

# Figure Check

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## Introduction

We are given a dataset of  $N$  bat echolocation call recordings denoted  $\{y_n\}_{n=1}^N$ . This recording is then processed to produce a set of smooth surfaces over a regular grid denoted  $\{\hat{S}_n\}_{n=1}^N$ . This surface is produced by smoothing the call spectrogram and mapping it to a regular grid over relevant frequencies and an absolute time scale.

Along with this dataset we are given a phylogeny defining the evolutionary relationships between the species of bat.

Thus, for the dataset of Mexican Bat echolocation calls and the given Phylogeny, Ancestral Reconstruction has been performed.

## The Current Model

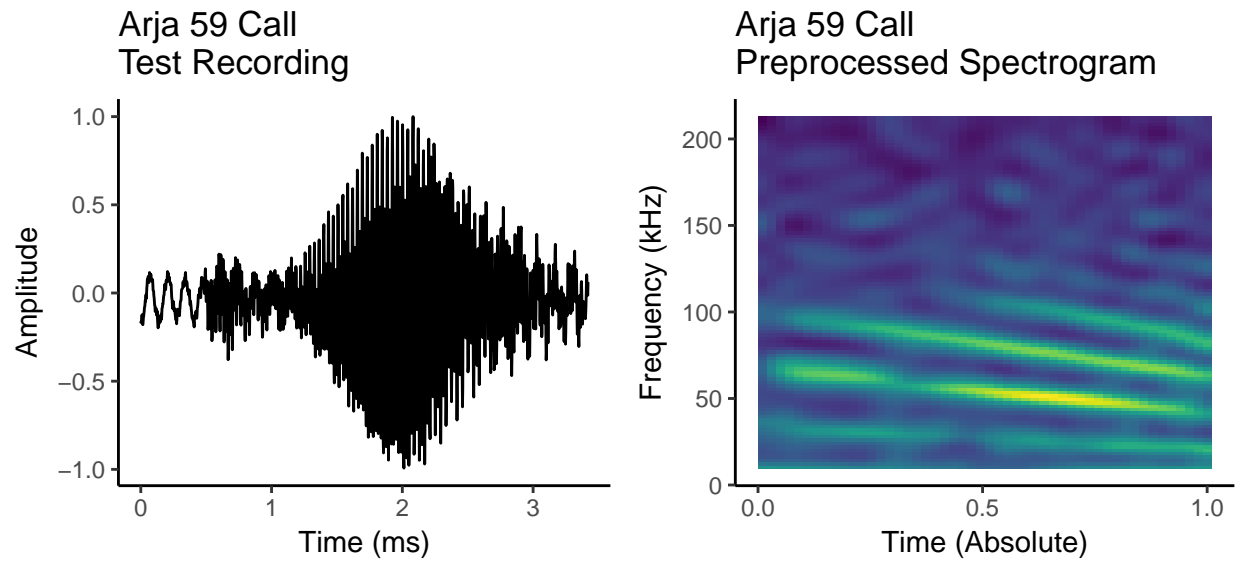


Figure 1: A randomly selected bat call from the species Arja alongside it's corresponding smoothed surface representation.

## Bat Phylogenetic Tree

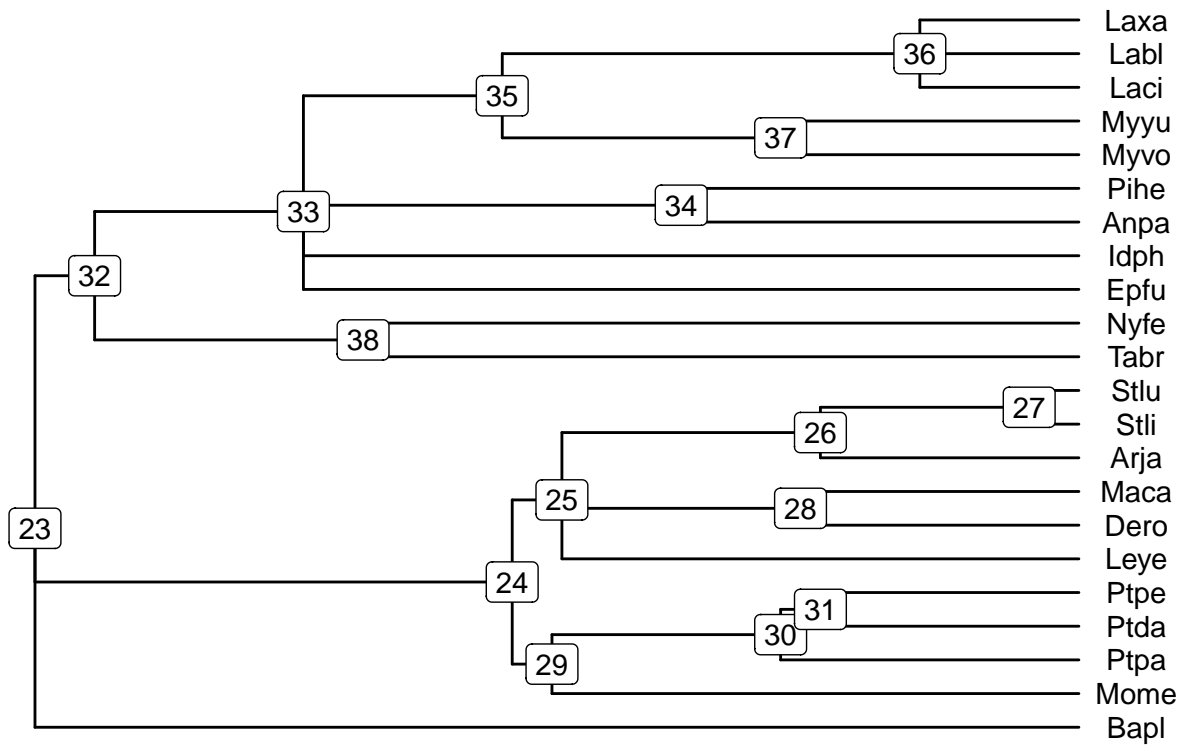


Figure 2: Tree of assumed evolutionary relationships between Bat Species

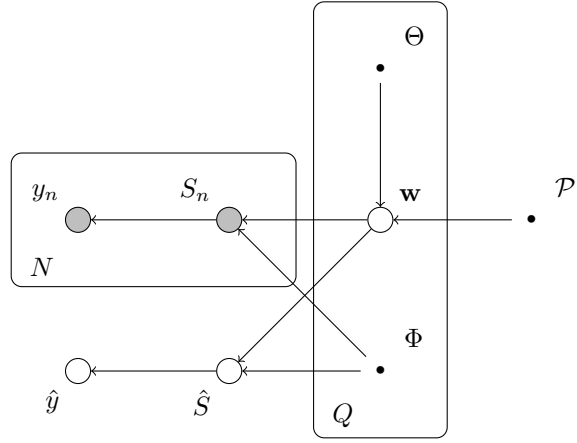


Figure 3: A Graphical model detailing the structure of the model for evolution used to produce reconstructions of ancestral bat echolocation calls.