**Supplementary Table 1. Taxon list of benthic megafauna presence (+) and absence (-) at each transect of the Carlsberg Ridge**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | ***OFOS1*** | ***OFOS2*** | ***OFOS3*** | ***TVG1*** | ***TVG5*** | ***TVG6*** | ***TVG7*** | ***TVG8*** | ***TVG2*** | ***TVG3*** |
| **Taxa** | ***Rift valley wall*** | | | ***Rift valley floor*** | | | | | ***Off-axial highs*** | |
| **Porifera** |  |  |  |  |  |  |  |  |  |  |
| *Aphrocallistes* sp | + | - | - | - | - | - | - | - | - | - |
| Bolosominae sp1 | + | - | - | - | - | - | - | - | - | - |
| Corbitellinae sp1 | - | - | - | - | - | - | - | - | + | + |
| Corbitellinae sp2 | + | - | - | - | - | - | - | - | - | - |
| Crateromorpha (Rosselidae) | + | - | - | - | - | - | - | - | - | - |
| Demospongiae sp1 | - | - | - | - | - | - | - | - | - | - |
| Demospongiae sp2 | + | - | - | - | - | - | - | - | - | - |
| Demospongiae sp3 | + | - | - | - | - | - | - | - | - | - |
| Demospongiae sp4 | + | - | - | - | - | - | - | - | - | - |
| Demospongiae sp5 | + | - | - | - | - | - | - | - | - | - |
| Demospongiae sp6 | + | - | - | - | - | - | - | - | - | - |
| *Eurete* sp | + | - | - | - | - | - | - | - | - | - |
| *Farrea* sp | - | - | - | - | - | - | - | - | + | + |
| Hexactinellida sp1 | + | - | - | - | - | - | - | - | - | - |
| Hexactinellida sp10 | + | - | - | - | - | - | - | - | - | - |
| Hexactinellida sp11 | + | - | - | - | - | - | - | - | - | - |
| Hexactinellida sp2 | + | - | - | - | - | - | - | + | - | - |
| Hexactinellida sp3 | + | - | - | - | - | - | - | - | - | - |
| Hexactinellida sp4 | + | - | - | - | - | - | - | - | - | - |
| Hexactinellida sp5 | + | + | - | - | - | - | - | - | - | - |
| Hexactinellida sp6 | + | - | - | - | - | - | - | - | - | - |
| Hexactinellida sp7 | + | - | + | - | - | + | - | + | - | - |
| Hexactinellida sp8 | + | - | - | - | - | - | - | - | - | - |
| Hexactinellida sp9 | - | - | - | - | - | - | - | - | + | + |
| Hyalonema sp | + | - | + | - | - | - | - | - | - | - |
| Rosselidae sp1 | + | - | - | - | - | - | - | - | - | - |
| Rosselidae sp2 | + | - | - | - | - | - | - | - | - | - |
| **Cnidaria** |  |  |  |  |  |  |  |  |  |  |
| *Schizopathes* sp | - | - | - | - | + | - | - | - | - | - |
| Actinaria sp1 | + | - | - | - | - | - | - | - | - | - |
| Actinaria sp2 | + | - | - | - | - | - | - | - | - | - |
| Actinaria sp3 | - | - | - | - | - | + | - | - | + | + |
| Actinaria sp4 | + | - | - | - | - | - | - | - | - | - |
| Chrysogorgia sp1 | + | - | - | - | - | - | - | - | - | - |
| Gorogonian sp1 | + | - | - | - | - | - | - | - | - | - |
| Gorogonian sp2 | + | - | - | - | - | - | - | - | - | - |
| Isididae sp1 | - | - | - | - | - | - | - | - | + | + |
