**DAY 31: Fri Nov 7 RAT Stable Isotopes**

Care N Use of Collections

1. **10:00-10:03 Business—**
   1. **new survey?**
   2. **REU at Smithsonian!**
   3. **Monday, your background is due**
2. **10:03-10:13 iRAT**: 10 min🡪one team done at 10:12, one at 10:13
3. **10:03- 10:23** tRAT: 10 min🡪one team finished at 10:20
4. **10:20-10:30** discussion of answers, arguing🡪

**They needed a reminder of how this unit is important in a museum context—here’s what I ended up saying in a later class period that could have been said today**

1. Why are we doing these units? Because, to work in a museum as a curator, eor even a collections manager, most people need at least a **masters and likely a PhD** these days. So **you’d be doing research, supervising research or at least contributing** to others research—and deciding if you think it is **OK to let people destructively sample** or just handle your specimens. So you should be versed in research.
2. We read how specimens are **biological filter paper,** so now we are reading about how exactly they are retaining a signature of their environment in their tissues. I don’t expect that you fully understand the research. I will test you on things we cover in class. In particular, I want you to be able to won’t test you on anything more than what I ask you to know in reading guides (which is not a lot these days)

**They also need some more details about how stable isotopes accumulate, so give them the fish and trophic levels handout**

1. **Review of how stable isotopes accumulate**
   1. show figure of fish nitrogen and write it up on the board how the stable isotope of 15N accumulates as you go up largely because it’s harder to pee out 15N
   2. same processes not happening in Carbon. Your 13C ratio is basically a reflection of the primary producers in your ecosystem, not your trophic level.
   3. Look at figure 2 in Ben-David and Flaherty together; have them try to figure out what it is saying about Carbon, Nitrogen, trophic levels. Then we talk about it as a group (first, I ask someone to describe the left side of the graph only, what are the axes, what is the trend; then we try to interpret it. Notice that the 3permil rule doesn’t work here—why is that? Because terrestrial isn’t as simple as aquatic/marine and because of the variety of diet eaten etc.). Wouldn’t hurt to come up with some specific questions for them to have to answer as a team.
2. **10:30-10:50 Activities using the Bond and Jones paper (I don’t expect to get through them all in one day—probably won’t start it until the next day…)**
   1. Explain that this is a bit out of order, because they haven’t yet read about how people use stable isotopes in research yet, but that I want to give them some ideas of what people are trying to account for in stable isotope studies and a structure for reading the next paper🡪as I write this, I’m not sure I need to do this activity at all. I’m thinking they should just work on understanding Figure 2. And maybe finding answers to the following questions in the Ben-David and Flaherty paper (I would tell them which section to look in)
   2. What is a natural abundance versus enriched stable isotope study? (they did well with this)
   3. Make a graph that comapres the amount of substrate on the x axis with the proportion of heavy isotope in the animal/tissue
   4. Make a graph that compares the amount of substrate on the x axis with the amount of discrimination against the heavy isotope
   5. ~~go through the paper in your folder. For each section in the discussion, write one or two home points to turn in~~
   6. ~~Lipids~~
   7. ~~Tissue preservation~~
   8. ~~Discrimination factors~~
   9. ~~Comparisons among and within food webs~~
   10. ~~Isotope mixing models~~
   11. ~~Tissue heterogeneity~~
   12. ~~Reconstructing historical diet~~
   13. ~~This was a good activity, though definitely needed at least two copies of the paper, probably four would have been better. They will finish it up on Monday and write up the bullet points on the board for grading.~~
   14. So Monday is half the time for peer grading, half the time for an activity. Then for Wednesday they read another more detailed isotope paper and for Friday, Mon, Wed, they get an article each day. So we get through three primary articles, two review articles and a chapter introducing stable isotopes.
   15. This RAT seemed easier for them, will have to look at the grades. I think it was easier because it was a much smaller amount of information to know. I should have emphasized fractionation more, probably even had them read the fractionation section even though they watched the video

**They needed a better reading guide to the next reading, because they were all lost about applying stable isotopes. I think modifying this class to help them move deeper into applying stable isotopes to ecological systems would be helpful**

**THEIR PREP:**

**RAT Reading and Youtube video**

**PREP:**

* Team folders
  + **Two copies of Figure 2 in**

Ben-David, Merav, and Elizabeth A. Flaherty. "Stable isotopes in mammalian research: a beginner's guide." *Journal of mammalogy* 93.2 (2012): 312-328.

* + **Activity 2:** 
    - two copies of the practical intro article
* Bond, ALEXANDER L., and I. L. Jones. "A practical introduction to stable-isotope analysis for seabird biologists: approaches, cautions and caveats."*Marine Ornithology* 37 (2009): 183-188.
  + - Should have printed off a sheet with the 7 sections and bullet points for each thing they were supposed to figure out, this would help guide them
  + RATS
    - 3 team RATS
    - 12 Individual RATS
    - SCRATCH OFF CARDS!