depths for species with a 4th root transformation.

TESTS FOR DIFFERENCES BETWEEN Grain GROUPS
(across all Depth groups)
Global Test
Sample statistic (Global R): 0.424
Significance level of sample statistic: 0.1%
Number of permutations: 999 (Random sample from a large number)
Number of permuted statistics greater than or equal to Global R: 0

Pairwise Tests

Facies Grain	R Statistic	Significance Level	Possible Permutation	Actual Permutati	Number >= Observed
Br-SD, Br-IG	0.399	0.1	Very large	999	0
Br-SD, Fg	0.461	0.1	Very large	999	0
Br-SD, Bl	0.04	0.1	Very large	999	0
Br-SD, G	0.287	0.1	Very large	999	0
Br-SD, HS	0.732	0.1	Very large	999	0
Br-IG, Fg	0.494	0.1	Very large	999	0
Br-IG, Bl	0.39	0.1	Very large	999	0
Br-IG, G	0.53	0.1	Very large	999	0
Br-IG, HS	0.854	0.1	Very large	999	0
Fg, Bl	0.642	0.1	Very large	999	0
Fg, G	0.723	0.1	Very large	999	0
Fg, HS	0.32	0.1	Very large	999	0
Bl, G	0.109	0.1	Very large	999	0
Bl, HS	0.875	0.1	Very large	999	0
G, HS	0.957	0.1	Very large	999	0

Table 5-27 Results of pairwise tests from 2-way ANOSIM between depth groups at 10m across all facies for species with a 4th root transformation.

TESTS FOR DIFFERENCES BETWEEN Depth GROUPS
(across all Facies groups)
Global Test
Sample statistic (Global R): 0.312
Significance level of sample statistic: 0.1%
Number of permutations: 999 (Random sample from a large number)
Number of permuted statistics greater than or equal to Global R: 0

Pairwise Tests

Depth 10m	R Statistic	Significance Level	Possible Permutation	Actual Permutati	Number >= Observed
1475-1675, 1675-1875	0.028	0.8	Very large	999	7
1475-1675, 1275-1475	0.26	0.1	Very large	999	0
1475-1675, 1075-1275	0.673	0.1	Very large	999	0
1475-1675, 875-1075	0.477	0.1	Very large	999	0
1475-1675, 2675-2875	0.432	7.3	55	55	4
1475-1675, 2475-2675	0.417	40	10	10	4
1475-1675, 2875-2975	0.21	10.7	216216	999	106
1475-1675, 2275-2475	0.163	0.6	Very large	999	5
1475-1675, 2075-2275	0.239	0.1	Very large	999	0
1475-1675, 1875-2075	0.587	0.1	Very large	999	0
1675-1875, 1275-1475	0.273	0.1	Very large	999	0
1675-1875, 1075-1275	0.535	0.1	Very large	999	0
1675-1875, 875-1075	0.225	4.5	242535	999	44
1675-1875, 2675-2875	0.797	0.1	5460	999	0
1675-1875, 2475-2675	0.865	0.1	51895935	999	0
1675-1875, 2875-2975	0.268	3	Very large	999	29
1675-1875, 2275-2475	0.081	7.2	Very large	999	71
1675-1875, 2075-2275	0.141	0.7	Very large	999	6
1675-1875, 1875-2075	0.327	0.1	Very large	999	0
1275-1475, 1075-1275	0.358	0.1	Very large	999	0
1275-1475, 875-1075	0.988	0.1	1370850	999	0
1275-1475, 2675-2875	0.429	6.7	15	15	1
1275-1475, 2475-2675	0.333	40	5	5	2
1275-1475, 2875-2975	0.512	0.3	630	630	2
1275-1475, 2275-2475	0.471	0.1	Very large	999	0
1275-1475, 2075-2275	0.348	0.1	Very large	999	0
1275-1475, 1875-2075	0.401	0.1	Very large	999	0
1075-1275, 875-1075	0.352	1.6	322241140	999	15
1075-1275, 2675-2875	0.545	5.6	36	36	2
1075-1275, 2475-2675	0.524	12.5	8	8	1
1075-1275, 2875-2975	0.512	0.2	3168	999	1
1075-1275, 2275-2475	0.915	0.1	Very large	999	0
1075-1275, 2075-2275	0.523	0.1	Very large	999	0
1075-1275, 1875-2075	0.792	0.1	Very large	999	0
875-1075, 2675-2875	1	0.1	703	703	1
875-1075, 2475-2675	1	2.7	37	37	1

Depth 10m	R Statistic	Significance Level	Possible Permutation	Actual Permutati	Number >= Observed
875-1075, 2875-2975	0.992	0.1	2248194	999	0
875-1075, 2275-2475	0.956	0.1	6031740	999	0
875-1075, 2075-2275	0.208	21.6	171	171	37
2675-2875, 2475-2675	0.619	0.5	2262330	999	4
2675-2875, 2875-2975	0.171	6.6	8096760	999	65
2675-2875, 2275-2475	0.617	0.3	73638180	999	2
2675-2875, 2075-2275	0.817	0.2	1260	999	1
2675-2875, 1875-2075	0.357	1.1	2380	999	10
2475-2675, 2875-2975	0.494	0.1	Very large	999	0
2475-2675, 2275-2475	0.576	0.1	Very large	999	0
2475-2675, 2075-2275	0.752	0.1	504735	999	0
2475-2675, 1875-2075	0.712	0.1	119759850	999	0
2875-2975, 2275-2475	0.456	0.1	Very large	999	0
2875-2975, 2075-2275	0.412	0.1	4186080	999	0
2875-2975, 1875-2075	0.368	0.1	20058300	999	0
2275-2475, 2075-2275	0.384	0.1	Very large	999	0
2275-2475, 1875-2075	0.185	0.1	Very large	999	0
2075-2275, 1875-2075	0.361	0.1	Very large	999	0

Failed Pairwise Tests

Groups	Error
875-1075, 1875-2075	Groups too small

Table 5-28 Results of pairwise tests from 2-way ANOSIM between facies groups at 10m across all depths for species with a 4th root transformation.

TESTS FOR DIFFERENCES BETWEEN Facies GROUPS
(across all Depth groups)
Global Test
Sample statistic (Global R): 0.434
Significance level of sample statistic: 0.1%
Number of permutations: 999 (Random sample from a large number)
Number of permuted statistics greater than or equal to Global R: 0

Pairwise Tests

Facies 10m	R Statistic	Significance Level	Possible Permutation	Actual Permutati	Number >= Observed
Fine Grain, Sedimentary Bedrock	0.836	0.1	Very large	999	0
Fine Grain, Discontinuous Sedimentary Bedrock	0.308	3.8	18000	999	37
Fine Grain, Boulder	1	33.3	3	3	1
Fine Grain, Discontinuous Igneous Bedrock	-0.073	72.1	2778300	999	720
Fine Grain, Igneous Bedrock	0.072	23.4	Very large	999	233
Fine Grain, Gravelly Fine Grain	0.608	0.1	Very large	999	0
Sedimentary Bedrock, Discontinuous Sedimentary Bedrock	0.298	0.1	Very large	999	0
Sedimentary Bedrock, Discontinuous Igneous Bedrock	0.594	0.1	5920200	999	0
Sedimentary Bedrock, Igneous Bedrock	0.444	0.1	Very large	999	0
Sedimentary Bedrock, Gravelly Fine Grain	0.349	0.1	Very large	999	0
Discontinuous Sedimentary Bedrock, Discontinuous Igneous Bedrock	-0.019	42.9	77	77	33
Discontinuous Sedimentary Bedrock, Igneous Bedrock	0.35	0.2	Very large	999	1
Discontinuous Sedimentary Bedrock, Gravelly Fine Grain	0.457	0.2	Very large	999	1
Boulder, Discontinuous Igneous Bedrock	-0.16	50	6	6	3
Boulder, Igneous Bedrock	-0.417	100	5	5	5
Discontinuous Igneous Bedrock, Igneous Bedrock	0.06	22.9	Very large	999	228
Discontinuous Igneous Bedrock, Gravelly Fine Gr	0.12	25.8	864864	999	257
Igneous Bedrock, Gravelly Fine Grain	0.104	4	Very large	999	39

Failed Pairwise Tests

Groups	Error
Sedimentary Bedrock, Boulder	Groups too small
Discontinuous Sedimentary Bedrock, Boulder	Groups too small
Boulder, Gravelly Fine Grain	Groups too small

Table 5-29 Results of pairwise tests from 2-way ANOSIM between depth groups at 50m across all facies for species with a 4th root transformation.

TESTS FOR DIFFERENCES BETWEEN Depth GROUPS
(across all Facies groups)
Global Test
Sample statistic (Global R): 0.344
Significance level of sample statistic: 0.1%
Number of permutations: 999 (Random sample from a large number)
Number of permuted statistics greater than or equal to Global R: 0

Pairwise Tests

Depth 50m	R Statistic	Significance Level	Possible Permutati	Actual Permutati	Number >= Observed
1675-1875, 1475-1675	0.053	5.4	Very large	999	53
1675-1875, 1275-1475	0.276	6.8	15810795	999	67
1675-1875, 1075-1275	0.63	0.1	57513456	999	0
1675-1875, 875-1075	0.325	6.4	5720	999	63
1675-1875, 2875-2975	0.379	4	32760	999	39
1675-1875, 2675-2875	0.581	9.5	84	84	8
1675-1875, 2475-2675	0.981	0.8	126	126	1
1675-1875, 2275-2475	0.146	8.8	Very large	999	87
1675-1875, 2075-2275	0.209	4.9	Very large	999	48
1675-1875, 1875-2075	0.259	4.5	2063880	999	44
1475-1675, 1275-1475	0.081	19.9	8.79E+08	999	198
1475-1675, 1075-1275	0.649	0.1	Very large	999	0
1475-1675, 875-1075	0.488	0.1	559130	999	0
1475-1675, 2875-2975	0.469	0.1	1035	999	0
1475-1675, 2675-2875	0.571	11.1	9	9	1
1475-1675, 2275-2475	0.33	0.2	Very large	999	1
1475-1675, 2075-2275	0.378	0.2	5.19E+08	999	1
1475-1675, 1875-2075	0.448	0.2	29601	999	1
1275-1475, 1075-1275	0.376	0.1	6.81E+08	999	0
1275-1475, 875-1075	0.809	0.2	2145	999	1
1275-1475, 2875-2975	0.365	11.1	45	45	5
1275-1475, 2675-2875	0.333	20	5	5	1
1275-1475, 2275-2475	0.837	0.1	540540	999	0
1275-1475, 2075-2275	0.841	0.1	135135	999	0
1275-1475, 1875-2075	0.893	0.1	3861	999	0
1075-1275, 875-1075	0.378	0.5	5005	999	4
1075-1275, 2875-2975	0.76	3.6	28	28	1
1075-1275, 2675-2875	0.8	14.3	7	7	1
1075-1275, 2275-2475	0.937	0.1	15484392	999	0
1075-1275, 2075-2275	0.807	0.1	14536368	999	0
1075-1275, 1875-2075	0.952	0.1	131670	999	0
875-1075, 2875-2975	1	1.8	55	55	1
875-1075, 2675-2875	1	10	10	10	1
875-1075, 2275-2475	0.738	1	385	385	4
875-1075, 2075-2275	-0.12	50	6	6	3
2875-2975, 2675-2875	0.236	10.5	2205	999	104

Depth 50m	R Statistic	Significance Level	Possible Permutati	Actual Permutati	Number >= Observed
2875-2975, 2475-2675	0.401	0.2	4410	999	1
2875-2975, 2275-2475	0.529	0.1	339570	999	0
2875-2975, 2075-2275	0.34	19.4	36	36	7
2875-2975, 1875-2075	0.572	1.6	126	126	2
2675-2875, 2475-2675	0.271	5.3	525	525	28
2675-2875, 2275-2475	0.504	1.1	2940	999	10
2675-2875, 2075-2275	-0.5	100	3	3	3
2675-2875, 1875-2075	0.618	9.5	21	21	2
2475-2675, 2275-2475	0.655	0.1	7350	999	0
2475-2675, 2075-2275	0.333	20	5	5	1
2475-2675, 1875-2075	0.919	0.8	126	126	1
2275-2475, 2075-2275	0.244	0.8	71717184	999	7
2275-2475, 1875-2075	0.215	2.3	6112260	999	22
2075-2275, 1875-2075	0.293	1	5987520	999	9

Failed Pairwise Tests

Groups	Error
1475-1675, 2475-2675	Groups too small
1275-1475, 2475-2675	Groups too small
1075-1275, 2475-2675	Groups too small
875-1075, 2475-2675	Groups too small
875-1075, 1875-2075	Groups too small

Table 5-30 Results of pairwise tests from 2-way ANOSIM between facies groups at 50m across all depths for species with a 4th root transformation.

TESTS FOR DIFFERENCES BETWEEN Facies GROUPS
(across all Depth groups)
Global Test
Sample statistic (Global R): 0.491
Significance level of sample statistic: 0.1%
Number of permutations: 999 (Random sample from a large number)
Number of permuted statistics greater than or equal to Global R: 0

Pairwise Tests

Facies 50m	R Statistic	Significance Level	Possible Permutati	Actual Permutati	Number >= Observed
Fine Grain, Discontinuous Sedimentary Bedrock	0.531	9.5	84	84	8
Fine Grain, Sedimentary Bedrock	0.823	0.1	Very large	999	0
Fine Grain, Igneous Bedrock	0.156	15.5	98784	999	154
Fine Grain, Discontinuous Igneous Bedrock	0.081	31.1	1125	999	310
Fine Grain, Gravelly Fine Grain	0.669	0.1	Very large	999	0
Discontinuous Sedimentary Bedrock, Sedimentary Bedrock	0.077	22.5	4.9E+08	999	224
Discontinuous Sedimentary Bedrock, Igneous Bedrock	0.436	0.7	148176	999	6
Discontinuous Sedimentary Bedrock, Discontinuous Igneous Bedrock	0.214	26.7	15	15	4
Discontinuous Sedimentary Bedrock, Gravelly Fine Grain	0.518	0.6	1681680	999	5
Discontinuous Sedimentary Bedrock, Igneous/Sedimentary	1	20	5	5	1
Sedimentary Bedrock, Igneous Bedrock	0.662	0.1	58677696	999	0
Sedimentary Bedrock, Discontinuous Igneous Bedrock	0.456	1.6	126	126	2
Sedimentary Bedrock, Gravelly Fine Grain	0.412	0.1	Very large	999	0
Sedimentary Bedrock, Igneous/Sedimentary	1	16.7	6	6	1
Igneous Bedrock, Discontinuous Igneous Bedrock	-0.002	48.6	13891500	999	485
Igneous Bedrock, Gravelly Fine Grain	0.135	10.8	Very large	999	107
Igneous Bedrock, Igneous/Sedimentary	0.9	16.7	6	6	1
Discontinuous Igneous Bedrock, Gravelly Fine Grain	0.05	33.4	1050	999	333

Failed Pairwise Tests

Groups	Error
Fine Grain, Igneous/Sedimentary	Groups too small
Discontinuous Igneous Bedrock, Igneous/Sedimentary	Groups too small
Gravelly Fine Grain, Igneous/Sedimentary	Groups too small

Table 5-31 Results of pairwise tests from 2-way ANOSIM between depth groups at 100m across all facies for species with a 4th root transformation.

TESTS FOR DIFFERENCES BETWEEN Depth GROUPS
(across all Facies groups)
Global Test
Sample statistic (Global R): 0.362
Significance level of sample statistic: 0.1%
Number of permutations: 999 (Random sample from a large number)
Number of permuted statistics greater than or equal to Global R: 0

Pairwise Tests

Depth 100m	R Statistic	Significance Level	Possible Permutati	Actual Permutati	Number >= Observed
1475-1675, 1275-1475	-0.038	49.7	350	350	174
1475-1675, 1675-1875	0.07	10.4	4.73E+08	999	103
1475-1675, 1075-1275	0.626	0.1	300300	999	0
1475-1675, 875-1075	0.635	0.3	672	672	2
1475-1675, 2875-2975	0.695	2.1	48	48	1
1475-1675, 2675-2875	1	25	4	4	1
1475-1675, 2275-2475	0.533	0.1	611520	999	0
1475-1675, 2075-2275	0.451	3.6	1170	999	35
1475-1675, 1875-2075	0.533	1.1	180	180	2
1275-1475, 1675-1875	-0.216	85	120	120	102
1275-1475, 1075-1275	0.138	25	3300	999	249
1275-1475, 875-1075	0.709	4.8	21	21	1
1275-1475, 2875-2975	-0.5	100	3	3	3
1275-1475, 2675-2875	0	100	3	3	3
1275-1475, 2275-2475	0.578	3.8	105	105	4
1275-1475, 2075-2275	0.944	1.7	60	60	1
1275-1475, 1875-2075	1	3.3	30	30	1
1675-1875, 1075-1275	0.555	0.6	42900	999	5
1675-1875, 875-1075	0.173	14.7	273	273	40
1675-1875, 2875-2975	0.4	8.5	390	390	33
1675-1875, 2675-2875	0	100	3	3	3
1675-1875, 2475-2675	1	33.3	3	3	1
1675-1875, 2275-2475	0.154	10	13644540	999	99
1675-1875, 2075-2275	0.07	22.3	50960	999	222
1675-1875, 1875-2075	0.015	22.3	13000	999	222
1075-1275, 875-1075	0.269	9.5	126	126	12
1075-1275, 2875-2975	0.917	20	5	5	1
1075-1275, 2675-2875	1	20	5	5	1
1075-1275, 2275-2475	0.911	0.1	21450	999	0
1075-1275, 2075-2275	0.912	0.6	165	165	1
1075-1275, 1875-2075	0.961	1.8	55	55	1
875-1075, 2875-2975	1	16.7	6	6	1
875-1075, 2675-2875	1	16.7	6	6	1
875-1075, 2275-2475	0.46	11.1	36	36	4
875-1075, 2075-2275	-0.5	100	3	3	3
2875-2975, 2675-2875	0.333	50	4	4	2

Depth 100m	R Statistic	Significance Level	Possible Permutati	Actual Permutati	Number >= Observed
2875-2975, 2475-2675	0.417	10	10	10	1
2875-2975, 2275-2475	0.699	0.3	1008	999	2
2875-2975, 2075-2275	1	33.3	3	3	1
2875-2975, 1875-2075	0.685	10	10	10	1
2675-2875, 2475-2675	0.333	50	4	4	2
2675-2875, 2275-2475	0.292	20	10	10	2
2475-2675, 2275-2475	0.727	4.8	63	63	3
2475-2675, 1875-2075	0.625	10	10	10	1
2275-2475, 2075-2275	0.049	38.4	315	315	121
2275-2475, 1875-2075	0.011	44.7	5040	999	446
2075-2275, 1875-2075	-0.257	87.3	189	189	165

Failed Pairwise Tests

Groups	Error
1475-1675, 2475-2675	Groups too small
1275-1475, 2475-2675	Groups too small
1075-1275, 2475-2675	Groups too small
875-1075, 2475-2675	Groups too small
875-1075, 1875-2075	Groups too small
2675-2875, 2075-2275	Groups too small
2675-2875, 1875-2075	Groups too small
2475-2675, 2075-2275	Groups too small

Table 5-32 Results of pairwise tests from 2-way ANOSIM between facies groups at 100m across all depths for species with a 4th root transformation.

TESTS FOR DIFFERENCES BETWEEN Facies GROUPS
(across all Depth groups)
Global Test
Sample statistic (Global R): 0.442
Significance level of sample statistic: 0.1%
Number of permutations: 999 (Random sample from a large number)
Number of permuted statistics greater than or equal to Global R: 0

Pairwise Tests

Facies 100m	R Statistic	Significance Level	Possible Permutati	Actual Permutati	Number >= Observed
Fine Grain, Sedimentary Bedrock	0.846	0.1	12512500	999	0
Fine Grain, Discontinuous Sedimentary Bedrock	-0.563	96.7	30	30	29
Fine Grain, Gravelly Fine Grain	0.604	0.2	5962320	999	1
Fine Grain, Discontinuous Igneous Bedrock	0.013	66.7	12	12	8
Fine Grain, Igneous Bedrock	0.182	34.7	72	72	25
Sedimentary Bedrock, Discontinuous Sedimentary Bedrock	0.003	47.6	2520	999	475
Sedimentary Bedrock, Gravelly Fine Grain	0.406	0.1	Very large	999	0
Sedimentary Bedrock, Discontinuous Igneous Bedrock	0.286	20	15	15	3
Sedimentary Bedrock, Igneous Bedrock	0.515	0.5	12600	999	4
Sedimentary Bedrock, Igneous/Sedimentary	1	33.3	3	3	1
Discontinuous Sedimentary Bedrock, Gravelly Fine Grain	0.189	8.8	28665	999	87
Discontinuous Sedimentary Bedrock, Igneous Bedrock	-0.021	49	100	100	49
Discontinuous Sedimentary Bedrock, Igneous/Sedimentary	1	33.3	3	3	1
Gravelly Fine Grain, Discontinuous Igneous Bedrock	0.055	33.3	21	21	7
Gravelly Fine Grain, Igneous Bedrock	0.111	19.3	183456	999	192
Discontinuous Igneous Bedrock, Igneous Bedrock	0.14	32.5	252	252	82
Igneous Bedrock, Igneous/Sedimentary	-0.556	100	4	4	4

Failed Pairwise Tests

Groups	Error
Fine Grain, Igneous/Sedimentary	Groups too small
Discontinuous Sedimentary Bedrock, Discontinuous Igneo	Groups too small
Gravelly Fine Grain, Igneous/Sedimentary	Groups too small
Discontinuous Igneous Bedrock, Igneous/Sedimentary	Groups too small

Table 5-33 Results of pairwise tests from 2-way ANOSIM between depth groups at 500m across all facies for species with a 4th root transformation.

TESTS FOR DIFFERENCES BETWEEN Depth GROUPS
(across all Facies groups)
Global Test
Sample statistic (Global R): 0.077
Significance level of sample statistic: 36.8%
Number of permutations: 999 (Random sample from 1984500)
Number of permuted statistics greater than or equal to Global R: 367

Pairwise Tests

Depth 500m	R Statistic	Significance Level	Possible Permutati	Actual Permutati	Number >= Observed
1675-1875, 1475-1675	-0.099	66.7	27	27	18
1675-1875, 1075-1275	-0.326	77.8	9	9	7
1675-1875, 2275-2475	0	66.7	9	9	6
1675-1875, 2075-2275	0	66.7	3	3	2
1675-1875, 875-1075	1	33.3	3	3	1
1675-1875, 1275-1475	0	66.7	3	3	2
1675-1875, 1875-2075	0	66.7	3	3	2
1475-1675, 1075-1275	-0.5	88.9	9	9	8
1475-1675, 2275-2475	0.5	33.3	9	9	3
1475-1675, 2075-2275	1	33.3	3	3	1
1475-1675, 875-1075	1	33.3	3	3	1
1475-1675, 1275-1475	0	66.7	3	3	2
1475-1675, 1875-2075	-1	100	3	3	3
2875-2975, 2675-2875	1	33.3	3	3	1
2875-2975, 2475-2675	1	33.3	3	3	1

Failed Pairwise Tests

Groups	Error
1675-1875, 2875-2975	Groups too small
1675-1875, 2675-2875	Groups too small
1675-1875, 2475-2675	Groups too small
1475-1675, 2875-2975	Groups too small
1475-1675, 2675-2875	Groups too small
1475-1675, 2475-2675	Groups too small
1075-1275, 2875-2975	Groups too small
1075-1275, 2675-2875	Groups too small
1075-1275, 2475-2675	Groups too small
1075-1275, 2275-2475	Groups too small
1075-1275, 2075-2275	Groups too small
1075-1275, 875-1075	Groups too small
1075-1275, 1275-1475	Groups too small
1075-1275, 1875-2075	Groups too small
2875-2975, 2275-2475	Groups too small
2875-2975, 2075-2275	Groups too small
2875-2975, 875-1075	Groups too small
2875-2975, 1275-1475	Groups too small

Failed Pairwise Tests	
Groups	Error
2875-2975, 1875-2075	Groups too small
2675-2875, 2475-2675	Groups too small
2675-2875, 2275-2475	Groups too small
2675-2875, 2075-2275	Groups too small
2675-2875, 875-1075	Groups too small
2675-2875, 1275-1475	Groups too small
2675-2875, 1875-2075	Groups too small
2475-2675, 2275-2475	Groups too small
2475-2675, 2075-2275	Groups too small
2475-2675, 875-1075	Groups too small
2475-2675, 1275-1475	Groups too small
2475-2675, 1875-2075	Groups too small
2275-2475, 2075-2275	Groups too small
2275-2475, 875-1075	Groups too small
2275-2475, 1275-1475	Groups too small
2275-2475, 1875-2075	Groups too small
2075-2275, 875-1075	Groups too small
2075-2275, 1275-1475	Groups too small
2075-2275, 1875-2075	Groups too small
875-1075, 1275-1475	Groups too small
875-1075, 1875-2075	Groups too small
1275-1475, 1875-2075	Groups too small

Table 5-34 Results of pairwise tests from 2-way ANOSIM between facies groups at 500m across all depths for species with a 4th root transformation.

TESTS FOR DIFFERENCES BETWEEN Facies GROUPS
(across all Depth groups)
Global Test
Sample statistic (Global R): 0.249
Significance level of sample statistic: 16.5%
Number of permutations: 999 (Random sample from 28350)
Number of permuted statistics greater than or equal to Global R: 164

Pairwise Tests

Facies 500m	R Statistic	Significance Level %	Possible Permutations	Actual Permutati	Number >= Observed
Discontinuous Sedimentary Bedrock, Fine Grain	0.258	33.3	27	27	9
Discontinuous Sedimentary Bedrock, Gravelly Fine Grain	0.25	22.2	9	9	2
Discontinuous Sedimentary Bedrock, Sedimentary Bedrock	0	66.7	9	9	6
Fine Grain, Gravelly Fine Grain	0.837	11.1	9	9	1
Fine Grain, Sedimentary Bedrock	1	11.1	9	9	1
Gravelly Fine Grain, Sedimentary Bedrock	-0.5	88.9	9	9	8

Failed Pairwise Tests

Groups	Error
Discontinuous Sedimentary Bedrock, Discontinuous Igneous Bedrock	Groups too small
Discontinuous Sedimentary Bedrock, Igneous Bedr	Groups too small
Discontinuous Sedimentary Bedrock, Igneous/Sedi	Groups too small
Fine Grain, Discontinuous Igneous Bedrock	Groups too small
Fine Grain, Igneous Bedrock	Groups too small
Fine Grain, Igneous/Sedimentary	Groups too small
Discontinuous Igneous Bedrock, Igneous Bedrock	Groups too small
Discontinuous Igneous Bedrock, Igneous/Sedimen	Groups too small
Discontinuous Igneous Bedrock, Gravelly Fine Grai	Groups too small
Discontinuous Igneous Bedrock, Sedimentary Bedr	Groups too small
Igneous Bedrock, Igneous/Sedimentary	Groups too small
Igneous Bedrock, Gravelly Fine Grain	Groups too small
Igneous Bedrock, Sedimentary Bedrock	Groups too small
Igneous/Sedimentary, Gravelly Fine Grain	Groups too small
Igneous/Sedimentary, Sedimentary Bedrock	Groups too small

Table 5-35 Results of pairwise tests from 2-way ANOSIM between depth groups at 1000m across all facies for species with a 4th root transformation.

TESTS FOR DIFFERENCES BETWEEN Depth GROUPS
(across all Facies groups)
Global Test
Sample statistic (Global R): -0.2
Significance level of sample statistic: 72.2%
Number of permutations: 36 (All possible permutations)
Number of permuted statistics greater than or equal to Global R: 26

Pairwise Tests

Depth 1000m	R Statistic	Significance Level %	Possible Permutations	Actual Permutati	Number >= Observed
1675-1875, 1475-1675	0	66.7	3	3	2
1675-1875, 1075-1275	-1	100	3	3	3
1675-1875, 2275-2475	0	66.7	3	3	2
1675-1875, 1875-2075	0	66.7	3	3	2

Failed Pairwise Tests

Groups	Error
1675-1875, 2875-2975	Groups too small
1675-1875, 2675-2875	Groups too small
1675-1875, 1275-1475	Groups too small
1475-1675, 1075-1275	Groups too small
1475-1675, 2875-2975	Groups too small
1475-1675, 2675-2875	Groups too small
1475-1675, 2275-2475	Groups too small
1475-1675, 1275-1475	Groups too small
1475-1675, 1875-2075	Groups too small
1075-1275, 2875-2975	Groups too small
1075-1275, 2675-2875	Groups too small
1075-1275, 2275-2475	Groups too small
1075-1275, 1275-1475	Groups too small
1075-1275, 1875-2075	Groups too small
2875-2975, 2675-2875	Groups too small
2875-2975, 2275-2475	Groups too small
2875-2975, 1275-1475	Groups too small
2875-2975, 1875-2075	Groups too small
2675-2875, 2275-2475	Groups too small
2675-2875, 1275-1475	Groups too small
2675-2875, 1875-2075	Groups too small
2275-2475, 1275-1475	Groups too small
2275-2475, 1875-2075	Groups too small
1275-1475, 1875-2075	Groups too small

Table 5-36 Results of pairwise tests from 2-way ANOSIM between facies groups at 1000m across all depths for species with a 4th root transformation.

TESTS FOR DIFFERENCES BETWEEN Facies GROUPS
(across all Depth groups)
Global Test
Sample statistic (Global R): 0.5
Significance level of sample statistic: 20%
Number of permutations: 15 (All possible permutations)
Number of permuted statistics greater than or equal to Global R: 3

Pairwise Tests

Facies 1000m	R Statistic	Significance Level %	Possible Permutations	Actual Permutati	Number >= Observed
Fine Grain, Igneous/Sedimentary*	1	33.3	3	3	1
Fine Grain, Discontinuous Sedimentary Bedrock	0.75	33.3	3	3	1
Igneous/Sedimentary*, Discontinuous Sedimentary Bedrock	0	66.7	3	3	2

Failed Pairwise Tests

Groups	Error
Fine Grain, Discontinuous Igneous Bedrock	Groups too small
Fine Grain, Igneous Bedrock	Groups too small
Fine Grain, Sedimentary Bedrock	Groups too small
Fine Grain, Gravelly Fine Grain	Groups too small
Discontinuous Igneous Bedrock, Igneous Bedrock	Groups too small
Discontinuous Igneous Bedrock, Igneous/Sedimentary*	Groups too small
Discontinuous Igneous Bedrock, Discontinuous Sedimentary Bedrock	Groups too small
Discontinuous Igneous Bedrock, Sedimentary Bedrock	Groups too small
Discontinuous Igneous Bedrock, Gravelly Fine Grain	Groups too small
Igneous Bedrock, Igneous/Sedimentary*	Groups too small

5.2.4 Species abundance data presence/absence transformed

Table 5-37 Results of pairwise tests from 2-way ANOSIM between depth groups across all attachment grain sizes for species with a presence/absence.

