# Assignment 3

Quinn (1989) examined the effects of season (winter/spring and summer/autumn) and adult density (8, 15, 30 and 45 animals per 225cm$^2$ enclosure) on the production of egg masses by intertidal pulmonate limpets (*Siphonaria diemenensis*). There were three replicate enclosures per treatment combination and the response variable was the number of egg masses per limpet in each enclosure. The data is in the file *quinn.xls*.

The null hypothesis were as follows:

- No difference between mean number of egg masses laid in each season, pooling densities.
- No difference in mean number of egg masses laid at each density, pooling seasons.
- No interaction between season and density, i.e. the effect of density on mean numbers of egg masses laid is independent of season and vice versa.

Quinn (1988) did a similar experiment at a lower level of the same shore where the limpets were larger. Different densities were used (6, 12, 24) but the same two seasons with three replicate enclosures per treatment combination. the null hypotheses were the same as above, except that there were only three densities. The data is in the file *quinn1.xls*.

**To do**

1. Do descriptive statistics.
2. Compute the two factor fixed effects ANOVA. Investigate whether all assumptions are fulfilled using tests and graphics.
3. Interpret your results.
4. Do a post-hoc analysis in order to find out which levels of the density are significantly different from each other.

*Reference*

Quinn, G. P. (1988). Ecology of the intertidal pulmonate limpet *Siphonaria diemenensis* Quoy et Gaimard. II Reproductive patterns and energetics. *Journal of Experimental Marine Biology and Ecology* 117 (2), pp 137-156.