

Using MixSIAR

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Learning outcomes

- ▶ Run MixSIAR on one of the standard examples
- ▶ Check convergence and produce plots in MixSIAR
- ▶ Be able to understand output from MixSIAR

Intro to MixSIAR

- ▶ MixSIAR implements a version of the CLR jags code already shown, and through this allows the introduction of random effects and covariates
- ▶ It's a bit limited in that:
 1. It's recommended to work with a GUI
 2. You can only put a certain number of random effects/covariates into the model
 3. It doesn't currently take account of uncertainty in TEFs (it calls this *discrimination*)
 4. It doesn't allow for much choice in prior distributions
- ▶ However, it's a great start at finding simple ways to run more complicated models

The main MixSIAR input screen

Running the Wolves example

- ▶ In the MixSIAR folder there are three files:
`wolves_consumer.csv`, `wolves_discrimination.csv`, and `wolves_sources.csv`
- ▶ These contain the consumer isotope data with two covariates, the discrimination data (no standard deviations), and the source data (for each different region)
- ▶ Note that MixSIAR allows you to input either the sources means/sds (as we have been using), or the raw source data, to which it fits a model to estimate the source parameters
- ▶ These data are similar to those used in the Semmens *et al* PLoS ONE paper already mentioned. The methods are more fully described in that paper
- ▶ The variables pack and region here are included as *nested* random effects, meaning that there are two layers of random effects which measure variability between regions and variability between packs. The overall residual measures variability within pack

Wolves example - consumers

Wolves example - sources

Wolves example - isospace plot

Wolves example - running

- ▶ First run the model as a test go, then choose a normal run
- ▶ These models are starting to get complicated, they take a while to run
- ▶ MixSIAR write JAGS code on the fly. Check out the JAGS model structure in `MixSIAR_model.txt`
- ▶ When it's finished click on `process output` to get at the (many) results
- ▶ You can also access an R script version of this (much better) in `mixsiar_script.r`

Analysing output

- ▶ First, check convergence using Brooks-Gelman-Rubin or Geweke (both previously covered)
- ▶ You then have access to histograms of the posterior distributions of the overall means, and also for each level of the hierarchy; here pack and region
- ▶ They also produce a pairs plot (like the matrix plot of yesterday) which can tell you about model inadequacy
- ▶ Use the `mixsiar_script.r` if you want full access to the JAGS output for any further analysis

MixSIAR output - trace plot

MixSIAR output - random effect densities

MixSIAR output - overall proportion densities

MixSIAR output - matrix plot

Summary

- ▶ We now know how to load in special types of consumers, sources, and discrimination factors in MixSIAR
- ▶ We have run one of the more complicated MixSIAR examples