TESTS FOR DIFFERENCES BETWEEN Depth GROUPS
(across all Grain groups)
Global Test
Sample statistic (Global R): 0.322
Significance level of sample statistic: 0.1%
Number of permutations: 999 (Random sample from a large number)
Number of permuted statistics greater than or equal to Global R: 0

Pairwise Tests

Depth Grain	R Statistic	Significan ce Level	Possible Permutati	Actual Permutati	Number >=
<875, 1075-1275	0.953	0.6	1968	999	5
<875, 1275-1475	0.528	10.2	25205	999	101
<875, 1475-1675	0.559	8	3328	999	79
<875, 1675-1875	0.518	0.4	464256	999	3
<875, 1875-2075	0.666	0.3	110490	999	2
<875, 2075-2275	0.475	0.4	30008	999	3
<875, 2275-2475	0.531	1.3	13920	999	12
<875, 2475-2675	-0.111	100	131	131	131
<875, 2675-2875	-0.216	100	43	43	43
<875, 2875-2975	-0.046	60.9	138	138	84
<875, 875-1075	0.929	2	152	152	3
1075-1275, 1275-1475	0.54	0.1	Very large	999	0
1075-1275, 1475-1675	0.247	0.1	Very large	999	0
1075-1275, 1675-1875	0.483	0.1	Very large	999	0
1075-1275, 1875-2075	-0.004	68	Very large	999	679
1075-1275, 2075-2275	0.142	0.1	Very large	999	0
1075-1275, 2275-2475	0.618	0.1	Very large	999	0
1075-1275, 2475-2675	0.985	0.1	9657648	999	0
1075-1275, 2675-2875	0.914	0.5	756	756	4
1075-1275, 2875-2975	0.704	0.1	Very large	999	0
1075-1275, 875-1075	0.199	0.1	Very large	999	0
1275-1475, 1475-1675	0.385	0.1	Very large	999	0
1275-1475, 1675-1875	0.286	0.1	Very large	999	0
1275-1475, 1875-2075	0.124	0.8	Very large	999	7
1275-1475, 2075-2275	0.693	0.1	Very large	999	0
1275-1475, 2275-2475	0.613	0.1	Very large	999	0
1275-1475, 2475-2675	0.902	0.1	575757	999	0
1275-1475, 2675-2875	0.777	0.2	12425	999	1
1275-1475, 2875-2975	0.65	0.1	Very large	999	0
1275-1475, 875-1075	0.735	0.1	Very large	999	0
1475-1675, 1675-1875	0.041	0.1	Very large	999	0
1475-1675, 1875-2075	0.178	0.1	Very large	999	0
1475-1675, 2075-2275	0.005	42.4	Very large	999	423
1475-1675, 2275-2475	0.46	0.1	Very large	999	0
1475-1675, 2475-2675	0.8	0.1	4.81E+08	999	0
1475-1675, 2675-2875	0.793	0.3	2240	999	2

Depth Grain	R Statistic	Significance Level	Possible Permutati	Actual Permutati	Number >=
1475-1675, 2875-2975	0.672	0.1	Very large	999	0
1475-1675, 875-1075	0.728	0.1	Very large	999	0
1675-1875, 1875-2075	0.379	0.1	Very large	999	0
1675-1875, 2075-2275	0.103	0.7	Very large	999	6
1675-1875, 2275-2475	0.465	0.1	Very large	999	0
1675-1875, 2475-2675	0.803	0.1	Very large	999	0
1675-1875, 2675-2875	0.567	0.1	Very large	999	0
1675-1875, 2875-2975	0.667	0.1	Very large	999	0
1675-1875, 875-1075	0.911	0.1	Very large	999	0
1875-2075, 2075-2275	0.097	0.3	Very large	999	2
1875-2075, 2275-2475	0.455	0.1	Very large	999	0
1875-2075, 2475-2675	0.804	0.1	Very large	999	0
1875-2075, 2675-2875	0.504	0.1	Very large	999	0
1875-2075, 2875-2975	0.723	0.1	Very large	999	0
1875-2075, 875-1075	0.101	0.2	Very large	999	1
2075-2275, 2275-2475	0.417	0.1	Very large	999	0
2075-2275, 2475-2675	0.618	0.1	Very large	999	0
2075-2275, 2675-2875	0.287	0.1	Very large	999	0
2075-2275, 2875-2975	0.276	0.1	Very large	999	0
2075-2275, 875-1075	0.373	0.1	Very large	999	0
2275-2475, 2475-2675	0.298	0.1	Very large	999	0
2275-2475, 2675-2875	0.069	1.6	Very large	999	15
2275-2475, 2875-2975	0.129	0.1	Very large	999	0
2275-2475, 875-1075	0.902	0.1	Very large	999	0
2475-2675, 2675-2875	0.218	0.1	Very large	999	0
2475-2675, 2875-2975	0.45	0.1	Very large	999	0
2475-2675, 875-1075	0.951	0.1	1712304	999	0
2675-2875, 2875-2975	0.114	0.1	Very large	999	0
2675-2875, 875-1075	0.939	0.1	6688	999	0
2875-2975, 875-1075	0.911	0.1	Very large	999	0

Table 5-38 Results of pairwise tests from 2-way ANOSIM between attachment grain size clasts across all depths for species with a presence/absence.

TESTS FOR DIFFERENCES BETWEEN Grain GROUPS
(across all Depth groups)
Global Test
Sample statistic (Global R): 0.394
Significance level of sample statistic: 0.1%
Number of permutations: 999 (Random sample from a large number)
Number of permuted statistics greater than or equal to Global R: 0

Pairwise Tests

Facies Grain	R Statistic	Significance Level	Possible Permutati	Actual Permutati	Number >=
Br-SD, Br-IG	0.348	0.1	Very large	999	0
Br-SD, Fg	0.422	0.1	Very large	999	0
Br-SD, Bl	0.025	0.5	Very large	999	4
Br-SD, G	0.275	0.1	Very large	999	0
Br-SD, HS	0.701	0.1	Very large	999	0
Br-IG, Fg	0.502	0.1	Very large	999	0
Br-IG, Bl	0.365	0.1	Very large	999	0
Br-IG, G	0.47	0.1	Very large	999	0
Br-IG, HS	0.852	0.1	Very large	999	0
Fg, Bl	0.617	0.1	Very large	999	0
Fg, G	0.713	0.1	Very large	999	0
Fg, HS	0.291	0.1	Very large	999	0
Bl, G	0.059	0.1	Very large	999	0
Bl, HS	0.85	0.1	Very large	999	0
G, HS	0.947	0.1	Very large	999	0

Table 5-39 Results of pairwise tests from 2-way ANOSIM between depth groups at 10m across all facies for species with a presence/absence.

TESTS FOR DIFFERENCES BETWEEN Depth GROUPS
(across all Facies groups)
Global Test
Sample statistic (Global R): 0.264
Significance level of sample statistic: 0.1%
Number of permutations: 999 (Random sample from a large number)
Number of permuted statistics greater than or equal to Global R: 0

Pairwise Tests

Depth 10m	R Statistic	Significance Level	Possible Permutati	Actual Permutati	Number >=
1475-1675, 1675-1875	0.014	4.3	Very large	999	42
1475-1675, 1275-1475	0.305	0.1	Very large	999	0
1475-1675, 1075-1275	0.633	0.1	Very large	999	0
1475-1675, 875-1075	0.442	0.1	Very large	999	0
1475-1675, 2675-2875	0.432	7.3	55	55	4
1475-1675, 2475-2675	0.417	40	10	10	4
1475-1675, 2875-2975	0.004	31	216216	999	309
1475-1675, 2275-2475	0.067	11.9	Very large	999	118
1475-1675, 2075-2275	0.138	0.6	Very large	999	5
1475-1675, 1875-2075	0.58	0.1	Very large	999	0
1675-1875, 1275-1475	0.339	0.1	Very large	999	0
1675-1875, 1075-1275	0.514	0.1	Very large	999	0
1675-1875, 875-1075	0.2	4.9	242535	999	48
1675-1875, 2675-2875	0.791	0.1	5460	999	0
1675-1875, 2475-2675	0.857	0.1	51895935	999	0
1675-1875, 2875-2975	0.19	5.9	Very large	999	58
1675-1875, 2275-2475	0.039	21.7	Very large	999	216
1675-1875, 2075-2275	0.091	3.2	Very large	999	31
1675-1875, 1875-2075	0.293	0.1	Very large	999	0
1275-1475, 1075-1275	0.307	0.1	Very large	999	0
1275-1475, 875-1075	0.967	0.1	78686790	999	0
1275-1475, 2675-2875	0.25	7.1	28	28	2
1275-1475, 2475-2675	0.2	28.6	7	7	2
1275-1475, 2875-2975	0.385	0.5	2310	999	4
1275-1475, 2275-2475	0.442	0.1	Very large	999	0
1275-1475, 2075-2275	0.333	0.1	Very large	999	0
1275-1475, 1875-2075	0.385	0.1	Very large	999	0
1075-1275, 875-1075	0.371	0.7	Very large	999	6
1075-1275, 2675-2875	0.414	4.4	45	45	2
1075-1275, 2475-2675	0.393	22.2	9	9	2
1075-1275, 2875-2975	0.421	0.1	5148	999	0
1075-1275, 2275-2475	0.763	0.1	Very large	999	0
1075-1275, 2075-2275	0.285	0.1	Very large	999	0
1075-1275, 1875-2075	0.638	0.1	Very large	999	0
875-1075, 2675-2875	1	0.1	703	703	1
875-1075, 2475-2675	1	2.7	37	37	1

Depth 10m	R Statistic	Significance Level	Possible Permutati	Actual Permutati	Number >=
875-1075, 2875-2975	0.992	0.1	2248194	999	0
875-1075, 2275-2475	0.951	0.1	6031740	999	0
875-1075, 2075-2275	0.121	40.9	171	171	70
2675-2875, 2475-2675	0.662	0.1	2262330	999	0
2675-2875, 2875-2975	0.138	7.8	8096760	999	77
2675-2875, 2275-2475	0.608	0.3	73638180	999	2
2675-2875, 2075-2275	0.772	0.3	1260	999	2
2675-2875, 1875-2075	0.354	0.6	2380	999	5
2475-2675, 2875-2975	0.462	0.1	Very large	999	0
2475-2675, 2275-2475	0.524	0.1	Very large	999	0
2475-2675, 2075-2275	0.699	0.1	504735	999	0
2475-2675, 1875-2075	0.707	0.1	1.2E+08	999	0
2875-2975, 2275-2475	0.457	0.1	Very large	999	0
2875-2975, 2075-2275	0.393	0.2	4186080	999	1
2875-2975, 1875-2075	0.364	0.1	20058300	999	0
2275-2475, 2075-2275	0.316	0.1	Very large	999	0
2275-2475, 1875-2075	0.125	0.1	Very large	999	0
2075-2275, 1875-2075	0.336	0.1	Very large	999	0

Failed Pairwise Tests

Groups	Error
875-1075, 1875-2075	Groups too small

Table 5-40 Results of pairwise tests from 2-way ANOSIM between facies groups at 10m across all depths for species with a presence/absence.

TESTS FOR DIFFERENCES BETWEEN Facies GROUPS
(across all Depth groups)
Global Test
Sample statistic (Global R): 0.4
Significance level of sample statistic: 0.1%
Number of permutations: 999 (Random sample from a large number)
Number of permuted statistics greater than or equal to Global R: 0
Pairwise Tests

Facies 10m	R Statistic	Significance Level	Possible Permutatio	Actual Permutati	Number >=
Fine Grain, Sedimentary Bedrock	0.804	0.1	Very large	999	0
Fine Grain, Discontinuous Sedimentary Bedrock	0.199	11.9	37800	999	118
Fine Grain, Boulder	1	33.3	3	3	1
Fine Grain, Discontinuous Igneous Bedrock	-0.086	76.3	2778300	999	762
Fine Grain, Igneous Bedrock	0.076	23.6	Very large	999	235
Fine Grain, Gravelly Fine Grain	0.6	0.1	Very large	999	0
Sedimentary Bedrock, Discontinuous Sedimentary Bedrock	0.196	0.7	Very large	999	6
Sedimentary Bedrock, Discontinuous Igneous Bedrock	0.567	0.1	5920200	999	0
Sedimentary Bedrock, Igneous Bedrock	0.39	0.1	Very large	999	0
Sedimentary Bedrock, Gravelly Fine Grain	0.324	0.1	Very large	999	0
Discontinuous Sedimentary Bedrock, Discontinuous Igneous Bedrock	0.067	32.5	77	77	25
Discontinuous Sedimentary Bedrock, Igneous Bedrock	0.359	0.1	Very large	999	0
Discontinuous Sedimentary Bedrock, Gravelly Fine Grain	0.465	0.1	Very large	999	0
Boulder, Discontinuous Igneous Bedrock	-0.06	66.7	6	6	4
Boulder, Igneous Bedrock	-0.5	100	5	5	5
Discontinuous Igneous Bedrock, Igneous Bedrock	0.059	22.7	Very large	999	226
Discontinuous Igneous Bedrock, Gravelly Fine Grain	0.116	25	864864	999	249
Igneous Bedrock, Gravelly Fine Grain	0.007	40.2	Very large	999	401

Failed Pairwise Tests

Groups	Error
Sedimentary Bedrock, Boulder	Groups too small
Discontinuous Sedimentary Bedrock, Boulder	Groups too small
Boulder, Gravelly Fine Grain	Groups too small

Table 5-41 Results of pairwise tests from 2-way ANOSIM between depth groups at 50m across all facies for species with a presence/absence.

TESTS FOR DIFFERENCES BETWEEN Depth GROUPS
(across all Facies groups)
Global Test
Sample statistic (Global R): 0.279
Significance level of sample statistic: 0.1%
Number of permutations: 999 (Random sample from a large number)
Number of permuted statistics greater than or equal to Global R: 0

Pairwise Tests

Depth 50m	R Statistic	Significance Level	Possible Permutati	Actual Permutati	Number >=
1675-1875, 1475-1675	0.05	5.8	Very large	999	57
1675-1875, 1275-1475	0.407	3.2	15810795	999	31
1675-1875, 1075-1275	0.585	0.1	57513456	999	0
1675-1875, 875-1075	0.351	6	5720	999	59
1675-1875, 2875-2975	0.24	7	32760	999	69
1675-1875, 2675-2875	0.544	9.5	84	84	8
1675-1875, 2475-2675	0.897	0.8	126	126	1
1675-1875, 2275-2475	0.062	28.1	Very large	999	280
1675-1875, 2075-2275	0.08	24.3	Very large	999	242
1675-1875, 1875-2075	0.018	38.8	2063880	999	387
1475-1675, 1275-1475	0.249	6.7	8.79E+08	999	66
1475-1675, 1075-1275	0.508	0.1	Very large	999	0
1475-1675, 875-1075	0.449	0.2	559130	999	1
1475-1675, 2875-2975	0.329	9.9	1035	999	98
1475-1675, 2675-2875	0.571	11.1	9	9	1
1475-1675, 2275-2475	0.167	7.5	Very large	999	74
1475-1675, 2075-2275	0.202	10.9	5.19E+08	999	108
1475-1675, 1875-2075	0.184	25.6	29601	999	255
1275-1475, 1075-1275	0.188	2.9	6.81E+08	999	28
1275-1475, 875-1075	0.736	0.3	2145	999	2
1275-1475, 2875-2975	0.365	11.1	45	45	5
1275-1475, 2675-2875	0.333	20	5	5	1
1275-1475, 2275-2475	0.827	0.1	540540	999	0
1275-1475, 2075-2275	0.862	0.1	135135	999	0
1275-1475, 1875-2075	0.921	0.1	3861	999	0
1075-1275, 875-1075	0.21	5.6	5005	999	55
1075-1275, 2875-2975	0.745	3.6	28	28	1
1075-1275, 2675-2875	0.8	14.3	7	7	1
1075-1275, 2275-2475	0.824	0.1	15484392	999	0
1075-1275, 2075-2275	0.711	0.1	14536368	999	0
1075-1275, 1875-2075	0.732	0.1	131670	999	0
875-1075, 2875-2975	1	1.8	55	55	1
875-1075, 2675-2875	1	10	10	10	1
875-1075, 2275-2475	0.83	1	385	385	4
875-1075, 2075-2275	-0.08	50	6	6	3
2875-2975, 2675-2875	0.209	12.7	2205	999	126

Depth 50m	R Statistic	Significance Level	Possible Permutati	Actual Permutati	Number >=
2875-2975, 2475-2675	0.302	2.1	4410	999	20
2875-2975, 2275-2475	0.5	0.1	339570	999	0
2875-2975, 2075-2275	0.27	25	36	36	9
2875-2975, 1875-2075	0.554	2.4	126	126	3
2675-2875, 2475-2675	0.228	11.8	525	525	62
2675-2875, 2275-2475	0.456	1	2940	999	9
2675-2875, 2075-2275	-0.5	100	3	3	3
2675-2875, 1875-2075	0.6	9.5	21	21	2
2475-2675, 2275-2475	0.422	0.3	7350	999	2
2475-2675, 2075-2275	-0.5	100	5	5	5
2475-2675, 1875-2075	0.838	0.8	126	126	1
2275-2475, 2075-2275	0.143	5.3	71717184	999	52
2275-2475, 1875-2075	0.13	8.3	6112260	999	82
2075-2275, 1875-2075	0.249	2.3	5987520	999	22

Failed Pairwise Tests

Groups	Error
1475-1675, 2475-2675	Groups too small
1275-1475, 2475-2675	Groups too small
1075-1275, 2475-2675	Groups too small
875-1075, 2475-2675	Groups too small
875-1075, 1875-2075	Groups too small

Table 5-42 Results of pairwise tests from 2-way ANOSIM between facies groups at 50m across all depths for species with a presence/absence.

TESTS FOR DIFFERENCES BETWEEN Facies GROUPS
(across all Depth groups)
Global Test
Sample statistic (Global R): 0.48
Significance level of sample statistic: 0.1%
Number of permutations: 999 (Random sample from a large number)
Number of permuted statistics greater than or equal to Global R: 0
Pairwise Tests

Facies 50m	R Statistic	Significance Level	Possible Permutati	Actual Permutati	Number >=
Fine Grain, Discontinuous Sedimentary Bedrock	0.474	9.5	84	84	8
Fine Grain, Sedimentary Bedrock	0.816	0.1	Very large	999	0
Fine Grain, Igneous Bedrock	0.172	14.8	98784	999	147
Fine Grain, Discontinuous Igneous Bedrock	0.105	29.2	1125	999	291
Fine Grain, Gravelly Fine Grain	0.662	0.1	Very large	999	0
Discontinuous Sedimentary Bedrock, Sedimentary Bedrock	0.042	32	4.9E+08	999	319
Discontinuous Sedimentary Bedrock, Igneous Bedrock	0.318	2.7	148176	999	26
Discontinuous Sedimentary Bedrock, Discontinuous Igneous Bedrock	0.107	46.7	15	15	7
Discontinuous Sedimentary Bedrock, Gravelly Fine Grain	0.458	3.7	1681680	999	36
Discontinuous Sedimentary Bedrock, Igneous/Sedimentary	1	20	5	5	1
Sedimentary Bedrock, Igneous Bedrock	0.644	0.1	58677696	999	0
Sedimentary Bedrock, Discontinuous Igneous Bedrock	0.481	1.6	126	126	2
Sedimentary Bedrock, Gravelly Fine Grain	0.432	0.1	Very large	999	0
Sedimentary Bedrock, Igneous/Sedimentary	1	16.7	6	6	1
Igneous Bedrock, Discontinuous Igneous Bedrock	0.02	35.5	13891500	999	354
Igneous Bedrock, Gravelly Fine Grain	0.055	32.7	Very large	999	326
Igneous Bedrock, Igneous/Sedimentary	0.9	16.7	6	6	1
Discontinuous Igneous Bedrock, Gravelly Fine Grain	0.154	15.3	1050	999	152

Failed Pairwise Tests

Groups	Error
Fine Grain, Igneous/Sedimentary	Groups too small
Discontinuous Igneous Bedrock, Igneous/Sedimentary	Groups too small
Gravelly Fine Grain, Igneous/Sedimentary	Groups too small

Table 5-43 Results of pairwise tests from 2-way ANOSIM between depth groups at 100m across all facies for species with a presence/absence.

TESTS FOR DIFFERENCES BETWEEN Depth GROUPS
(across all Facies groups)
Global Test
Sample statistic (Global R): 0.303
Significance level of sample statistic: 0.1%
Number of permutations: 999 (Random sample from a large number)
Number of permuted statistics greater than or equal to Global R: 0

Pairwise Tests

Depth 100m	R Statistic	Significance Level	Possible Permutati	Actual Permutati	Number >=
1475-1675, 1275-1475	-0.145	75.2	105	105	79
1475-1675, 1075-1275	0.438	0.5	128700	999	4
1475-1675, 875-1075	0.424	6.7	252	252	17
1475-1675, 1675-1875	0.108	3.4	60843510	999	33
1475-1675, 2875-2975	0.366	19.4	36	36	7
1475-1675, 2675-2875	1	33.3	3	3	1
1475-1675, 2275-2475	0.294	1.7	458640	999	16
1475-1675, 2075-2275	0.205	15.7	1170	999	156
1475-1675, 1875-2075	0.213	18.9	180	180	34
1275-1475, 1075-1275	0.054	38.8	3300	999	387
1275-1475, 875-1075	0.582	4.8	21	21	1
1275-1475, 1675-1875	-0.079	58.3	120	120	70
1275-1475, 2875-2975	0.375	33.3	3	3	1
1275-1475, 2675-2875	0	100	3	3	3
1275-1475, 2275-2475	0.611	2.9	105	105	3
1275-1475, 2075-2275	0.735	1.7	60	60	1
1275-1475, 1875-2075	1	3.3	30	30	1
1075-1275, 875-1075	0.063	29.4	126	126	37
1075-1275, 1675-1875	0.558	0.8	10725	999	7
1075-1275, 2875-2975	0.946	6.7	15	15	1
1075-1275, 2675-2875	1	20	5	5	1
1075-1275, 2275-2475	0.893	0.1	21450	999	0
1075-1275, 2075-2275	0.907	1.2	165	165	2
1075-1275, 1875-2075	0.898	1.8	55	55	1
875-1075, 1675-1875	0.254	15.4	273	273	42
875-1075, 2875-2975	1	4.8	21	21	1
875-1075, 2675-2875	1	16.7	6	6	1
875-1075, 2275-2475	0.55	8.3	36	36	3
875-1075, 2075-2275	-0.5	100	3	3	3
1675-1875, 2875-2975	0.274	8.2	390	390	32
1675-1875, 2675-2875	0	100	3	3	3
1675-1875, 2475-2675	0.375	66.7	3	3	2
1675-1875, 2275-2475	0.092	20.8	5847660	999	207
1675-1875, 2075-2275	0.087	29.1	15288	999	290
1675-1875, 1875-2075	-0.196	75.2	3900	999	751
2875-2975, 2675-2875	0.409	16.7	12	12	2

Depth 100m	R Statistic	Significance Level	Possible Permutati	Actual Permutati	Number >=
2875-2975, 2475-2675	0.167	40	10	10	4
2875-2975, 2275-2475	0.621	0.3	3024	999	2
2875-2975, 2075-2275	0	66.7	3	3	2
2875-2975, 1875-2075	0.648	10	10	10	1
2675-2875, 2475-2675	0.333	50	4	4	2
2675-2875, 2275-2475	0.125	30	10	10	3
2475-2675, 2275-2475	0.49	9.5	63	63	6
2475-2675, 1875-2075	0.375	20	10	10	2
2275-2475, 2075-2275	0.184	22.2	315	315	70
2275-2475, 1875-2075	0.069	31.8	5040	999	317
2075-2275, 1875-2075	-0.175	73	189	189	138

Failed Pairwise Tests

Groups	Error
1475-1675, 2475-2675	Groups too small
1275-1475, 2475-2675	Groups too small
1075-1275, 2475-2675	Groups too small
875-1075, 2475-2675	Groups too small
875-1075, 1875-2075	Groups too small
2675-2875, 2075-2275	Groups too small
2675-2875, 1875-2075	Groups too small
2475-2675, 2075-2275	Groups too small

Table 5-44 Results of pairwise tests from 2-way ANOSIM between facies groups at 100m across all depths for species with a presence/absence.

TESTS FOR DIFFERENCES BETWEEN Facies GROUPS
(across all Depth groups)
Global Test
Sample statistic (Global R): 0.399
Significance level of sample statistic: 0.1%
Number of permutations: 999 (Random sample from a large number)
Number of permuted statistics greater than or equal to Global R: 0
Pairwise Tests

Facies 100m	R Statistic	Significance Level	Possible Permutation	Actual Permutati	Number >=
Fine Grain, Discontinuous Sedimentary Bedrock	-0.563	96.7	30	30	29
Fine Grain, Gravelly Fine Grain	0.519	0.3	3832920	999	2
Fine Grain, Discontinuous Igneous Bedrock	0.011	58.3	36	36	21
Fine Grain, Igneous Bedrock	0.12	35	180	180	63
Fine Grain, Sedimentary Bedrock	0.89	0.1	1608750	999	0
Discontinuous Sedimentary Bedrock, Gravelly Fine Grain	0.324	5.1	28665	999	50
Discontinuous Sedimentary Bedrock, Igneous Bedrock	-0.208	90	100	100	90
Discontinuous Sedimentary Bedrock, Sedimentary Bedrock	0.007	42.9	2520	999	428
Discontinuous Sedimentary Bedrock, Igneous/Sedimentary	0	66.7	3	3	2
Gravelly Fine Grain, Discontinuous Igneous Bedrock	0.109	28.6	21	21	6
Gravelly Fine Grain, Igneous Bedrock	0.132	24.2	183456	999	241
Gravelly Fine Grain, Sedimentary Bedrock	0.276	1.5	Very large	999	14
Discontinuous Igneous Bedrock, Igneous Bedrock	0.09	34.1	252	252	86
Discontinuous Igneous Bedrock, Sedimentary Bedrock	0.339	13.3	15	15	2
Igneous Bedrock, Sedimentary Bedrock	0.573	0.2	3780	999	1
Igneous Bedrock, Igneous/Sedimentary	-0.667	100	4	4	4
Sedimentary Bedrock, Igneous/Sedimentary	1	33.3	3	3	1

Failed Pairwise Tests

Groups	Error
Fine Grain, Igneous/Sedimentary	Groups too small
Discontinuous Sedimentary Bedrock, Discontinuous Igneous Bedrock	Groups too small
Gravelly Fine Grain, Igneous/Sedimentary	Groups too small
Discontinuous Igneous Bedrock, Igneous/Sedimentary	Groups too small

Table 5-45 Results of pairwise tests from 2-way ANOSIM between depth groups at 500m across all facies for species with a presence/absence.

TESTS FOR DIFFERENCES BETWEEN Depth GROUPS
(across all Facies groups)
Global Test
Sample statistic (Global R): 0.188
Significance level of sample statistic: 21.8%
Number of permutations: 999 (Random sample from 1984500)
Number of permuted statistics greater than or equal to Global R: 217

Pairwise Tests

Depth 500m	R Statistic	Significance Level	Possible Permutati	Actual Permutati	Number >=
1675-1875, 1475-1675	-0.049	59.3	27	27	16
1675-1875, 1075-1275	-0.163	66.7	9	9	6
1675-1875, 2275-2475	0.25	44.4	9	9	4
1675-1875, 2075-2275	0	66.7	3	3	2
1675-1875, 875-1075	1	33.3	3	3	1
1675-1875, 1275-1475	0.5	66.7	3	3	2
1675-1875, 1875-2075	0	66.7	3	3	2
1475-1675, 1075-1275	-0.5	88.9	9	9	8
1475-1675, 2275-2475	1	11.1	9	9	1
1475-1675, 2075-2275	1	33.3	3	3	1
1475-1675, 875-1075	1	33.3	3	3	1
1475-1675, 1275-1475	0	66.7	3	3	2
1475-1675, 1875-2075	-0.5	100	3	3	3
2875-2975, 2675-2875	1	33.3	3	3	1
2875-2975, 2475-2675	1	33.3	3	3	1

Failed Pairwise Tests

Groups	Error
1675-1875, 2875-2975	Groups too small
1675-1875, 2675-2875	Groups too small
1675-1875, 2475-2675	Groups too small
1475-1675, 2875-2975	Groups too small
1475-1675, 2675-2875	Groups too small
1475-1675, 2475-2675	Groups too small
1075-1275, 2875-2975	Groups too small
1075-1275, 2675-2875	Groups too small
1075-1275, 2475-2675	Groups too small
1075-1275, 2275-2475	Groups too small
1075-1275, 2075-2275	Groups too small
1075-1275, 875-1075	Groups too small
1075-1275, 1275-1475	Groups too small
1075-1275, 1875-2075	Groups too small
2875-2975, 2275-2475	Groups too small
2875-2975, 2075-2275	Groups too small
2875-2975, 875-1075	Groups too small
2875-2975, 1275-1475	Groups too small

Failed Pairwise Tests	
Groups	Error
2875-2975, 1875-2075	Groups too small
2675-2875, 2475-2675	Groups too small
2675-2875, 2275-2475	Groups too small
2675-2875, 2075-2275	Groups too small
2675-2875, 875-1075	Groups too small
2675-2875, 1275-1475	Groups too small
2675-2875, 1875-2075	Groups too small
2475-2675, 2275-2475	Groups too small
2475-2675, 2075-2275	Groups too small
2475-2675, 875-1075	Groups too small
2475-2675, 1275-1475	Groups too small
2475-2675, 1875-2075	Groups too small
2275-2475, 2075-2275	Groups too small
2275-2475, 875-1075	Groups too small
2275-2475, 1275-1475	Groups too small
2275-2475, 1875-2075	Groups too small
2075-2275, 875-1075	Groups too small
2075-2275, 1275-1475	Groups too small
2075-2275, 1875-2075	Groups too small
875-1075, 1275-1475	Groups too small
875-1075, 1875-2075	Groups too small
1275-1475, 1875-2075	Groups too small

Table 5-46 Results of pairwise tests from 2-way ANOSIM between facies groups at 500m across all depths for species with a presence/absence.

TESTS FOR DIFFERENCES BETWEEN Facies GROUPS
(across all Depth groups)
Global Test
Sample statistic (Global R): 0.066
Significance level of sample statistic: 35.2%
Number of permutations: 999 (Random sample from 28350)
Number of permuted statistics greater than or equal to Global R: 351
Pairwise Tests

Facies 500m	R Statistic	Significance Level	Possible Permutati	Actual Permutati	Number >=
Discontinuous Sedimentary Bedrock, Fine Grain	-0.077	70.4	27	27	19
Discontinuous Sedimentary Bedrock, Gravelly Fine Grain	0.5	11.1	9	9	1
Discontinuous Sedimentary Bedrock, Sedimentary Bedrock	0	66.7	9	9	6
Fine Grain, Gravelly Fine Grain	0.348	33.3	9	9	3
Fine Grain, Sedimentary Bedrock	0.5	33.3	9	9	3
Gravelly Fine Grain, Sedimentary Bedrock	-1	100	9	9	9

Failed Pairwise Tests

Groups	Error
Discontinuous Sedimentary Bedrock, Discontinuous Igneous Bedrock	Groups too small
Discontinuous Sedimentary Bedrock, Igneous Bedrock	Groups too small
Discontinuous Sedimentary Bedrock, Igneous/Sedimentary	Groups too small
Fine Grain, Discontinuous Igneous Bedrock	Groups too small
Fine Grain, Igneous Bedrock	Groups too small
Fine Grain, Igneous/Sedimentary	Groups too small
Discontinuous Igneous Bedrock, Igneous Bedrock	Groups too small
Discontinuous Igneous Bedrock, Igneous/Sedimentary	Groups too small
Discontinuous Igneous Bedrock, Gravelly Fine Grain	Groups too small
Discontinuous Igneous Bedrock, Sedimentary Bedrock	Groups too small
Igneous Bedrock, Igneous/Sedimentary	Groups too small
Igneous Bedrock, Gravelly Fine Grain	Groups too small
Igneous Bedrock, Sedimentary Bedrock	Groups too small
Igneous/Sedimentary, Gravelly Fine Grain	Groups too small
Igneous/Sedimentary, Sedimentary Bedrock	Groups too small

Table 5-47 Results of pairwise tests from 2-way ANOSIM between depth groups at 1000m across all facies for species with a presence/absence.

TESTS FOR DIFFERENCES BETWEEN Depth GROUPS
(across all Facies groups)
Global Test
Sample statistic (Global R): -0.3
Significance level of sample statistic: 75%
Number of permutations: 36 (All possible permutations)
Number of permuted statistics greater than or equal to Global R: 27

Pairwise Tests

Depth 1000m	R Statistic	Significance Level	Possible Permutati	Actual Permutati	Number >=
1675-1875, 1475-1675	-0.5	100	3	3	3
1675-1875, 1075-1275	-1	100	3	3	3
1675-1875, 2275-2475	0	66.7	3	3	2
1675-1875, 1875-2075	0	66.7	3	3	2

Failed Pairwise Tests

Groups	Error
1675-1875, 2875-2975	Groups too small
1675-1875, 2675-2875	Groups too small
1675-1875, 1275-1475	Groups too small
1475-1675, 1075-1275	Groups too small
1475-1675, 2875-2975	Groups too small
1475-1675, 2675-2875	Groups too small
1475-1675, 2275-2475	Groups too small
1475-1675, 1275-1475	Groups too small
1475-1675, 1875-2075	Groups too small
1075-1275, 2875-2975	Groups too small
1075-1275, 2675-2875	Groups too small
1075-1275, 2275-2475	Groups too small
1075-1275, 1275-1475	Groups too small
1075-1275, 1875-2075	Groups too small
2875-2975, 2675-2875	Groups too small
2875-2975, 2275-2475	Groups too small
2875-2975, 1275-1475	Groups too small
2875-2975, 1875-2075	Groups too small
2675-2875, 2275-2475	Groups too small
2675-2875, 1275-1475	Groups too small
2675-2875, 1875-2075	Groups too small
2275-2475, 1275-1475	Groups too small
2275-2475, 1875-2075	Groups too small
1275-1475, 1875-2075	Groups too small

Table 5-48. Results of pairwise tests from 2-way ANOSIM between facies groups at 1000m across all depths for species with a presence/absence.

