# Supplementary Tables and Figures

## Supplementary Tables

Supplementary Table I: Lower and upper limits of each size class (biovolume, mm3) and corresponding equivalent spherical diameter (ESD, µm) as calculated using the minor and major ellipsoidal axis.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Size  class | Important property | Lower biovolume (mm3) | Upper  Biovolume (mm3) | Lower ESD (µm) | Upper ESD (µm) |
| 1 |  | 5.56x10-04 | 1.10 x10-03 | 1.02 x10+02 | 1.28 x10+02 |
| 2 |  | 1.10x10-03 | 2.19 x10-03 | 1.28 x10+02 | 1.61 x10+02 |
| 3 |  | 2.19 x10-03 | 4.38 x10-03 | 1.61 x10+02 | 2.03 x10+02 |
| 4 |  | 4.38 x10-03 | 8.78 x10 -03 | 2.03 x10+02 | 2.56 x10+02 |
| 5 | Start of Multinet data | 8.78 x10-03 | 1.76 x10-02 | 2.56 x10+02 | 3.23 x10+02 |
| 6 |  | 1.76 x10-02 | 3.50 x10-02 | 3.23 x10+02 | 4.06 x10+02 |
| 7 | Start of UVP5 data | 3.50 x10-02 | 7.03 x10-02 | 4.06 x10+02 | 5.12 x10+02 |
| 8 | Mode of NBSS\_MTN | 7.03 x10-02 | 1.41 x10-01 | 5.12 x10+02 | 6.45 x10+02 |
| 9 |  | 1.41 x10-01 | 2.81 x10-01 | 6.45 x10+02 | 8.13 x10+02 |
| 10 |  | 2.81 x10-01 | 5.56 x10-01 | 8.13 x10+02 | 1.02 x10+02 |
| 11 |  | 5.56 x10-01 | 1.12 x10+00 | 1.02 x10+03 | 1.29 x10+03 |
| 12 | Mode of NBSS\_Zuvp  Min size used to compute the NBSS slopes | 1.12 x10+00 | 2.27 x10+00 | 1.29 x10+03 | 1.63 x10+03 |
| 13 |  | 2.27 x10+00 | 4.51 x10+00 | 1.63 x10+03 | 2.05 x10+03 |
| 14 |  | 4.51 x10+00 | 8.99 x10+00 | 2.05 x10+03 | 2.58 x10+03 |
| 15 |  | 8.99 x10+00 | 1.80 x10+01 | 2.58 x10+03 | 3.25 x10+03 |
| 16 |  | 1.80 x10+01 | 3.61 x10+01 | 3.25 x10+03 | 4.10 x10+03 |
| 17 |  | 3.61 x10+01 | 7.19 x10+01 | 4.10 x10+03 | 5.16 x10+03 |
| 18 | Max size to compute the NBSS slopes | 7.19 x10+01 | 1.44 x10+02 | 5.16 x10+03 | 6.50 x10+03 |
| 19 |  | 1.44 x10+02 | 2.88 x10+02 | 6.50 x10+03 | 8.19 x10+03 |
| 20 |  | 2.88 x10+02 | 5.72 x10+02 | 8.19 x10+03 | 1.03 x10+04 |

Supplementary Table II: Biomass variation between the reconstructed estimate and the Net (reconstructed – Net) and between the reconstructed estimate and the UVP (reconstructed-UVP)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| From Median Biomass (mgC m-3) | | | | |
| Latitudinal bands | Biomass difference | 0-200m | 200-500m | 500-1000m |
| 0-30° | Reconstruted-Net  Reconstruted-UVP | 1.66 (136%)  0.67 (30.44%) | 0.81 (615%)  0.08 (6.56%) | 0.27 (900%)  0.04 (14.2%) |
| 30-60° | Reconstruted-Net  Reconstruted-UVP | 3.4 (308.7%)  0.74 (19.59%) | 1.23 (440%)  0.74 (97%) | 0.77 (440.5%)  0.024 (2.71%) |
| >60° | Reconstruted-Net  Reconstruted-UVP | 0.24 (4.25%)  2.00 (53%) | 2.71 (26%)  4.27 (48%) | 0.68 (31.66%)  0.78 (38%) |

Supplementary Table III: Comparison of mesozooplankton Normalized Biovolume Size Spectra (NBSS) slopes and size ranges at different locations. Modified from Matsuno et al. (2012). For Tara data we show median values and in brackets first and third quartiles values.

