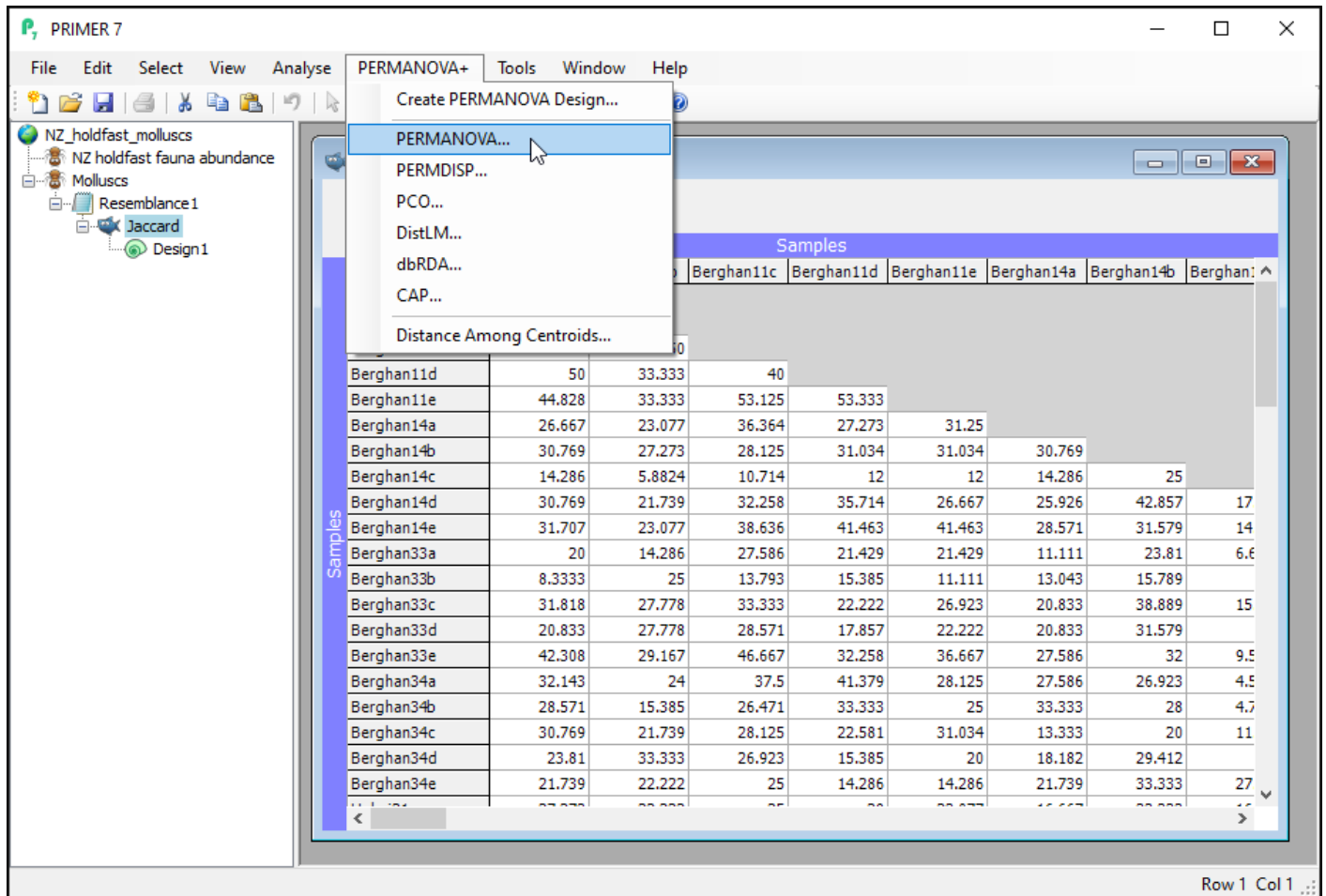


Step 4: Run PERMANOVA

Once the design file is created, we are ready to go ahead with the PERMANOVA analysis.

1. Click on the 'Jaccard' resemblance matrix in the Explorer tree so that it is the active item in the workspace, then click **PERMANOVA+ > PERMANOVA...**



2. Check to see that the 'Design worksheet:' is **Design1**; this is the design file we created in the previous step that contains the three-way nested design. For the rest, we will keep most of the defaults in the PERMANOVA dialog, but it is wise to increase 'Num. permutations:' from **999** to **9999**, as shown below, then click **OK**.