TESTS FOR DIFFERENCES BETWEEN Facies GROUPS
(across all Depth groups)
Global Test
Sample statistic (Global R): -0.125
Significance level of sample statistic: 66.7%
Number of permutations: 15 (All possible permutations)
Number of permuted statistics greater than or equal to Global R: 10
Pairwise Tests

Facies 1000m	R Statistic	Significance Level	Possible Permutati	Actual Permutati	Number >=
Fine Grain, Igneous/Sedimentary*	0	66.7	3	3	2
Fine Grain, Discontinuous Sedimentary Bedrock	0	66.7	3	3	2
Igneous/Sedimentary*, Discontinuous Sedimentary Bedrock	-1	100	3	3	3

Failed Pairwise Tests

Groups	Error
Fine Grain, Discontinuous Igneous Bedrock	Groups too small
Fine Grain, Igneous Bedrock	Groups too small
Fine Grain, Sedimentary Bedrock	Groups too small
Fine Grain, Gravelly Fine Grain	Groups too small
Discontinuous Igneous Bedrock, Igneous Bedrock	Groups too small
Discontinuous Igneous Bedrock, Igneous/Sedimentary*	Groups too small
Discontinuous Igneous Bedrock, Discontinuous Sedimentary Bedrock	Groups too small
Discontinuous Igneous Bedrock, Sedimentary Bedrock	Groups too small
Discontinuous Igneous Bedrock, Gravelly Fine Grain	Groups too small
Igneous Bedrock, Igneous/Sedimentary*	Groups too small
Igneous Bedrock, Discontinuous Sedimentary Bedrock	Groups too small
Igneous Bedrock, Sedimentary Bedrock	Groups too small
Igneous Bedrock, Gravelly Fine Grain	Groups too small
Igneous/Sedimentary*, Sedimentary Bedrock	Groups too small
Igneous/Sedimentary*, Gravelly Fine Grain	Groups too small
Discontinuous Sedimentary Bedrock, Sedimentary Bedrock	Groups too small
Discontinuous Sedimentary Bedrock, Gravelly Fine Grain	Groups too small
Sedimentary Bedrock, Gravelly Fine Grain	Groups too small

5.3 SIMPER Results

In this section are the SIMPER analysis for depth and substrate at different spatial scales for functional groups and species with two transformations (4^{th} root and presence/absence).

5.3.1 Functional Groups abundance data fourth root transformed

Table 5-49 The average within group similarity from 2-way SIMPER analysis accounting for 100% of similarity for depth across all attachment grain sizes for functional groups with a 4th root transformation.

Functional Group 4th root Grain Examines Depth groups (across all Grain groups)					
Group 1675-1875 Average similarity: 87.22					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Soft Coral	0.9	82.48	2.79	94.57	94.57
Large Gorgonian	0.4	4.72	0.25	5.41	99.99
Cup Coral	0.01	0.01	0.01	0.01	99.99
Small Gorgonian	0.01	0	0.01	0	100
D.dianthus	0	0	0	0	100
Antipatharian	0	0	#######	0	100
Pennatulacean	0	0	#######	0	100
Group 1475-1675 Average similarity: 76.24					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Soft Coral	0.86	40.03	0.93	52.51	52.51
Large Gorgonian	0.67	35.74	0.82	46.88	99.38
Cup Coral	0.04	0.37	0.07	0.48	99.87
D.dianthus	0.01	0.07	0.03	0.09	99.96
Small Gorgonian	0.03	0.03	0.03	0.04	100
Antipatharian	0	0	0.01	0	100
Pennatulacean	0	0	#######	0	100
Group 1275-1475 Average similarity: 62.44					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Large Gorgonian	1.15	54.51	1.45	87.29	87.29
Soft Coral	0.6	7.84	0.37	12.56	99.85
Small Gorgonian	0.03	0.06	0.03	0.09	99.95
Pennatulacean	0.01	0.02	0.02	0.04	99.99
Cup Coral	0.01	0.01	0.01	0.01	100
D.dianthus	0	0	0.01	0	100
Group 1075-1275 Average similarity: 80.54					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Soft Coral	1.7	75.26	4.51	93.45	93.45
Large Gorgonian	0.37	5.21	0.41	6.47	99.91
Small Gorgonian	0.02	0.06	0.02	0.07	99.99
Pennatulacean	0.01	0.01	0.01	0.01	100
Group 1875-2075 Average similarity: 72.98					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Soft Coral	1.49	67.86	2.23	93	93
Large Gorgonian	0.35	5.03	0.33	6.89	99.89

Functional Group 4th root Grain Examines Depth groups (across all Grain groups)					
Cup Coral	0.02	0.08	0.03	0.11	100
D.dianthus	0	0	0	0	100
Group 2075-2275					
Average similarity: 56.07					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Soft Coral	0.77	47.19	1.07	84.17	84.17
Small Gorgonian	0.16	4.84	0.23	8.64	92.81
Large Gorgonian	0.15	3.56	0.22	6.34	99.15
D.dianthus	0.04	0.4	0.06	0.71	99.86
Cup Coral	0.02	0.04	0.02	0.07	99.93
Pennatulacean	0.01	0.04	0.02	0.07	100
Group 2275-2475					
Average similarity: 70.16					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Large Gorgonian	1.07	60.82	1.87	86.69	86.69
Soft Coral	0.42	6.42	0.33	9.15	95.84
Small Gorgonian	0.16	2.92	0.18	4.16	100
Group 2475-2675					
Average similarity: 74.43					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Small Gorgonian	0.95	73.97	1.87	99.38	99.38
Soft Coral	0.07	0.41	0.07	0.55	99.94
Cup Coral	0.02	0.04	0.02	0.05	99.98
Large Gorgonian	0.02	0.01	0.01	0.02	100
Antipatharian	0	0	#######	0	100
D.dianthus	0.01	0	#######	0	100
Pennatulacean	0	0	#######	0	100
Group 2675-2875					
Average similarity: 42.22					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Small Gorgonian	0.72	33.86	0.77	80.19	80.19
Large Gorgonian	0.3	7.99	0.31	18.92	99.1
Soft Coral	0.07	0.26	0.06	0.62	99.72
Cup Coral	0.05	0.12	0.03	0.28	100
Group 2875-2975					
Average similarity: 45.77					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Large Gorgonian	0.66	34.25	0.75	74.84	74.84
Small Gorgonian	0.35	11.42	0.36	24.96	99.79
Soft Coral	0.08	0.09	0.03	0.21	100

Functional Group 4th root Grain
Examines Depth groups (across all Grain groups)

Group 875-1075
Average similarity: 89.14

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Small Gorgonian	0.59	70.56	1.67	79.16	79.16
Soft Coral	0.74	18.49	0.51	20.75	99.9
Pennatulacean	0.03	0.08	0.03	0.09	100
Large Gorgonian	0.01	0	0.01	0	100

Group <875
No groups with at least 2 samples

Table 5-50 The average within group similarity from 2-way SIMPER analysis accounting for 100% of similarity for attachment grain size across all depths for functional groups with a 4th root transformation.

Functional Group 4th root Grain Examines Grain groups (across all Depth groups)					
Group Bl					
Average similarity: 78.01					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Soft Coral	1.38	76.46	2.72	98.01	98.01
Large Gorgonian	0.19	1.5	0.17	1.92	99.93
Small Gorgonian	0.04	0.06	0.03	0.07	100
Antipatharian	0	0	#######	0	100
Cup Coral	0	0	#######	0	100
D.dianthus	0	0	#######	0	100
Pennatulacean	0	0	#######	0	100
Group Br-IG					
Average similarity: 65.31					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Small Gorgonian	0.59	57.7	1.25	88.34	88.34
Large Gorgonian	0.18	3.68	0.2	5.63	93.97
Soft Coral	0.24	3.21	0.19	4.91	98.88
Cup Coral	0.08	0.64	0.08	0.99	99.87
D.dianthus	0.02	0.09	0.03	0.13	100
Group Br-SD					
Average similarity: 59.86					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Soft Coral	1.23	48.29	1.34	80.67	80.67
Large Gorgonian	0.62	11.13	0.48	18.59	99.26
Cup Coral	0.04	0.37	0.07	0.61	99.87
D.dianthus	0.02	0.07	0.03	0.12	99.99
Small Gorgonian	0.01	0	0.01	0	100
Antipatharian	0.01	0	0.01	0	100
Group Fg					
Average similarity: 64.96					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Large Gorgonian	0.9	47.17	1.2	72.61	72.61
Small Gorgonian	0.29	12.71	0.39	19.56	92.17
Soft Coral	0.29	5.04	0.31	7.77	99.93
Pennatulacean	0.03	0.04	0.02	0.07	100
Group G					
Average similarity: 88.95					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Soft Coral	1.33	88.83	6.02	99.87	99.87
Large Gorgonian	0.06	0.12	0.05	0.13	100
Group HS					

Functional Group 4th root Grain Examines Grain groups (across all Depth groups)					
Average similarity: 82.92					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Large Gorgonian	1.74	81.17	3.3	97.89	97.89
Soft Coral	0.22	1.72	0.18	2.07	99.96
Small Gorgonian	0.03	0.03	0.03	0.04	100

Table 5-51 The average within group similarity from 2-way SIMPER analysis accounting for 100% of similarity for depth across all facies at 10 m for functional groups with a 4th root transformation.

Functional Groups 4th root 10 m Examines Depth groups (across all Facies groups)					
Group 1475-1675					
Average similarity: 50.46					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Large Gorgonian	1.45	31.24	0.89	61.91	61.91
Soft Coral	1.08	18.45	0.67	36.57	98.49
Small Gorgonian	0.17	0.51	0.14	1.02	99.5
D.dianthus	0.07	0.23	0.05	0.45	99.95
Cup Coral	0.08	0.02	0.03	0.04	100
Antipatharian	0.02	0	0.01	0	100
Group 1675-1875					
Average similarity: 48.56					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Soft Coral	1.18	29.2	0.82	60.13	60.13
Large Gorgonian	1.02	19.3	0.64	39.73	99.86
D.dianthus	0.03	0.04	0.02	0.09	99.95
Small Gorgonian	0.04	0.02	0.03	0.05	100
Group 1275-1475					
Average similarity: 50.48					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Soft Coral	1.71	29.52	1.1	58.49	58.49
Large Gorgonian	0.98	19.8	0.95	39.23	97.71
Pennatulacean	0.09	0.7	0.09	1.38	99.09
Small Gorgonian	0.11	0.33	0.07	0.66	99.75
Cup Coral	0.05	0.09	0.03	0.17	99.92
D.dianthus	0.05	0.04	0.03	0.08	100
Group 1075-1275					
Average similarity: 75.21					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Soft Coral	2.34	67.68	4.22	89.98	89.98
Large Gorgonian	0.67	7.24	0.59	9.62	99.61
Small Gorgonian	0.09	0.21	0.05	0.28	99.88
Pennatulacean	0.04	0.08	0.04	0.1	99.98
Antipatharian	0.02	0.01	0.02	0.02	100
Group 875-1075					
Average similarity: 78.27					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Small Gorgonian	1.34	77.25	4.93	98.69	98.69
Pennatulacean	0.18	0.9	0.16	1.15	99.84
Soft Coral	0.16	0.07	0.04	0.09	99.92
Large Gorgonian	0.05	0.06	0.04	0.08	100

Group 2675-2875					
Average similarity: 53.98					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Small Gorgonian	1.12	31.61	1.12	58.56	58.56
Large Gorgonian	0.7	20.72	0.8	38.38	96.94
Soft Coral	0.25	1.65	0.23	3.06	100
Group 2475-2675					
Average similarity: 71.92					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Small Gorgonian	1.56	71.5	3.68	99.42	99.42
Large Gorgonian	0.14	0.22	0.08	0.31	99.73
Soft Coral	0.13	0.19	0.08	0.27	100
Group 2875-2975					
Average similarity: 50.23					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Large Gorgonian	0.99	42.68	1.15	84.98	84.98
Small Gorgonian	0.5	6.05	0.36	12.05	97.03
Soft Coral	0.21	1.49	0.16	2.97	100
Group 2275-2475					
Average similarity: 62.87					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Soft Coral	0.78	32.04	0.85	50.96	50.96
Large Gorgonian	0.87	27.81	0.83	44.24	95.2
Small Gorgonian	0.23	3.02	0.22	4.8	100
Group 2075-2275					
Average similarity: 58.84					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Soft Coral	1.12	53.47	1.46	90.87	90.87
Large Gorgonian	0.29	3.6	0.23	6.12	97
Small Gorgonian	0.19	1.48	0.16	2.51	99.51
D.dianthus	0.08	0.29	0.09	0.49	100
Group 1875-2075					
Average similarity: 61.08					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Large Gorgonian	0.83	31.44	1.02	51.47	51.47
Soft Coral	0.86	28.97	0.86	47.42	98.89
Cup Coral	0.12	0.68	0.11	1.11	100

Table 5-52 The average within group similarity from 2-way SIMPER analysis accounting for 100% of similarity for facies at 10 m across all depths for functional groups with a 4th root transformation.

Functional Groups 4th root 10 m Examines Facies groups (across all Depth groups)					
	Group Fine Grain Average similarity: 70.58				
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Small Gorgonian	0.89	65.68	2.11	93.06	93.06
Pennatulacean	0.2	1.91	0.18	2.71	95.78
D.dianthus	0.1	1.67	0.14	2.37	98.14
Soft Coral	0.17	0.62	0.09	0.88	99.02
Large Gorgonian	0.1	0.53	0.09	0.75	99.77
Cup Coral	0.05	0.09	0.04	0.13	99.91
Antipatharian	0.03	0.07	0.04	0.09	100
	Group Sedimentary Bedrock Average similarity: 69.34				
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Soft Coral	1.72	55.5	2	80.04	80.04
Large Gorgonian	0.99	13.66	0.65	19.71	99.74
Small Gorgonian	0.05	0.09	0.04	0.13	99.87
D.dianthus	0.04	0.07	0.03	0.09	99.96
Cup Coral	0.03	0.02	0.03	0.03	100
Antipatharian	0.02	0	0.01	0	100
	Group Discontinuous Sedimentary Bedrock Average similarity: 63.93				
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Soft Coral	1.17	58.02	1.56	90.76	90.76
Small Gorgonian	0.24	5	0.3	7.82	98.59
Large Gorgonian	0.24	0.9	0.17	1.41	100
	Group Boulder No groups with at least 2 samples				
	Group Discontinuous Igneous Bedrock Average similarity: 54.42				
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Small Gorgonian	1.12	37.61	1.08	69.12	69.12
Large Gorgonian	0.43	9.39	0.51	17.25	86.37
Soft Coral	0.38	7.42	0.31	13.63	100
	Group Igneous Bedrock Average similarity: 60.27				
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Soft Coral	0.64	32.63	0.8	54.13	54.13

Group Igneous Bedrock
Average similarity: 60.27

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Small Gorgonian	0.49	18.58	0.58	30.84	84.97
Large Gorgonian	0.3	8.34	0.35	13.84	98.81
Cup Coral	0.12	0.54	0.1	0.9	99.71
D.dianthus	0.05	0.17	0.07	0.29	100

Group Gravelly Fine Grain
Average similarity: 49.62

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Large Gorgonian	1.31	25.01	0.75	50.4	50.4
Soft Coral	1.21	24.37	0.74	49.11	99.51
Small Gorgonian	0.11	0.24	0.1	0.49	100

Table 5-53 The average within group similarity from 2-way SIMPER analysis accounting for 100% of similarity for depth across all facies at 50 m for functional groups with a 4th root transformation.

Functional Group 4th root 50m Examines Depth groups (across all Facies groups)					
		Group 1675-1875			
		Average similarity: 49.22			
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Soft Coral	1.71	32.23	1.02	65.48	65.48
Large Gorgonian	1.35	16.78	0.68	34.1	99.57
Small Gorgonian	0.16	0.21	0.09	0.43	100
		Group 1475-1675			
		Average similarity: 57.08			
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Large Gorgonian	1.97	28.88	1.04	50.59	50.59
Soft Coral	1.6	20.76	1.06	36.36	86.96
Small Gorgonian	0.51	3.65	0.5	6.4	93.35
D.dianthus	0.21	3.4	0.22	5.95	99.31
Cup Coral	0.18	0.36	0.07	0.64	99.94
Antipatharian	0.06	0.03	0.06	0.06	100
		Group 1275-1475			
		Average similarity: 54.01			
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Soft Coral	2.5	30.27	1.43	56.04	56.04
Large Gorgonian	1.71	21.69	1.46	40.15	96.19
D.dianthus	0.2	1.71	0.16	3.16	99.36
Small Gorgonian	0.33	0.35	0.16	0.64	100
		Group 1075-1275			
		Average similarity: 76.26			
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Soft Coral	3.01	54.16	2.35	71.02	71.02
Large Gorgonian	1.14	15.72	1.35	20.61	91.63
Small Gorgonian	0.37	3.53	0.26	4.63	96.26
Pennatulacean	0.22	2.65	0.25	3.48	99.74
Antipatharian	0.08	0.2	0.08	0.26	100
Cup Coral	0	0	#######	0	100
D.dianthus	0	0	#######	0	100
		Group 875-1075			
		Average similarity: 66.82			
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Small Gorgonian	1.72	62.16	4.79	93.02	93.02
Pennatulacean	0.54	4.66	0.44	6.98	100

Group 2875-2975					
Average similarity: 55.21					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Large Gorgonian	1.29	37.64	1.51	68.17	68.17
Small Gorgonian	0.81	11.72	0.62	21.23	89.4
Soft Coral	0.36	5.85	0.44	10.6	100

Group 2675-2875					
Average similarity: 70.33					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Small Gorgonian	1.4	35.45	2.17	50.4	50.4
Large Gorgonian	1.03	31.44	7.3	44.7	95.09
Soft Coral	0.46	3.45	0.38	4.91	100

Group 2475-2675					
Average similarity: 63.26					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Small Gorgonian	2.11	59	3.52	93.27	93.27
Large Gorgonian	0.31	2.27	0.33	3.59	96.86
Soft Coral	0.4	1.98	0.33	3.14	100

Group 2275-2475					
Average similarity: 62.54					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Soft Coral	1.2	42.98	1.6	68.72	68.72
Large Gorgonian	0.94	12.56	0.54	20.09	88.81
Small Gorgonian	0.45	7	0.42	11.19	100

Group 2075-2275					
Average similarity: 48.53					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Soft Coral	1.39	42.56	1.38	87.7	87.7
Large Gorgonian	0.53	4.18	0.33	8.61	96.31
Small Gorgonian	0.35	1.79	0.26	3.69	100

Group 1875-2075					
Average similarity: 69.52					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Soft Coral	1.35	41.4	1.63	59.54	59.54
Large Gorgonian	1.04	26.86	1.16	38.64	98.18
Cup Coral	0.21	1.26	0.2	1.82	100

Table 5-54 The average within group similarity from 2-way SIMPER analysis accounting for 100% of similarity for facies at 50 m across all depths for functional groups with a 4th root transformation.

Functional Group 4th root 50m Examines Facies groups (across all Depth groups)					
Group Fine Grain					
Average similarity: 49.39					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Small Gorgonian	0.92	28.53	0.9	57.77	57.77
D.dianthus	0.26	10.42	0.4	21.1	78.86
Pennatulacean	0.3	5.85	0.42	11.84	90.7
Soft Coral	0.37	3.01	0.21	6.09	96.79
Cup Coral	0.11	0.91	0.1	1.85	98.64
Large Gorgonian	0.16	0.36	0.1	0.72	99.37
Antipatharian	0.05	0.31	0.1	0.63	100
Group Discontinuous Sedimentary Bedrock					
Average similarity: 42.25					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Soft Coral	1.56	32.17	1	76.14	76.14
Large Gorgonian	0.82	6.34	0.44	15	91.14
Small Gorgonian	0.38	3.74	0.39	8.86	100
Antipatharian	0	0	#######	0	100
Cup Coral	0.08	0	#######	0	100
D.dianthus	0.07	0	#######	0	100
Pennatulacean	0.08	0	#######	0	100
Group Sedimentary Bedrock					
Average similarity: 70.17					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Soft Coral	2.46	47.29	1.94	67.4	67.4
Large Gorgonian	1.66	21.96	1.31	31.29	98.69
Small Gorgonian	0.19	0.83	0.19	1.18	99.87
Cup Coral	0.06	0.05	0.06	0.08	99.95
Antipatharian	0.07	0.04	0.06	0.05	100
Group Igneous Bedrock					
Average similarity: 57.82					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Soft Coral	1.11	35.4	1.16	61.23	61.23
Large Gorgonian	0.58	10.91	0.55	18.87	80.1
Small Gorgonian	0.73	10.88	0.54	18.81	98.91
Cup Coral	0.28	0.63	0.14	1.09	100
Group Discontinuous Igneous Bedrock					
Average similarity: 64.25					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Small Gorgonian	1.21	30.7	1.12	47.78	47.78
Large Gorgonian	0.73	23.9	1.03	37.2	84.98
Soft Coral	0.45	9.65	0.44	15.02	100

Group Gravelly Fine Grain

Average similarity: 54.63

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Soft Coral	1.92	29.93	1.09	54.78	54.78
Large Gorgonian	1.91	22.96	0.84	42.04	96.82
Small Gorgonian	0.34	1.74	0.33	3.18	100
Antipatharian	0	0	#######	0	100
Cup Coral	0.05	0	#######	0	100
D.dianthus	0.02	0	#######	0	100
Pennatulacean	0.03	0	#######	0	100

Group Igneous/Sedimentary

No groups with at least 2 samples

Table 5-55 The average within group similarity from 2-way SIMPER analysis accounting for 100% of similarity for depth across all facies at 100 m for functional groups with a 4th root transformation.

Functional Group 4th root 100m Examines Depth groups (across all Facies groups)					
Group 1475-1675					
Average similarity: 65.93					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Large Gorgonian	2.58	33.62	1.46	51	51
Soft Coral	2.13	20.99	1.67	31.84	82.84
Small Gorgonian	0.87	8.94	1.13	13.56	96.4
D.dianthus	0.27	2.18	0.21	3.31	99.71
Cup Coral	0.32	0.19	0.13	0.29	100
Group 1275-1475					
Average similarity: 46.20					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Soft Coral	3.05	25.24	1.15	54.63	54.63
Large Gorgonian	2.5	20.96	1.45	45.37	100
Group 1675-1875					
Average similarity: 44.07					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Soft Coral	1.9	26.86	0.97	60.95	60.95
Large Gorgonian	1.58	16.54	0.77	37.54	98.49
Small Gorgonian	0.26	0.66	0.16	1.51	100
Group 1075-1275					
Average similarity: 78.44					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Soft Coral	3.85	51.57	2.76	65.74	65.74
Large Gorgonian	1.51	19.03	2.12	24.26	90.01
Small Gorgonian	0.63	5.21	0.47	6.64	96.65
Pennatulacean	0.27	2.09	0.27	2.67	99.32
Antipatharian	0.14	0.54	0.15	0.68	100
Cup Coral	0	0	#######	0	100
D.dianthus	0	0	#######	0	100
Group 875-1075					
Average similarity: 59.73					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Small Gorgonian	1.81	52.54	4.35	87.96	87.96
Pennatulacean	0.75	7.19	0.62	12.04	100
Group 2875-2975					
Average similarity: 82.06					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Large Gorgonian	1.54	39.54	4.75	48.18	48.18
Small Gorgonian	1.1	28.33	1.77	34.52	82.7
Soft Coral	0.54	14.2	1.09	17.3	100

Group 2675-2875

Average similarity: 78.15

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Small Gorgonian	2.09	41.51	9.29	53.12	53.12
Large Gorgonian	1.1	28.99	3.86	37.1	90.22
Soft Coral	0.59	7.65	0.58	9.78	100

Group 2475-2675

Average similarity: 69.50

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Small Gorgonian	2.55	39.67	#######	57.07	57.07
Large Gorgonian	0.73	14.92	#######	21.46	78.54
Soft Coral	0.94	14.92	#######	21.46	100

Group 2275-2475

Average similarity: 60.64

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Soft Coral	1.38	42.13	1.61	69.47	69.47
Large Gorgonian	0.94	11.21	0.54	18.48	87.95
Small Gorgonian	0.58	6.65	0.51	10.97	98.93
Cup Coral	0.13	0.65	0.19	1.07	100

Group 2075-2275

Average similarity: 56.45

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Soft Coral	1.8	40.96	3.75	72.56	72.56
Large Gorgonian	0.99	9.12	0.6	16.15	88.72
Small Gorgonian	0.45	6.37	0.5	11.28	100

Group 1875-2075

Average similarity: 51.09

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Soft Coral	1.56	32.82	0.99	64.25	64.25
Large Gorgonian	1.12	18.27	0.73	35.75	100

Table 5-56 The average within group similarity from 2-way SIMPER analysis accounting for 100% of similarity for facies at 100 m across all depths for functional groups with a 4th root transformation.

Functional Group 4th root 100m Examines Facies groups (across all Depth groups)					
Group Fine Grain					
Average similarity: 52.22					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Small Gorgonian	1.27	31.2	1.32	59.75	59.75
Pennatulacean	0.4	6.65	0.55	12.74	72.49
Soft Coral	0.6	6.12	0.4	11.72	84.21
D.dianthus	0.3	5.83	0.36	11.15	95.36
Large Gorgonian	0.28	1.48	0.2	2.84	98.2
Antipatharian	0.1	0.94	0.2	1.8	100
Group Discontinuous Sedimentary Bedrock					
Average similarity: 40.80					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Soft Coral	1.92	29.4	1.27	72.06	72.06
Small Gorgonian	0.62	5.73	0.49	14.04	86.1
Large Gorgonian	1.38	5.67	0.5	13.9	100
Group Sedimentary Bedrock					
Average similarity: 70.88					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Soft Coral	3.03	43.93	1.92	61.98	61.98
Large Gorgonian	2.15	24.69	2.13	34.84	96.82
Small Gorgonian	0.27	2.04	0.31	2.87	99.7
Cup Coral	0.13	0.22	0.13	0.3	100
Group Gravelly Fine Grain					
Average similarity: 58.68					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Soft Coral	2.24	29.57	1.22	50.4	50.4
Large Gorgonian	2.23	25.14	1.04	42.84	93.23
Small Gorgonian	0.5	3.97	0.59	6.77	100
Group Discontinuous Igneous Bedrock					
Average similarity: 57.75					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Large Gorgonian	0.98	28.26	1.42	48.93	48.93
Small Gorgonian	1.33	24.91	1.09	43.12	92.06
Soft Coral	0.47	4.59	0.45	7.94	100

Group Igneous Bedrock					
Average similarity: 61.69					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Soft Coral	1.52	33.35	1.87	54.07	54.07
Small Gorgonian	1.04	17.87	1.05	28.96	83.03
Large Gorgonian	0.76	9.49	0.57	15.39	98.42
Cup Coral	0.32	0.97	0.24	1.58	100
Antipatharian	0.07	0	#######	0	100
D.dianthus	0.19	0	#######	0	100
Pennatulacean	0	0	#######	0	100
Group Igneous/Sedimentary					
No groups with at least 2 samples					

Table 5-57 The average within group similarity from 2-way SIMPER analysis accounting for 100% of similarity for depth across all facies at 500 m for functional groups with a 4th root transformation.

Functional Group 4th root 500m Examines Depth groups (across all Facies groups)					
		Group 1675-1875			
		Average similarity: 35.47			
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Soft Coral	2.83	23.37	1.96	65.9	65.9
Small Gorgonian	1	6.15	0.58	17.34	83.24
Large Gorgonian	2.07	5.94	0.58	16.76	100
		Group 1475-1675			
		Average similarity: 63.17			
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Large Gorgonian	4.01	25.37	0.71	40.16	40.16
Soft Coral	3.94	13.5	7.1	21.37	61.53
Small Gorgonian	1.56	11.75	2.29	18.61	80.14
Cup Coral	0.91	7.72	0.71	12.21	92.35
D.dianthus	0.69	4.83	0.71	7.65	100
		Group 1075-1275			
		Average similarity: 60.31			
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Soft Coral	4.98	31.68	#######	52.53	52.53
Small Gorgonian	1.35	28.63	#######	47.47	100
		Group 2875-2975			
		Average similarity: 92.81			
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Large Gorgonian	2.3	41.26	#######	44.46	44.46
Small Gorgonian	1.93	33.28	#######	35.85	80.31
Soft Coral	1.25	18.27	#######	19.69	100
		Group 2675-2875			
		No groups with at least 2 samples			
		Group 2475-2675			
		No groups with at least 2 samples			
		Group 2275-2475			
		No groups with at least 2 samples			
		Group 2075-2275			
		No groups with at least 2 samples			
		Group 875-1075			
		No groups with at least 2 samples			
		Group 1275-1475			
		No groups with at least 2 samples			
		Group 1875-2075			
		No groups with at least 2 samples			

Table 5-58 The average within group similarity from 2-way SIMPER analysis accounting for 100% of similarity for facies at 500 m across all depths for functional groups with a 4th root transformation.

Functional Group 4th root 500m Examines Facies groups (across all Depth groups)					
Group Discontinuous Sedimentary Bedrock Average similarity: 30.03					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Soft Coral	3.95	13.42	7.49	44.68	44.68
Cup Coral	0.79	7.72	0.71	25.69	70.38
D.dianthus	0.46	4.83	0.71	16.09	86.47
Small Gorgonian	0.76	4.06	0.71	13.53	100
Group Fine Grain Average similarity: 48.61					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Soft Coral	1.4	25.07	2.68	51.57	51.57
Small Gorgonian	1.73	23.54	3.27	48.43	100
Antipatharian	0.24	0	#######	0	100
Cup Coral	0	0	#######	0	100
D.dianthus	0.59	0	#######	0	100
Large Gorgonian	0.44	0	#######	0	100
Sea Pen	0.66	0	#######	0	100
Group Discontinuous Igneous Bedrock Average similarity: 92.81					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Large Gorgonian	1.95	41.26	#######	44.46	44.46
Small Gorgonian	2.61	33.28	#######	35.85	80.31
Soft Coral	1.51	18.27	#######	19.69	100
Group Igneous Bedrock No groups with at least 2 samples					
Group Igneous/Sedimentary No groups with at least 2 samples					
Group Gravelly Fine Grain Average similarity: 67.89					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Large Gorgonian	4.03	34.28	1.47	50.5	50.5
Soft Coral	3.42	25.91	1.65	38.17	88.67
Small Gorgonian	1.22	7.69	0.71	11.33	100
Antipatharian	0.14	0	#######	0	100
Cup Coral	0	0	#######	0	100
D.dianthus	0.14	0	#######	0	100
Sea Pen	0.29	0	#######	0	100
Group Sedimentary Bedrock No groups with at least 2 samples					

Table 5-59 The average within group similarity from 2-way SIMPER analysis accounting for 100% of similarity for depth across all facies at 1000 m for functional groups with a 4th root transformation.

Functional Group 4th root 1000m Examines Depth groups (across all Facies groups)					
		Group 1675-1875			
		Average similarity: 51.50			
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Soft Coral	3.69	20.37	3.53	39.56	39.56
Large Gorgonian	3.01	18.64	0.71	36.19	75.74
Small Gorgonian	1.99	12.49	2.32	24.26	100
		Group 1475-1675			
		No groups with at least 2 samples			
		Group 1075-1275			
		No groups with at least 2 samples			
		Group 2875-2975			
		No groups with at least 2 samples			
		Group 2675-2875			
		No groups with at least 2 samples			
		Group 2275-2475			
		No groups with at least 2 samples			
		Group 1275-1475			
		No groups with at least 2 samples			
		Group 1875-2075			
		No groups with at least 2 samples			

Table 5-60 The average within group similarity from 2-way SIMPER analysis accounting for 100% of similarity for facies at 1000 m across all depths for functional groups with a 4th root transformation.

Functional Group 4th root 1000m					
Examines Facies groups (across all Depth groups)					
Group Fine Grain					
Average similarity: 32.59					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Small Gorgonian	1.93	16.3	#######	50	50
Soft Coral	1.55	16.3	#######	50	100
Group Discontinuous Igneous Bedrock					
No groups with at least 2 samples					
Group Igneous Bedrock					
No groups with at least 2 samples					
Group Igneous/Sedimentary*					
No groups with at least 2 samples					
Group Discontinuous Sedimentary Bedrock					
Average similarity: 70.41					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Large Gorgonian	4.92	37.28	#######	52.94	52.94
Soft Coral	4.29	24.45	#######	34.72	87.66
Small Gorgonian	1.35	8.69	#######	12.34	100
Group Sedimentary Bedrock					
No groups with at least 2 samples					
Group Gravelly Fine Grain					
No groups with at least 2 samples					
Groups Fine Grain & Discontinuous Igneous Bedrock					
No pairs of groups with samples					
Groups Fine Grain & Igneous Bedrock					
No pairs of groups with samples					
Groups Discontinuous Igneous Bedrock & Igneous Bedrock					
No pairs of groups with samples					

5.3.2 Functional Groups abundance data presence/absence transformed

Table 5-61 The average within group similarity from 2-way SIMPER analysis accounting for 100% of similarity for depth across all for attachment grain size for functional groups with a presence/absence transformation.

