Hypotheses about my data

For my data (and with some data I have yet to collect), I have a few hypotheses.

1) I hypothesize that Hg concentrations will vary between sites.
   - To test this in SMB (only 2 sites) I will perform a two-sample t-test between the two sites
     - From this, I can see if there if my data shows whether there's a difference in Hg concentration between the site
     - However, I should also look at the effect size of this difference (i.e. if there is a difference, how different are they)
   - To test this in YP (3 sites) I will perform an ANOVA between the 3 sites
     - This will tell me whether there is a difference between somewhere between my sites
     - If there is, then I can use a post hoc test to explore the mean differences between pairs of groups
     - From there I should also be looking at the effect size (i.e. what actually is the mean difference between the groups)
     - Alternatively, I could do a pooled t-test

2) I hypothesize that essential fatty acid profiles will vary between sites.
   - I will essentially do the same analysis as Hg but I will examine the two EFAs I'm looking at (EPA and DHA) separately.
   - For SMB, I'll do a t-test between the two sites for both EFAs
     - Then I'll look at the effect size
   - For YP, I'll do an ANOVA between the sites for both EFAs
     - If there's a difference, then I'll do a post hoc test to see where what the pairwise differences are
     - Then I'll look at the effect size of the pairwise differences

3) If fatty acids and/or Hg concentrations vary between sites, then I predict that there will be a difference in feeding habits and trophic position between the sites.
   - To look at feeding habits and trophic position, I am going to perform a stable isotope analysis of carbon ($\delta^{13}C$) to determine their reliance on terrestrial or aquatic food sources and a stable isotope analysis of nitrogen ($\delta^{15}N$) to indicate the trophic level of different organisms
   - As $\delta^{15}N$ increases, this is an indication that trophic level increases, and when $\delta^{13}C$ increases, it shows that there's more reliance on terrestrial food sources as opposed to aquatic food sources
   - Hg tends to biomagnify up the food web, so I hypothesize that sites with higher $\delta^{15}N$ will have higher mercury concentration
     - First, I will look at the correlation coefficient between $\delta^{15}N$ and Hg at each site to see if Hg actually increases with $\delta^{15}N$, and if so, how strong this relationship is

    - I can also do an ANOVA to compare $\delta^{15}N$ between sites and if I get a significant p-value, then I do a post hoc test to see the site-wise comparisons to determine where the difference is occurring
    - Then, I can look at means to see if the sites with higher Hg also have higher $\delta^{15}N$
- Furthermore, I may expect to see differences in Hg if the fish rely on different food sources across different sites (i.e. $\delta^{13}C$ varies with Hg)
    - To test this I will also look at the correlation coefficient between $\delta^{13}C$ and Hg at each site to see if there's a relationship between $\delta^{13}C$ and Hg, and how strong that relationship is
    - Then, I can look at means to see if the sites with higher/lower Hg also have higher/lower $\delta^{13}C$ (depending on the relationship in the correlation)