

# **RFCx Arbimon Pattern Matching Analysis for Bird Song Recognition**

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RFCx (Rainforest Connection) Arbimon is a Bio-acoustics analysis platform for audio data collected with autonomous recording units (ARUs). It is a free, speedy and user-friendly resource that allows validation from citizen scientists to add credibility. Multiple types of analyses are featured in their web interface, including pattern matching, soundscape analysis, and a random forest model analysis. Here, I focus on the use of pattern matching analysis which is characterized by Arbimon as object recognition using a cross correlation analysis to identify presence of similar patterns in other audio files.

The Pattern Matching algorithm is used for species-specific identification by matching species templates with a-priori identified calls within the chosen recordings. This is done by matching vocalization patterns from spectrograms on a temporal/frequency scale. A correlation threshold assigns a similarity or correlation between the template and audio data. Results with regions of interest (ROIs) higher than the correlation threshold are marked as potential presence of the species assigned to the template (Tutorial available: <https://support.rfcx.org/article/4-pattern-matching>).

This software was tested with data from the 2020 Hemlock bird surveys, collected by fifteen volunteers of the Nova Scotia Bird Society or other naturalists in the Listening Together project. Recordings were captured at Polly Poddy Rock Road from June 11 to June 24, at Armstrong Lake Road from June 9 to June 18, and at Bourinot Road between June 18 to July 4. The species of interest for this study included Ovenbird, Blackburnian warbler, Red-eyed vireo, Blue-headed vireo, and Black-throated green warbler. The abundance or presence/absence of these species was analysed by using a sample size between 290 and 420 minutes of recordings (each recording is one minute). Pattern matching analyses were conducted with correlation thresholds of 0.1, 0.2 and 0.3 to determine which settings efficiently provide the most accurate results.

It was found that for species with little song variation like the Black-throated green warbler and the Ovenbird, a correlation threshold of 0.3 reduces the verification effort without compromising the accuracy of the results. Audio data with ROIs between 0.1 and 0.2 had less than

a 25% chance of being an accurate match with the species of interest. However, for species with longer songs or higher song variation (e.g., Vireos), it is easier to measure the presence/absence than the abundance with pattern matching in RFCx Arbimon. Another option would be to set the threshold to 0.1 and have a higher verification effort.

For more information, see [https://rfcx.org/our\\_work](https://rfcx.org/our_work).