Functional Groups presence/absence Grain Examines Depth groups (across all Grain groups)					
Group 1675-1875					
Average similarity: 93.55					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Soft Coral	0.79	88.3	2.85	94.39	94.39
Large Gorgonian	0.25	5.23	0.25	5.59	99.99
Cup Coral	0.01	0.01	0.01	0.01	99.99
Small Gorgonian	0.01	0	0.01	0	100
D.dianthus	0	0	0	0	100
Antipatharian	0	0	#######	0	100
Pennatulacean	0	0	#######	0	100
Group 1475-1675					
Average similarity: 81.12					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Soft Coral	0.65	44.04	0.93	54.28	54.28
Large Gorgonian	0.4	36.57	0.81	45.08	99.36
Cup Coral	0.04	0.41	0.07	0.5	99.87
D.dianthus	0.01	0.07	0.03	0.09	99.95
Small Gorgonian	0.03	0.04	0.03	0.05	100
Antipatharian	0	0	0.01	0	100
Group 1275-1475					
Average similarity: 67.90					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Large Gorgonian	0.75	58.63	1.43	86.35	86.35
Soft Coral	0.44	9.17	0.38	13.51	99.86
Small Gorgonian	0.03	0.06	0.03	0.09	99.95
Pennatulacean	0.01	0.02	0.02	0.03	99.98
Cup Coral	0.01	0.01	0.01	0.01	100
D.dianthus	0	0	0.01	0	100
Antipatharian	0	0	#######	0	100
Group 1075-1275					
Average similarity: 86.62					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Soft Coral	0.97	79.1	3.78	91.32	91.32
Large Gorgonian	0.32	7.45	0.42	8.6	99.92
Small Gorgonian	0.02	0.06	0.02	0.07	99.99
Pennatulacean	0.01	0.01	0.01	0.01	100
Antipatharian	0	0	#######	0	100
Cup Coral	0	0	#######	0	100
D.dianthus	0	0	#######	0	100

Group 1875-2075					
Average similarity: 81.96					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Soft Coral	0.9	75.25	2.21	91.81	91.81
Large Gorgonian	0.28	6.63	0.34	8.08	99.89
Cup Coral	0.02	0.09	0.03	0.11	100
D.dianthus	0	0	0	0	100

Group 2075-2275					
Average similarity: 61.25					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Soft Coral	0.68	52.03	1.09	84.94	84.94
Small Gorgonian	0.16	4.9	0.23	7.99	92.94
Large Gorgonian	0.12	3.85	0.22	6.28	99.22
D.dianthus	0.04	0.4	0.06	0.65	99.87
Cup Coral	0.02	0.04	0.02	0.06	99.94
Pennatulacean	0.01	0.04	0.02	0.06	100

Group 2275-2475					
Average similarity: 76.77					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Large Gorgonian	0.61	66.22	1.84	86.26	86.26
Soft Coral	0.39	7.51	0.34	9.78	96.04
Small Gorgonian	0.15	3.04	0.18	3.96	100

Group 2475-2675					
Average similarity: 78.63					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Small Gorgonian	0.88	78.15	1.89	99.39	99.39
Soft Coral	0.07	0.43	0.07	0.55	99.94
Cup Coral	0.02	0.04	0.02	0.05	99.98
Large Gorgonian	0.02	0.01	0.01	0.02	100
Antipatharian	0	0	#######	0	100
D.dianthus	0.01	0	#######	0	100
Pennatulacean	0	0	#######	0	100

Group 2675-2875					
Average similarity: 45.32					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Small Gorgonian	0.61	36.78	0.77	81.16	81.16
Large Gorgonian	0.3	8.15	0.31	17.98	99.15
Soft Coral	0.07	0.27	0.06	0.6	99.74
Cup Coral	0.05	0.12	0.03	0.26	100

Group 2875-2975

Average similarity: 47.98

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Large Gorgonian	0.61	36.33	0.76	75.71	75.71
Small Gorgonian	0.33	11.56	0.36	24.1	99.8
Soft Coral	0.08	0.09	0.03	0.2	100

Group 875-1075

Average similarity: 93.70

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Small Gorgonian	0.56	73.31	1.68	78.23	78.23
Soft Coral	0.42	20.31	0.51	21.68	99.91
Pennatulacean	0.03	0.08	0.03	0.09	100
Large Gorgonian	0.01	0	0.01	0	100
Antipatharian	0	0	#######	0	100
Cup Coral	0	0	#######	0	100
D.dianthus	0	0	#######	0	100

Group <875

No groups with at least 2 samples

Table 5-62 The average within group similarity from 2-way SIMPER analysis accounting for 100% of similarity results for attachment grain size across all depth for functional groups with a presence/absence transformation.

Functional Groups presence/absence Grain Examines Grain groups (across all Depth groups)					
Group Bl					
Average similarity: 84.80					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Soft Coral	0.92	82.85	2.68	97.7	97.7
Large Gorgonian	0.18	1.89	0.18	2.22	99.93
Small Gorgonian	0.03	0.06	0.03	0.07	100
Group Br-IG					
Average similarity: 69.11					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Small Gorgonian	0.54	60.97	1.25	88.22	88.22
Large Gorgonian	0.17	3.89	0.2	5.63	93.85
Soft Coral	0.21	3.47	0.19	5.02	98.87
Cup Coral	0.08	0.7	0.08	1.01	99.88
D.dianthus	0.02	0.09	0.03	0.12	100
Group Br-SD					
Average similarity: 66.18					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Soft Coral	0.77	51.85	1.32	78.35	78.35
Large Gorgonian	0.46	13.84	0.5	20.92	99.27
Cup Coral	0.04	0.41	0.07	0.62	99.88
D.dianthus	0.02	0.07	0.03	0.11	99.99
Small Gorgonian	0.01	0	0.01	0	100
Antipatharian	0.01	0	0.01	0	100
Pennatulacean	0	0	#######	0	100
Group Fg					
Average similarity: 70.57					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Large Gorgonian	0.59	51.37	1.19	72.79	72.79
Small Gorgonian	0.28	13.2	0.39	18.7	91.5
Soft Coral	0.26	5.96	0.31	8.44	99.94
Pennatulacean	0.03	0.04	0.02	0.06	100
Group G					
Average similarity: 96.54					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Soft Coral	0.98	96.38	6.62	99.84	99.84
Large Gorgonian	0.06	0.15	0.05	0.16	100
Group HS					
Average similarity: 85.42					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Large Gorgonian	0.96	83.11	3.04	97.3	97.3
Soft Coral	0.18	2.26	0.19	2.65	99.95
Small Gorgonian	0.03	0.05	0.03	0.05	100
Antipatharian	0	0	#######	0	100
Cup Coral	0	0	#######	0	100
D.dianthus	0	0	#######	0	100
Pennatulacean	0	0	#######	0	100

Table 5-63 The average within group similarity from 2-way SIMPER analysis accounting for 100% of similarity results for depth across all facies for 10m for functional groups with a presence/absence transformation.

Functional Groups presence/absence 10m Examines Depth groups (across all Facies groups)					
Group 1475-1675					
Average similarity: 57.55					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Large Gorgonian	0.65	32.93	0.91	57.22	57.22
Soft Coral	0.57	23.48	0.72	40.8	98.02
Small Gorgonian	0.15	0.86	0.14	1.49	99.51
D.dianthus	0.07	0.25	0.05	0.43	99.94
Cup Coral	0.05	0.03	0.03	0.05	99.99
Antipatharian	0.02	0	0.01	0.01	100
Pennatulacean	0	0	#######	0	100
Group 1675-1875					
Average similarity: 57.44					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Soft Coral	0.7	34.37	0.85	59.83	59.83
Large Gorgonian	0.52	22.99	0.65	40.02	99.85
D.dianthus	0.03	0.05	0.02	0.08	99.93
Small Gorgonian	0.03	0.04	0.03	0.07	100
Group 1275-1475					
Average similarity: 63.76					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Soft Coral	0.75	34.37	1.18	53.91	53.91
Large Gorgonian	0.62	28.06	1.03	44.01	97.92
Pennatulacean	0.09	0.73	0.09	1.14	99.07
Small Gorgonian	0.09	0.45	0.08	0.71	99.78
Cup Coral	0.04	0.08	0.03	0.13	99.9
D.dianthus	0.05	0.06	0.03	0.1	100
Group 1075-1275					
Average similarity: 81.37					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Soft Coral	0.93	68.18	3.54	83.79	83.79
Large Gorgonian	0.48	12.87	0.59	15.82	99.6
Small Gorgonian	0.09	0.23	0.05	0.28	99.89
Pennatulacean	0.04	0.08	0.04	0.1	99.98
Antipatharian	0.02	0.01	0.02	0.02	100
Group 875-1075					
Average similarity: 86.23					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Small Gorgonian	0.95	84.94	4.42	98.5	98.5
Pennatulacean	0.18	1.11	0.16	1.29	99.79
Soft Coral	0.08	0.11	0.04	0.12	99.91
Large Gorgonian	0.05	0.08	0.04	0.09	100

		Group 2675-2875			
		Average similarity: 61.58			
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Small Gorgonian	0.77	34.39	1.13	55.84	55.84
Large Gorgonian	0.62	25.09	0.82	40.74	96.58
Soft Coral	0.23	2.11	0.23	3.42	100
		Group 2475-2675			
		Average similarity: 82.09			
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Small Gorgonian	1	81.53	3.66	99.31	99.31
Large Gorgonian	0.14	0.28	0.08	0.34	99.66
Soft Coral	0.09	0.28	0.08	0.34	100
		Group 2875-2975			
		Average similarity: 55.80			
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Large Gorgonian	0.8	47.57	1.14	85.25	85.25
Small Gorgonian	0.4	6.58	0.36	11.79	97.04
Soft Coral	0.2	1.65	0.16	2.96	100
		Group 2275-2475			
		Average similarity: 69.35			
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Soft Coral	0.69	36.36	0.91	52.42	52.42
Large Gorgonian	0.39	29.7	0.82	42.83	95.25
Small Gorgonian	0.2	3.29	0.22	4.75	100
Antipatharian	0.02	0	#######	0	100
Cup Coral	0.02	0	#######	0	100
D.dianthus	0	0	#######	0	100
Pennatulacean	0	0	#######	0	100
		Group 2075-2275			
		Average similarity: 67.59			
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Soft Coral	0.85	61.46	1.48	90.93	90.93
Large Gorgonian	0.23	4.08	0.24	6.03	96.97
Small Gorgonian	0.15	1.74	0.16	2.57	99.54
D.dianthus	0.08	0.31	0.09	0.46	100
		Group 1875-2075			
		Average similarity: 69.92			
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Large Gorgonian	0.57	35.62	1.02	50.94	50.94
Soft Coral	0.73	33.66	0.9	48.13	99.07
Cup Coral	0.08	0.65	0.11	0.93	100
Antipatharian	0	0	#######	0	100
D.dianthus	0	0	#######	0	100
Pennatulacean	0	0	#######	0	100
Small Gorgonian	0	0	#######	0	100

Table 5-64 The average within group similarity from 2-way SIMPER analysis accounting for 100% of similarity results for facies for 10m across all depth for functional groups with a presence/absence transformation.

Functional Groups presence/absence 10m Examines Facies groups (across all Depth groups)					
Group Fine Grain Average similarity: 77.51					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Small Gorgonian	0.65	72.17	2.06	93.1	93.1
Pennatulacean	0.19	2.13	0.18	2.75	95.85
D.dianthus	0.09	1.76	0.14	2.27	98.13
Soft Coral	0.14	0.68	0.09	0.88	99.01
Large Gorgonian	0.09	0.62	0.09	0.8	99.8
Cup Coral	0.04	0.09	0.04	0.11	99.91
Antipatharian	0.03	0.07	0.04	0.09	100
Group Sedimentary Bedrock Average similarity: 77.23					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Soft Coral	0.83	57.52	1.98	74.47	74.47
Large Gorgonian	0.63	19.49	0.72	25.23	99.7
Small Gorgonian	0.05	0.12	0.04	0.16	99.85
D.dianthus	0.03	0.08	0.03	0.1	99.96
Cup Coral	0.02	0.03	0.03	0.04	99.99
Antipatharian	0.02	0	0.01	0.01	100
Group Discontinuous Sedimentary Bedrock Average similarity: 70.00					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Soft Coral	0.82	62.86	1.55	89.8	89.8
Small Gorgonian	0.18	5.87	0.3	8.38	98.18
Large Gorgonian	0.21	1.27	0.17	1.82	100
Group Boulder No groups with at least 2 samples					
Group Discontinuous Igneous Bedrock Average similarity: 58.94					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Small Gorgonian	0.76	39.84	1.09	67.59	67.59
Large Gorgonian	0.38	10.81	0.51	18.34	85.93
Soft Coral	0.33	8.29	0.31	14.07	100

Group Igneous Bedrock					
Average similarity: 66.10					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Soft Coral	0.56	34.84	0.8	52.71	52.71
Small Gorgonian	0.37	21.21	0.58	32.08	84.79
Large Gorgonian	0.25	9.35	0.35	14.14	98.93
Cup Coral	0.09	0.52	0.1	0.79	99.72
D.dianthus	0.05	0.19	0.07	0.28	100
Antipatharian	0.01	0	#######	0	100
Pennatulacean	0	0	#######	0	100
Group Gravelly Fine Grain					
Average similarity: 57.66					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Soft Coral	0.67	29.54	0.78	51.23	51.23
Large Gorgonian	0.6	27.71	0.76	48.05	99.28
Small Gorgonian	0.09	0.42	0.1	0.72	100

Table 5-65 The average within group similarity from 2-way SIMPER analysis accounting for 100% of similarity results for depth across all facies for 50m for functional groups with a presence/absence transformation.

Functional Groups presence/absence 10m Examines Facies groups (across all Depth groups)					
Group Fine Grain Average similarity: 77.51					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Small Gorgonian	0.65	72.17	2.06	93.1	93.1
Pennatulacean	0.19	2.13	0.18	2.75	95.85
D.dianthus	0.09	1.76	0.14	2.27	98.13
Soft Coral	0.14	0.68	0.09	0.88	99.01
Large Gorgonian	0.09	0.62	0.09	0.8	99.8
Cup Coral	0.04	0.09	0.04	0.11	99.91
Antipatharian	0.03	0.07	0.04	0.09	100
Group Sedimentary Bedrock Average similarity: 77.23					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Soft Coral	0.83	57.52	1.98	74.47	74.47
Large Gorgonian	0.63	19.49	0.72	25.23	99.7
Small Gorgonian	0.05	0.12	0.04	0.16	99.85
D.dianthus	0.03	0.08	0.03	0.1	99.96
Cup Coral	0.02	0.03	0.03	0.04	99.99
Antipatharian	0.02	0	0.01	0.01	100
Group Discontinuous Sedimentary Bedrock Average similarity: 70.00					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Soft Coral	0.82	62.86	1.55	89.8	89.8
Small Gorgonian	0.18	5.87	0.3	8.38	98.18
Large Gorgonian	0.21	1.27	0.17	1.82	100
Group Boulder No groups with at least 2 samples					
Group Discontinuous Igneous Bedrock Average similarity: 58.94					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Small Gorgonian	0.76	39.84	1.09	67.59	67.59
Large Gorgonian	0.38	10.81	0.51	18.34	85.93
Soft Coral	0.33	8.29	0.31	14.07	100

Group 875-1075					
Average similarity: 72.13					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Small Gorgonian	0.9	64.63	3.47	89.6	89.6
Pennatulacean	0.5	7.5	0.44	10.4	100
Group 2875-2975					
Average similarity: 63.53					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Large Gorgonian	0.92	42.55	1.51	66.98	66.98
Small Gorgonian	0.58	13.14	0.62	20.68	87.65
Soft Coral	0.33	7.84	0.44	12.35	100
Group 2675-2875					
Average similarity: 80.00					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Large Gorgonian	0.86	40.48	8.3	50.6	50.6
Small Gorgonian	0.86	34.76	2.16	43.45	94.05
Soft Coral	0.43	4.76	0.38	5.95	100
Group 2475-2675					
Average similarity: 68.94					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Small Gorgonian	1	62.06	2.04	90.02	90.02
Large Gorgonian	0.29	3.7	0.33	5.37	95.4
Soft Coral	0.29	3.17	0.33	4.6	100
Group 2275-2475					
Average similarity: 72.15					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Soft Coral	0.88	50.28	1.82	69.68	69.68
Large Gorgonian	0.36	13.89	0.56	19.25	88.93
Small Gorgonian	0.36	7.99	0.42	11.07	100
Group 2075-2275					
Average similarity: 57.61					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Soft Coral	0.84	49.75	1.35	86.35	86.35
Large Gorgonian	0.37	5.58	0.33	9.69	96.04
Small Gorgonian	0.26	2.28	0.26	3.96	100
Group 1875-2075					
Average similarity: 80.51					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Soft Coral	0.94	49.23	1.78	61.15	61.15
Large Gorgonian	0.63	30	1.21	37.26	98.41
Cup Coral	0.13	1.28	0.2	1.59	100

Table 5-66 The average within group similarity from 2-way SIMPER analysis accounting for 100% of similarity results for facies at 50m across all depth for functional groups with a presence/absence transformation.

Functional Groups presence/absence 50m Examines Facies groups (across all Depth groups)					
Group Fine Grain Average similarity: 53.67					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Small Gorgonian	0.59	29.8	0.88	55.53	55.53
D.dianthus	0.24	11.73	0.41	21.86	77.39
Pennatulacean	0.27	7.07	0.42	13.17	90.56
Soft Coral	0.3	3.33	0.22	6.21	96.77
Cup Coral	0.08	1	0.1	1.86	98.63
Large Gorgonian	0.14	0.4	0.1	0.75	99.38
Antipatharian	0.05	0.33	0.1	0.62	100
Group Discontinuous Sedimentary Bedrock Average similarity: 49.24					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Soft Coral	0.79	35.83	0.98	72.77	72.77
Large Gorgonian	0.5	8.64	0.44	17.54	90.31
Small Gorgonian	0.29	4.77	0.38	9.69	100
Group Sedimentary Bedrock Average similarity: 80.48					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Soft Coral	0.89	44.25	2.11	54.98	54.98
Large Gorgonian	0.84	34.68	1.65	43.1	98.07
Small Gorgonian	0.18	1.36	0.2	1.69	99.76
Cup Coral	0.04	0.1	0.06	0.13	99.89
Antipatharian	0.07	0.09	0.06	0.11	100
Group Igneous Bedrock Average similarity: 65.39					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Soft Coral	0.79	41.13	1.19	62.89	62.89
Large Gorgonian	0.46	13.21	0.56	20.19	83.08
Small Gorgonian	0.43	10.42	0.55	15.94	99.02
Cup Coral	0.21	0.64	0.14	0.98	100
Antipatharian	0.04	0	#######	0	100
D.dianthus	0.07	0	#######	0	100
Pennatulacean	0	0	#######	0	100
Group Discontinuous Igneous Bedrock Average similarity: 74.76					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Small Gorgonian	0.8	36.19	1.04	48.41	48.41
Large Gorgonian	0.53	28.25	1.06	37.79	86.2
Soft Coral	0.33	10.32	0.46	13.8	100

Group Gravelly Fine Grain					
Average similarity: 66.63					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Soft Coral	0.86	39.49	1.35	59.26	59.26
Large Gorgonian	0.66	23.52	0.92	35.3	94.56
Small Gorgonian	0.27	3.62	0.34	5.44	100

Group Igneous/Sedimentary

No groups with at least 2 samples

Table 5-67 The average within group similarity from 2-way SIMPER analysis accounting for 100% of similarity results for depth across all facies for 100m for functional groups with a presence/absence transformation.

Functional Groups presence/absence 100m Examines Depth groups (across all Facies groups)					
Group 1475-1675 Average similarity: 79.68					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Soft Coral	0.79	31.94	2.46	40.09	40.09
Large Gorgonian	0.79	25.77	1.89	32.35	72.43
Small Gorgonian	0.68	19.17	1.23	24.06	96.49
D.dianthus	0.21	2.45	0.22	3.07	99.56
Cup Coral	0.21	0.35	0.13	0.44	100
Group 1275-1475 Average similarity: 58.33					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Large Gorgonian	0.67	29.17	1.39	50	50
Soft Coral	0.83	29.17	1.39	50	100
Group 1675-1875 Average similarity: 59.49					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Soft Coral	0.75	33.92	1.2	57.02	57.02
Large Gorgonian	0.63	24.43	0.93	41.06	98.09
Small Gorgonian	0.21	1.14	0.16	1.91	100
Group 1075-1275 Average similarity: 87.06					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Soft Coral	0.93	39.56	3.09	45.44	45.44
Large Gorgonian	0.71	37.38	2.29	42.94	88.38
Small Gorgonian	0.57	7.34	0.51	8.43	96.81
Pennatulacean	0.21	2.18	0.27	2.51	99.32
Antipatharian	0.14	0.6	0.15	0.68	100
Group 875-1075 Average similarity: 66.00					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Small Gorgonian	0.83	54.67	2.85	82.83	82.83
Pennatulacean	0.67	11.33	0.62	17.17	100
Group 2875-2975 Average similarity: 89.33					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Large Gorgonian	1	41.33	2.86	46.27	46.27
Small Gorgonian	0.75	28	1.76	31.34	77.61
Soft Coral	0.5	20	1.1	22.39	100

Group 2675-2875					
Average similarity: 77.46					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Large Gorgonian	0.75	33.97	5.92	43.85	43.85
Small Gorgonian	1	33.97	5.92	43.85	87.7
Soft Coral	0.5	9.52	0.58	12.3	100

Group 2475-2675					
Average similarity: 75.00					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Large Gorgonian	0.67	25	#######	33.33	33.33
Small Gorgonian	1	25	#######	33.33	66.67
Soft Coral	0.67	25	#######	33.33	100

Group 2275-2475					
Average similarity: 69.81					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Soft Coral	0.88	46.73	1.66	66.93	66.93
Large Gorgonian	0.35	14.44	0.57	20.69	87.62
Small Gorgonian	0.41	7.72	0.51	11.05	98.67
Cup Coral	0.12	0.93	0.19	1.33	100
Antipatharian	0.06	0	#######	0	100
D.dianthus	0.06	0	#######	0	100
Pennatulacean	0	0	#######	0	100

Group 2075-2275					
Average similarity: 63.89					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Soft Coral	1	43.06	3.05	67.39	67.39
Large Gorgonian	0.67	12.5	0.63	19.57	86.96
Small Gorgonian	0.33	8.33	0.51	13.04	100

Group 1875-2075					
Average similarity: 53.33					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Soft Coral	0.89	33.33	1.07	62.5	62.5
Large Gorgonian	0.67	20	0.73	37.5	100

Table 5-68 The average within group similarity from 2-way SIMPER analysis accounting for 100% of similarity results for facies for 100m across all depth for functional groups with a presence/absence transformation.

Functional Groups presence/absence 100m Examines Facies groups (across all Depth groups)					
Group Fine Grain					
Average similarity: 57.50					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Small Gorgonian	0.76	33.13	1.25	57.61	57.61
Pennatulacean	0.33	8.54	0.56	14.86	72.46
Soft Coral	0.48	6.6	0.4	11.47	83.94
D.dianthus	0.24	6.53	0.36	11.35	95.29
Large Gorgonian	0.24	1.67	0.2	2.9	98.19
Antipatharian	0.1	1.04	0.2	1.81	100
Cup Coral	0.05	0	#######	0	100
Group Discontinuous Sedimentary Bedrock					
Average similarity: 45.49					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Soft Coral	0.77	29.41	1.29	64.66	64.66
Small Gorgonian	0.46	8.24	0.51	18.1	82.76
Large Gorgonian	0.54	7.84	0.51	17.24	100
Antipatharian	0.08	0	#######	0	100
Cup Coral	0.23	0	#######	0	100
D.dianthus	0.15	0	#######	0	100
Pennatulacean	0.15	0	#######	0	100
Group Sedimentary Bedrock					
Average similarity: 82.46					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Large Gorgonian	0.93	41.33	3.06	50.12	50.12
Soft Coral	0.89	37.13	2.17	45.03	95.15
Small Gorgonian	0.26	3.61	0.34	4.37	99.52
Cup Coral	0.07	0.4	0.13	0.48	100
Antipatharian	0.07	0	#######	0	100
D.dianthus	0.07	0	#######	0	100
Pennatulacean	0	0	#######	0	100
Group Gravelly Fine Grain					
Average similarity: 73.90					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Soft Coral	0.91	39.18	1.73	53.02	53.02
Large Gorgonian	0.74	25.82	1.18	34.94	87.95
Small Gorgonian	0.38	8.9	0.62	12.05	100
Group Discontinuous Igneous Bedrock					
Average similarity: 59.81					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Large Gorgonian	0.63	33.71	1.41	56.37	56.37
Small Gorgonian	0.75	20.38	1.07	34.08	90.45
Soft Coral	0.38	5.71	0.45	9.55	100

Group Igneous Bedrock

Average similarity: 66.48

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Soft Coral	0.93	36.85	1.94	55.43	55.43
Small Gorgonian	0.6	18.52	1.04	27.86	83.29
Large Gorgonian	0.53	9.72	0.58	14.62	97.91
Cup Coral	0.27	1.39	0.24	2.09	100

Group Igneous/Sedimentary

No groups with at least 2 samples

Table 5-69 The average within group similarity from 2-way SIMPER analysis accounting for 100% of similarity results for depth across all facies for 500m for functional groups with a presence/absence transformation.

Functional groups presence/absences 500m Examines Depth groups (across all Facies groups)					
	Group 1675-1875				
	Average similarity: 55.24				
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Soft Coral	1	32.38	4.91	58.62	58.62
Large Gorgonian	0.71	13.33	0.58	24.14	82.76
Small Gorgonian	0.57	9.52	0.58	17.24	100
	Group 1475-1675				
	Average similarity: 82.86				
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Small Gorgonian	1	24.29	4.01	29.31	29.31
Soft Coral	1	24.29	4.01	29.31	58.62
Large Gorgonian	0.83	14.29	0.71	17.24	75.86
Cup Coral	0.5	10	0.71	12.07	87.93
D.dianthus	0.5	10	0.71	12.07	100
	Group 1075-1275				
	Average similarity: 66.67				
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Small Gorgonian	1	33.33	#######	50	50
Soft Coral	1	33.33	#######	50	100
	Group 2875-2975				
	Average similarity: 100.00				
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Large Gorgonian	1	33.33	#######	33.33	33.33
Small Gorgonian	1	33.33	#######	33.33	66.67
Soft Coral	1	33.33	#######	33.33	100
	Group 2675-2875				
	No groups with at least 2 samples				
	Group 2475-2675				
	No groups with at least 2 samples				
	Group 2275-2475				
	No groups with at least 2 samples				
	Group 2075-2275				
	No groups with at least 2 samples				
	Group 875-1075				
	No groups with at least 2 samples				
	Group 1275-1475				
	No groups with at least 2 samples				
	Group 1875-2075				
	No groups with at least 2 samples				

Table 5-70 The average within group similarity from 2-way SIMPER analysis accounting for 100% of similarity for facies for 500m across all depth for functional groups with a presence/absence transformation.

Functional groups presence/absences 500m Examines Facies groups (across all Depth groups)					
Group Discontinuous Sedimentary Bedrock					
Average similarity: 54.29					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Soft Coral	1	24.29	4.01	44.74	44.74
Cup Coral	0.38	10	0.71	18.42	63.16
D.dianthus	0.38	10	0.71	18.42	81.58
Small Gorgonian	0.63	10	0.71	18.42	100
Group Fine Grain					
Average similarity: 61.90					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Small Gorgonian	1	30.95	9.19	50	50
Soft Coral	1	30.95	9.19	50	100
Group Discontinuous Igneous Bedrock					
Average similarity: 100.00					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Large Gorgonian	1	33.33	#######	33.33	33.33
Small Gorgonian	1	33.33	#######	33.33	66.67
Soft Coral	1	33.33	#######	33.33	100
Group Igneous Bedrock					
No groups with at least 2 samples					
Group Igneous/Sedimentary					
No groups with at least 2 samples					
Group Gravelly Fine Grain					
Average similarity: 82.86					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Large Gorgonian	0.86	34.29	4.24	41.38	41.38
Soft Coral	1	34.29	4.24	41.38	82.76
Small Gorgonian	0.71	14.29	0.71	17.24	100
Group Sedimentary Bedrock					
No groups with at least 2 samples					

Table 5-71 The average within group similarity from 2-way SIMPER analysis accounting for 100% of similarity for depth across all facies for 1000m for functional groups with a presence/absence transformation.

Functional Groups presenc/absence 1000m Examines Depth groups (across all Facies groups)					
Group 1675-1875					
Average similarity: 58.33					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Small Gorgonian	1	23.61	12.02	40.48	40.48
Soft Coral	1	23.61	12.02	40.48	80.95
Large Gorgonian	0.8	11.11	0.71	19.05	100
Group 1475-1675					
No groups with at least 2 samples					
Group 1075-1275					
No groups with at least 2 samples					
Group 2875-2975					
No groups with at least 2 samples					
Group 2675-2875					
No groups with at least 2 samples					
Group 2275-2475					
No groups with at least 2 samples					
Group 1275-1475					
No groups with at least 2 samples					
Group 1875-2075					
No groups with at least 2 samples					

Table 5-72 The average within group similarity from 2-way SIMPER analysis accounting for 100% of similarity for facies for 1000m across all depth for functional groups with a presence/absence transformation.

Functional Groups presenc/absence 1000m Examines Facies groups (across all Depth groups)					
Group Fine Grain					
Average similarity: 50.00					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Small Gorgonian	1	25	#######	50	50
Soft Coral	1	25	#######	50	100
Group Discontinuous Igneous Bedrock					
No groups with at least 2 samples					
Group Igneous Bedrock					
No groups with at least 2 samples					
Group Igneous/Sedimentary*					
No groups with at least 2 samples					
Group Discontinuous Sedimentary Bedrock					
Average similarity: 66.67					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Large Gorgonian	1	22.22	#######	33.33	33.33
Small Gorgonian	1	22.22	#######	33.33	66.67
Soft Coral	1	22.22	#######	33.33	100
Group Sedimentary Bedrock					
No groups with at least 2 samples					
Group Gravelly Fine Grain					
No groups with at least 2 samples					
Groups Fine Grain & Discontinuous Igneous Bedrock					
No pairs of groups with samples					
Groups Fine Grain & Igneous Bedrock					
No pairs of groups with samples					
Groups Discontinuous Igneous Bedrock & Igneous Bedrock					
No pairs of groups with samples					

5.3.3 Species abundance data fourth root transformed

Table 5-73 The average within group similarity from 2-way SIMPER analysis accounting for 100% of similarity for depth across all for attachment grain size species with a 4th root transformation.