|  |  |  |  |
| --- | --- | --- | --- |
| **Location/Depth** | **Size range (mm)** | **Slope** | **Reference** |
| Gulf of St Lawrence (open water) / upper 50 m (49°N) | 0.25–2 | - 0.47 | (Herman and Harvey 2006) |
| Barents Sea/upper 240m (76°N) | 0.25–14 | - 0.63 | (Basedow et al. 2010) |
| Tasman Sea (33°S) | 0.11–3.3 | - 0.69 | Baird et al. (2008) |
| Chukchi Sea (less productive) (69°N) | 0.25–2 | -0.86 | (Matsuno et al. 2012) |
| Gulf of St Lawrence (estuary) 49°N | 0.25–2 | -0.9 | (Herman and Harvey 2006) |
| Western Antarctic Peninsula (Fall) 70°S | 0.25–14 | - 0.92 | (Zhou et al. 2009) |
| Northwest Pacific Ocean 40°N | 0.5-5 | - 1.13 | (Sato et al. 2015) |
| North Pacific Ocean 28°N | 0.18-4 | - 1.13 | (Rodriguez and Mullin 1986) |
| Northwest Atlantic Ocean 35°N | 0.07-8 | - 1.14 | (Quinones et al. 2003) |
| California Current 36°N | 0.2-3.3 | - 1.43 | (Huntley et al. 1995) |
| West Antarctic Peninsula (summer) 70°S | 0.25-14 | - 1.8 | (Zhou et al. 2009) |
| California Bight 30°N | 0.05-8 | - 2.3 | (Napp et al. 1993) |
| Brazilian Continental Shelf 20°S | 0.25-8 | - 1.01 | (Marcolin et al. 2013) |
| (Coastal Stations and Abrolhos Bank) 20°S | 0.1-5 | - 1.25 | (Marcolin et al. 2013) |
| Brazilian Continental Shelf (Oceanic Stations) 20°S | 0.25-8 | - 0.91 | (Marcolin et al. 2013) |
| Western Pacific 20°N | 0.31-20 | - 0.90 (-0.85 to -0.92) | (Dai et al. 2016) |
| Western Pacific (group A) | 0.31-20 | - 0.89 | (Dai et al. 2016) |
| Western Pacific (group B) | 0.31-20 | - 0.92 | (Dai et al. 2016) |
| Western Pacific (group C1) | 0.31-20 | - 0.88 | (Dai et al. 2016) |
| Western Pacific (group C2) | 0.31-20 | - 0.85 | (Dai et al. 2016) |
| Western Pacific (group A) | 0.39-31 | - 0.77 | (Dai et al. 2017) |
| Western Pacific (group B) | 0.39-31 | - 0.69 | (Dai et al. 2017) |
| Western Pacific (group C) | 0.39-31 | - 0.57 | (Dai et al. 2017) |
| Tara polar collected data 0-200m | (0.3 to 31) | -0.94 (-0.71 to -1.45) | This study |
| Tara polar *in situ* UVP 0-200m | (0.5 to 31) | -0.73 (-0.40 to -1.06) | This study |
| Tara temperate collected data 0-200m | (0.3 to 31) | -0.74 (-0.59 to -0.96) | This study |
| Tara temperate *in situ* UVP 0-200m | (0.5 to 31) | -0.52 (-0.36 to -0.92) | This study |
| Tara tropic collected data 0-200m | (0.3 to 31) | -0.89 (-0.67 to -1.04) | This study |
| Tara tropic *in situ* UVP 0-200m | (0.5 to 31) | -0.78 (-0.52 to -0.99) | This study |
| Tara polar collected data 200-500m | (0.3 to 20) | -0.86 (-0.66 to -1.14) | This study |
| Tara polar *in situ* UVP 200-500m | (0.5 to 20) | -0.93 (-0.74 to -1.07) | This study |
| Tara temperate collected data 200-500m | (0.3 to 20) | -0.64 (-0.50 to -0.85) | This study |
| Tara temperate *in situ* UVP 200-500m | (0.5 to 20) | -0.74 (-0.33 to -0.89) | This study |
| Tara tropic collected data 200-500m | (0.3 to 20) | -0.60 (-0.46 to -0.79) | This study |
| Tara tropic *in situ* UVP 200-500m | (0.5 to 20) | -0.57 (-0.37 to -0.87) | This study |

## Supplementary Figures



**Supplementary Figure 1**: NBSS of all living zooplankton (noted Zoo) sampled by the UVP5 (red) and nets (green). The shaded area corresponds to the 25 and 75 quartiles around the median of all NBSS observed at the 57 stations shown in Figure 1. The black shaded line corresponds to the 1mm while the marron shaded lines delimit the size range used to extract and to compare the NBSS slopes.