PERMANOVA

Design worksheet: Design1 Covariable worksheet: Molluscs

Terms... Pool... ☐ Include interactions

Test

☒ Main test

☐ Pair-wise test

For term: Location

For pairs of levels of factor: Location

Sums of Squares

☐ Type I (sequential)

☐ Type II (conditional)

☒ Type III (partial)

Num. permutations: 9999

Permutation method

☐ Unrestricted permutation of raw data

☒ Permutation of residuals under a reduced model

☐ Permutation of residuals under the full model

☐ Do Monte Carlo tests

☒ Fixed effects sum to zero

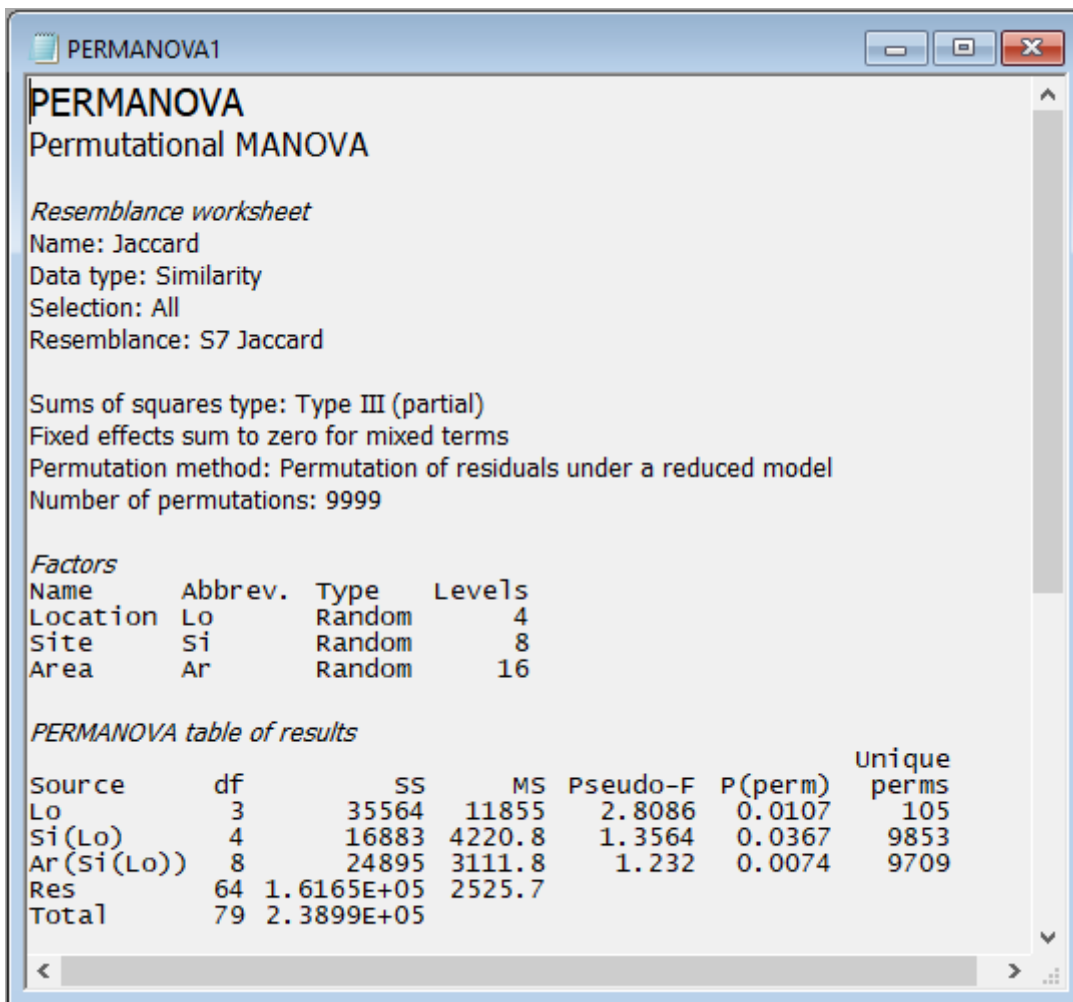
☒ Use short names

OK Cancel Help

3. This produces an output file (called 'PERMANOVA1') in the Explorer tree. It shows:

- the details of the choices you made in the PERMANOVA dialog to run the analysis;
- the details of your experimental design; and
- the PERMANOVA table of results

as follows:



Interpretation

These results show that there is statistically significant variability in the identities of molluscs among holdfasts at each of the three spatial scales in the experimental design: **Areas** ($F_{8,64} = 1.23$, $P < 0.01$), **Sites** ($F_{4,8} = 1.36$, $P < 0.05$) and **Locations** ($F_{3,4} = 2.81$, $P < 0.05$). Note that the p-value for Locations is somewhat limited by the number of unique values of the pseudo-F statistic under permutation that are available here. Specifically, when we permute 2 samples per group (i.e., the 8 Sites) randomly across 4 groups (the Locations), there are just 105 unique values of pseudo-F that can be obtained, so the minimum possible p-value here is $1/105 = 0.0095$).

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