Species 4th root Grain size Examines Depth groups (across all Grain groups)					
Group 1075-1275 Average similarity: 65.84					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Anthomastus sp	1.56	53.09	2.79	80.64	80.64
Nephtheidae F	0.77	10.8	0.62	16.4	97.04
Primnoa sp	0.16	1.04	0.18	1.58	98.61
Acanthogorgia sp	0.17	0.64	0.16	0.98	99.59
Paramuricea spp.	0.06	0.2	0.08	0.3	99.89
Acanella sp	0.02	0.06	0.02	0.09	99.97
Isididae F	0.02	0.01	0.02	0.02	99.99
Anthoptilum grandiflorum	0.01	0	0.01	0.01	100
Paragorgia sp	0.01	0	0.01	0	100
Group 1275-1475 Average similarity: 59.80					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Isididae F	1.08	53.74	1.42	89.86	89.86
Anthomastus sp	0.54	5.29	0.33	8.84	98.7
Nephtheidae F	0.19	0.62	0.11	1.03	99.73
Acanella sp	0.03	0.06	0.03	0.1	99.83
Acanthogorgia sp	0.03	0.05	0.02	0.08	99.9
Paramuricea spp.	0.03	0.04	0.03	0.06	99.97
Cup Coral (unknown)	0.01	0.01	0.01	0.01	99.98
Large Gorgonian (unknown)	0	0	0.01	0.01	99.99
Primnoa sp	0.01	0	0.01	0.01	99.99
Desmophyllum dianthus	0	0	0.01	0	100
Pennatula sp.	0	0	0	0	100
Pennatulacea (whip-like)	0	0	0	0	100
Group 1475-1675 Average similarity: 75.07					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Anthomastus sp	0.85	39.24	0.92	52.28	52.28
Isididae F	0.58	35.11	0.8	46.77	99.05
Cup Coral (unknown)	0.04	0.37	0.07	0.49	99.54
Acanthogorgia sp	0.06	0.21	0.06	0.28	99.81
Desmophyllum dianthus	0.01	0.07	0.03	0.09	99.91
Paramuricea spp.	0.02	0.03	0.03	0.04	99.95
Nephtheidae F	0.02	0.01	0.02	0.02	99.97
Swiftia sp	0.01	0.01	0.02	0.01	99.98
Acanella sp	0.01	0.01	0.01	0.01	99.99
Large Gorgonian (unknown)	0.01	0	0.01	0.01	100
Primnoa sp	0.01	0	0.01	0	100
Small Gorgonian (unknown)	0.01	0	0	0	100
Antipatharian sp.	0	0	0	0	100

Group 1675-1875					
Average similarity: 85.82					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Anthomastus sp	0.89	81.57	2.67	95.05	95.05
Isididae F	0.35	4.17	0.23	4.86	99.91
Corallium sp.	0.03	0.04	0.03	0.04	99.96
Paramuricea spp.	0.02	0.02	0.02	0.02	99.98
Cup Coral (unknown)	0.01	0.01	0.01	0.01	99.99
Acanthogorgia sp	0.01	0	0.01	0	99.99
Acanella sp	0	0	0.01	0	99.99
Soft Coral (unknown)	0.01	0	0.01	0	100
Desmophyllum dianthus	0	0	0	0	100
Anthoptilum grandiflorum	0	0	#######	0	100
Antipatharian (unknown)	0	0	#######	0	100
Antipatharian sp.	0	0	#######	0	100
Bathypathes sp	0	0	#######	0	100
Chrysogorgia cf. agassizii	0	0	#######	0	100
Chrysogorgia sp. (unknown)	0	0	#######	0	100
Chrysogorgia sp. 1	0	0	#######	0	100
Chrysogorgia sp. 2	0	0	#######	0	100
Halipteris finmarchica	0	0	#######	0	100
Heteropolypus cf. insolitus	0	0	#######	0	100
Large Gorgonian (unknown)	0	0	#######	0	100
Lepidisis sp	0	0	#######	0	100
Narella cf. laxa	0	0	#######	0	100
Nephtheidae F	0	0	#######	0	100
Paragorgia sp	0	0	#######	0	100
Parastenella sp	0	0	#######	0	100
Pennatula sp.	0	0	#######	0	100
Pennatula sp. (bushy, orange)	0	0	#######	0	100
Pennatulacea (whip-like)	0	0	#######	0	100
Primnoa sp	0	0	#######	0	100
Small Gorgonian (unknown)	0	0	#######	0	100
Swiftia sp	0	0	#######	0	100
Umbellula encrinus	0	0	#######	0	100

Group 1875-2075					
Average similarity: 57.32					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Anthomastus sp	1.31	43.24	1.62	75.44	75.44
Nephtheidae F	0.72	12.46	0.61	21.74	97.18
Isididae F	0.11	0.76	0.11	1.33	98.5
Acanthogorgia sp	0.12	0.38	0.11	0.66	99.16
Primnoa sp	0.09	0.32	0.1	0.56	99.71
Paramuricea spp.	0.04	0.08	0.04	0.14	99.86

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Cup Coral (unknown)	0.02	0.08	0.03	0.14	100
Desmophyllum dianthus	0	0	0	0	100
Paragorgia sp	0	0	0	0	100

Group 2075-2275
Average similarity: 50.51

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Anthomastus sp	0.74	45.29	1.03	89.66	89.66
Acanella sp	0.11	3.58	0.19	7.08	96.75
Corallium sp.	0.07	0.5	0.09	0.99	97.74
Desmophyllum dianthus	0.04	0.4	0.06	0.79	98.53
Chrysogorgia sp. 1	0.03	0.2	0.05	0.39	98.92
Chrysogorgia cf. agassizii	0.02	0.12	0.03	0.24	99.16
Isididae F	0.04	0.12	0.03	0.24	99.4
Soft Coral (unknown)	0.04	0.12	0.03	0.24	99.63
Paramuricea spp.	0.02	0.07	0.03	0.13	99.76
Cup Coral (unknown)	0.02	0.04	0.02	0.08	99.84
Pennatula sp.	0.01	0.04	0.02	0.08	99.92
Small Gorgonian (unknown)	0.01	0.04	0.02	0.08	100
Acanthogorgia sp	0	0	#######	0	100
Anthoptilum grandiflorum	0	0	#######	0	100
Antipatharian (unknown)	0	0	#######	0	100
Antipatharian sp.	0	0	#######	0	100
Bathypathes sp	0	0	#######	0	100
Chrysogorgia sp. (unknown)	0.01	0	#######	0	100
Chrysogorgia sp. 2	0	0	#######	0	100
Halipteris finmarchica	0	0	#######	0	100
Heteropolypus cf. insolitus	0	0	#######	0	100
Large Gorgonian (unknown)	0	0	#######	0	100
Lepidisis sp	0	0	#######	0	100
Narella cf. laxa	0	0	#######	0	100
Nephtheidae F	0	0	#######	0	100
Paragorgia sp	0	0	#######	0	100
Parastenella sp	0	0	#######	0	100
Pennatula sp. (bushy, orange)	0	0	#######	0	100
Pennatulacea (whip-like)	0	0	#######	0	100
Primnoa sp	0	0	#######	0	100
Swiftia sp	0	0	#######	0	100
Umbellula encrinus	0	0	#######	0	100

Group 2275-2475
Average similarity: 53.60

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Isididae F	0.93	42.7	1.08	79.67	79.67
Anthomastus sp	0.4	6.24	0.32	11.63	91.31
Chrysogorgia cf. agassizii	0.15	2.82	0.18	5.26	96.56

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Chrysogorgia sp. 1	0.14	1.8	0.17	3.37	99.93
Heteropolypus cf. insolitus	0.01	0.03	0.02	0.05	99.98
Corallium sp.	0.01	0.01	0.02	0.02	100
Acanella sp	0	0	#######	0	100
Acanthogorgia sp	0	0	#######	0	100
Anthoptilum grandiflorum	0	0	#######	0	100
Antipatharian (unknown)	0	0	#######	0	100
Antipatharian sp.	0	0	#######	0	100
Bathypathes sp	0.01	0	#######	0	100
Chrysogorgia sp. (unknown)	0	0	#######	0	100
Chrysogorgia sp. 2	0	0	#######	0	100
Cup Coral (unknown)	0.01	0	#######	0	100
Desmophyllum dianthus	0	0	#######	0	100
Halipteris finmarchica	0	0	#######	0	100
Large Gorgonian (unknown)	0	0	#######	0	100
Lepidisis sp	0	0	#######	0	100
Narella cf. laxa	0	0	#######	0	100
Nephtheidae F	0	0	#######	0	100
Paragorgia sp	0	0	#######	0	100
Paramuricea spp.	0.01	0	#######	0	100
Parastenella sp	0	0	#######	0	100
Pennatula sp.	0	0	#######	0	100
Pennatula sp. (bushy, orange)	0	0	#######	0	100
Pennatulacea (whip-like)	0	0	#######	0	100
Primnoa sp	0	0	#######	0	100
Small Gorgonian (unknown)	0	0	#######	0	100
Soft Coral (unknown)	0	0	#######	0	100
Swiftia sp	0.01	0	#######	0	100
Umbellula encrinus	0	0	#######	0	100

Group 2475-2675

Average similarity: 71.74

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Chrysogorgia cf. agassizii	0.94	71.37	1.74	99.49	99.49
Nephtheidae F	0.06	0.32	0.06	0.44	99.93
Cup Coral (unknown)	0.02	0.04	0.02	0.05	99.98
Small Gorgonian (unknown)	0.01	0.01	0.01	0.02	100

Group 2675-2875

Average similarity: 35.41

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Chrysogorgia cf. agassizii	0.69	31.2	0.72	88.13	88.13
Isididae F	0.21	3.48	0.2	9.82	97.95
Chrysogorgia sp. 1	0.07	0.35	0.06	0.98	98.93
Anthomastus sp	0.07	0.26	0.06	0.74	99.67
Cup Coral (unknown)	0.05	0.12	0.03	0.33	100

Group 2875-2975					
Average similarity: 24.07					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Lepidisis sp	0.36	12.78	0.41	53.09	53.09
Chrysogorgia cf. agassizii	0.3	7.48	0.29	31.06	84.15
Isididae F	0.21	2.4	0.16	9.98	94.13
Large Gorgonian (unknown)	0.1	1.22	0.12	5.08	99.21
Anthomastus sp	0.08	0.09	0.03	0.39	99.61
Narella cf. laxa	0.03	0.09	0.03	0.39	100
Group 875-1075					
Average similarity: 87.68					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Acanella sp	0.59	70.56	1.67	80.48	80.48
Nephtheidae F	0.62	9.68	0.48	11.04	91.52
Anthomastus sp	0.55	7.38	0.45	8.42	99.94
Anthoptilum grandiflorum	0.02	0.05	0.03	0.06	100
Paramuricea spp.	0.01	0	0.01	0	100
Group <875					
No groups with at least 2 samples					

Table 5-74 The average within group similarity from 2-way SIMPER analysis accounting for 100% of similarity for attachment grain size across all depths for species with a 4th root transformation.

Species 4th root Grain size Examines Grain groups (across all Depth groups)					
	Group Br-SD Average similarity: 49.16				
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Anthomastus sp	1.19	41.19	1.25	83.79	83.79
Isididae F	0.26	3.26	0.21	6.64	90.43
Nephtheidae F	0.26	2.68	0.29	5.45	95.88
Primnoa sp	0.13	0.64	0.14	1.3	97.18
Acanthogorgia sp	0.12	0.57	0.12	1.16	98.34
Cup Coral (unknown)	0.04	0.37	0.07	0.75	99.09
Paramuricea spp.	0.08	0.2	0.07	0.41	99.5
Chrysogorgia sp. 1	0.02	0.09	0.04	0.18	99.67
Corallium sp.	0.04	0.08	0.04	0.16	99.83
Desmophyllum dianthus	0.02	0.07	0.03	0.15	99.98
Large Gorgonian (unknown)	0.01	0	0.01	0.01	99.99
Soft Coral (unknown)	0	0	0.01	0.01	100
Paragorgia sp	0	0	0	0	100
Antipatharian sp.	0	0	0	0	100
Acanella sp	0	0	0	0	100
	Group Br-IG Average similarity: 60.71				
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Chrysogorgia cf. agassizii	0.57	55.26	1.18	91.03	91.03
Anthomastus sp	0.2	2.71	0.18	4.46	95.49
Lepidisis sp	0.06	1.16	0.11	1.91	97.4
Cup Coral (unknown)	0.08	0.64	0.08	1.06	98.46
Isididae F	0.04	0.3	0.06	0.49	98.94
Nephtheidae F	0.03	0.23	0.05	0.38	99.32
Paramuricea spp.	0.03	0.14	0.04	0.23	99.56
Large Gorgonian (unknown)	0.02	0.11	0.04	0.18	99.74
Desmophyllum dianthus	0.02	0.09	0.03	0.14	99.88
Acanthogorgia sp	0.01	0.03	0.02	0.05	99.93
Chrysogorgia sp. 1	0.02	0.03	0.02	0.04	99.97
Narella cf. laxa	0.01	0.01	0.01	0.01	99.99
Small Gorgonian (unknown)	0.01	0.01	0.01	0.01	100
	Group Fg Average similarity: 63.13				
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Isididae F	0.89	46.89	1.2	74.28	74.28
Acanella sp	0.29	12.67	0.39	20.07	94.36
Anthomastus sp	0.24	3.26	0.26	5.16	99.51
Nephtheidae F	0.05	0.29	0.07	0.45	99.97
Anthoptilum grandiflorum	0.01	0.01	0.01	0.02	99.98
Soft Coral (unknown)	0.01	0	0.01	0.01	99.99

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Pennatula sp.	0.01	0	0	0	99.99
Heteropolypus cf. insolitus	0	0	0	0	100
Pennatulacea (whip-like)	0	0	0	0	100
Small Gorgonian (unknown)	0	0	0	0	100
Acanthogorgia sp	0	0	0	0	100
Antipatharian (unknown)	0	0	#######	0	100
Antipatharian sp.	0	0	#######	0	100
Bathypathes sp	0	0	#######	0	100
Chrysogorgia cf. agassizii	0	0	#######	0	100
Chrysogorgia sp. (unknown)	0	0	#######	0	100
Chrysogorgia sp. 1	0	0	#######	0	100
Chrysogorgia sp. 2	0	0	#######	0	100
Corallium sp.	0	0	#######	0	100
Cup Coral (unknown)	0	0	#######	0	100
Desmophyllum dianthus	0	0	#######	0	100
Halipteris finmarchica	0	0	#######	0	100
Large Gorgonian (unknown)	0	0	#######	0	100
Lepidisis sp	0	0	#######	0	100
Narella cf. laxa	0	0	#######	0	100
Paragorgia sp	0	0	#######	0	100
Paramuricea spp.	0	0	#######	0	100
Parastenella sp	0	0	#######	0	100
Pennatula sp. (bushy, orange)	0	0	#######	0	100
Primnoa sp	0	0	#######	0	100
Swiftia sp	0	0	#######	0	100
Umbellula encrinus	0	0	#######	0	100

Group Bl

Average similarity: 72.03

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Anthomastus sp	1.24	61.87	1.88	85.9	85.9
Nephtheidae F	0.55	9.52	0.52	13.22	99.12
Acanthogorgia sp	0.1	0.38	0.1	0.53	99.65
Isididae F	0.04	0.11	0.04	0.16	99.81
Paramuricea spp.	0.04	0.07	0.04	0.09	99.9
Chrysogorgia cf. agassizii	0.02	0.04	0.02	0.06	99.96
Primnoa sp	0.02	0.01	0.02	0.02	99.98
Large Gorgonian (unknown)	0.01	0.01	0.01	0.01	100
Lepidisis sp	0.01	0	0.01	0	100
Small Gorgonian (unknown)	0.01	0	0.01	0	100
Acanella sp	0	0	#######	0	100
Anthoptilum grandiflorum	0	0	#######	0	100
Antipatharian (unknown)	0	0	#######	0	100
Antipatharian sp.	0	0	#######	0	100
Bathypathes sp	0	0	#######	0	100
Chrysogorgia sp. (unknown)	0	0	#######	0	100

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Chrysogorgia sp. 1	0	0	#######	0	100
Chrysogorgia sp. 2	0	0	#######	0	100
Corallium sp.	0	0	#######	0	100
Cup Coral (unknown)	0	0	#######	0	100
Desmophyllum dianthus	0	0	#######	0	100
Halipteris finmarchica	0	0	#######	0	100
Heteropolypus cf. insolitus	0	0	#######	0	100
Narella cf. laxa	0	0	#######	0	100
Paragorgia sp	0	0	#######	0	100
Parastenella sp	0	0	#######	0	100
Pennatula sp.	0	0	#######	0	100
Pennatula sp. (bushy, orange)	0	0	#######	0	100
Pennatulacea (whip-like)	0	0	#######	0	100
Soft Coral (unknown)	0	0	#######	0	100
Swiftia sp	0	0	#######	0	100
Umbellula encrinus	0	0	#######	0	100

Group G

Average similarity: 83.38

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Anthomastus sp	1.22	78.18	2.92	93.77	93.77
Nephtheidae F	0.39	5.14	0.35	6.17	99.93
Acanthogorgia sp	0.04	0.04	0.04	0.05	99.99
Isididae F	0.01	0.01	0.01	0.01	100
Soft Coral (unknown)	0	0	0	0	100
Paramuricea spp.	0	0	0	0	100
Large Gorgonian (unknown)	0	0	0	0	100
Primnoa sp	0	0	0	0	100

Group HS

Average similarity: 82.57

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Isididae F	1.73	81.03	3.29	98.14	98.14
Anthomastus sp	0.21	1.41	0.19	1.71	99.85
Nephtheidae F	0.05	0.11	0.05	0.13	99.98
Swiftia sp	0.02	0.01	0.02	0.02	100
Small Gorgonian (unknown)	0.01	0	0	0	100
Acanella sp	0.01	0	0	0	100

Table 5-75 The average within group similarity from 2-way SIMPER analysis accounting for 100% of similarity for depth across all facies for 10m for species with a 4th root transformation.

Species 4th root 10 m Examines Depth groups (across all Facies groups)					
	Group 1475-1675				
	Average similarity: 42.89				
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Isididae F	1.22	24.47	0.67	57.05	57.05
Anthomastus sp	1.04	17.62	0.65	41.07	98.12
Desmophyllum dianthus	0.07	0.23	0.05	0.53	98.65
Acanthogorgia sp	0.14	0.18	0.07	0.42	99.07
Nephtheidae F	0.1	0.08	0.04	0.18	99.26
Paramuricea spp.	0.09	0.07	0.06	0.17	99.43
Swiftia sp	0.05	0.06	0.05	0.14	99.56
Large Gorgonian (unknown)	0.07	0.06	0.05	0.13	99.69
Small Gorgonian (unknown)	0.06	0.05	0.03	0.13	99.82
Acanella sp	0.06	0.05	0.04	0.11	99.93
Cup Coral (unknown)	0.08	0.02	0.03	0.04	99.97
Primnoa sp	0.06	0.01	0.02	0.02	100
Antipatharian sp.	0.02	0	0.01	0	100
	Group 1675-1875				
	Average similarity: 44.71				
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Anthomastus sp	1.16	28.34	0.81	63.39	63.39
Isididae F	0.87	16.13	0.54	36.09	99.48
Paramuricea spp.	0.08	0.1	0.06	0.22	99.7
Desmophyllum dianthus	0.03	0.04	0.02	0.1	99.8
Corallium sp.	0.08	0.04	0.03	0.09	99.89
Acanthogorgia sp	0.04	0.02	0.02	0.04	99.93
Soft Coral (unknown)	0.04	0.01	0.02	0.03	99.96
Large Gorgonian (unknown)	0.02	0.01	0.02	0.03	99.98
Acanella sp	0.02	0.01	0.01	0.02	100
	Group 1275-1475				
	Average similarity: 32.36				
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Nephtheidae F	1.02	13.39	0.86	41.39	41.39
Anthomastus sp	1.42	10.44	0.59	32.25	73.65
Acanthogorgia sp	0.52	5.02	0.47	15.53	89.17
Paramuricea spp.	0.38	1.72	0.29	5.33	94.5
Isididae F	0.35	0.81	0.18	2.49	96.99
Large Gorgonian (unknown)	0.09	0.38	0.1	1.16	98.15
Primnoa sp	0.19	0.32	0.16	1	99.15
Cup Coral (unknown)	0.05	0.09	0.03	0.27	99.42
Anthoptilum grandiflorum	0.04	0.08	0.03	0.25	99.67
Small Gorgonian (unknown)	0.04	0.06	0.03	0.18	99.85
Desmophyllum dianthus	0.05	0.03	0.03	0.09	99.94
Acanella sp	0.07	0.01	0.03	0.04	99.98
Paragorgia sp	0.05	0.01	0.03	0.02	100

Group 1075-1275

Average similarity: 64.43

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Anthomastus sp	2.17	46.46	3	72.11	72.11
Nephtheidae F	1.31	14.54	0.97	22.56	94.67
Acanthogorgia sp	0.45	2.31	0.38	3.59	98.26
Primnoa sp	0.26	0.43	0.17	0.66	98.92
Paramuricea spp.	0.2	0.41	0.16	0.64	99.56
Acanella sp	0.07	0.19	0.05	0.3	99.86
Isididae F	0.09	0.08	0.07	0.12	99.98
Antipatharian sp.	0.02	0.01	0.02	0.02	100
Small Gorgonian (unknown)	0.02	0	0.02	0	100

Group 875-1075

Average similarity: 77.94

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Acanella sp	1.34	77.25	4.93	99.11	99.11
Anthoptilum grandiflorum	0.13	0.59	0.13	0.75	99.86
Paramuricea spp.	0.05	0.06	0.04	0.08	99.94
Anthomastus sp	0.14	0.05	0.04	0.06	100

Group 2675-2875

Average similarity: 45.52

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Chrysogorgia cf. agassizii	1.12	29.07	1.07	63.86	63.86
Isididae F	0.52	10.47	0.45	23	86.85
Chrysogorgia sp. 1	0.23	4.52	0.41	9.93	96.78
Anthomastus sp	0.25	1.46	0.23	3.22	100

Group 2475-2675

Average similarity: 62.41

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Chrysogorgia cf. agassizii	1.52	62.13	2.12	99.55	99.55
Small Gorgonian (unknown)	0.09	0.28	0.08	0.45	100

Group 2875-2975

Average similarity: 28.21

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Lepidisis sp	0.58	17.9	0.63	63.46	63.46
Chrysogorgia cf. agassizii	0.49	4.96	0.34	17.58	81.05
Isididae F	0.41	2.95	0.25	10.47	91.52
Anthomastus sp	0.2	1.34	0.16	4.76	96.28
Large Gorgonian (unknown)	0.18	1.05	0.15	3.72	100
Acanella sp	0	0	#######	0	100
Acanthogorgia sp	0	0	#######	0	100

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Anthoptilum grandiflorum	0	0	#######	0	100
Antipatharian (unknown)	0	0	#######	0	100
Antipatharian sp.	0	0	#######	0	100
Bathypathes sp	0	0	#######	0	100
Chrysogorgia sp. (unknown)	0	0	#######	0	100
Chrysogorgia sp. 1	0.04	0	#######	0	100
Chrysogorgia sp. 2	0.04	0	#######	0	100
Corallium sp.	0	0	#######	0	100
Cup Coral (unknown)	0	0	#######	0	100
Desmophyllum dianthus	0	0	#######	0	100
Halipteris finmarchica	0	0	#######	0	100
Heteropolypus cf. insolitus	0	0	#######	0	100
Narella cf. laxa	0.08	0	#######	0	100
Nephtheidae F	0	0	#######	0	100
Paragorgia sp	0	0	#######	0	100
Paramuricea spp.	0	0	#######	0	100
Parastenella sp	0	0	#######	0	100
Pennatula sp.	0	0	#######	0	100
Pennatula sp. (bushy, orange)	0	0	#######	0	100
Pennatulacea (whip-like)	0	0	#######	0	100
Primnoa sp	0	0	#######	0	100
Small Gorgonian (unknown)	0	0	#######	0	100
Soft Coral (unknown)	0.04	0	#######	0	100
Swiftia sp	0	0	#######	0	100
Umbellula encrinus	0	0	#######	0	100

Group 2275-2475

Average similarity: 52.89

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Anthomastus sp	0.76	30.18	0.82	57.06	57.06
Isididae F	0.72	18.73	0.59	35.42	92.48
Chrysogorgia cf. agassizii	0.23	2.99	0.22	5.66	98.14
Chrysogorgia sp. 1	0.15	0.86	0.14	1.62	99.76
Heteropolypus cf. insolitus	0.03	0.13	0.04	0.24	100

Group 2075-2275

Average similarity: 55.54

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Anthomastus sp	1.11	52.29	1.42	94.15	94.15
Acanella sp	0.14	1.09	0.14	1.96	96.12
Chrysogorgia sp. 1	0.08	1.02	0.12	1.83	97.95
Corallium sp.	0.12	0.42	0.09	0.75	98.7
Desmophyllum dianthus	0.08	0.29	0.09	0.52	99.22
Isididae F	0.09	0.18	0.07	0.32	99.54
Soft Coral (unknown)	0.06	0.17	0.09	0.3	99.84
Chrysogorgia cf. agassizii	0.04	0.09	0.05	0.16	100

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Acanthogorgia sp	0	0	#######	0	100
Anthoptilum grandiflorum	0	0	#######	0	100
Antipatharian (unknown)	0	0	#######	0	100
Antipatharian sp.	0	0	#######	0	100
Bathypathes sp	0	0	#######	0	100
Chrysogorgia sp. (unknown)	0.02	0	#######	0	100
Chrysogorgia sp. 2	0	0	#######	0	100
Cup Coral (unknown)	0.06	0	#######	0	100
Halipteris finmarchica	0	0	#######	0	100
Heteropolypus cf. insolitus	0	0	#######	0	100
Large Gorgonian (unknown)	0	0	#######	0	100
Lepidisis sp	0	0	#######	0	100
Narella cf. laxa	0	0	#######	0	100
Nephtheidae F	0	0	#######	0	100
Paragorgia sp	0	0	#######	0	100
Paramuricea spp.	0.04	0	#######	0	100
Parastenella sp	0	0	#######	0	100
Pennatula sp.	0.02	0	#######	0	100
Pennatula sp. (bushy, orange)	0	0	#######	0	100
Pennatulacea (whip-like)	0	0	#######	0	100
Primnoa sp	0	0	#######	0	100
Small Gorgonian (unknown)	0.02	0	#######	0	100
Swiftia sp	0	0	#######	0	100
Umbellula encrinus	0	0	#######	0	100

Group 1875-2075

Average similarity: 52.93

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Anthomastus sp	0.82	25.69	0.79	48.54	48.54
Isididae F	0.68	25.31	0.83	47.81	96.35
Paramuricea spp.	0.13	1.26	0.14	2.37	98.72
Cup Coral (unknown)	0.12	0.68	0.11	1.28	100

Table 5-76 The average within group similarity from 2-way SIMPER analysis accounting for 100% of similarity for facies at 10 m across all depths for species with a 4th root transformation.

Species 4th root 10 m Examines Facies groups (across all Depth groups)					
Group Fine Grain					
Average similarity: 68.82					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Acanella sp	0.76	65.39	2.08	95	95
Desmophyllum dianthus	0.1	1.67	0.14	2.43	97.43
Anthoptilum grandiflorum	0.1	0.58	0.12	0.84	98.27
Anthomastus sp	0.15	0.42	0.08	0.62	98.89
Chrysogorgia cf. agassizii	0.13	0.28	0.06	0.41	99.29
Isididae F	0.04	0.23	0.06	0.33	99.62
Cup Coral (unknown)	0.05	0.09	0.04	0.14	99.76
Antipatharian sp.	0.03	0.07	0.04	0.1	99.85
Lepidisis sp	0.03	0.05	0.04	0.08	99.93
Paramuricea spp.	0.03	0.05	0.04	0.07	100
Group Sedimentary Bedrock					
Average similarity: 57.39					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Anthomastus sp	1.58	37.7	1.6	65.7	65.7
Nephtheidae F	0.72	12	0.8	20.91	86.61
Isididae F	0.45	4	0.26	6.97	93.57
Acanthogorgia sp	0.32	2.38	0.35	4.15	97.73
Paramuricea spp.	0.19	0.58	0.17	1.01	98.74
Primnoa sp	0.16	0.35	0.15	0.6	99.34
Large Gorgonian (unknown)	0.06	0.11	0.06	0.19	99.53
Chrysogorgia sp. 1	0.04	0.07	0.04	0.13	99.66
Corallium sp.	0.07	0.07	0.04	0.13	99.78
Desmophyllum dianthus	0.04	0.06	0.03	0.11	99.89
Small Gorgonian (unknown)	0.03	0.04	0.02	0.06	99.96
Cup Coral (unknown)	0.03	0.02	0.03	0.03	99.99
Acanella sp	0.02	0	0.01	0	100
Antipatharian sp.	0.01	0	0.01	0	100
Paragorgia sp	0.01	0	0.01	0	100
Anthoptilum grandiflorum	0	0	#######	0	100
Antipatharian (unknown)	0	0	#######	0	100
Bathypathes sp	0	0	#######	0	100
Chrysogorgia cf. agassizii	0	0	#######	0	100
Chrysogorgia sp. (unknown)	0	0	#######	0	100
Chrysogorgia sp. 2	0	0	#######	0	100
Halipteris finmarchica	0	0	#######	0	100
Heteropolypus cf. insolitus	0	0	#######	0	100
Lepidisis sp	0	0	#######	0	100
Narella cf. laxa	0	0	#######	0	100
Parastenella sp	0	0	#######	0	100
Pennatula sp.	0	0	#######	0	100
Pennatula sp. (bushy, orange)	0	0	#######	0	100

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Pennatulacea (whip-like)	0	0	#######	0	100
Soft Coral (unknown)	0.01	0	#######	0	100
Swiftia sp	0	0	#######	0	100
Umbellula encrinus	0	0	#######	0	100

Group Discontinuous Sedimentary Bedrock

Average similarity: 60.52

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Anthomastus sp	1.1	55.76	1.46	92.13	92.13
Acanella sp	0.23	3.92	0.28	6.48	98.61
Soft Coral (unknown)	0.16	0.6	0.17	0.99	99.6
Isididae F	0.11	0.24	0.1	0.4	100

Group Boulder

No groups with at least 2 samples

Group Discontinuous Igneous Bedrock

Average similarity: 48.12

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Chrysogorgia cf. agassizii	1.11	35.45	1.03	73.68	73.68
Anthomastus sp	0.38	7.33	0.3	15.23	88.92
Isididae F	0.25	3.24	0.31	6.73	95.65
Chrysogorgia sp. 1	0.19	2.09	0.27	4.35	100

Group Igneous Bedrock

Average similarity: 51.50

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Anthomastus sp	0.59	29.57	0.74	57.43	57.43
Chrysogorgia cf. agassizii	0.47	16.24	0.54	31.54	88.96
Lepidisis sp	0.15	3.23	0.23	6.28	95.24
Paramuricea spp.	0.06	1.01	0.12	1.96	97.2
Cup Coral (unknown)	0.12	0.54	0.1	1.06	98.26
Isididae F	0.07	0.37	0.08	0.72	98.98
Large Gorgonian (unknown)	0.05	0.19	0.07	0.38	99.35
Desmophyllum dianthus	0.05	0.17	0.07	0.34	99.69
Soft Coral (unknown)	0.05	0.09	0.04	0.18	99.87
Small Gorgonian (unknown)	0.02	0.07	0.04	0.13	100

Group Gravelly Fine Grain

Average similarity: 44.24

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Anthomastus sp	1.19	23.62	0.73	53.39	53.39
Isididae F	1.16	20.34	0.61	45.98	99.37
Acanthogorgia sp	0.09	0.07	0.05	0.15	99.52
Paramuricea spp.	0.09	0.06	0.05	0.15	99.67
Chrysogorgia sp. 1	0.02	0.03	0.02	0.07	99.74

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Nephtheidae F	0.14	0.03	0.04	0.06	99.8
Swiftia sp	0.03	0.03	0.03	0.06	99.87
Acanella sp	0.05	0.03	0.03	0.06	99.93
Small Gorgonian (unknown)	0.02	0.01	0.02	0.03	99.96
Large Gorgonian (unknown)	0.02	0.01	0.02	0.02	99.97
Heteropolypus cf. insolitus	0.01	0.01	0.01	0.01	99.99
Primnoa sp	0.03	0	0.02	0.01	99.99
Soft Coral (unknown)	0.01	0	0.01	0.01	100
Corallium sp.	0.02	0	0.01	0	100

Table 5-77 The average within group similarity from 2-way SIMPER analysis accounting for 100% of similarity for depth across all facies for 50m for species with a 4th root transformation.