**Supplementary Figure 2**: Comparison and correlation of Other Rhizaria from UVP5 (red) and Net (green) detected with a very distinct size distribution for the two sampling methods (ESD <1 mm in Multinet samples and ESD>1 mm in UVP5 samples). **(a)** NBSS comparison, the black dashed line corresponds to the 1mm while the marron dashed lines delimit the size range used to extract and compare the NBSS slopes; **(b)** The total concentration of Other-Rhizaria across all paired samples observations from the two methods were significantly correlated (r2=0.53, p-value=9.34x10-31, y=0.70x+0.38). Zoo means zooplankton; **(c)** Forminifera image from Net and **(d)** Other rhizarian image from UVP5.



**Supplementary Figure 3:** Biovolume contributions of different zooplankton taxa to the reconstructed NBSS (for plankton size from 1 to 8mm) in three depth layers (0-200, 200-500 and 500-1000 m) and three latitudinal bands (0°-30°, 30°-60°, >60). **(a)** UVP5 and **(b)** Multinet, for both of them the top panel indicates the surface; the middle panel indicates the upper mesopelagic layer and the bottom panel for the lower mesopelagic layer. The colors represent different groups of zooplankton and Gel- means Gelatinous.



**Supplementary Figure 4:** Biomass contributions of different zooplankton taxa to the reconstructed NBSS (for plankton size from 1 to 8mm) in three depth layers (0-200, 200-500 and 500-1000 m) and three latitudinal bands (0°-30°, 30°-60°, >60). **(a)** UVP5 and **(b)** Multinet, for both of them the top panel indicates the surface; the middle panel indicates the upper mesopelagic layer and the bottom panel for the lower mesopelagic layer. The colors represent different groups of zooplankton and Gel- means Gelatinous.





**Supplementary Figure 5-I: (a)** Pheodaria, **(b)** Collodaria; NBSS maximum selection from Multinet and UVP5 based on the maximum value observed for individual taxonomic groups; the x-axis is the size classes in equivalent spherical diameter (ESD, µm) calculated from the ellipsoidal biovolume and the y-axis the NBSS. Zoo means zooplankton.





**Supplementary Figure 5-I: *(c)*** *Other Rhizarian,* ***(d)*** *Crustacea*; NBSS maximum selection from Multinet and UVP5 based on the maximum value observed for individual taxonomic groups; the x-axis is the size classes in equivalent spherical diameter (ESD, µm) calculated from the ellipsoidal biovolume and the y-axis the NBSS. Zoo means zooplankton.





**Supplementary Figure 5-II: *(e)*** *Gelatinous Herbivore,* ***(f)*** *Gelatinous Carnivorous*; NBSS maximum selection from Multinet and UVP5 based on the maximum value observed for individual taxonomic groups; the x-axis is the size classes in equivalent spherical diameter (ESD, µm) calculated from the ellipsoidal biovolume and the y-axis the NBSS. Zoo means zooplankton.



**Supplementary Figure 5-II:***,* ***(g)*** *Other living*; NBSS maximum selection from Multinet and UVP5 based on the maximum value observed for individual taxonomic groups; the x-axis is the size classes in equivalent spherical diameter (ESD, µm) calculated from the ellipsoidal biovolume and the y-axis the NBSS. Zoo means zooplankton.



**Supplementary Figure 6:** Distribution of **(a)** reconstructed biomass and **(b)** NBSS slopes in latitudinal bands. The box represents the 25 and 75 quartiles around the median and the black line indicates the limit for the outliers. Statistical Test is ANOVA (\* if pvalue<0.05, \*\* if pvalue < 0.01 and \*\*\* if pvalue < 0.001). Anova on Biomass: (Tropical\_0-200m, Polar\_0-200m, \*\*), (Temperate\_0-200m, Polar\_0-200m, \*), (Tropical\_200-500m, Polar\_200-500m, \*\*\*), (Temperate\_200-500m, Polar\_200-500m, \*\*\*). Anova on Slopes are not significant.