| Isididae sp2 | - | - | - | - | - | - | - | - | + | + |
| Octocoral sp1 | + | - | - | - | - | - | - | - | - | - |
| Pennatulacea | + | - | - | - | - | - | - | - | - | - |
| *Stichopathes* sp | - | - | - | - | - | - | - | - | + | + |
| *Stylasterine* sp | + | - | - | - | - | - | - | - | - | - |
| Whip coral sp1 | + | - | + | - | - | - | - | - | - | - |
| Whip coral sp2 | + | - | + | - | + | - | + | + | + | + |
| **Echinodermata** |  |  |  |  |  |  |  |  |  |  |
| Asteroid sp1 | + | - | - | - | - | - | - | + | - | - |
| Asteroid sp2 | + | - | - | - | - | - | - | - | - | - |
| Asteroid sp3 | - | - | + | - | - | - | + | - | - | - |
| Asteroid sp4 | - | - | - | - | - | - | - | - | + | - |
| Benthodytes sp1 | + | - | - | - | - | - | - | - | - | - |
| Benthodytes sp2 | + | - | + | + | + | + | + | + | + | - |
| Benthothuria sp | - | - | + | - | - | - | - | - | - | - |
| Brisingid sp1 | + | - | - | - | + | - | + | - | - | + |
| Brisingid sp2 | - | - | - | - | - | - | - | - | + | + |
| Crinoidea sp1 | - | - | - | - | - | - | - | - | - | + |
| Echinoidea sp1 | - | - | - | - | - | - | - | - | - | - |
| Echinoidea sp2 | + | - | - | + | - | + | + | - | - | - |
| Elpidiidae sp1 | - | + | + | - | - | - | - | - | - | - |
| *Enypniastes eximia* | + | + | + | - | - | - | - | - | - | - |
| Laetmogonidae sp1 | - | - | + | - | - | - | - | - | - | - |
| Ophiuroidea sp1 | + | - | - | - | - | - | - | - | - | - |
| Ophiuroidea sp2 | - | - | + | - | - | - | - | - | - | - |
| Ophiuroidea sp3 | + | - | - | - | - | - | - | - | + | - |
| Ophiuroidea sp4 | + | - | - | - | - | - | + | - | - | - |
| Ophiuroidea sp5 | + | - | - | - | - | - | - | - | - | - |
| Ophiuroidea sp6 | - | - | - | - | + | - | + | + | - | - |
| Ophiuroidea sp7 | - | - | + | - | - | - | + | - | - | - |
| Peniagone sp | + | + | + | - | + | + | + | + | - | - |
| Stalk Crinoidea | + | - | - | - | - | - | - | - | - | - |
| Synallactidae sp1 | - | - | + | - | + | + | - | - | - | - |
| Synallactidae sp2 | - | - | - | - | - | - | + | - | - | - |
| **Arthropoda** |  |  |  |  |  |  |  |  |  |  |
| Galatheidae sp2 | - | - | + | - | - | - | - | - | - | - |
| Galtheidae sp1 | + | - | - | - | - | - | - | - | - | - |
| *Cerataspis* sp | + | + | + | + | + | + | + | + | - | - |
| unidentified Brachyuran sp1 | + | + | - | - | - | + | + | - | - | - |
| Unidentified decapoda sp1 | + | - | - | - | - | - | + | - | - | - |
| **Chordata** |  |  |  |  |  |  |  |  |  |  |
| Anguiliformes sp1 | + | - | - | - | - | - | - | - | - | - |
| Anguiliformes sp2 | + | - | - | + | + | - | + | - | - | - |
| Anguiliformes sp3 | - | - | - | - | - | - | - | - | + | - |
| Anguiliformes sp4 | - | - | - | - | - | - | - | - | + | - |
| Anguiliformes sp5 | - | - | - | - | - | - | - | - | + | + |
