PERMANOVA
Permutational MANOVA

Resemblance worksheet
Name: ITS2_Sydney_ITS2-varinats_rm1_stand_sqrt_resem
Data type: Similarity
Selection: All
Standardise Samples by Total
Transform: Square root
Resemblance: S17 Bray Curtis similarity

Sums of squares type: Type III (partial)
Fixed effects sum to zero for mixed terms
Permutation method: Unrestricted permutation of raw data
Number of permutations: 999

Factors

Name	Type	Levels
Site	Fixed	3
Habitat	Fixed	5
Season	Fixed	2

PAIR-WISE TESTS

Term 'SitexHabitatxSeason' for pairs of levels of factor 'Site'

Within level 'Hard coral' of factor 'Habitat'
Within level 'Pre-bleaching' of factor 'Season'

Groups	t	P(perm)	Unique perms
Site 1, Site 2	0.9975	0.588	35
Site 1, Site 3	1.9484	0.021	35
Site 2, Site 3	1.3629	0.222	35

Denominators

Groups	Denominator	Den.df
Site 1, Site 2	1*Res	6
Site 1, Site 3	1*Res	6
Site 2, Site 3	1*Res	6

Average Similarity between/within groups

	Site 1	Site 2	Site 3
Site 1	87.355		
Site 2	88.01	88.97	
Site 3	81.132	84.758	82.059

Within level 'Hard coral' of factor 'Habitat'
Within level 'Bleaching' of factor 'Season'

Groups	t	P(perm)	Unique perms
Site 1, Site 2	2.1004	0.087	35
Site 1, Site 3	1.2671	0.418	35
Site 2, Site 3	1.052	0.338	35

Denominators

Groups	Denominator	Den.df
Site 1, Site 2	1*Res	6
Site 1, Site 3	1*Res	6
Site 2, Site 3	1*Res	6

Average Similarity between/within groups

	Site 1	Site 2	Site 3
Site 1	97.057		
Site 2	92.452	92.447	
Site 3	93.187	91.982	90.587

Within level 'Soft coral' of factor 'Habitat'
Within level 'Pre-bleaching' of factor 'Season'

```
                                        Unique
Groups                       t  P(perm)  perms
Site 1, Site 2 Denominator is 0
Site 1, Site 3 Denominator is 0
Site 2, Site 3 Denominator is 0
```

Denominators
```
Groups          Denominator Den.df
Site 1, Site 2  1*Res             0
Site 1, Site 3  1*Res             0
Site 2, Site 3  1*Res             0
```

Average Similarity between/within groups
```
        Site 1 Site 2 Site 3
Site 1    100
Site 2    100    100
Site 3    100    100    100
```

Within level 'Soft coral' of factor 'Habitat'
Within level 'Bleaching' of factor 'Season'

```
                                        Unique
Groups                       t  P(perm)  perms
Site 2, Site 3 Denominator is 0
```

Denominators
```
Groups          Denominator Den.df
Site 2, Site 3  1*Res             0
```

Average Similarity between/within groups
```
        Site 2 Site 3
Site 2    100
Site 3    100    100
```

Within level 'Water' of factor 'Habitat'
Within level 'Pre-bleaching' of factor 'Season'
```
                                Unique
Groups              t  P(perm)   perms
Site 1, Site 2 2.0154   0.024       35
Site 1, Site 3 8.9166   0.031       12
Site 2, Site 3 4.9563   0.034       15
```

Denominators
```
Groups          Denominator Den.df
Site 1, Site 2  1*Res             6
Site 1, Site 3  1*Res             6
Site 2, Site 3  1*Res             6
```

Average Similarity between/within groups
```
        Site 1 Site 2 Site 3
Site 1   76.5
Site 2 57.189 63.709
Site 3      0 28.935 97.238
```

Within level 'Water' of factor 'Habitat'
Within level 'Bleaching' of factor 'Season'
```
                                Unique
Groups              t  P(perm)   perms
Site 1, Site 2 9.6249   0.031       35
Site 1, Site 3 14.315   0.028       25
Site 2, Site 3 1.8974   0.153       25
```

