Table A1.1. Principal component loadings for the first three components extracted from a PCA of six acoustic variables measured from songs of 31 male *Geothlypis beldingi*. These components summarize the major axes of acoustic variation among individuals.

Variables	PC1	PC2	PC3
Eigenvalues	2.68	1.26	1.09
Variance explained	44.72	21.08	18.19
Maximum frequency	0.7	0.2	-0.4
Minimum frequency	-0.8	-0.4	-0.2
Bandwidth	-0.7	-0.5	-0.1
Peak frequency	0.2	-0.2	-0.9
Number of notes	0.7	-0.6	0.1
Duration of the song	0.5	-0.7	0.3

Table A1.2. Linear Discriminant Analysis (LDA) confusion matrix showing classification accuracy of individual songs into northern and southern populations of *Geothlypis beldingi* based on six acoustic variables.

	Northern	Southern
Northern	79.20%	20.79%
Southern	27.77 %	72.22%

Table A1.3. Random Forest confusion matrix showing classification performance for northern and southern populations of *Geothlypis beldingi* using six acoustic variables.

	Northern	Southern	Class error
Northern	76.47%	23.52%	0.089
Southern	16.66 %	83.33%	0.166

Table A1.4. Results of a nested ANOVA partitioning acoustics variation (based on the first three PCA components among regions (north and south), populations, and individuals of *Geothlypis beldingi*.

Components	Df	Sum sq	Mean sq	F value	*P*
CP1[1]					
Region	1	72.52	72.52	143.43	<0.001
Population	3	32.99	11	21.75	<0.001
Individual	27	207.75	7.69	15.22	<0.001
Residuals	123	62.19	0.51		
CP2[2]					
Region	1	1.68	1.685	2.078	0.152
Population	3	21.65	7.217	8.901	<0.001
Individual	27	94.64	3.505	4.323	<0.001
Residuals	123	99.72	0.811		
CP3[3]					
Region	1	11.64	11.636	19.443	<0.001
Population	3	3.62	1.208	2.019	0.115
Individual	27	74.96	2.776	4.639	<0.001
Residuals	123	73.61	0.598		

[1] Component associated with minimum frequency, maximum frequency, bandwidth, and number of notes.
[2] Component associated with the duration of the song.
[3] Component associated with a peak frequency.

Figure A1.1. Number of note types by region. Northern populations showed lower note type diversity, whereas southern populations displayed a broader variety of note types.