| Halosaur sp1 | - | - | - | - | - | + | - | - | - | + |
| Ophidiid sp1 | - | - | - | - | - | + | + | - | - | - |
| Synaphobranchid sp1 | + | - | - | - | - | - | - | - | + | - |
| *Typhlonus* sp | - | - | - | - | - | + | + | + | - | - |
| Unidentified chordate sp1 | + | - | + | - | - | - | - | - | - | - |
| Unidentified chordate sp2 | + | + | + | - | - | - | - | + | - | - |
| Unidentified chordate sp3 | - | + | - | - | - | - | - | - | - | - |
| Unidentified chordate sp4 | - | - | - | - | - | - | - | - | - | + |
| Unidentified chordate sp5 | - | - | + | - | - | - | - | - | - | - |
| **Others** |  |  |  |  |  |  |  |  |  |  |
| *Tomopteris* sp | - | - | + | - | - | - | - | - | - | - |
| Xenophyophorea | + | - | - | - | - | - | - | - | - | - |

**Supplementary Table 2. SIMPER analysis of substratum types in Carlsberg Ridge area; average abundances (Av. Abund), average Similarity (Av. Sim), Average Dissimilarity (Av. Diss), contributed percentage (Contrib.%) and cumulative contribution (Cum%).**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ***Group A; Average similarity: 70.74*** | | | | |
| **Substratum types** | **Av.Abund** | **Av.Sim** | **Contrib%** | **Cum.%** |
| BCS | 9.51 | 70.74 | 100 | 100 |
| ***Group B; Average similarity: 67.53*** | | | | |
| S | 6.93 | 30.93 | 45.8 | 45.8 |
| BCS | 4.19 | 17.51 | 25.93 | 71.73 |
| BS | 3.54 | 13.5 | 19.99 | 91.72 |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| ***Groups A & B; Average dissimilarity = 57.63*** | | | | | | |
|  | **Group A** | **Group B** |  |  |  |  |
| **Substratum types** | **Av.Abund** | **Av.Abund** | **Av.Diss** | **Diss/SD** | **Contrib%** | **Cum.%** |
| S | 0.76 | 6.93 | 19.69 | 2.61 | 34.17 | 34.17 |
| BCS | 9.51 | 4.19 | 16.63 | 3.39 | 28.86 | 63.04 |
| BS | 1.92 | 3.54 | 7.53 | 1.44 | 13.06 | 76.1 |
| SB | 0.68 | 1.69 | 4.5 | 1.12 | 7.82 | 83.91 |
| CS | 0 | 1 | 2.89 | 0.69 | 5.01 | 88.92 |
| C | 0 | 1.01 | 2.86 | 0.6 | 4.96 | 93.88 |

**Supplementary Table 3. SIMPER analysis of megafaunal abundances in Carlsberg Ridge area; average abundances (Av. Abund), average Similarity (Av. Sim), Average Dissimilarity (Av. Diss), contributed percentage (Contrib.%) and cumulative contribution (Cum%).**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ***Group A; Average similarity: 60.89*** | | | | |
| **Taxa** | **Av.Abund** | **Av.Sim** | **Contrib%** | **Cum.%** |
| *Stichopathes* sp | 6.2 | 13.62 | 22.37 | 22.37 |
| Brisingid sp2 | 3.47 | 9 | 14.78 | 37.15 |
| Isididae sp1 | 3.43 | 8.21 | 13.49 | 50.64 |
| Actinaria sp3 | 3.01 | 8.21 | 13.49 | 64.14 |
| Hexactinellida sp9 | 2.79 | 6.87 | 11.29 | 75.42 |
| *Farrea* sp | 2.25 | 3.67 | 6.03 | 81.46 |