Denominators
```
Groups          Denominator Den.df
Site 1, Site 2  1*Res             6
```

```
Site 1, Site 3 1*Res              5
Site 2, Site 3 1*Res              5
```

Average Similarity between/within groups
```
        Site 1 Site 2 Site 3
Site 1 85.137
Site 2 19.754 84.997
Site 3      0  83.64 96.363
```

Within level 'Sediment' of factor 'Habitat'
Within level 'Pre-bleaching' of factor 'Season'
```
                              Unique
Groups             t P(perm)  perms
Site 1, Site 2 1.7317  0.103     10
Site 1, Site 3 1.7401  0.108     35
Site 2, Site 3 1.3447  0.193     35
```

Denominators
```
Groups         Denominator Den.df
Site 1, Site 2 1*Res            4
Site 1, Site 3 1*Res            5
Site 2, Site 3 1*Res            5
```

Average Similarity between/within groups
```
        Site 1 Site 2 Site 3
Site 1 31.541
Site 2 4.9023 28.518
Site 3  21.56 28.391 40.239
```

Within level 'Sediment' of factor 'Habitat'
Within level 'Bleaching' of factor 'Season'
```
                                      Unique
Groups                    t P(perm)   perms
Site 1, Site 2 Denominator is 0
Site 1, Site 3      0.96266   0.821        5
Site 2, Site 3       1.9777   0.071       11
```

Denominators
```
Groups         Denominator Den.df
Site 1, Site 2 1*Res            1
Site 1, Site 3 1*Res            3
Site 2, Site 3 1*Res            4
```

Average Similarity between/within groups
```
        Site 1 Site 2 Site 3
Site 1      0
Site 2      0    100
Site 3 28.146 10.562 26.115
```

Within level 'Macroalgae' of factor 'Habitat'
Within level 'Pre-bleaching' of factor 'Season'
```
                              Unique
Groups             t P(perm)  perms
Site 1, Site 2 1.8427  0.025     35
Site 1, Site 3 3.0488  0.042     26
Site 2, Site 3 1.1311  0.313     25
```

Denominators
```
Groups         Denominator Den.df
Site 1, Site 2 1*Res            6
Site 1, Site 3 1*Res            6
Site 2, Site 3 1*Res            6
```

Average Similarity between/within groups
```
        Site 1 Site 2 Site 3
Site 1 25.353
Site 2 4.4298 28.966
```

```
Site 3        0 50.772 78.743
```

Within level 'Macroalgae' of factor 'Habitat'
Within level 'Bleaching' of factor 'Season'

```
                         Unique
Groups                t P(perm)  perms
Site 1, Site 2 0.94831   0.523     15
Site 1, Site 3  2.4045   0.036     25
Site 2, Site 3   1.249   0.405      4
```

Denominators
```
Groups         Denominator Den.df
Site 1, Site 2 1*Res            4
Site 1, Site 3 1*Res            5
Site 2, Site 3 1*Res            3
```

Average Similarity between/within groups
```
       Site 1 Site 2 Site 3
Site 1 22.607
Site 2 15.008      0
Site 3      0 44.815 79.258
```

PERMANOVA
Permutational MANOVA

Resemblance worksheet
Name: ITS2_Sydney_ITS2-varinats_rm1_stand_sqrt_resem
Data type: Similarity
Selection: All
Standardise Samples by Total
Transform: Square root
Resemblance: S17 Bray Curtis similarity

Sums of squares type: Type III (partial)
Fixed effects sum to zero for mixed terms
Permutation method: Unrestricted permutation of raw data
Number of permutations: 999

Factors

Name	Type	Levels
Site	Fixed	3
Habitat	Fixed	5
Season	Fixed	2

PAIR-WISE TESTS

Term 'SitexHabitatxSeason' for pairs of levels of factor 'Habitat'

Within level 'Site 1' of factor 'Site'
Within level 'Pre-bleaching' of factor 'Season'

