

Table S1. PERMANOVA testing the effects of environment and host phylum (taxonomy) by trait type*.

| Trait/factors | DF | SS | MS | Pseudo-F | <i>P</i> -value | ECV (%) |
|-------------------------|----|---------|--------|----------|-----------------|---------|
| COG | | | | | | |
| Environment | 6 | 123.38 | 20.56 | 1.58 | 0.044 | 9.3 |
| Host Phyla | 3 | 203.98 | 67.99 | 5.23 | 0.001 | 40.1 |
| Residuals | 13 | 169.04 | 13.00 | | | 50.6 |
| Resistance | | | | | | |
| Environment | 6 | 124.93 | 20.82 | 0.92 | 0.710 | - |
| Host Phyla | 3 | 113.40 | 37.80 | 1.67 | 0.008 | 13.5 |
| Residuals | 10 | 225.90 | 22.59 | | | 86.6 |
| Carbon cycling | | | | | | |
| Environment | 6 | 763.41 | 127.23 | 1.05 | 0.295 | - |
| Host Phyla | 4 | 755.32 | 188.83 | 1.56 | 0.001 | 9.7 |
| Residuals | 17 | 2056.50 | 120.97 | | | 90.4 |
| Nitrogen cycling | | | | | | |
| Environment | 6 | 174.59 | 29.10 | 0.94 | 0.733 | - |
| Host Phyla | 4 | 187.90 | 46.97 | 1.52 | 0.002 | 9.8 |
| Residuals | 15 | 464.23 | 30.95 | | | 90.2 |
| Mobility | | | | | | |
| Environment | 6 | 35.14 | 5.86 | 0.85 | 0.780 | - |
| Host Phyla | 4 | 136.75 | 34.19 | 4.97 | 0.001 | 44.2 |
| Residuals | 16 | 110.18 | 6.89 | | | 55.8 |

*Significant *P*-values are boldface, indicates statistical significance with $P < 0.05$; *P*-values based on 999 permutations (lowest *P*-value possible 0.001); DF – degrees of freedom; SS – sum of squares; Pseudo-F – F value by permutation; ECV – estimated components of variation; Formula – Trait distance matrices ~ Environment + Host Phylum.