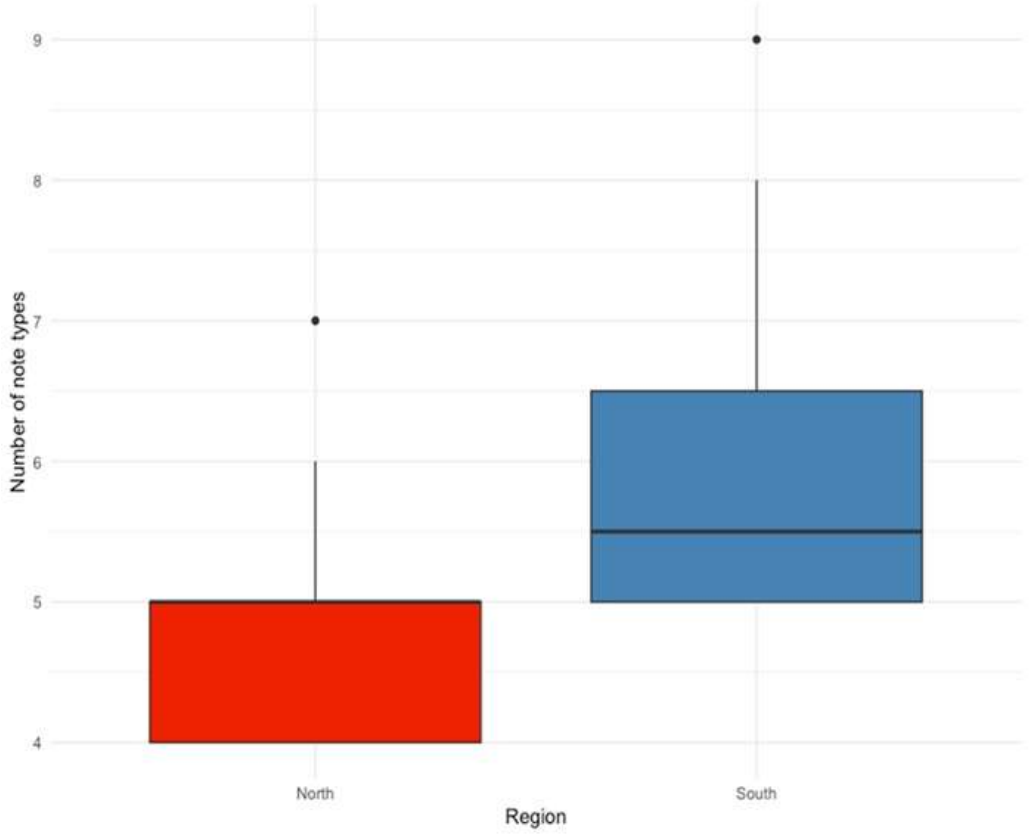

Figure A1.2. Principal Coordinates Analysis (PCoA) using Jaccard dissimilarity among populations. PERMANOVA results show significant regional separation (R^2 = 0.61, p = 0.001). Each point represents pairwise acoustic dissimilarities.

