#### 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

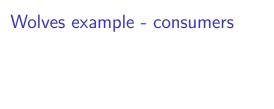
#### Intro to MixSIAR

- 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
  - 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

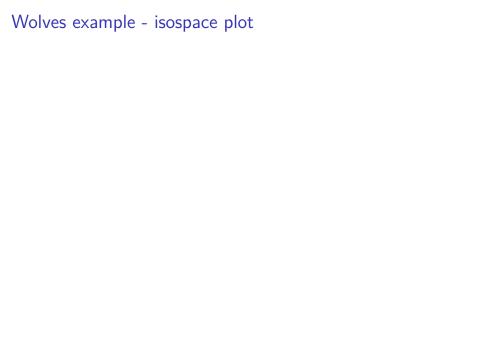
## The main MixSIAR input screen

#### Running the Wolves example

- In the MixSIAR folder there are three files: wolves\_consumer.csv, wolves\_dicrimination.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 - sources



#### Wolves example - running

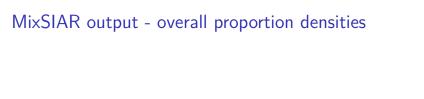
- First run the model as a test go, then choose a normal run
- ► These models are starting to get complicated, they take a while to run
- MixSIAR write JAGS code on the fly. Check out the JAGS model structure in MixSIAR\_model.txt
- When it's finished click on process output to get at the (many) results
- 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 - 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