Groups	t	P(perm)	Unique perms
Hard coral, Soft coral	18.322	0.02	8
Hard coral, Water	0.97997	0.546	35
Hard coral, Sediment	0.25023	0.792	35
Hard coral, Macroalgae	2.2476	0.026	35
Soft coral, Water	8.9903	0.021	8
Soft coral, Sediment	3.6962	0.032	8
Soft coral, Macroalgae	3.2326	0.023	8
Water, Sediment	0.54308	0.711	35
Water, Macroalgae	2.0965	0.027	35
Sediment, Macroalgae	1.3915	0.123	35

Denominators

Groups	Denominator	Den.df
Hard coral, Soft coral	1*Res	6
Hard coral, Water	1*Res	6
Hard coral, Sediment	1*Res	5
Hard coral, Macroalgae	1*Res	6
Soft coral, Water	1*Res	6
Soft coral, Sediment	1*Res	5
Soft coral, Macroalgae	1*Res	6
Water, Sediment	1*Res	5
Water, Macroalgae	1*Res	6
Sediment, Macroalgae	1*Res	5

Average Similarity between/within groups

	Hard coral	Soft coral	Water	Sediment	Macroalgae
Hard coral	87.355				
Soft coral	0	100			
Water	82.517	0	76.5		
Sediment	59.265	0	57.356	31.541	
Macroalgae	26.708	0	25.153	18.033	25.353

Within level 'Site 1' of factor 'Site'
Within level 'Bleaching' of factor 'Season'

Unique

```
Groups                          t  P(perm)  perms
Hard coral, Water          1.8903    0.025     35
Hard coral, Sediment       5.2092      0.2      5
Hard coral, Macroalgae     1.4926    0.053     35
Water, Sediment            1.4607      0.4      5
Water, Macroalgae          1.5088    0.059     35
Sediment, Macroalgae       0.71501   0.796      5
```

Denominators
```
Groups                     Denominator  Den.df
Hard coral, Water          1*Res             6
Hard coral, Sediment       1*Res             3
Hard coral, Macroalgae     1*Res             6
Water, Sediment            1*Res             3
Water, Macroalgae          1*Res             6
Sediment, Macroalgae       1*Res             3
```

Average Similarity between/within groups
```
            Hard coral   Water  Sediment  Macroalgae
Hard coral      97.057
Water           86.382  85.137
Sediment        84.876  81.037        0
Macroalgae      48.269  42.955   40.965      22.607
```

Within level 'Site 2' of factor 'Site'
Within level 'Pre-bleaching' of factor 'Season'
```
                                       Unique
Groups                         t  P(perm)  perms
Hard coral, Soft coral    22.501     0.03      8
Hard coral, Water         2.5552    0.031     35
Hard coral, Sediment      3.1593    0.032     35
Hard coral, Macroalgae    2.9137    0.029     35
Soft coral, Water         4.9911    0.027      8
Soft coral, Sediment      2.2375    0.146      4
Soft coral, Macroalgae    1.3581    0.149      4
Water, Sediment           1.9531    0.026     35
Water, Macroalgae         1.7566    0.026     35
Sediment, Macroalgae      0.96681   0.575     25
```

Denominators
```
Groups                     Denominator  Den.df
Hard coral, Soft coral     1*Res             6
Hard coral, Water          1*Res             6
Hard coral, Sediment       1*Res             5
Hard coral, Macroalgae     1*Res             6
Soft coral, Water          1*Res             6
Soft coral, Sediment       1*Res             5
Soft coral, Macroalgae     1*Res             6
Water, Sediment            1*Res             5
Water, Macroalgae          1*Res             6
Sediment, Macroalgae       1*Res             5
```

Average Similarity between/within groups
```
            Hard coral  Soft coral   Water  Sediment  Macroalgae
Hard coral      88.97
Soft coral          0      100
Water          59.197   28.755  63.709
Sediment        5.6101   41.118   22.89    28.518
Macroalgae     10.507   53.539  30.201    30.681      28.966
```

Within level 'Site 2' of factor 'Site'
Within level 'Bleaching' of factor 'Season'
```
                                       Unique
Groups                             t  P(perm)  perms
Hard coral, Soft coral        33.614    0.032      8
Hard coral, Water             12.036    0.029     35
Hard coral, Sediment          22.409    0.076     11
Hard coral, Macroalgae        1.9971    0.065     15
```

```
Soft coral, Water                       2.088   0.144        8
Soft coral, Sediment    Denominator is 0
Soft coral, Macroalgae                  1.633   0.315        2
Water, Sediment                        11.016   0.058       11
Water, Macroalgae                      1.2937   0.322       15
Sediment, Macroalgae                   1.7321   0.351        2
```