Species 4th root 50 m Examines Depth groups (across all Facies groups)					
	Group 1675-1875				
	Average similarity: 42.98				
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Anthomastus sp	1.68	30.51	0.99	71	71
Isididae F	1.04	11.68	0.48	27.17	98.17
Paramuricea spp.	0.24	0.27	0.13	0.64	98.81
Corallium sp.	0.21	0.2	0.09	0.47	99.29
Acanthogorgia sp	0.15	0.15	0.09	0.36	99.64
Acanella sp	0.13	0.1	0.06	0.23	99.87
Soft Coral (unknown)	0.13	0.06	0.06	0.13	100
	Group 1475-1675				
	Average similarity: 44.88				
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Isididae F	1.5	18.96	0.65	42.25	42.25
Anthomastus sp	1.49	18.31	0.99	40.79	83.04
Desmophyllum dianthus	0.21	3.4	0.22	7.57	90.61
Acanthogorgia sp	0.41	1.29	0.22	2.88	93.49
Swiftia sp	0.15	0.58	0.19	1.3	94.79
Small Gorgonian (unknown)	0.22	0.54	0.16	1.21	96
Large Gorgonian (unknown)	0.21	0.47	0.18	1.05	97.05
Nephtheidae F	0.27	0.39	0.15	0.87	97.92
Cup Coral (unknown)	0.18	0.35	0.06	0.78	98.7
Paramuricea spp.	0.25	0.33	0.17	0.74	99.45
Primnoa sp	0.21	0.15	0.11	0.33	99.77
Acanella sp	0.17	0.1	0.1	0.23	100
	Group 1275-1475				
	Average similarity: 40.93				
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Nephtheidae F	1.55	13.2	1.37	32.25	32.25
Acanthogorgia sp	0.98	10.33	1.29	25.24	57.49
Paramuricea spp.	0.81	6.33	1	15.46	72.96
Anthomastus sp	1.97	6.02	0.46	14.72	87.67
Isididae F	1	1.89	0.45	4.61	92.28
Desmophyllum dianthus	0.2	1.71	0.16	4.18	96.46
Large Gorgonian (unknown)	0.22	0.82	0.27	2	98.46
Primnoa sp	0.43	0.63	0.28	1.54	100
	Group 1075-1275				
	Average similarity: 62.24				
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Anthomastus sp	2.79	34.1	2.12	54.78	54.78
Nephtheidae F	1.82	14	1.28	22.49	77.27
Acanthogorgia sp	0.92	6.56	0.96	10.53	87.8

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Acanella sp	0.29	2.86	0.23	4.59	92.39
Paramuricea spp.	0.47	1.98	0.45	3.18	95.57
Primnoa sp	0.48	1.33	0.38	2.14	97.71
Isididae F	0.28	0.7	0.25	1.13	98.84
Anthoptilum grandiflorum	0.08	0.21	0.08	0.33	99.17
Antipatharian sp.	0.08	0.18	0.08	0.28	99.45
Pennatulacea (whip-like)	0.08	0.16	0.08	0.25	99.7
Pennatula sp.	0.08	0.14	0.08	0.23	99.93
Small Gorgonian (unknown)	0.08	0.04	0.08	0.07	100

Group 875-1075

Average similarity: 64.89

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Acanella sp	1.72	60.6	4.47	93.39	93.39
Anthoptilum grandiflorum	0.42	4.29	0.44	6.61	100

Group 2875-2975

Average similarity: 35.40

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Lepidisis sp	0.88	19.23	0.82	54.33	54.33
Chrysogorgia cf. agassizii	0.79	8.3	0.61	23.46	77.78
Anthomastus sp	0.35	4.35	0.43	12.3	90.08
Isididae F	0.54	1.79	0.24	5.05	95.13
Large Gorgonian (unknown)	0.3	1.73	0.24	4.87	100
Acanella sp	0	0	#######	0	100
Acanthogorgia sp	0	0	#######	0	100
Anthoptilum grandiflorum	0	0	#######	0	100
Antipatharian (unknown)	0	0	#######	0	100
Antipatharian sp.	0	0	#######	0	100
Bathypathes sp	0	0	#######	0	100
Chrysogorgia sp. (unknown)	0	0	#######	0	100
Chrysogorgia sp. 1	0.08	0	#######	0	100
Chrysogorgia sp. 2	0.08	0	#######	0	100
Corallium sp.	0	0	#######	0	100
Cup Coral (unknown)	0	0	#######	0	100
Desmophyllum dianthus	0	0	#######	0	100
Halipteris finmarchica	0	0	#######	0	100
Heteropolypus cf. insolitus	0	0	#######	0	100
Narella cf. laxa	0.1	0	#######	0	100
Nephtheidae F	0	0	#######	0	100
Paragorgia sp	0	0	#######	0	100
Paramuricea spp.	0	0	#######	0	100
Parastenella sp	0	0	#######	0	100
Pennatula sp.	0	0	#######	0	100
Pennatula sp. (bushy, orange)	0	0	#######	0	100
Pennatulacea (whip-like)	0	0	#######	0	100

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Primnoa sp	0	0	#######	0	100
Small Gorgonian (unknown)	0	0	#######	0	100
Soft Coral (unknown)	0.08	0	#######	0	100
Swiftia sp	0	0	#######	0	100
Umbellula encrinus	0	0	#######	0	100
	Group 2675-2875				
	Average similarity: 48.97				
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Chrysogorgia cf. agassizii	1.39	31.03	2.17	63.35	63.35
Isididae F	0.72	11.81	0.79	24.12	87.48
Anthomastus sp	0.46	3.07	0.38	6.26	93.74
Chrysogorgia sp. 1	0.31	3.07	0.38	6.26	100
	Group 2475-2675				
	Average similarity: 41.41				
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Chrysogorgia cf. agassizii	1.97	41.41	1.44	100	100
Acanella sp	0	0	#######	0	100
Acanthogorgia sp	0	0	#######	0	100
Anthomastus sp	0.14	0	#######	0	100
Anthoptilum grandiflorum	0	0	#######	0	100
Antipatharian (unknown)	0	0	#######	0	100
Antipatharian sp.	0	0	#######	0	100
Bathypathes sp	0	0	#######	0	100
Chrysogorgia sp. (unknown)	0	0	#######	0	100
Chrysogorgia sp. 1	0.14	0	#######	0	100
Chrysogorgia sp. 2	0	0	#######	0	100
Corallium sp.	0	0	#######	0	100
Cup Coral (unknown)	0.19	0	#######	0	100
Desmophyllum dianthus	0.19	0	#######	0	100
Halipteris finmarchica	0	0	#######	0	100
Heteropolypus cf. insolitus	0	0	#######	0	100
Isididae F	0	0	#######	0	100
Large Gorgonian (unknown)	0.14	0	#######	0	100
Lepidisis sp	0.14	0	#######	0	100
Narella cf. laxa	0	0	#######	0	100
Nephtheidae F	0.26	0	#######	0	100
Paragorgia sp	0	0	#######	0	100
Paramuricea spp.	0	0	#######	0	100
Parastenella sp	0	0	#######	0	100
Pennatula sp.	0	0	#######	0	100
Pennatula sp. (bushy, orange)	0	0	#######	0	100
Pennatulacea (whip-like)	0	0	#######	0	100
Primnoa sp	0	0	#######	0	100
Small Gorgonian (unknown)	0.29	0	#######	0	100

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Soft Coral (unknown)	0	0	#######	0	100
Swiftia sp	0	0	#######	0	100
Umbellula encrinus	0	0	#######	0	100

Group 2275-2475

Average similarity: 53.12

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Anthomastus sp	1.19	39	1.69	73.43	73.43
Chrysogorgia cf. agassizii	0.45	6.75	0.43	12.7	86.13
Isididae F	0.74	5.99	0.35	11.28	97.41
Heteropolypus cf. insolitus	0.08	0.95	0.14	1.79	99.2
Chrysogorgia sp. 1	0.21	0.42	0.14	0.8	100

Group 2075-2275

Average similarity: 40.34

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Anthomastus sp	1.37	37.51	1.32	92.98	92.98
Acanella sp	0.27	1.35	0.26	3.34	96.31
Corallium sp.	0.24	0.72	0.15	1.78	98.09
Isididae F	0.2	0.5	0.15	1.25	99.34
Soft Coral (unknown)	0.18	0.27	0.15	0.66	100

Group 1875-2075

Average similarity: 66.68

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Anthomastus sp	1.28	39.6	1.62	59.39	59.39
Isididae F	0.74	17.18	0.75	25.77	85.16
Paramuricea spp.	0.35	8.63	0.51	12.95	98.1
Cup Coral (unknown)	0.21	1.26	0.2	1.9	100

Table 5-78 SIMPER results for facies transformation for 50m across all depth for species with a 4th root.

Species 4th root 50 m					
Examines Facies groups (across all Depth groups)					
Group Fine Grain					
Average similarity: 42.21					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Acanella sp	0.73	26.3	0.85	62.31	62.31
Desmophyllum dianthus	0.26	10.42	0.4	24.68	86.99
Anthoptilum grandiflorum	0.17	1.87	0.27	4.42	91.41
Cup Coral (unknown)	0.11	0.91	0.1	2.16	93.58
Chrysogorgia cf. agassizii	0.19	0.86	0.14	2.04	95.62
Anthomastus sp	0.3	0.8	0.13	1.89	97.52
Isididae F	0.07	0.3	0.1	0.72	98.24
Antipatharian sp.	0.05	0.28	0.1	0.66	98.89
Pennatulacea (whip-like)	0.08	0.24	0.1	0.58	99.47
Pennatula sp.	0.05	0.22	0.1	0.53	100
Group Discontinuous Sedimentary Bedrock					
Average similarity: 33.18					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Anthomastus sp	1.5	28.76	0.94	86.68	86.68
Acanella sp	0.37	2.81	0.38	8.48	95.16
Isididae F	0.5	1.05	0.21	3.17	98.32
Soft Coral (unknown)	0.18	0.56	0.21	1.68	100
Group Sedimentary Bedrock					
Average similarity: 56.73					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Anthomastus sp	2.22	29.6	1.46	52.17	52.17
Nephtheidae F	1.06	11.3	1.03	19.91	72.08
Acanthogorgia sp	0.73	6.93	0.82	12.21	84.29
Isididae F	0.75	3.76	0.32	6.64	90.93
Paramuricea spp.	0.5	2.52	0.51	4.44	95.37
Primnoa sp	0.36	1.09	0.34	1.91	97.28
Large Gorgonian (unknown)	0.18	0.64	0.21	1.13	98.41
Corallium sp.	0.23	0.4	0.12	0.71	99.12
Small Gorgonian (unknown)	0.11	0.38	0.11	0.66	99.79
Chrysogorgia sp. 1	0.07	0.08	0.06	0.14	99.93
Cup Coral (unknown)	0.06	0.04	0.06	0.07	100
Group Igneous Bedrock					
Average similarity: 51.71					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Anthomastus sp	1.03	31.78	1.12	61.46	61.46
Chrysogorgia cf. agassizii	0.72	10.05	0.54	19.43	80.9
Lepidisis sp	0.26	4.58	0.31	8.85	89.75
Paramuricea spp.	0.21	4.32	0.34	8.35	98.09
Cup Coral (unknown)	0.28	0.63	0.14	1.22	99.32

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Soft Coral (unknown)	0.12	0.35	0.14	0.68	100

Group Discontinuous Igneous Bedrock
Average similarity: 41.36

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Chrysogorgia cf. agassizii	1.13	21.25	0.88	51.37	51.37
Anthomastus sp	0.45	9.52	0.44	23.02	74.4
Lepidisis sp	0.26	4.23	0.38	10.23	84.63
Isididae F	0.36	3.94	0.4	9.52	94.15
Large Gorgonian (unknown)	0.17	1.4	0.22	3.38	97.53
Chrysogorgia sp. 1	0.21	1.02	0.22	2.47	100

Group Gravelly Fine Grain
Average similarity: 45.89

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Anthomastus sp	1.88	28.13	1.06	61.3	61.3
Isididae F	1.67	16.62	0.6	36.22	97.51
Swiftia sp	0.09	0.3	0.13	0.66	98.17
Acanthogorgia sp	0.24	0.24	0.12	0.53	98.7
Paramuricea spp.	0.23	0.21	0.13	0.46	99.16
Small Gorgonian (unknown)	0.09	0.12	0.1	0.27	99.43
Acanella sp	0.15	0.11	0.07	0.24	99.68
Heteropolypus cf. insolitus	0.03	0.08	0.04	0.18	99.85
Nephtheidae F	0.3	0.04	0.06	0.09	99.94
Large Gorgonian (unknown)	0.04	0.02	0.04	0.03	99.98
Primnoa sp	0.1	0.01	0.04	0.02	100
Anthoptilum grandiflorum	0	0	#######	0	100
Antipatharian (unknown)	0	0	#######	0	100
Antipatharian sp.	0	0	#######	0	100
Bathypathes sp	0	0	#######	0	100
Chrysogorgia cf. agassizii	0.02	0	#######	0	100
Chrysogorgia sp. (unknown)	0	0	#######	0	100
Chrysogorgia sp. 1	0.02	0	#######	0	100
Chrysogorgia sp. 2	0	0	#######	0	100
Corallium sp.	0.06	0	#######	0	100
Cup Coral (unknown)	0.05	0	#######	0	100
Desmophyllum dianthus	0.02	0	#######	0	100
Halipteris finmarchica	0.02	0	#######	0	100
Lepidisis sp	0.02	0	#######	0	100
Narella cf. laxa	0	0	#######	0	100
Paragorgia sp	0	0	#######	0	100
Parastenella sp	0.02	0	#######	0	100
Pennatula sp.	0.02	0	#######	0	100
Pennatula sp. (bushy, orange)	0	0	#######	0	100
Pennatulacea (whip-like)	0	0	#######	0	100
Soft Coral (unknown)	0	0	#######	0	100

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Umbellula encrinus	0	0	#######	0	100

Group Igneous/Sedimentary
No groups with at least 2 samples

Table 5-79 The average within group similarity from 2-way SIMPER analysis accounting for 100% of similarity for depth across all facies for 100m for species with a 4th root transformation.

Species 4th root 100m Examines Depth groups (across all Facies groups)					
	Group 1475-1675				
	Average similarity: 47.66				
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Isididae F	2	20.75	0.81	43.55	43.55
Anthomastus sp	1.95	16.27	1.49	34.13	77.68
Desmophyllum dianthus	0.27	2.18	0.21	4.58	82.26
Swiftia sp	0.31	2.12	0.42	4.44	86.7
Acanthogorgia sp	0.64	1.75	0.37	3.66	90.37
Small Gorgonian (unknown)	0.39	1.28	0.29	2.69	93.06
Paramuricea spp.	0.45	0.93	0.34	1.95	95.01
Large Gorgonian (unknown)	0.38	0.88	0.29	1.84	96.85
Nephtheidae F	0.44	0.52	0.16	1.08	97.93
Primnoa sp	0.42	0.51	0.23	1.07	99.01
Acanella sp	0.29	0.34	0.22	0.7	99.71
Cup Coral (unknown)	0.32	0.14	0.13	0.29	100
Anthoptilum grandiflorum	0	0	#######	0	100
Antipatharian (unknown)	0	0	#######	0	100
Antipatharian sp.	0.06	0	#######	0	100
Bathypathes sp	0.05	0	#######	0	100
Chrysogorgia cf. agassizii	0	0	#######	0	100
Chrysogorgia sp. (unknown)	0	0	#######	0	100
Chrysogorgia sp. 1	0	0	#######	0	100
Chrysogorgia sp. 2	0	0	#######	0	100
Corallium sp.	0	0	#######	0	100
Halipteris finmarchica	0	0	#######	0	100
Heteropolypus cf. insolitus	0	0	#######	0	100
Lepidisis sp	0	0	#######	0	100
Narella cf. laxa	0	0	#######	0	100
Paragorgia sp	0	0	#######	0	100
Parastenella sp	0.06	0	#######	0	100
Pennatula sp.	0	0	#######	0	100
Pennatula sp. (bushy, orange)	0	0	#######	0	100
Pennatulacea (whip-like)	0	0	#######	0	100
Soft Coral (unknown)	0.07	0	#######	0	100
Umbellula encrinus	0	0	#######	0	100
	Group 1275-1475				
	Average similarity: 41.82				
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Nephtheidae F	1.87	11.49	1.38	27.48	27.48
Acanthogorgia sp	1.16	8.24	1.47	19.7	47.18
Paramuricea spp.	1.04	8.1	1.46	19.37	66.55
Anthomastus sp	2.66	7.15	0.5	17.1	83.65
Isididae F	1.71	3.12	0.5	7.45	91.1
Large Gorgonian (unknown)	0.4	1.86	0.5	4.45	95.55

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Primnoa sp	0.77	1.86	0.5	4.45	100
Acanella sp	0.49	0	#######	0	100
Anthoptilum grandiflorum	0	0	#######	0	100
Antipatharian (unknown)	0.17	0	#######	0	100
Antipatharian sp.	0	0	#######	0	100
Bathypathes sp	0	0	#######	0	100
Chrysogorgia cf. agassizii	0	0	#######	0	100
Chrysogorgia sp. (unknown)	0	0	#######	0	100
Chrysogorgia sp. 1	0	0	#######	0	100
Chrysogorgia sp. 2	0	0	#######	0	100
Corallium sp.	0.32	0	#######	0	100
Cup Coral (unknown)	0.3	0	#######	0	100
Desmophyllum dianthus	0.36	0	#######	0	100
Halipteris finmarchica	0.17	0	#######	0	100
Heteropolypus cf. insolitus	0	0	#######	0	100
Lepidisis sp	0.17	0	#######	0	100
Narella cf. laxa	0	0	#######	0	100
Paragorgia sp	0	0	#######	0	100
Parastenella sp	0	0	#######	0	100
Pennatula sp.	0	0	#######	0	100
Pennatula sp. (bushy, orange)	0	0	#######	0	100
Pennatulacea (whip-like)	0	0	#######	0	100
Small Gorgonian (unknown)	0.17	0	#######	0	100
Soft Coral (unknown)	0	0	#######	0	100
Swiftia sp	0	0	#######	0	100
Umbellula encrinus	0	0	#######	0	100

Group 1675-1875
Average similarity: 36.10

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Anthomastus sp	1.85	25.15	0.93	69.65	69.65
Isididae F	1.13	9.64	0.45	26.69	96.35
Acanella sp	0.22	0.4	0.11	1.11	97.45
Paramuricea spp.	0.35	0.35	0.15	0.98	98.43
Corallium sp.	0.35	0.3	0.16	0.83	99.26
Acanthogorgia sp	0.25	0.27	0.11	0.74	100

Group 1075-1275
Average similarity: 63.40

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Anthomastus sp	3.49	29.41	2.17	46.38	46.38
Nephtheidae F	2.27	12.74	1.27	20.1	66.48
Acanthogorgia sp	1.24	7.88	1.3	12.44	78.91
Paramuricea spp.	0.82	4.81	0.94	7.59	86.5
Acanella sp	0.55	3.74	0.41	5.89	92.39
Isididae F	0.56	2.13	0.53	3.37	95.76

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Primnoa sp	0.69	1.31	0.39	2.06	97.82
Anthoptilum grandiflorum	0.16	0.44	0.15	0.69	98.51
Antipatharian sp.	0.14	0.41	0.15	0.65	99.16
Pennatulacea (whip-like)	0.14	0.41	0.15	0.65	99.81
Small Gorgonian (unknown)	0.14	0.12	0.15	0.19	100
	Group 875-1075				
	Average similarity: 57.02				
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Acanella sp	1.81	50.28	4.12	88.17	88.17
Anthoptilum grandiflorum	0.56	6.74	0.62	11.83	100
	Group 2875-2975				
	Average similarity: 55.93				
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Chrysogorgia cf. agassizii	1.06	19.14	1.57	34.21	34.21
Lepidisis sp	1.08	17.89	1.38	31.99	66.2
Anthomastus sp	0.52	9.43	1.09	16.86	83.06
Isididae F	0.82	6.08	0.45	10.86	93.92
Large Gorgonian (unknown)	0.45	3.4	0.45	6.08	100
Acanella sp	0	0	#######	0	100
Acanthogorgia sp	0	0	#######	0	100
Anthoptilum grandiflorum	0	0	#######	0	100
Antipatharian (unknown)	0	0	#######	0	100
Antipatharian sp.	0	0	#######	0	100
Bathypathes sp	0	0	#######	0	100
Chrysogorgia sp. (unknown)	0	0	#######	0	100
Chrysogorgia sp. 1	0.13	0	#######	0	100
Chrysogorgia sp. 2	0.13	0	#######	0	100
Corallium sp.	0	0	#######	0	100
Cup Coral (unknown)	0	0	#######	0	100
Desmophyllum dianthus	0	0	#######	0	100
Halipteris finmarchica	0	0	#######	0	100
Heteropolypus cf. insolitus	0	0	#######	0	100
Narella cf. laxa	0.15	0	#######	0	100
Nephtheidae F	0	0	#######	0	100
Paragorgia sp	0	0	#######	0	100
Paramuricea spp.	0	0	#######	0	100
Parastenella sp	0	0	#######	0	100
Pennatula sp.	0	0	#######	0	100
Pennatula sp. (bushy, orange)	0	0	#######	0	100
Pennatulacea (whip-like)	0	0	#######	0	100
Primnoa sp	0	0	#######	0	100
Small Gorgonian (unknown)	0	0	#######	0	100
Soft Coral (unknown)	0.13	0	#######	0	100
Swiftia sp	0	0	#######	0	100

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Anthomastus sp	1.36	36.53	1.86	72.33	72.33
Chrysogorgia cf. agassizii	0.57	6.65	0.51	13.18	85.51
Isididae F	0.72	4.26	0.32	8.44	93.95
Heteropolypus cf. insolitus	0.12	1.69	0.19	3.35	97.3
Chrysogorgia sp. 1	0.22	0.71	0.19	1.42	98.71
Cup Coral (unknown)	0.13	0.65	0.19	1.29	100

Group 2075-2275

Average similarity: 41.72

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Anthomastus sp	1.77	34.57	2.93	82.87	82.87
Acanella sp	0.44	5.05	0.48	12.09	94.96
Soft Coral (unknown)	0.29	1.05	0.29	2.52	97.48
Isididae F	0.42	1.05	0.29	2.52	100

Group 1875-2075

Average similarity: 45.74

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Anthomastus sp	1.52	28.51	0.99	62.32	62.32
Paramuricea spp.	0.53	9.64	0.45	21.08	83.4
Isididae F	0.68	7.6	0.45	16.6	100

Table 5-80 The average within group similarity from 2-way SIMPER analysis accounting for 100% of similarity for facies for 100m across all depth for species with a 4th root transformation.

Species 4th root 100m					
Examines Facies groups (across all Depth groups)					
Group Fine Grain					
Average similarity: 41.47					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Acanella sp	0.94	27.24	1.15	65.69	65.69
Desmophyllum dianthus	0.3	5.83	0.36	14.05	79.73
Anthoptilum grandiflorum	0.27	3.58	0.44	8.62	88.36
Chrysogorgia cf. agassizii	0.33	1.4	0.2	3.38	91.74
Isididae F	0.12	1.27	0.2	3.05	94.79
Anthomastus sp	0.49	0.72	0.2	1.74	96.53
Antipatharian sp.	0.1	0.72	0.2	1.74	98.26
Pennatulacea (whip-like)	0.14	0.72	0.2	1.74	100
Group Discontinuous Sedimentary Bedrock					
Average similarity: 30.67					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Anthomastus sp	1.86	24.52	1.18	79.94	79.94
Acanella sp	0.53	3.56	0.39	11.61	91.55
Soft Coral (unknown)	0.2	0.74	0.24	2.42	93.98
Isididae F	1.06	0.74	0.24	2.42	96.39
Corallium sp.	0.45	0.55	0.24	1.8	98.2
Paramuricea spp.	0.54	0.55	0.24	1.8	100
Group Sedimentary Bedrock					
Average similarity: 57.30					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Anthomastus sp	2.76	25.38	1.61	44.28	44.28
Nephtheidae F	1.3	10.8	1.06	18.85	63.13
Acanthogorgia sp	0.93	8.07	1.26	14.09	77.22
Isididae F	1.09	4.56	0.42	7.95	85.17
Paramuricea spp.	0.69	4.38	0.86	7.64	92.8
Primnoa sp	0.53	1.38	0.39	2.42	95.22
Small Gorgonian (unknown)	0.23	1.1	0.25	1.92	97.14
Large Gorgonian (unknown)	0.26	0.77	0.26	1.35	98.49
Chrysogorgia sp. 1	0.14	0.34	0.13	0.6	99.09
Corallium sp.	0.33	0.26	0.13	0.45	99.54
Cup Coral (unknown)	0.13	0.16	0.13	0.28	99.81
Acanella sp	0.07	0.11	0.13	0.19	100
Group Gravelly Fine Grain					
Average similarity: 45.43					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Anthomastus sp	2.18	26.42	1.19	58.16	58.16
Isididae F	1.87	15.83	0.65	34.85	93.01
Swiftia sp	0.17	1.03	0.28	2.26	95.27
Paramuricea spp.	0.32	0.51	0.22	1.12	96.39
Acanella sp	0.22	0.4	0.14	0.88	97.28
Heteropolypus cf. insolitus	0.06	0.35	0.09	0.76	98.04
Acanthogorgia sp	0.33	0.34	0.16	0.75	98.79

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Small Gorgonian (unknown)	0.12	0.19	0.15	0.42	99.21
Large Gorgonian (unknown)	0.11	0.15	0.15	0.34	99.55
Primnoa sp	0.23	0.13	0.15	0.29	99.84
Nephtheidae F	0.36	0.07	0.09	0.16	100
Anthoptilum grandiflorum	0	0	#######	0	100
Antipatharian (unknown)	0	0	#######	0	100
Antipatharian sp.	0	0	#######	0	100
Bathypathes sp	0.03	0	#######	0	100
Chrysogorgia cf. agassizii	0.04	0	#######	0	100
Chrysogorgia sp. (unknown)	0	0	#######	0	100
Chrysogorgia sp. 1	0.03	0	#######	0	100
Chrysogorgia sp. 2	0	0	#######	0	100
Corallium sp.	0.03	0	#######	0	100
Cup Coral (unknown)	0.03	0	#######	0	100
Desmophyllum dianthus	0	0	#######	0	100
Halipteris finmarchica	0	0	#######	0	100
Lepidisis sp	0	0	#######	0	100
Narella cf. laxa	0	0	#######	0	100
Paragorgia sp	0	0	#######	0	100
Parastenella sp	0.03	0	#######	0	100
Pennatula sp.	0.03	0	#######	0	100
Pennatula sp. (bushy, orange)	0	0	#######	0	100
Pennatulacea (whip-like)	0	0	#######	0	100
Soft Coral (unknown)	0	0	#######	0	100
Umbellula encrinus	0	0	#######	0	100

Group Discontinuous Igneous Bedrock

Average similarity: 40.37

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Chrysogorgia cf. agassizii	1.32	20.33	1.09	50.35	50.35
Lepidisis sp	0.51	7.13	0.45	17.66	68.01
Isididae F	0.6	5.76	0.45	14.26	82.28
Anthomastus sp	0.47	3.89	0.45	9.63	91.9
Chrysogorgia sp. 1	0.27	3.27	0.45	8.1	100

Group Igneous Bedrock

Average similarity: 52.93

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Anthomastus sp	1.38	29.97	1.55	56.63	56.63
Chrysogorgia cf. agassizii	1.02	15.37	1.01	29.04	85.67
Lepidisis sp	0.34	2.99	0.42	5.65	91.32
Paramuricea spp.	0.28	2.68	0.24	5.06	96.38
Cup Coral (unknown)	0.32	0.97	0.24	1.84	98.22
Large Gorgonian (unknown)	0.31	0.94	0.24	1.78	100

Group Igneous/Sedimentary

No groups with at least 2 samples

Table 5-81 The average within group similarity from 2-way SIMPER analysis accounting for 100% of similarity for depth across all facies for 500m for species with a 4th root transformation.

Species 4th root 500m Examines Depth groups (across all Facies groups)					
	Group 1675-1875				
	Average similarity: 29.21				
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Anthomastus sp	2.68	16.67	1.01	57.08	57.08
Acanella sp	0.86	5.66	0.58	19.39	76.47
Paramuricea spp.	0.88	3.75	0.58	12.85	89.32
Soft Coral (unknown)	0.41	3.12	0.58	10.68	100
	Group 1475-1675				
	Average similarity: 40.89				
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Isididae F	3.33	15.89	0.71	38.86	38.86
Anthomastus sp	3.9	8.55	6.52	20.92	59.77
Cup Coral (unknown)	0.91	4.84	0.71	11.84	71.61
Swiftia sp	0.52	3.53	0.71	8.63	80.25
Desmophyllum dianthus	0.69	3.03	0.71	7.41	87.66
Acanella sp	0.89	2.55	0.71	6.23	93.89
Paramuricea spp.	1.16	2.5	0.71	6.11	100
Acanthogorgia sp	1.43	0	#######	0	100
Anthoptilum grandiflorum	0	0	#######	0	100
Antipatharian (unknown)	0.17	0	#######	0	100
Antipatharian sp.	0.2	0	#######	0	100
Bathypathes sp	0.17	0	#######	0	100
Chrysogorgia cf. agassizii	0	0	#######	0	100
Chrysogorgia sp. (unknown)	0	0	#######	0	100
Chrysogorgia sp. 1	0	0	#######	0	100
Chrysogorgia sp. 2	0	0	#######	0	100
Corallium sp.	0	0	#######	0	100
Halipteris finmarchica	0	0	#######	0	100
Heteropolypus cf. insolitus	0	0	#######	0	100
Large Gorgonian (unknown)	0.73	0	#######	0	100
Lepidisis sp	0	0	#######	0	100
Narella cf. laxa	0	0	#######	0	100
Nephtheidae F	1.45	0	#######	0	100
Paragorgia sp	0	0	#######	0	100
Parastenella sp	0.2	0	#######	0	100
Pennatula sp.	0	0	#######	0	100
Pennatula sp. (bushy, orange)	0	0	#######	0	100
Pennatulacea (whip-like)	0	0	#######	0	100
Primnoa sp	1.45	0	#######	0	100
Small Gorgonian (unknown)	0.79	0	#######	0	100
Soft Coral (unknown)	0.22	0	#######	0	100
Umbellula encrinus	0	0	#######	0	100

Group 1075-1275

Average similarity: 19.38

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Acanella sp	1.28	19.38	#######	100	100

Group 2875-2975

Average similarity: 75.21

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Lepidisis sp	1.97	18.9	#######	25.13	25.13
Chrysogorgia cf. agassizii	1.88	17.79	#######	23.66	48.78
Isididae F	1.72	15.89	#######	21.13	69.91
Large Gorgonian (unknown)	1.37	12.86	#######	17.1	87.01
Anthomastus sp	1.21	9.77	#######	12.99	100

Group 2675-2875

No groups with at least 2 samples

Group 2475-2675

No groups with at least 2 samples

Group 2275-2475

No groups with at least 2 samples

Group 2075-2275

No groups with at least 2 samples

Group 875-1075

No groups with at least 2 samples

Group 1275-1475

No groups with at least 2 samples

Group 1875-2075

No groups with at least 2 samples

Table 5-82 The average within group similarity from 2-way SIMPER analysis accounting for 100% of similarity for facies for 500m across all depth for species with a 4th root transformation.

Species 4th root 500m					
Examines Facies groups (across all Depth groups)					
Group Discontinuous Sedimentary Bedrock					
Average similarity: 18.91					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Cup Coral (unknown)	0.79	4.84	0.71	25.6	25.6
Soft Coral (unknown)	0.53	4.68	0.71	24.74	50.33
Anthomastus sp	3.64	3.81	0.71	20.16	70.49
Desmophyllum dianthus	0.46	3.03	0.71	16.03	86.52
Acanella sp	0.59	2.55	0.71	13.48	100
Group Fine Grain					
Average similarity: 26.68					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Acanella sp	1.73	18.19	10.75	68.16	68.16
Anthomastus sp	1.14	8.5	0.71	31.84	100
Acanthogorgia sp	0.2	0	#######	0	100
Anthoptilum grandiflorum	0.56	0	#######	0	100
Antipatharian (unknown)	0	0	#######	0	100
Antipatharian sp.	0.24	0	#######	0	100
Bathypathes sp	0	0	#######	0	100
Chrysogorgia cf. agassizii	0	0	#######	0	100
Chrysogorgia sp. (unknown)	0	0	#######	0	100
Chrysogorgia sp. 1	0	0	#######	0	100
Chrysogorgia sp. 2	0	0	#######	0	100
Corallium sp.	0	0	#######	0	100
Cup Coral (unknown)	0	0	#######	0	100
Desmophyllum dianthus	0.59	0	#######	0	100
Halipteris finmarchica	0	0	#######	0	100
Heteropolypus cf. insolitus	0.26	0	#######	0	100
Isididae F	0	0	#######	0	100
Large Gorgonian (unknown)	0	0	#######	0	100
Lepidisis sp	0	0	#######	0	100
Narella cf. laxa	0	0	#######	0	100
Nephtheidae F	0	0	#######	0	100
Paragorgia sp	0	0	#######	0	100
Paramuricea spp.	0.24	0	#######	0	100
Parastenella sp	0	0	#######	0	100
Pennatula sp.	0.24	0	#######	0	100
Pennatula sp. (bushy, orange)	0.2	0	#######	0	100
Pennatulacea (whip-like)	0.44	0	#######	0	100
Primnoa sp	0	0	#######	0	100
Small Gorgonian (unknown)	0	0	#######	0	100
Soft Coral (unknown)	0	0	#######	0	100
Swiftia sp	0	0	#######	0	100
Umbellula encrinus	0.2	0	#######	0	100

Group Discontinuous Igneous Bedrock
Average similarity: 75.21

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Lepidisis sp	1.28	18.9	#######	25.13	25.13
Chrysogorgia cf. agassizii	2.58	17.79	#######	23.66	48.78
Isididae F	1.32	15.89	#######	21.13	69.91
Large Gorgonian (unknown)	0.93	12.86	#######	17.1	87.01
Anthomastus sp	1.38	9.77	#######	12.99	100

Group Igneous Bedrock
No groups with at least 2 samples

Group Igneous/Sedimentary
No groups with at least 2 samples

Group Gravelly Fine Grain
Average similarity: 48.80

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Anthomastus sp	3.34	21.25	1.28	43.55	43.55
Isididae F	3.66	15.89	0.71	32.56	76.11
Paramuricea spp.	1.2	8.13	1.83	16.65	92.77
Swiftia sp	0.44	3.53	0.71	7.23	100

Group Sedimentary Bedrock
No groups with at least 2 samples

Table 5-83 The average within group similarity from 2-way SIMPER analysis accounting for 100% of similarity for depth across all facies for 1000m for species with a 4th root transformation.