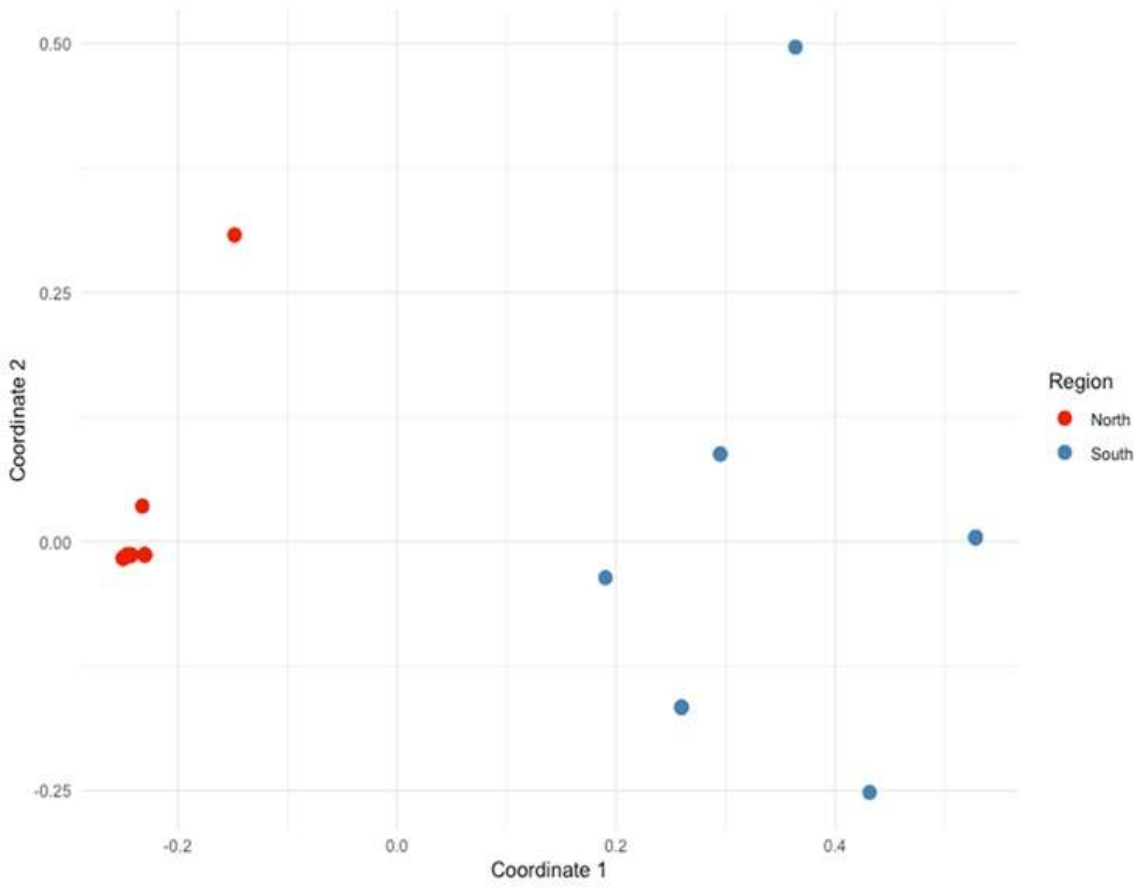

Figure A1.3. Principal Component Analysis (PCA) projection illustrating the acoustic space defined by three principal axes, explaining 81.39% of the total variation. Each point corresponds to the songs from one of the 31 individuals across five populations (North: San Ignacio, La Purísima, and Comondú; South: San Bartolo, San José del Cabo).

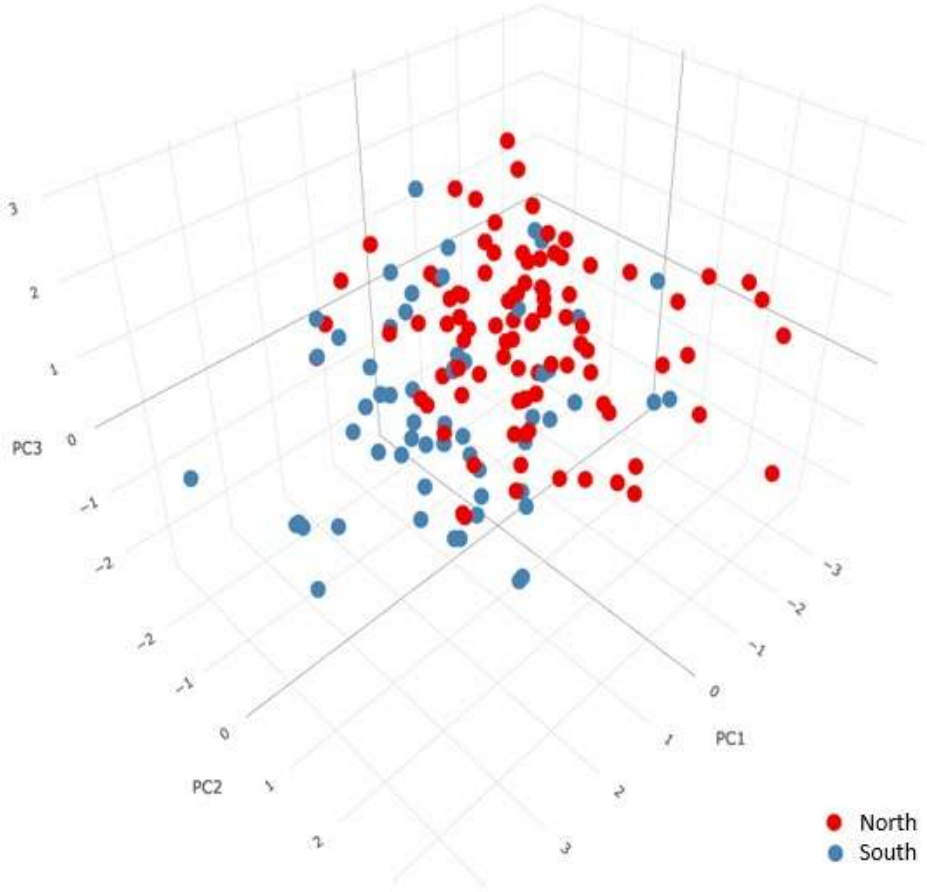

Figure A1.4. Importance of acoustic variables in the Random Forest classification of northern and southern populations of *Geothlypis beldingi*, based on the Gini index. Minimum frequency (Fmin) is the strongest predictor. Variables: Fmin = minimum frequency (kHz), NN = number of notes, Fmax = maximum frequency (kHz), FP = peak frequency (kHz), duration of the song (s), and AB = bandwidth (kHz).