| ***Group B; Average similarity: 42.84*** | | | | |
| *Cerataspis* sp | 1.71 | 11.43 | 26.67 | 26.67 |
| *Peniagone* sp | 1.43 | 8.66 | 20.22 | 46.89 |
| *Benthodytes* sp2 | 0.94 | 5.82 | 13.59 | 60.48 |
| ***Group C; Average similarity: 32.87*** | | | | |
| *Cerataspis* sp | 1.61 | 14.2 | 43.21 | 43.21 |
| Elpidiidae sp1 | 0.77 | 6.23 | 18.95 | 62.17 |
| *Enypniastes eximia* | 0.7 | 4.82 | 14.68 | 76.85 |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| ***Groups A & C; Average dissimilarity = 99.01*** | | | | | | |
|  | **Group A** | **Group C** |  |  |  |  |
| **Taxa** | **Av.Abund** | **Av.Abund** | **Av.Diss** | **Diss/SD** | **Contrib%** | **Cum.%** |
| *Stichopathes* sp | 6.2 | 0 | 14.31 | 10.81 | 14.45 | 14.45 |
| Brisingid sp2 | 3.47 | 0 | 8.21 | 14.46 | 8.29 | 22.74 |
| Isididae sp1 | 3.43 | 0 | 8.02 | 67.3 | 8.1 | 30.84 |
| Actinaria sp3 | 3.01 | 0 | 7.2 | 8.41 | 7.27 | 38.11 |
| Hexactinellida sp4 | 2.79 | 0 | 6.55 | 53.99 | 6.62 | 44.73 |
| Isididae sp2 | 2.91 | 0 | 6.14 | 1.47 | 6.2 | 50.93 |
| *Farrea* sp | 2.25 | 0 | 5.01 | 2.98 | 5.06 | 55.99 |
| Whip coral sp2 | 2.06 | 0.13 | 4.03 | 1.32 | 4.07 | 60.06 |
| *Cerataspis* sp | 0 | 1.61 | 3.9 | 3.26 | 3.94 | 64 |
| Corbitellinae sp1 | 1.23 | 0 | 3 | 4.68 | 3.03 | 67.03 |
| ***Groups C & B; Average dissimilarity = 71.97*** | | | | | | |
| *Typhlonus* sp | 0 | 1.46 | 6.02 | 1.44 | 8.36 | 8.36 |
| Unidentified Brachyuran sp1 | 0.68 | 0.97 | 4.43 | 1.23 | 6.15 | 14.51 |
| *Peniagone* sp | 0.61 | 1.43 | 3.61 | 1.76 | 5.01 | 19.53 |
| Benthodytes sp2 | 0.13 | 0.94 | 3.53 | 4.92 | 4.91 | 24.43 |
| Elpidiidae sp1 | 0.77 | 0 | 3.52 | 3.04 | 4.9 | 29.33 |
| Unidentified chordate sp2 | 0.9 | 0.22 | 3.51 | 1.8 | 4.88 | 34.21 |
| *Enypniastes* sp | 0.7 | 0 | 3.22 | 2.29 | 4.48 | 38.69 |
| Hexactinellida sp11 | 0.22 | 0.65 | 3.2 | 1.19 | 4.45 | 43.14 |
| *Hyalonema* sp | 0.65 | 0 | 3.04 | 0.9 | 4.23 | 47.37 |
| Anguiliformes sp2 | 0 | 0.62 | 2.77 | 0.74 | 3.84 | 51.22 |
| Ophiuroidea sp6 | 0 | 0.56 | 2.6 | 1.49 | 3.62 | 54.83 |
| Synallactidae sp1 | 0.25 | 0.55 | 2.55 | 1.23 | 3.54 | 58.38 |
| Brisingid sp1 | 0 | 0.56 | 2.48 | 0.77 | 3.44 | 61.82 |
| ***Groups A & B; Average dissimilarity = 94.10*** | | | | | | |
| *Stichopathes* sp | 6.2 | 0 | 13.12 | 7.05 | 13.94 | 13.94 |
| Brisingid sp2 | 3.47 | 0 | 7.52 | 8.69 | 7.99 | 21.93 |
| Isididae sp1 | 3.43 | 0 | 7.35 | 9.5 | 7.81 | 29.74 |
| Actinaria sp3 | 3.01 | 0.17 | 6.22 | 5.48 | 6.61 | 36.35 |
| Hexactinellida sp9 | 2.79 | 0 | 6 | 9.72 | 6.38 | 42.73 |
| Isididae sp2 | 2.91 | 0 | 5.67 | 1.54 | 6.03 | 48.76 |
| *Farrea* sp | 2.25 | 0 | 4.61 | 2.95 | 4.89 | 53.65 |
| *Cerataspis* sp | 0 | 1.71 | 3.78 | 3.6 | 4.01 | 57.66 |
| Corbitellinae sp1 | 0 | 1.43 | 3.1 | 3.68 | 3.29 | 60.95 |