Species 4th root 1000m					
Examines Depth groups (across all Facies groups)					
Group 1675-1875					
Average similarity: 38.96					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Anthomastus sp	3.64	14.44	44.6	37.05	37.05
Isididae F	2.34	10.48	0.71	26.9	63.95
Acanella sp	1.9	9.71	1.53	24.92	88.87
Paramuricea spp.	1.3	2.35	0.71	6.04	94.92
Acanthogorgia sp	0.99	1.98	0.71	5.08	100
Anthoptilum grandiflorum	0.3	0	#######	0	100
Antipatharian (unknown)	0	0	#######	0	100
Antipatharian sp.	0.44	0	#######	0	100
Bathypathes sp	0	0	#######	0	100
Chrysogorgia cf. agassizii	0	0	#######	0	100
Chrysogorgia sp. (unknown)	0.24	0	#######	0	100
Chrysogorgia sp. 1	0	0	#######	0	100
Chrysogorgia sp. 2	0	0	#######	0	100
Corallium sp.	1	0	#######	0	100
Cup Coral (unknown)	1	0	#######	0	100
Desmophyllum dianthus	0.74	0	#######	0	100
Halipteris finmarchica	0	0	#######	0	100
Heteropolypus cf. insolitus	0	0	#######	0	100
Large Gorgonian (unknown)	0.61	0	#######	0	100
Lepidisis sp	0	0	#######	0	100
Narella cf. laxa	0	0	#######	0	100
Nephtheidae F	0.96	0	#######	0	100
Paragorgia sp	0	0	#######	0	100
Parastenella sp	0	0	#######	0	100
Pennatula sp.	0.24	0	#######	0	100
Pennatula sp. (bushy, orange)	0	0	#######	0	100
Pennatulacea (whip-like)	0.2	0	#######	0	100
Primnoa sp	0.75	0	#######	0	100
Small Gorgonian (unknown)	0.58	0	#######	0	100
Soft Coral (unknown)	0.9	0	#######	0	100
Swiftia sp	0	0	#######	0	100
Umbellula encrinus	0	0	#######	0	100
Group 1475-1675					
No groups with at least 2 samples					
Group 1075-1275					
No groups with at least 2 samples					
Group 2875-2975					
No groups with at least 2 samples					

Group 2675-2875
No groups with at least 2 samples

Group 2275-2475
No groups with at least 2 samples

Group 1275-1475
No groups with at least 2 samples

Group 1875-2075
No groups with at least 2 samples

Table 5-84 The average within group similarity from 2-way SIMPER analysis accounting for 100% of similarity for facies for 1000m across all depths for species with a 4th root transformation.

Species 4th root 1000m					
Examines Facies groups (across all Depth groups)					
Group Fine Grain					
Average similarity: 28.42					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Acanella sp	1.93	14.21	#######	50	50
Anthomastus sp	1.45	14.21	#######	50	100
Group Discontinuous Sedimentary Bedrock					
Average similarity: 49.51					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Isididae F	4.54	20.96	#######	42.33	42.33
Anthomastus sp	4.26	14.67	#######	29.62	71.96
Acanella sp	0.95	5.21	#######	10.53	82.49
Paramuricea spp.	1.4	4.71	#######	9.51	92
Acanthogorgia sp	0.8	3.96	#######	8	100
Anthoptilum grandiflorum	0	0	#######	0	100
Antipatharian (unknown)	0	0	#######	0	100
Antipatharian sp.	0.3	0	#######	0	100
Bathypathes sp	0	0	#######	0	100
Chrysogorgia cf. agassizii	0.33	0	#######	0	100
Chrysogorgia sp. (unknown)	0	0	#######	0	100
Chrysogorgia sp. 1	0.96	0	#######	0	100
Chrysogorgia sp. 2	0	0	#######	0	100
Corallium sp.	1.79	0	#######	0	100
Cup Coral (unknown)	0.64	0	#######	0	100
Desmophyllum dianthus	0.3	0	#######	0	100
Halipteris finmarchica	0	0	#######	0	100
Heteropolypus cf. insolitus	0.3	0	#######	0	100
Large Gorgonian (unknown)	0.41	0	#######	0	100
Lepidisis sp	0	0	#######	0	100
Narella cf. laxa	0	0	#######	0	100
Nephtheidae F	0.78	0	#######	0	100
Paragorgia sp	0	0	#######	0	100
Parastenella sp	0	0	#######	0	100
Pennatula sp.	0	0	#######	0	100
Pennatula sp. (bushy, orange)	0	0	#######	0	100
Pennatulacea (whip-like)	0	0	#######	0	100
Primnoa sp	0.94	0	#######	0	100
Small Gorgonian (unknown)	0.37	0	#######	0	100
Soft Coral (unknown)	0.33	0	#######	0	100
Swiftia sp	0	0	#######	0	100
Umbellula encrinus	0	0	#######	0	100
Group Discontinuous Igneous Bedrock					
No groups with at least 2 samples					
Group Igneous Bedrock					
No groups with at least 2 samples					

Group Igneous/Sedimentary*
No groups with at least 2 samples

Group Sedimentary Bedrock
No groups with at least 2 samples

Group Gravelly Fine Grain
No groups with at least 2 samples

Groups Fine Grain & Discontinuous Igneous Bedrock
No pairs of groups with samples

Groups Fine Grain & Igneous Bedrock
No pairs of groups with samples

Groups Discontinuous Igneous Bedrock & Igneous Bedrock
No pairs of groups with samples

5.3.4 Species abundance data presence/absence transformed

Table 5-85 The average within group similarity from 2-way SIMPER analysis accounting for 100% of similarity for depth across all attachment grain sizes for species with a presence/absence transformation.

Examines Depth groups (across all Grain groups)					
Group 1075-1275					
Average similarity: 69.80					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Anthomastus sp	0.95	54.26	2.57	77.74	77.74
Nephtheidae F	0.55	12.93	0.63	18.53	96.27
Primnoa sp	0.13	1.38	0.19	1.98	98.24
Acanthogorgia sp	0.15	0.88	0.16	1.26	99.5
Paramuricea spp.	0.06	0.27	0.08	0.39	99.89
Acanella sp	0.02	0.06	0.02	0.08	99.97
Isididae F	0.02	0.02	0.02	0.02	99.99
Anthoptilum grandiflorum	0.01	0	0.01	0.01	100
Paragorgia sp	0.01	0	0.01	0	100
Group 1275-1475					
Average similarity: 64.74					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Isididae F	0.68	57.68	1.4	89.11	89.11
Anthomastus sp	0.4	6.15	0.34	9.51	98.61
Nephtheidae F	0.15	0.71	0.11	1.1	99.72
Acanella sp	0.03	0.06	0.03	0.1	99.81
Acanthogorgia sp	0.03	0.05	0.03	0.08	99.89
Paramuricea spp.	0.03	0.05	0.03	0.07	99.97
Cup Coral (unknown)	0.01	0.01	0.01	0.01	99.98
Primnoa sp	0.01	0.01	0.01	0.01	99.99
Large Gorgonian (unknown)	0	0	0.01	0.01	99.99
Desmophyllum dianthus	0	0	0.01	0	100
Pennatula sp.	0	0	0	0	100
Pennatulacea (whip-like)	0	0	0	0	100
Group 1475-1675					
Average similarity: 79.64					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Anthomastus sp	0.64	43.05	0.92	54.06	54.06
Isididae F	0.32	35.76	0.79	44.91	98.96
Cup Coral (unknown)	0.04	0.41	0.07	0.51	99.48
Acanthogorgia sp	0.05	0.26	0.07	0.33	99.8
Desmophyllum dianthus	0.01	0.07	0.03	0.09	99.89
Paramuricea spp.	0.02	0.04	0.03	0.05	99.94
Nephtheidae F	0.02	0.01	0.02	0.02	99.96
Swiftia sp	0.01	0.01	0.02	0.02	99.98
Acanella sp	0.01	0.01	0.01	0.01	99.99
Large Gorgonian (unknown)	0.01	0.01	0.01	0.01	99.99
Primnoa sp	0.01	0	0.01	0	100
Small Gorgonian (unknown)	0.01	0	0	0	100
Antipatharian sp.	0	0	0	0	100

Group 1675-1875					
Average similarity: 92.01					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Anthomastus sp	0.79	87.32	2.72	94.91	94.91
Isididae F	0.22	4.61	0.23	5.01	99.91
Corallium sp.	0.01	0.04	0.03	0.04	99.95
Paramuricea spp.	0.02	0.02	0.02	0.02	99.98
Cup Coral (unknown)	0.01	0.01	0.01	0.01	99.99
Acanthogorgia sp	0.01	0	0.01	0	99.99
Acanella sp	0	0	0.01	0	99.99
Soft Coral (unknown)	0.01	0	0.01	0	100
Desmophyllum dianthus	0	0	0	0	100
Anthoptilum grandiflorum	0	0	#######	0	100
Antipatharian (unknown)	0	0	#######	0	100
Antipatharian sp.	0	0	#######	0	100
Bathypathes sp	0	0	#######	0	100
Chrysogorgia cf. agassizii	0	0	#######	0	100
Chrysogorgia sp. (unknown)	0	0	#######	0	100
Chrysogorgia sp. 1	0	0	#######	0	100
Chrysogorgia sp. 2	0	0	#######	0	100
Halipteris finmarchica	0	0	#######	0	100
Heteropolypus cf. insolitus	0	0	#######	0	100
Large Gorgonian (unknown)	0	0	#######	0	100
Lepidisis sp	0	0	#######	0	100
Narella cf. laxa	0	0	#######	0	100
Nephtheidae F	0	0	#######	0	100
Paragorgia sp	0	0	#######	0	100
Parastenella sp	0	0	#######	0	100
Pennatula sp.	0	0	#######	0	100
Pennatula sp. (bushy, orange)	0	0	#######	0	100
Pennatulacea (whip-like)	0	0	#######	0	100
Primnoa sp	0	0	#######	0	100
Small Gorgonian (unknown)	0	0	#######	0	100
Swiftia sp	0	0	#######	0	100
Umbellula encrinus	0	0	#######	0	100
Group 1875-2075					
Average similarity: 63.89					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Anthomastus sp	0.86	47.7	1.62	74.67	74.67
Nephtheidae F	0.5	14.19	0.62	22.2	96.88
Isididae F	0.09	0.88	0.11	1.38	98.26
Acanthogorgia sp	0.11	0.5	0.11	0.78	99.04
Primnoa sp	0.07	0.43	0.1	0.67	99.71
Paramuricea spp.	0.04	0.1	0.04	0.15	99.86

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Cup Coral (unknown)	0.02	0.09	0.03	0.13	100
Desmophyllum dianthus	0	0	0	0	100
Paragorgia sp	0	0	0	0	100

Group 2075-2275

Average similarity: 55.24

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Anthomastus sp	0.65	49.91	1.05	90.36	90.36
Acanella sp	0.11	3.62	0.19	6.56	96.91
Corallium sp.	0.05	0.56	0.09	1.01	97.92
Desmophyllum dianthus	0.04	0.4	0.06	0.72	98.64
Chrysogorgia sp. 1	0.03	0.2	0.05	0.36	99
Chrysogorgia cf. agassizii	0.02	0.12	0.03	0.22	99.22
Isididae F	0.03	0.12	0.03	0.22	99.44
Soft Coral (unknown)	0.04	0.12	0.03	0.22	99.65
Paramuricea spp.	0.02	0.07	0.03	0.13	99.78
Cup Coral (unknown)	0.02	0.04	0.02	0.07	99.86
Pennatula sp.	0.01	0.04	0.02	0.07	99.93
Small Gorgonian (unknown)	0.01	0.04	0.02	0.07	100

Group 2275-2475

Average similarity: 57.28

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Isididae F	0.51	45.06	1.06	78.67	78.67
Anthomastus sp	0.38	7.3	0.34	12.75	91.41
Chrysogorgia cf. agassizii	0.15	2.93	0.18	5.12	96.53
Chrysogorgia sp. 1	0.11	1.94	0.17	3.39	99.93
Heteropolypus cf. insolitus	0.01	0.03	0.02	0.05	99.98
Corallium sp.	0.01	0.01	0.02	0.02	100

Group 2475-2675

Average similarity: 75.83

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Chrysogorgia cf. agassizii	0.87	75.45	1.75	99.5	99.5
Nephtheidae F	0.06	0.33	0.06	0.44	99.94
Cup Coral (unknown)	0.02	0.04	0.02	0.05	99.98
Small Gorgonian (unknown)	0.01	0.01	0.01	0.02	100

Group 2675-2875

Average similarity: 38.23

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Chrysogorgia cf. agassizii	0.59	33.91	0.73	88.71	88.71
Isididae F	0.2	3.58	0.2	9.37	98.08
Chrysogorgia sp. 1	0.07	0.35	0.06	0.91	98.99
Anthomastus sp	0.07	0.27	0.06	0.71	99.7
Cup Coral (unknown)	0.05	0.12	0.03	0.3	100

Group 2875-2975					
Average similarity: 24.97					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Lepidisis sp	0.33	13.47	0.41	53.94	53.94
Chrysogorgia cf. agassizii	0.28	7.59	0.29	30.41	84.35
Isididae F	0.2	2.46	0.16	9.84	94.2
Large Gorgonian (unknown)	0.1	1.26	0.12	5.05	99.24
Anthomastus sp	0.08	0.09	0.03	0.38	99.62
Narella cf. laxa	0.03	0.09	0.03	0.38	100
Group 875-1075					
Average similarity: 92.42					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Acanella sp	0.56	73.31	1.68	79.31	79.31
Nephtheidae F	0.41	10.38	0.49	11.23	90.55
Anthomastus sp	0.39	8.68	0.46	9.39	99.94
Anthoptilum grandiflorum	0.02	0.05	0.03	0.06	100
Paramuricea spp.	0.01	0	0.01	0	100
Group <875					
No groups with at least 2 samples					

Table 5-86 The average within group similarity from 2-way SIMPER analysis accounting for 100% of similarity for all attachment grain sizes across all depths for species with a presence/absence transformation.

Examines Grain groups (across all Depth groups)					
Group Br-SD					
Average similarity: 53.03					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Anthomastus sp	0.77	43.66	1.22	82.33	82.33
Isididae F	0.18	3.55	0.21	6.7	89.04
Nephtheidae F	0.19	3.29	0.29	6.2	95.24
Primnoa sp	0.1	0.86	0.15	1.61	96.85
Acanthogorgia sp	0.11	0.75	0.13	1.41	98.27
Cup Coral (unknown)	0.04	0.41	0.07	0.77	99.04
Paramuricea spp.	0.07	0.25	0.07	0.48	99.51
Chrysogorgia sp. 1	0.02	0.09	0.04	0.17	99.69
Corallium sp.	0.02	0.08	0.04	0.15	99.84
Desmophyllum dianthus	0.02	0.07	0.03	0.14	99.98
Large Gorgonian (unknown)	0.01	0	0.01	0.01	99.99
Soft Coral (unknown)	0	0	0.01	0.01	100
Paragorgia sp	0	0	0	0	100
Acanella sp	0	0	0	0	100
Antipatharian sp.	0	0	0	0	100
Group Br-IG					
Average similarity: 64.26					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Chrysogorgia cf. agassizii	0.52	58.45	1.19	90.96	90.96
Anthomastus sp	0.18	2.92	0.18	4.54	95.5
Lepidisis sp	0.06	1.22	0.11	1.9	97.4
Cup Coral (unknown)	0.08	0.7	0.08	1.08	98.48
Isididae F	0.04	0.31	0.06	0.48	98.96
Nephtheidae F	0.03	0.24	0.05	0.37	99.33
Paramuricea spp.	0.03	0.15	0.04	0.23	99.57
Large Gorgonian (unknown)	0.02	0.11	0.04	0.18	99.74
Desmophyllum dianthus	0.02	0.09	0.03	0.13	99.88
Acanthogorgia sp	0.01	0.04	0.02	0.06	99.93
Chrysogorgia sp. 1	0.02	0.03	0.02	0.04	99.97
Narella cf. laxa	0.01	0.01	0.01	0.01	99.99
Small Gorgonian (unknown)	0.01	0.01	0.01	0.01	100
Group Fg					
Average similarity: 68.39					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Isididae F	0.59	51.03	1.19	74.61	74.61
Acanella sp	0.27	13.16	0.39	19.25	93.86
Anthomastus sp	0.22	3.85	0.26	5.64	99.5
Nephtheidae F	0.04	0.32	0.07	0.47	99.97
Anthoptilum grandiflorum	0.01	0.01	0.01	0.02	99.98
Soft Coral (unknown)	0.01	0	0.01	0.01	99.99

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Pennatula sp.	0.01	0	0	0	99.99
Heteropolypus cf. insolitus	0	0	0	0	100
Pennatulacea (whip-like)	0	0	0	0	100
Small Gorgonian (unknown)	0	0	0	0	100
Acanthogorgia sp	0	0	0	0	100

Group Bl

Average similarity: 78.87

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Anthomastus sp	0.9	67.45	1.87	85.52	85.52
Nephtheidae F	0.37	10.65	0.53	13.51	99.02
Acanthogorgia sp	0.09	0.49	0.11	0.62	99.65
Isididae F	0.04	0.12	0.04	0.15	99.8
Paramuricea spp.	0.04	0.08	0.04	0.1	99.9
Chrysogorgia cf. agassizii	0.02	0.04	0.02	0.06	99.96
Primnoa sp	0.02	0.02	0.02	0.02	99.98
Large Gorgonian (unknown)	0.01	0.01	0.01	0.01	99.99
Lepidisis sp	0.01	0	0.01	0	100
Small Gorgonian (unknown)	0.01	0	0.01	0	100

Group G

Average similarity: 90.35

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Anthomastus sp	0.96	84.45	3.07	93.47	93.47
Nephtheidae F	0.28	5.83	0.35	6.45	99.92
Acanthogorgia sp	0.03	0.06	0.04	0.06	99.99
Isididae F	0.01	0.01	0.01	0.01	100
Soft Coral (unknown)	0	0	0	0	100
Paramuricea spp.	0	0	0	0	100
Large Gorgonian (unknown)	0	0	0	0	100
Primnoa sp	0	0	0	0	100

Group HS

Average similarity: 84.91

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Isididae F	0.96	82.9	3.02	97.64	97.64
Anthomastus sp	0.18	1.87	0.19	2.2	99.84
Nephtheidae F	0.03	0.12	0.05	0.14	99.97
Swiftia sp	0.02	0.02	0.02	0.02	100
Acanella sp	0.01	0	0	0	100
Small Gorgonian (unknown)	0	0	0	0	100

Table 5-87 The average within group similarity from 2-way SIMPER analysis accounting for 100% of similarity for depth across all facies for 10 m for species with a presence/absence transformation.

Species presence/absence 10m Examines Depth groups (across all Facies groups)					
	Group 1475-1675				
	Average similarity: 46.27				
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Isididae F	0.47	22.97	0.65	49.63	49.63
Anthomastus sp	0.54	22.23	0.7	48.05	97.68
Acanthogorgia sp	0.11	0.26	0.08	0.56	98.24
Desmophyllum dianthus	0.07	0.25	0.05	0.53	98.77
Paramuricea spp.	0.08	0.11	0.06	0.24	99.01
Swiftia sp	0.05	0.1	0.05	0.23	99.24
Nephtheidae F	0.07	0.09	0.04	0.19	99.43
Acanella sp	0.05	0.08	0.05	0.17	99.6
Large Gorgonian (unknown)	0.07	0.07	0.05	0.16	99.76
Small Gorgonian (unknown)	0.05	0.07	0.04	0.16	99.92
Cup Coral (unknown)	0.05	0.02	0.03	0.05	99.96
Primnoa sp	0.04	0.02	0.03	0.03	99.99
Antipatharian sp.	0.02	0	0.01	0.01	100
	Group 1675-1875				
	Average similarity: 51.86				
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Anthomastus sp	0.69	33.1	0.83	63.83	63.83
Isididae F	0.42	18.46	0.54	35.6	99.43
Paramuricea spp.	0.07	0.15	0.06	0.28	99.71
Desmophyllum dianthus	0.03	0.05	0.02	0.09	99.8
Corallium sp.	0.04	0.04	0.03	0.07	99.87
Acanthogorgia sp	0.03	0.02	0.02	0.04	99.92
Large Gorgonian (unknown)	0.02	0.02	0.02	0.03	99.95
Soft Coral (unknown)	0.03	0.02	0.02	0.03	99.98
Acanella sp	0.02	0.01	0.01	0.02	100
	Group 1275-1475				
	Average similarity: 37.81				
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Nephtheidae F	0.6	17.03	0.89	45.04	45.04
Anthomastus sp	0.55	8.83	0.58	23.37	68.4
Acanthogorgia sp	0.4	6.9	0.52	18.25	86.66
Paramuricea spp.	0.31	2.63	0.32	6.96	93.61
Isididae F	0.18	1.15	0.2	3.05	96.66
Primnoa sp	0.13	0.53	0.16	1.4	98.06
Large Gorgonian (unknown)	0.09	0.43	0.11	1.13	99.19
Anthoptilum grandiflorum	0.04	0.08	0.03	0.21	99.4
Cup Coral (unknown)	0.04	0.08	0.03	0.21	99.62
Small Gorgonian (unknown)	0.04	0.06	0.03	0.16	99.78
Desmophyllum dianthus	0.05	0.04	0.03	0.11	99.89
Acanella sp	0.05	0.03	0.03	0.07	99.96

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Paragorgia sp	0.04	0.02	0.03	0.04	100
Antipatharian (unknown)	0.02	0	#######	0	100
Antipatharian sp.	0	0	#######	0	100
Bathypathes sp	0	0	#######	0	100
Chrysogorgia cf. agassizii	0	0	#######	0	100
Chrysogorgia sp. (unknown)	0	0	#######	0	100
Chrysogorgia sp. 1	0	0	#######	0	100
Chrysogorgia sp. 2	0	0	#######	0	100
Corallium sp.	0.02	0	#######	0	100
Halipteris finmarchica	0.02	0	#######	0	100
Heteropolypus cf. insolitus	0.02	0	#######	0	100
Lepidisis sp	0.02	0	#######	0	100
Narella cf. laxa	0	0	#######	0	100
Parastenella sp	0	0	#######	0	100
Pennatula sp.	0.02	0	#######	0	100
Pennatula sp. (bushy, orange)	0.02	0	#######	0	100
Pennatulacea (whip-like)	0.02	0	#######	0	100
Soft Coral (unknown)	0	0	#######	0	100
Swiftia sp	0	0	#######	0	100
Umbellula encrinus	0	0	#######	0	100

Group 1075-1275

Average similarity: 67.40

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Anthomastus sp	0.93	44.14	2.47	65.49	65.49
Nephtheidae F	0.67	17.75	0.97	26.33	91.82
Acanthogorgia sp	0.35	3.76	0.38	5.58	97.4
Primnoa sp	0.18	0.72	0.17	1.06	98.46
Paramuricea spp.	0.17	0.67	0.16	1	99.46
Acanella sp	0.07	0.2	0.05	0.3	99.76
Isididae F	0.08	0.14	0.07	0.21	99.97
Antipatharian sp.	0.02	0.01	0.02	0.02	99.99
Small Gorgonian (unknown)	0.02	0	0.02	0.01	100

Group 875-1075

Average similarity: 85.83

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Acanella sp	0.95	84.94	4.42	98.97	98.97
Anthoptilum grandiflorum	0.13	0.73	0.13	0.85	99.82
Anthomastus sp	0.08	0.08	0.04	0.09	99.91
Paramuricea spp.	0.05	0.08	0.04	0.09	100

Group 2675-2875

Average similarity: 49.52

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Chrysogorgia cf. agassizii	0.77	30.38	1.05	61.34	61.34

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Acanella sp	0	0	#######	0	100
Acanthogorgia sp	0	0	#######	0	100
Anthoptilum grandiflorum	0	0	#######	0	100
Antipatharian (unknown)	0	0	#######	0	100
Antipatharian sp.	0	0	#######	0	100
Bathypathes sp	0	0	#######	0	100
Chrysogorgia sp. (unknown)	0	0	#######	0	100
Chrysogorgia sp. 1	0.04	0	#######	0	100
Chrysogorgia sp. 2	0.04	0	#######	0	100
Corallium sp.	0	0	#######	0	100
Cup Coral (unknown)	0	0	#######	0	100
Desmophyllum dianthus	0	0	#######	0	100
Halipteris finmarchica	0	0	#######	0	100
Heteropolypus cf. insolitus	0	0	#######	0	100
Narella cf. laxa	0.08	0	#######	0	100
Nephtheidae F	0	0	#######	0	100
Paragorgia sp	0	0	#######	0	100
Paramuricea spp.	0	0	#######	0	100
Parastenella sp	0	0	#######	0	100
Pennatula sp.	0	0	#######	0	100
Pennatula sp. (bushy, orange)	0	0	#######	0	100
Pennatulacea (whip-like)	0	0	#######	0	100
Primnoa sp	0	0	#######	0	100
Small Gorgonian (unknown)	0	0	#######	0	100
Soft Coral (unknown)	0.04	0	#######	0	100
Swiftia sp	0	0	#######	0	100
Umbellula encrinus	0	0	#######	0	100

Group 2275-2475

Average similarity: 58.02

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Anthomastus sp	0.67	33.91	0.87	58.44	58.44
Isididae F	0.3	19.79	0.58	34.11	92.55
Chrysogorgia cf. agassizii	0.2	3.26	0.22	5.62	98.17
Chrysogorgia sp. 1	0.09	0.93	0.14	1.6	99.77
Heteropolypus cf. insolitus	0.03	0.13	0.04	0.23	100

Group 2075-2275

Average similarity: 63.20

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Anthomastus sp	0.85	59.68	1.43	94.42	94.42
Acanella sp	0.11	1.22	0.15	1.93	96.36
Chrysogorgia sp. 1	0.08	1.02	0.12	1.61	97.97
Corallium sp.	0.08	0.43	0.09	0.68	98.64
Desmophyllum dianthus	0.08	0.31	0.09	0.49	99.13
Isididae F	0.08	0.23	0.07	0.36	99.49

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Soft Coral (unknown)	0.06	0.21	0.09	0.34	99.83
Chrysogorgia cf. agassizii	0.04	0.11	0.05	0.17	100
Group 1875-2075					
Average similarity: 60.08					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Anthomastus sp	0.69	29.83	0.82	49.66	49.66
Isididae F	0.43	28.17	0.83	46.89	96.55
Paramuricea spp.	0.12	1.43	0.14	2.37	98.92
Cup Coral (unknown)	0.08	0.65	0.11	1.08	100

Table 5-88 The average within group similarity from 2-way SIMPER analysis accounting for 100% of similarity for facies at 10 m across all depths for species with a presence/absence transformation.

Species presence/absence 10m Examines Facies groups (across all Depth groups)					
Group Fine Grain					
Average similarity: 75.59					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Acanella sp	0.56	71.86	2.03	95.06	95.06
Desmophyllum dianthus	0.09	1.76	0.14	2.33	97.39
Anthoptilum grandiflorum	0.1	0.7	0.12	0.92	98.31
Anthomastus sp	0.13	0.46	0.08	0.61	98.92
Chrysogorgia cf. agassizii	0.09	0.29	0.06	0.38	99.3
Isididae F	0.04	0.24	0.06	0.32	99.62
Cup Coral (unknown)	0.04	0.09	0.04	0.12	99.74
Antipatharian sp.	0.03	0.07	0.04	0.09	99.83
Lepidisis sp	0.03	0.07	0.04	0.09	99.91
Paramuricea spp.	0.03	0.07	0.04	0.09	100
Group Sedimentary Bedrock					
Average similarity: 61.40					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Anthomastus sp	0.76	36.65	1.48	59.68	59.68
Nephtheidae F	0.42	14.75	0.81	24.01	83.7
Isididae F	0.26	4.43	0.26	7.21	90.91
Acanthogorgia sp	0.26	3.67	0.37	5.97	96.88
Paramuricea spp.	0.16	0.91	0.18	1.49	98.37
Primnoa sp	0.11	0.57	0.16	0.94	99.3
Large Gorgonian (unknown)	0.06	0.13	0.06	0.21	99.52
Chrysogorgia sp. 1	0.02	0.08	0.04	0.13	99.65
Desmophyllum dianthus	0.03	0.08	0.03	0.12	99.77
Corallium sp.	0.04	0.07	0.04	0.11	99.88
Small Gorgonian (unknown)	0.03	0.04	0.03	0.07	99.95
Cup Coral (unknown)	0.02	0.02	0.03	0.03	99.99
Acanella sp	0.02	0	0.01	0.01	99.99
Antipatharian sp.	0.01	0	0.01	0	100
Paragorgia sp	0.01	0	0.01	0	100
Group Discontinuous Sedimentary Bedrock					
Average similarity: 65.84					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Anthomastus sp	0.79	60.35	1.45	91.65	91.65
Acanella sp	0.18	4.4	0.29	6.68	98.34
Soft Coral (unknown)	0.14	0.77	0.17	1.17	99.5
Isididae F	0.11	0.33	0.1	0.5	100

Group Discontinuous Igneous Bedrock					
Average similarity: 50.96					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Chrysogorgia cf. agassizii	0.76	36.76	1.02	72.13	72.13
Anthomastus sp	0.33	8.13	0.31	15.95	88.08
Isididae F	0.24	3.59	0.31	7.04	95.12
Chrysogorgia sp. 1	0.19	2.49	0.27	4.88	100
Group Igneous Bedrock					
Average similarity: 55.65					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Anthomastus sp	0.53	31.32	0.75	56.29	56.29
Chrysogorgia cf. agassizii	0.36	18.27	0.53	32.83	89.12
Lepidisis sp	0.13	3.35	0.23	6.02	95.14
Paramuricea spp.	0.06	1.15	0.12	2.06	97.2
Cup Coral (unknown)	0.09	0.52	0.1	0.94	98.13
Isididae F	0.06	0.44	0.08	0.8	98.93
Large Gorgonian (unknown)	0.05	0.21	0.07	0.38	99.31
Desmophyllum dianthus	0.05	0.19	0.07	0.34	99.65
Soft Coral (unknown)	0.05	0.11	0.04	0.2	99.85
Small Gorgonian (unknown)	0.02	0.08	0.04	0.15	100
Group Gravelly Fine Grain					
Average similarity: 49.71					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Anthomastus sp	0.67	28.43	0.77	57.19	57.19
Isididae F	0.49	20.88	0.6	42	99.19
Acanthogorgia sp	0.06	0.1	0.05	0.2	99.39
Paramuricea spp.	0.08	0.1	0.06	0.2	99.59
Swiftia sp	0.03	0.05	0.03	0.1	99.69
Acanella sp	0.04	0.04	0.03	0.08	99.77
Nephtheidae F	0.05	0.03	0.04	0.07	99.84
Chrysogorgia sp. 1	0.02	0.03	0.02	0.06	99.9
Small Gorgonian (unknown)	0.02	0.02	0.02	0.04	99.94
Large Gorgonian (unknown)	0.02	0.01	0.02	0.02	99.97
Primnoa sp	0.02	0.01	0.02	0.01	99.98
Heteropolypus cf. insolitus	0.01	0.01	0.01	0.01	99.99
Soft Coral (unknown)	0.01	0	0.01	0.01	100
Corallium sp.	0.02	0	0.01	0	100
Group Boulder					
No groups with at least 2 samples					

Table 5-89 The average within group similarity from 2-way SIMPER analysis accounting for 100% of similarity for depth across all facies for 50 m for species with a presence/absence transformation.