Denominators
```
Groups                       Denominator Den.df
Hard coral, Soft coral  1*Res               6
Hard coral, Water       1*Res               6
Hard coral, Sediment    1*Res               4
Hard coral, Macroalgae  1*Res               4
Soft coral, Water       1*Res               6
Soft coral, Sediment    1*Res               4
Soft coral, Macroalgae  1*Res               4
Water, Sediment         1*Res               4
Water, Macroalgae       1*Res               4
Sediment, Macroalgae    1*Res               2
```

Average Similarity between/within groups

	Hard coral	Soft coral	Water	Sediment	Macroalgae
Hard coral	92.447				
Soft coral	0	100			
Water	19.329	84.86	84.997		
Sediment	0	0	0	100	
Macroalgae	24.14	50	46.782	0	0

Within level 'Site 3' of factor 'Site'
Within level 'Pre-bleaching' of factor 'Season'
```
                                        Unique
Groups                          t P(perm)  perms
Hard coral, Soft coral   15.117     0.02        8
Hard coral, Water        14.789     0.034      12
Hard coral, Sediment     2.9748     0.042      35
Hard coral, Macroalgae   9.2454     0.021      26
Soft coral, Water             1        1        1
Soft coral, Sediment     1.4094     0.15        8
Soft coral, Macroalgae   0.6786        1        4
Water, Sediment          1.4347     0.132      15
Water, Macroalgae       0.84091     0.966       8
Sediment, Macroalgae     1.4006     0.085      35
```

Denominators
```
Groups                       Denominator Den.df
Hard coral, Soft coral  1*Res               6
Hard coral, Water       1*Res               6
Hard coral, Sediment    1*Res               6
Hard coral, Macroalgae  1*Res               6
Soft coral, Water       1*Res               6
Soft coral, Sediment    1*Res               6
Soft coral, Macroalgae  1*Res               6
Water, Sediment         1*Res               6
Water, Macroalgae       1*Res               6
Sediment, Macroalgae    1*Res               6
```

Average Similarity between/within groups

	Hard coral	Soft coral	Water	Sediment	Macroalgae
Hard coral	82.059				
Soft coral	0	100			
Water	0	98.619	97.238		
Sediment	27.604	56.588	55.995	40.239	
Macroalgae	0	88.443	87.392	52.232	78.743

Within level 'Site 3' of factor 'Site'
Within level 'Bleaching' of factor 'Season'
```
                                        Unique
Groups                          t P(perm)  perms
```

```
Hard coral, Soft coral 28.697   0.034        8
Hard coral, Water      22.741   0.026       25
Hard coral, Sediment   2.1293   0.037       35
Hard coral, Macroalgae 10.281   0.025       25
Soft coral, Water      1.1952   0.456        2
Soft coral, Sediment    1.941   0.025        8
Soft coral, Macroalgae 1.1952   0.438        2
Water, Sediment        1.6239   0.053       25
Water, Macroalgae      1.0749    0.63        2
Sediment, Macroalgae   1.5644    0.05       25
```

Denominators
```
Groups                 Denominator Den.df
Hard coral, Soft coral 1*Res              6
Hard coral, Water      1*Res              5
Hard coral, Sediment   1*Res              6
Hard coral, Macroalgae 1*Res              5
Soft coral, Water      1*Res              5
Soft coral, Sediment   1*Res              6
Soft coral, Macroalgae 1*Res              5
Water, Sediment        1*Res              5
Water, Macroalgae      1*Res              4
Sediment, Macroalgae   1*Res              5
```

Average Similarity between/within groups
```
            Hard coral  Soft coral   Water Sediment Macroalgae
Hard coral      90.587
Soft coral           0         100
Water                0      98.182  96.363
Sediment        28.211       35.21  35.402   26.115
Macroalgae           0      89.629  88.101   33.643     79.258
```