**Comparing stable isotope and DNA metabarcoding data**

**Data:**

***Isotopes:***

N = 78 spiders

Individual-level stable isotope N and C values

Individuals from high-low productivity and small-large sites

***DNA:***

N = 40 spiders, of which 19 have isotope data (potential to increase overlapped sample size if allowed back in lab to finish isotopes!)

Individual-level DNA metabarcoding diet data

Individuals from some high-low productivity site pairs

***All:***

Body size (length and mass) of all individuals

**Possible directions:**

1. Trophic level comparison of both methods
2. Niche space by one or both methods (I know how to do this by isotopes, but worth some exploring for diet)
3. Trophic position of observed diet items vs. isotopic trophic position
4. Directions proposed in some attached papers combining methods! (I’ve only skimmed!)
5. Isotopic niche space by island productivity/size (Young et al. 2013 and Layman papers)
6. Body size and DNA/isotope trophic niche comparison
   1. I’m doing a larger project related to this topic, so potential here for this to be an analysis in a published paper with co-authorship

**Working Bibliography (lots published since these, so worth some more literature explorations!):**

Birkhofer, K., H. Bylund, P. Dalin, O. Ferlian, V. Gagic, P. A. Hambäck, M. Klapwijk, L. Mestre, E. Roubinet, M. Schroeder, J. A. Stenberg, M. Porcel, C. Björkman, and M. Jonsson. 2017. Methods to identify the prey of invertebrate predators in terrestrial field studies. Ecol. Evol. 7: 1942–1953.

A comparison of different methods of diet analysis and different types of ecological questions where they may be more or less suited.

Kartzinel, T. R., P. a. Chen, T. C. Coverdale, D. L. Erickson, W. J. Kress, M. L. Kuzmina, D. I. Rubenstein, W. Wang, and R. M. Pringle. 2015. DNA metabarcoding illuminates dietary niche partitioning by African large herbivores. Proc. Natl. Acad. Sci. 112: 8019–8024.

A foundational diet metabarcoding project that has some mention of “validating” DNA results with stable isotope results. Haven’t read that part too closely recently, but could be a possible direction for these data, and a good way to frame these data if they get used to “validate” my larger project on metabarcoding diet and body size.

Krehenwinkel, H., S. Kennedy, S. Pekar, and R. G. Gillespie. 2016. A cost-efficient and simple protocol to enrich prey DNA from extractions of predatory arthropods for large-scale gut content analysis by Illumina sequencing. Methods Ecol. Evol. 8: 126–134.

The DNA metabarcoding method that I modeled my method after. A good introduction to the jargon and method.

Layman, C. A., M. S. Araujo, R. Boucek, C. M. Hammerschlag-Peyer, E. Harrison, Z. R. Jud, P. Matich, A. E. Rosenblatt, J. J. Vaudo, L. A. Yeager, D. M. Post, and S. Bearhop. 2012. Applying stable isotopes to examine food-web structure: An overview of analytical tools. Biol. Rev. 87: 545–562.

One of several foundational papers in stable isotope research in ecology. Could be a good place to start for understanding what is possible with stable isotopes!

Layman, C. A., J. P. Quattrochi, C. M. Peyer, and J. E. Allgeier. 2007. Niche width collapse in a resilient top predator following ecosystem fragmentation. Ecol. Lett. 10: 937–944.

An example of using stable isotope “niche space” to assess communities before-after a human disturbance.

Layman, C. A., K. O. Winemiller, D. A. Arrington, and D. B. Jepsen. 2005. Body size and trophic position in a diverse tropical food web. Ecology 86: 2530–2535.

A body size paper comparing gut contents to stable isotope data in fish. Could be a good paper to inspire methods.

Layman, C., D. A. Arrington, C. G. Montana, and D. M. Post. 2007. Can Stable Isotope Ratios Provide for Community-Wide Measures of Trophic Structure. Ecology 88: 42–48.

The method paper outlining use of “niche space” stable isotope approaches.

Nielsen, J. M., E. L. Clare, B. Hayden, M. T. Brett, and P. Kratina. 2018. Diet tracing in ecology: Method comparison and selection. Methods Ecol. Evol. 9: 278–291.

Haven’t read this paper, but it looks to include both stable isotope and DNA metabarcoding data. Could be good to glean for methods.

Nigro, K. M., S. A. Hathaway, A. S. Wegmann, A. Miller-ter Kuile, R. N. Fisher, and H. S. Young. 2017. Stable isotope analysis as an early monitoring tool for community-scale effects of rat eradication. Restor. Ecol. 25: 1015–1025.

This is a paper from Palmyra comparing land crab isotopic niches before and after rat eradication. This could be a good method to follow for this paper! Also Katie was an undergraduate tech in the Young lab when she pulled this together!

Roswag, A., N. I. Becker, and J. A. Encarnação. 2018. Isotopic and dietary niches as indicators for resource partitioning in the gleaner bats Myotis bechsteinii, M. nattereri, and Plecotus auritus. Mamm. Biol. 89: 62–70.

Again, haven’t read it, but also includes DNA metabarcoding and stable isotope data.

Whitaker, M. R. L., C. C. M. Baker, S. M. Salzman, D. J. Martins, and N. E. Pierce. 2019. Combining stable isotope analysis with DNA metabarcoding improves inferences of trophic ecology. PLoS One 14: 1–15.

Also a comparison between stable isotope and DNA metabarcoding data.

Young, H. S., D. J. Mccauley, R. B. Dunbar, M. S. Hutson, A. Miller-ter Kuile, and R. Dirzo. 2013. The roles of productivity and ecosystem size in determining food chain length in tropical terrestrial ecosystems. Ecology 94: 692–701.

Foundational paper from Palmyra worth reading thoroughly. Explains the system and includes some data from the spider species that makes up the dataset in this proposal. If you want to explore some of the ecological factors influencing diet (island size, island productivity), this would be a key paper to build ideas off.