Species presence/absence 50m Examines Depth groups (across all Facies groups)					
Group 1675-1875 Average similarity: 50.26					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Anthomastus sp	0.75	37.15	1.11	73.93	73.93
Isididae F	0.35	11.85	0.48	23.59	97.52
Paramuricea spp.	0.2	0.51	0.13	1.01	98.53
Acanthogorgia sp	0.13	0.29	0.09	0.57	99.1
Corallium sp.	0.1	0.21	0.1	0.42	99.52
Acanella sp	0.1	0.15	0.06	0.3	99.83
Soft Coral (unknown)	0.1	0.09	0.06	0.17	100
Group 1475-1675 Average similarity: 48.76					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Anthomastus sp	0.61	26.51	1.17	54.38	54.38
Isididae F	0.39	12.05	0.65	24.71	79.09
Desmophyllum dianthus	0.18	3.86	0.22	7.91	86.99
Acanthogorgia sp	0.29	1.66	0.25	3.41	90.4
Swiftia sp	0.13	1.25	0.19	2.57	92.98
Small Gorgonian (unknown)	0.18	0.85	0.17	1.74	94.72
Large Gorgonian (unknown)	0.18	0.67	0.19	1.38	96.1
Paramuricea spp.	0.18	0.62	0.17	1.27	97.37
Nephtheidae F	0.16	0.46	0.15	0.95	98.32
Cup Coral (unknown)	0.13	0.4	0.07	0.82	99.14
Primnoa sp	0.13	0.23	0.12	0.46	99.6
Acanella sp	0.13	0.19	0.1	0.4	100
Group 1275-1475 Average similarity: 52.44					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Acanthogorgia sp	0.67	15.27	1.47	29.11	29.11
Nephtheidae F	0.67	15.27	1.47	29.11	58.22
Paramuricea spp.	0.6	10.32	1.08	19.68	77.9
Anthomastus sp	0.53	4.65	0.39	8.87	86.77
Isididae F	0.4	2.84	0.46	5.42	92.18
Desmophyllum dianthus	0.2	1.71	0.16	3.26	95.44
Large Gorgonian (unknown)	0.2	1.29	0.28	2.46	97.9
Primnoa sp	0.2	1.1	0.28	2.1	100
Group 1075-1275 Average similarity: 62.96					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Anthomastus sp	0.81	23.36	2.01	37.1	37.1
Nephtheidae F	0.65	16.91	1.33	26.85	63.95
Acanthogorgia sp	0.58	11.23	0.97	17.84	81.79

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Paramuricea spp.	0.35	3.75	0.46	5.96	87.75
Acanella sp	0.27	2.96	0.23	4.7	92.44
Primnoa sp	0.31	2.64	0.39	4.19	96.64
Isididae F	0.23	1.31	0.26	2.09	98.73
Anthoptilum grandiflorum	0.08	0.21	0.08	0.34	99.06
Antipatharian sp.	0.08	0.18	0.08	0.29	99.35
Pennatulacea (whip-like)	0.08	0.16	0.08	0.25	99.61
Pennatula sp.	0.08	0.14	0.08	0.22	99.83
Small Gorgonian (unknown)	0.08	0.11	0.08	0.17	100
Antipatharian (unknown)	0	0	#######	0	100
Bathypathes sp	0	0	#######	0	100
Chrysogorgia cf. agassizii	0	0	#######	0	100
Chrysogorgia sp. (unknown)	0	0	#######	0	100
Chrysogorgia sp. 1	0	0	#######	0	100
Chrysogorgia sp. 2	0	0	#######	0	100
Corallium sp.	0	0	#######	0	100
Cup Coral (unknown)	0	0	#######	0	100
Desmophyllum dianthus	0	0	#######	0	100
Halipteris finmarchica	0	0	#######	0	100
Heteropolypus cf. insolitus	0	0	#######	0	100
Large Gorgonian (unknown)	0	0	#######	0	100
Lepidisis sp	0	0	#######	0	100
Narella cf. laxa	0	0	#######	0	100
Paragorgia sp	0	0	#######	0	100
Parastenella sp	0	0	#######	0	100
Pennatula sp. (bushy, orange)	0.04	0	#######	0	100
Soft Coral (unknown)	0	0	#######	0	100
Swiftia sp	0	0	#######	0	100
Umbellula encrinus	0.04	0	#######	0	100

Group 875-1075
Average similarity: 68.52

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Acanella sp	0.9	61.76	3.06	90.14	90.14
Anthoptilum grandiflorum	0.4	6.76	0.44	9.86	100

Group 2875-2975
Average similarity: 38.99

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Lepidisis sp	0.67	21.5	0.8	55.14	55.14
Chrysogorgia cf. agassizii	0.58	8.64	0.6	22.16	77.3
Anthomastus sp	0.33	5.21	0.43	13.36	90.66
Isididae F	0.42	1.96	0.24	5.03	95.69
Large Gorgonian (unknown)	0.25	1.68	0.24	4.31	100

Group 2675-2875

	Average similarity: 51.84				
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Chrysogorgia cf. agassizii	0.86	29.12	2.13	56.17	56.17
Isididae F	0.57	14.56	0.79	28.08	84.25
Anthomastus sp	0.43	4.08	0.38	7.87	92.13
Chrysogorgia sp. 1	0.29	4.08	0.38	7.87	100
	Group 2475-2675				
	Average similarity: 35.19				
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Chrysogorgia cf. agassizii	0.86	35.19	1.16	100	100
	Group 2275-2475				
	Average similarity: 59.93				
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Anthomastus sp	0.88	44.58	1.88	74.39	74.39
Chrysogorgia cf. agassizii	0.36	7.64	0.43	12.75	87.14
Isididae F	0.24	5.83	0.36	9.73	96.87
Heteropolypus cf. insolitus	0.08	1.04	0.14	1.74	98.61
Chrysogorgia sp. 1	0.12	0.83	0.14	1.39	100
	Group 2075-2275				
	Average similarity: 46.25				
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Anthomastus sp	0.84	42.66	1.26	92.24	92.24
Acanella sp	0.21	1.63	0.25	3.53	95.77
Corallium sp.	0.16	0.87	0.15	1.88	97.65
Isididae F	0.16	0.72	0.15	1.57	99.22
Soft Coral (unknown)	0.16	0.36	0.15	0.78	100
	Group 1875-2075				
	Average similarity: 75.51				
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Anthomastus sp	0.88	45.77	1.7	60.61	60.61
Isididae F	0.38	17.69	0.77	23.43	84.04
Paramuricea spp.	0.31	10.77	0.52	14.26	98.3
Cup Coral (unknown)	0.13	1.28	0.2	1.7	100
Acanella sp	0	0	#######	0	100
Acanthogorgia sp	0	0	#######	0	100
Anthoptilum grandiflorum	0	0	#######	0	100
Antipatharian (unknown)	0	0	#######	0	100
Antipatharian sp.	0	0	#######	0	100
Bathypathes sp	0	0	#######	0	100
Chrysogorgia cf. agassizii	0	0	#######	0	100
Chrysogorgia sp. (unknown)	0	0	#######	0	100
Chrysogorgia sp. 1	0	0	#######	0	100

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Chrysogorgia sp. 2	0	0	#######	0	100
Corallium sp.	0.06	0	#######	0	100
Desmophyllum dianthus	0	0	#######	0	100
Halipteris finmarchica	0	0	#######	0	100
Heteropolypus cf. insolitus	0	0	#######	0	100
Large Gorgonian (unknown)	0	0	#######	0	100
Lepidisis sp	0	0	#######	0	100
Narella cf. laxa	0	0	#######	0	100
Nephtheidae F	0	0	#######	0	100
Paragorgia sp	0	0	#######	0	100
Parastenella sp	0	0	#######	0	100
Pennatula sp.	0	0	#######	0	100
Pennatula sp. (bushy, orange)	0	0	#######	0	100
Pennatulacea (whip-like)	0	0	#######	0	100
Primnoa sp	0	0	#######	0	100
Small Gorgonian (unknown)	0	0	#######	0	100
Soft Coral (unknown)	0.06	0	#######	0	100
Swiftia sp	0	0	#######	0	100
Umbellula encrinus	0	0	#######	0	100

Table 5-90 The average within group similarity from 2-way SIMPER analysis accounting for 100% of similarity for facies for 50 m across all depth for species with a presence/absence transformation.

Species presence/absence 50m Examines Facies groups (across all Depth groups)					
	Group Fine Grain				
	Average similarity: 45.22				
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Acanella sp	0.46	26.87	0.82	59.44	59.44
Desmophyllum dianthus	0.24	11.73	0.41	25.95	85.39
Anthoptilum grandiflorum	0.16	2.77	0.27	6.12	91.5
Cup Coral (unknown)	0.08	1	0.1	2.21	93.72
Anthomastus sp	0.24	0.92	0.13	2.03	95.74
Chrysogorgia cf. agassizii	0.14	0.83	0.14	1.84	97.59
Isididae F	0.05	0.33	0.1	0.74	98.32
Antipatharian sp.	0.05	0.29	0.1	0.63	98.96
Pennatulacea (whip-like)	0.08	0.25	0.1	0.55	99.51
Pennatula sp.	0.05	0.22	0.1	0.49	100
	Group Discontinuous Sedimentary Bedrock				
	Average similarity: 37.16				
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Anthomastus sp	0.79	31.48	0.89	84.71	84.71
Acanella sp	0.29	3.41	0.37	9.17	93.88
Isididae F	0.29	1.52	0.21	4.08	97.96
Soft Coral (unknown)	0.14	0.76	0.21	2.04	100
	Group Sedimentary Bedrock				
	Average similarity: 61.29				
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Anthomastus sp	0.77	23.97	1.25	39.1	39.1
Nephtheidae F	0.48	13.53	1.06	22.07	61.18
Acanthogorgia sp	0.5	10.92	0.91	17.81	78.99
Paramuricea spp.	0.39	4.5	0.52	7.34	86.33
Isididae F	0.38	4.31	0.35	7.03	93.36
Primnoa sp	0.23	2.05	0.34	3.34	96.71
Large Gorgonian (unknown)	0.16	0.91	0.23	1.49	98.2
Small Gorgonian (unknown)	0.11	0.44	0.12	0.73	98.92
Corallium sp.	0.13	0.44	0.12	0.72	99.64
Chrysogorgia sp. 1	0.04	0.16	0.06	0.26	99.91
Cup Coral (unknown)	0.04	0.06	0.06	0.09	100
Acanella sp	0.07	0	#######	0	100
Anthoptilum grandiflorum	0	0	#######	0	100
Antipatharian (unknown)	0.02	0	#######	0	100
Antipatharian sp.	0.04	0	#######	0	100
Bathypathes sp	0.02	0	#######	0	100
Chrysogorgia cf. agassizii	0	0	#######	0	100
Chrysogorgia sp. (unknown)	0	0	#######	0	100
Chrysogorgia sp. 2	0	0	#######	0	100
Desmophyllum dianthus	0.04	0	#######	0	100

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Halipteris finmarchica	0	0	#######	0	100
Heteropolypus cf. insolitus	0	0	#######	0	100
Lepidisis sp	0	0	#######	0	100
Narella cf. laxa	0	0	#######	0	100
Paragorgia sp	0.02	0	#######	0	100
Parastenella sp	0	0	#######	0	100
Pennatula sp.	0	0	#######	0	100
Pennatula sp. (bushy, orange)	0	0	#######	0	100
Pennatulacea (whip-like)	0	0	#######	0	100
Soft Coral (unknown)	0.05	0	#######	0	100
Swiftia sp	0	0	#######	0	100
Umbellula encrinus	0	0	#######	0	100

Group Igneous Bedrock
Average similarity: 56.02

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Anthomastus sp	0.75	35.14	1.12	62.73	62.73
Chrysogorgia cf. agassizii	0.43	9.36	0.54	16.71	79.43
Paramuricea spp.	0.18	5.38	0.35	9.61	89.05
Lepidisis sp	0.21	4.95	0.3	8.83	97.87
Cup Coral (unknown)	0.21	0.64	0.14	1.14	99.02
Soft Coral (unknown)	0.11	0.55	0.14	0.98	100

Group Discontinuous Igneous Bedrock
Average similarity: 44.92

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Chrysogorgia cf. agassizii	0.73	22.1	0.83	49.19	49.19
Anthomastus sp	0.33	10.09	0.45	22.46	71.66
Lepidisis sp	0.2	5.16	0.38	11.48	83.14
Isididae F	0.27	4.85	0.39	10.8	93.94
Chrysogorgia sp. 1	0.2	1.36	0.22	3.03	96.97
Large Gorgonian (unknown)	0.13	1.36	0.22	3.03	100
Acanella sp	0	0	#######	0	100
Acanthogorgia sp	0	0	#######	0	100
Anthoptilum grandiflorum	0	0	#######	0	100
Antipatharian (unknown)	0	0	#######	0	100
Antipatharian sp.	0	0	#######	0	100
Bathypathes sp	0	0	#######	0	100
Chrysogorgia sp. (unknown)	0	0	#######	0	100
Chrysogorgia sp. 2	0.13	0	#######	0	100
Corallium sp.	0	0	#######	0	100
Cup Coral (unknown)	0.07	0	#######	0	100
Desmophyllum dianthus	0	0	#######	0	100
Halipteris finmarchica	0	0	#######	0	100
Heteropolypus cf. insolitus	0	0	#######	0	100
Narella cf. laxa	0	0	#######	0	100

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Nephtheidae F	0	0	#######	0	100
Paragorgia sp	0	0	#######	0	100
Paramuricea spp.	0	0	#######	0	100
Parastenella sp	0	0	#######	0	100
Pennatula sp.	0	0	#######	0	100
Pennatula sp. (bushy, orange)	0	0	#######	0	100
Pennatulacea (whip-like)	0	0	#######	0	100
Primnoa sp	0	0	#######	0	100
Small Gorgonian (unknown)	0.07	0	#######	0	100
Soft Coral (unknown)	0	0	#######	0	100
Swiftia sp	0	0	#######	0	100
Umbellula encrinus	0	0	#######	0	100

Group Gravelly Fine Grain
Average similarity: 51.68

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Anthomastus sp	0.86	36.42	1.26	70.47	70.47
Isididae F	0.5	13.17	0.58	25.48	95.95
Swiftia sp	0.08	0.65	0.13	1.25	97.2
Acanthogorgia sp	0.16	0.4	0.12	0.77	97.97
Paramuricea spp.	0.17	0.39	0.13	0.76	98.73
Small Gorgonian (unknown)	0.08	0.27	0.1	0.52	99.25
Acanella sp	0.11	0.19	0.07	0.37	99.62
Heteropolypus cf. insolitus	0.03	0.09	0.04	0.17	99.8
Nephtheidae F	0.09	0.05	0.06	0.1	99.89
Large Gorgonian (unknown)	0.03	0.03	0.04	0.06	99.95
Primnoa sp	0.05	0.03	0.04	0.05	100

Group Igneous/Sedimentary
No groups with at least 2 samples

Table 5-91 The average within group similarity from 2-way SIMPER analysis accounting for 100% of similarity for depth across all facies for 100 m for species with a presence/absence transformation.

Species presence/absence 100m Examines Depth groups (across all Facies groups)					
	Group 1475-1675				
	Average similarity: 50.82				
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Anthomastus sp	0.68	22.81	1.7	44.88	44.88
Isididae F	0.47	11.24	0.82	22.12	66.99
Swiftia sp	0.26	4.91	0.43	9.66	76.65
Desmophyllum dianthus	0.21	2.45	0.22	4.82	81.47
Acanthogorgia sp	0.42	2.3	0.39	4.53	86
Small Gorgonian (unknown)	0.32	1.89	0.31	3.73	89.73
Paramuricea spp.	0.32	1.72	0.34	3.38	93.11
Large Gorgonian (unknown)	0.32	1.37	0.32	2.7	95.81
Primnoa sp	0.26	0.87	0.25	1.72	97.53
Acanella sp	0.21	0.59	0.22	1.16	98.69
Nephtheidae F	0.21	0.46	0.17	0.9	99.59
Cup Coral (unknown)	0.21	0.21	0.13	0.41	100
	Group 1275-1475				
	Average similarity: 51.42				
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Acanthogorgia sp	0.67	11.96	1.47	23.26	23.26
Nephtheidae F	0.67	11.96	1.47	23.26	46.53
Paramuricea spp.	0.67	11.96	1.47	23.26	69.79
Anthomastus sp	0.67	4.55	0.5	8.84	78.63
Isididae F	0.5	3.85	0.5	7.48	86.11
Large Gorgonian (unknown)	0.33	3.57	0.5	6.95	93.05
Primnoa sp	0.33	3.57	0.5	6.95	100
Acanella sp	0.33	0	#######	0	100
Anthoptilum grandiflorum	0	0	#######	0	100
Antipatharian (unknown)	0.17	0	#######	0	100
Antipatharian sp.	0	0	#######	0	100
Bathypathes sp	0	0	#######	0	100
Chrysogorgia cf. agassizii	0	0	#######	0	100
Chrysogorgia sp. (unknown)	0	0	#######	0	100
Chrysogorgia sp. 1	0	0	#######	0	100
Chrysogorgia sp. 2	0	0	#######	0	100
Corallium sp.	0.17	0	#######	0	100
Cup Coral (unknown)	0.17	0	#######	0	100
Desmophyllum dianthus	0.33	0	#######	0	100
Halipteris finmarchica	0.17	0	#######	0	100
Heteropolypus cf. insolitus	0	0	#######	0	100
Lepidisis sp	0.17	0	#######	0	100
Narella cf. laxa	0	0	#######	0	100
Paragorgia sp	0	0	#######	0	100
Parastenella sp	0	0	#######	0	100
Pennatula sp.	0	0	#######	0	100

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Pennatula sp. (bushy, orange)	0	0	#######	0	100
Pennatulacea (whip-like)	0	0	#######	0	100
Small Gorgonian (unknown)	0.17	0	#######	0	100
Soft Coral (unknown)	0	0	#######	0	100
Swiftia sp	0	0	#######	0	100
Umbellula encrinus	0	0	#######	0	100

Group 1675-1875

Average similarity: 42.52

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Anthomastus sp	0.71	30.85	1.13	72.55	72.55
Isididae F	0.33	9.16	0.47	21.53	94.09
Paramuricea spp.	0.29	0.74	0.15	1.73	95.82
Acanella sp	0.17	0.63	0.11	1.49	97.31
Acanthogorgia sp	0.21	0.63	0.11	1.49	98.8
Corallium sp.	0.17	0.51	0.16	1.2	100

Group 1075-1275

Average similarity: 66.53

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Anthomastus sp	0.86	17.96	2.32	26.99	26.99
Nephtheidae F	0.64	13.66	1.31	20.53	47.52
Acanthogorgia sp	0.64	12.84	1.33	19.29	66.81
Paramuricea spp.	0.57	9.62	0.95	14.46	81.28
Isididae F	0.43	4.24	0.54	6.37	87.65
Acanella sp	0.5	4.2	0.41	6.32	93.97
Primnoa sp	0.36	2.35	0.4	3.53	97.51
Anthoptilum grandiflorum	0.14	0.48	0.15	0.72	98.22
Antipatharian sp.	0.14	0.43	0.15	0.65	98.87
Pennatulacea (whip-like)	0.14	0.43	0.15	0.65	99.52
Small Gorgonian (unknown)	0.14	0.32	0.15	0.48	100

Group 875-1075

Average similarity: 60.00

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Acanella sp	0.83	50	2.6	83.33	83.33
Anthoptilum grandiflorum	0.5	10	0.62	16.67	100

Group 2875-2975

Average similarity: 59.33

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Lepidisis sp	0.75	19.33	1.36	32.58	32.58
Chrysogorgia cf. agassizii	0.75	18	1.51	30.34	62.92
Anthomastus sp	0.5	11.33	1.09	19.1	82.02
Isididae F	0.63	6.67	0.45	11.24	93.26
Large Gorgonian (unknown)	0.38	4	0.45	6.74	100

Group 2675-2875
Average similarity: 49.60

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Chrysogorgia cf. agassizii	1	25.26	7.94	50.93	50.93
Isididae F	0.5	9.52	0.58	19.2	70.13
Anthomastus sp	0.5	7.41	0.58	14.93	85.07
Chrysogorgia sp. 1	0.5	7.41	0.58	14.93	100

Group 2475-2675
Average similarity: 20.00

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Chrysogorgia cf. agassizii	1	20	#######	100	100

Group 2275-2475
Average similarity: 55.99

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Anthomastus sp	0.88	39.07	1.91	69.79	69.79
Chrysogorgia cf. agassizii	0.41	7.72	0.51	13.78	83.57
Isididae F	0.24	4.94	0.34	8.82	92.39
Heteropolypus cf. insolitus	0.12	1.85	0.19	3.31	95.7
Chrysogorgia sp. 1	0.12	1.48	0.19	2.65	98.35
Cup Coral (unknown)	0.12	0.93	0.19	1.65	100

Group 2075-2275
Average similarity: 45.08

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Anthomastus sp	1	35.93	2.56	79.72	79.72
Acanella sp	0.33	6.24	0.5	13.84	93.56
Isididae F	0.33	1.52	0.29	3.36	96.92
Soft Coral (unknown)	0.22	1.39	0.29	3.08	100

Group 1875-2075
Average similarity: 44.00

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Anthomastus sp	0.89	26	1.08	59.09	59.09
Paramuricea spp.	0.44	10	0.45	22.73	81.82
Isididae F	0.33	8	0.45	18.18	100

Table 5-92 The average within group similarity from 2-way SIMPER analysis accounting for 100% of similarity for facies for 100 m across all depth for species with a presence/absence transformation.

Species presence/absence 100m Examines Facies groups (across all Depth groups)					
Group Fine Grain Average similarity: 44.17					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Acanella sp	0.57	27.6	1.09	62.47	62.47
Desmophyllum dianthus	0.24	6.53	0.36	14.78	77.25
Anthoptilum grandiflorum	0.24	5	0.43	11.32	88.57
Chrysogorgia cf. agassizii	0.19	1.39	0.2	3.14	91.71
Isididae F	0.1	1.39	0.2	3.14	94.86
Anthomastus sp	0.38	0.76	0.2	1.71	96.57
Antipatharian sp.	0.1	0.76	0.2	1.71	98.29
Pennatulacea (whip-like)	0.14	0.76	0.2	1.71	100
Group Discontinuous Sedimentary Bedrock Average similarity: 32.67					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Anthomastus sp	0.77	24.08	1.19	73.7	73.7
Acanella sp	0.38	4.4	0.41	13.48	87.18
Corallium sp.	0.23	1.07	0.24	3.27	90.45
Isididae F	0.38	1.07	0.24	3.27	93.73
Paramuricea spp.	0.38	1.07	0.24	3.27	97
Soft Coral (unknown)	0.15	0.98	0.24	3	100
Group Sedimentary Bedrock Average similarity: 62.70					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Anthomastus sp	0.78	17.49	1.47	27.9	27.9
Acanthogorgia sp	0.59	12.44	1.31	19.84	47.74
Nephtheidae F	0.48	11.42	1.08	18.22	65.96
Paramuricea spp.	0.52	8.37	0.86	13.35	79.31
Isididae F	0.52	6.55	0.52	10.45	89.75
Primnoa sp	0.3	2.34	0.4	3.74	93.49
Small Gorgonian (unknown)	0.22	1.41	0.27	2.24	95.73
Large Gorgonian (unknown)	0.22	1.07	0.27	1.71	97.44
Chrysogorgia sp. 1	0.07	0.71	0.13	1.14	98.58
Corallium sp.	0.19	0.4	0.13	0.63	99.21
Acanella sp	0.07	0.26	0.13	0.41	99.62
Cup Coral (unknown)	0.07	0.24	0.13	0.38	100
Group Gravelly Fine Grain Average similarity: 50.34					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Anthomastus sp	0.91	33.2	1.55	65.96	65.96
Isididae F	0.53	10.93	0.62	21.71	87.67
Swiftia sp	0.15	2.38	0.28	4.73	92.39
Paramuricea spp.	0.24	1.01	0.21	2.01	94.4

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Acanella sp	0.18	0.66	0.14	1.32	95.72
Acanthogorgia sp	0.18	0.66	0.14	1.32	97.04
Small Gorgonian (unknown)	0.09	0.42	0.15	0.84	97.88
Heteropolypus cf. insolitus	0.06	0.38	0.09	0.75	98.63
Large Gorgonian (unknown)	0.09	0.32	0.15	0.63	99.26
Primnoa sp	0.12	0.29	0.15	0.57	99.83
Nephtheidae F	0.09	0.08	0.09	0.17	100
Anthoptilum grandiflorum	0	0	#######	0	100
Antipatharian (unknown)	0	0	#######	0	100
Antipatharian sp.	0	0	#######	0	100
Bathypathes sp	0.03	0	#######	0	100
Chrysogorgia cf. agassizii	0.03	0	#######	0	100
Chrysogorgia sp. (unknown)	0	0	#######	0	100
Chrysogorgia sp. 1	0.03	0	#######	0	100
Chrysogorgia sp. 2	0	0	#######	0	100
Corallium sp.	0.03	0	#######	0	100
Cup Coral (unknown)	0.03	0	#######	0	100
Desmophyllum dianthus	0	0	#######	0	100
Halipteris finmarchica	0	0	#######	0	100
Lepidisis sp	0	0	#######	0	100
Narella cf. laxa	0	0	#######	0	100
Paragorgia sp	0	0	#######	0	100
Parastenella sp	0.03	0	#######	0	100
Pennatula sp.	0.03	0	#######	0	100
Pennatula sp. (bushy, orange)	0	0	#######	0	100
Pennatulacea (whip-like)	0	0	#######	0	100
Soft Coral (unknown)	0	0	#######	0	100
Umbellula encrinus	0	0	#######	0	100
Group Discontinuous Igneous Bedrock					
Average similarity: 37.76					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Chrysogorgia cf. agassizii	0.75	15.16	1.08	40.14	40.14
Lepidisis sp	0.38	8	0.45	21.19	61.33
Isididae F	0.38	5.71	0.45	15.13	76.46
Anthomastus sp	0.38	4.44	0.45	11.77	88.23
Chrysogorgia sp. 1	0.25	4.44	0.45	11.77	100
Acanella sp	0	0	#######	0	100
Acanthogorgia sp	0	0	#######	0	100
Anthoptilum grandiflorum	0	0	#######	0	100
Antipatharian (unknown)	0	0	#######	0	100
Antipatharian sp.	0	0	#######	0	100
Bathypathes sp	0	0	#######	0	100
Chrysogorgia sp. (unknown)	0	0	#######	0	100
Chrysogorgia sp. 2	0.13	0	#######	0	100
Corallium sp.	0	0	#######	0	100

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Cup Coral (unknown)	0.13	0	#######	0	100
Desmophyllum dianthus	0	0	#######	0	100
Halipteris finmarchica	0	0	#######	0	100
Heteropolypus cf. insolitus	0	0	#######	0	100
Large Gorgonian (unknown)	0.13	0	#######	0	100
Narella cf. laxa	0	0	#######	0	100
Nephtheidae F	0	0	#######	0	100
Paragorgia sp	0	0	#######	0	100
Paramuricea spp.	0	0	#######	0	100
Parastenella sp	0	0	#######	0	100
Pennatula sp.	0	0	#######	0	100
Pennatula sp. (bushy, orange)	0	0	#######	0	100
Pennatulacea (whip-like)	0	0	#######	0	100
Primnoa sp	0	0	#######	0	100
Small Gorgonian (unknown)	0.13	0	#######	0	100
Soft Coral (unknown)	0	0	#######	0	100
Swiftia sp	0	0	#######	0	100
Umbellula encrinus	0	0	#######	0	100

Group Igneous Bedrock

Average similarity: 54.91

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Anthomastus sp	0.87	30.65	1.56	55.82	55.82
Chrysogorgia cf. agassizii	0.6	15.83	0.97	28.84	84.65
Lepidisis sp	0.27	3.15	0.43	5.73	90.39
Paramuricea spp.	0.2	2.78	0.24	5.06	95.45
Cup Coral (unknown)	0.27	1.39	0.24	2.53	97.98
Large Gorgonian (unknown)	0.27	1.11	0.24	2.02	100

Group Igneous/Sedimentary

No groups with at least 2 samples

Table 5-93 The average within group similarity from 2-way SIMPER analysis accounting for 100% of similarity for depth across all facies for 500 m for species with a presence/absence transformation.

Species presence/absence 500m Examines Depth groups (across all Facies groups)					
Group 1675-1875					
Average similarity: 41.27					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Anthomastus sp	0.86	17.86	1.15	43.27	43.27
Paramuricea spp.	0.71	9.52	0.58	23.08	66.35
Acanella sp	0.43	8.33	0.58	20.19	86.54
Soft Coral (unknown)	0.29	5.56	0.58	13.46	100
Group 1475-1675					
Average similarity: 48.53					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Anthomastus sp	1	12.13	23.33	25	25
Isididae F	0.67	6.25	0.71	12.88	37.88
Paramuricea spp.	0.67	6.25	0.71	12.88	50.76
Swiftia sp	0.33	6.25	0.71	12.88	63.64
Acanella sp	0.67	5.88	0.71	12.12	75.76
Cup Coral (unknown)	0.5	5.88	0.71	12.12	87.88
Desmophyllum dianthus	0.5	5.88	0.71	12.12	100
Group 1075-1275					
Average similarity: 20.00					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Acanella sp	1	20	#######	100	100
Group 2875-2975					
Average similarity: 71.43					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Anthomastus sp	1	14.29	#######	20	20
Chrysogorgia cf. agassizii	1	14.29	#######	20	40
Isididae F	1	14.29	#######	20	60
Large Gorgonian (unknown)	1	14.29	#######	20	80
Lepidisis sp	1	14.29	#######	20	100
Group 2675-2875					
No groups with at least 2 samples					
Group 2475-2675					
No groups with at least 2 samples					
Group 2275-2475					
No groups with at least 2 samples					
Group 2075-2275					
No groups with at least 2 samples					
Group 875-1075					
No groups with at least 2 samples					
Group 1275-1475					
No groups with at least 2 samples					
Group 1875-2075					
No groups with at least 2 samples					

Table 5-94 The average within group similarity from 2-way SIMPER analysis accounting for 100% of similarity for facies for 500 m across all depth for species with a presence/absence transformation.

Species presence/absence 500m Examines Facies groups (across all Depth groups)					
Group Discontinuous Sedimentary Bedrock					
Average similarity: 31.86					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Soft Coral (unknown)	0.38	8.33	0.71	26.15	26.15
Acanella sp	0.5	5.88	0.71	18.46	44.62
Anthomastus sp	0.88	5.88	0.71	18.46	63.08
Cup Coral (unknown)	0.38	5.88	0.71	18.46	81.54
Desmophyllum dianthus	0.38	5.88	0.71	18.46	100
Group Fine Grain					
Average similarity: 35.00					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Acanella sp	1	22.5	6.36	64.29	64.29
Anthomastus sp	0.8	12.5	0.71	35.71	100
Group Discontinuous Igneous Bedrock					
Average similarity: 71.43					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Anthomastus sp	1	14.29	#######	20	20
Chrysogorgia cf. agassizii	1	14.29	#######	20	40
Isididae F	0.75	14.29	#######	20	60
Large Gorgonian (unknown)	0.75	14.29	#######	20	80
Lepidisis sp	0.75	14.29	#######	20	100
Group Gravelly Fine Grain					
Average similarity: 53.57					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Anthomastus sp	1	20.54	1.81	38.33	38.33
Paramuricea spp.	0.86	20.54	1.81	38.33	76.67
Isididae F	0.57	6.25	0.71	11.67	88.33
Swiftia sp	0.29	6.25	0.71	11.67	100
Group Igneous Bedrock					
No groups with at least 2 samples					
Group Igneous/Sedimentary					
No groups with at least 2 samples					
Group Sedimentary Bedrock					
No groups with at least 2 samples					

Table 5-95 The average within group similarity from 2-way SIMPER analysis accounting for 100% of similarity for depth across all facies for 1000 m for species with a presence/absence transformation.

Species preence/absence 1000m Examines Depth groups (across all Facies groups)					
Group 1675-1875					
Average similarity: 46.32					
Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Acanella sp	1	15.26	2.28	32.95	32.95
Anthomastus sp	1	15.26	2.28	32.95	65.91
Acanthogorgia sp	0.6	5.26	0.71	11.36	77.27
Isididae F	0.6	5.26	0.71	11.36	88.64
Paramuricea spp.	0.8	5.26	0.71	11.36	100
Anthoptilum grandiflorum	0.2	0	#######	0	100
Antipatharian (unknown)	0	0	#######	0	100
Antipatharian sp.	0.4	0	#######	0	100
Bathypathes sp	0	0	#######	0	100
Chrysogorgia cf. agassizii	0	0	#######	0	100
Chrysogorgia sp. (unknown)	0.2	0	#######	0	100
Chrysogorgia sp. 1	0	0	#######	0	100
Chrysogorgia sp. 2	0	0	#######	0	100
Corallium sp.	0.4	0	#######	0	100
Cup Coral (unknown)	0.4	0	#######	0	100
Desmophyllum dianthus	0.6	0	#######	0	100
Halipteris finmarchica	0	0	#######	0	100
Heteropolypus cf. insolitus	0	0	#######	0	100
Large Gorgonian (unknown)	0.4	0	#######	0	100
Lepidisis sp	0	0	#######	0	100
Narella cf. laxa	0	0	#######	0	100
Nephtheidae F	0.4	0	#######	0	100
Paragorgia sp	0	0	#######	0	100
Parastenella sp	0	0	#######	0	100
Pennatula sp.	0.2	0	#######	0	100
Pennatula sp. (bushy, orange)	0	0	#######	0	100
Pennatulacea (whip-like)	0.2	0	#######	0	100
Primnoa sp	0.2	0	#######	0	100
Small Gorgonian (unknown)	0.4	0	#######	0	100
Soft Coral (unknown)	0.6	0	#######	0	100
Swiftia sp	0	0	#######	0	100
Umbellula encrinus	0	0	#######	0	100
Group 1475-1675					
No groups with at least 2 samples					
Group 1075-1275					
No groups with at least 2 samples					
Group 2875-2975					
No groups with at least 2 samples					

Group 2675-2875
No groups with at least 2 samples

Group 2275-2475
No groups with at least 2 samples

Group 1275-1475
No groups with at least 2 samples

Group 1875-2075
No groups with at least 2 samples

Table 5-96 The average within group similarity from 2-way SIMPER analysis accounting for 100% of similarity for facies for 1000 m across all depth for species with a presence/absence transformation.

Species preence/absence 1000m
Examines Facies groups (across all Depth groups)

Group Fine Grain
Average similarity: 40.00

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Acanella sp	1	20	#######	50	50
Anthomastus sp	1	20	#######	50	100

Group Discontinuous Sedimentary Bedrock
Average similarity: 52.63

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Acanella sp	0.75	10.53	#######	20	20
Acanthogorgia sp	0.5	10.53	#######	20	40
Anthomastus sp	1	10.53	#######	20	60
Isididae F	1	10.53	#######	20	80
Paramuricea spp.	1	10.53	#######	20	100

Group Discontinuous Igneous Bedrock
No groups with at least 2 samples

Group Igneous Bedrock
No groups with at least 2 samples

Group Igneous/Sedimentary*
No groups with at least 2 samples
Group Sedimentary Bedrock
No groups with at least 2 samples

Group Gravelly Fine Grain
No groups with at least 2 samples

Groups Fine Grain & Discontinuous Igneous Bedrock
No pairs of groups with samples

Groups Fine Grain & Igneous Bedrock
No pairs of groups with samples

Groups Discontinuous Igneous Bedrock & Igneous Bedrock
No pairs of groups with samples