

Application of a Houston toad classifier

This document provides guidance on how to appropriately use the two Houston toad classifiers available for analyzing automated recording device (ARD) data. ARDs are used for performing presence/absence surveys for the Houston toad. Protocol for performing presence/absence surveys can be found on our website:

- https://www.fws.gov/southwest/es/AustinTexas/ESA_Sci_permits.html

Kaleidoscope Pro (Wildlife Acoustics: <https://www.wildlifeacoustics.com>) is a software suite used for automated detection and subsequent analysis of sounds of interest within digital audio files. The detection of Houston toad vocalizations from audio recordings made by ARDs enables the level of survey effort required to allow a reasonable probability of detecting this amphibian when it is present at a pond. This document provides guidance on the application of classifiers suitable for use in Kaleidoscope Pro software with a workflow designed to minimize false negative detections. The approach is designed to avoid the project-level mistake of incorrectly concluding that vocalizing Houston toads are absent from the recording area.

Automated analysis of audio data is complicated by the variable environmental, recording, and signal qualities across sites. The underlying heterogeneity in subsequent automated classifier performance comes from many sources. One important aspect of variability that can be controlled is in the use of a high-quality classifier designed for detection of the vocalizing species of interest. However, the variation in biotic and abiotic background noise at the recording sites and the distance between the vocalizing toad and the ARD alongside the quality of the recording device itself all impact the efficiency of automated software detections of the vocalizations. These sources necessitate a two-step classifier approach as an efficient approach to minimize an inappropriate determination of absence.

To create an efficient and timesaving approach, a two-step system was designed. The first step applies a classifier (Houston toad Classifier 1) that may fail to detect Houston toads under certain circumstances but minimizes false positive reporting by the software. If that classifier fails to detect Houston toads at a survey site, then a second, more permissive classifier (Houston toad Classifier 4) is applied to the same set of audio files from the ARDs that was analyzed by Houston toad Classifier 1. This is a site-by-site process, i.e. each site surveyed must undergo this two-step process. Overall, this process enables detection of “clear and proximal” Houston toad call detection in minimal analytical time, with little post-analytical review from Houston toad Classifier 1, when detection conditions allow it. However, as it is restrictive, preventing false negative reporting necessitates application of Houston toad Classifier 4 when the first classifier fails to return positive detections. Houston toad Classifier 4 will return a greater number of false positive detections from the software but it minimizes false negatives and thus reducing the likelihood that ARD data are used in making a determination of absence when vocalizing Houston toads are actually present within the recording area.

The workflow for users with audio data is as follows:

1. On the Batch tab, direct Kaleidoscope Pro to the folder with the audio data.
2. Also on the Batch tab, direct Kaleidoscope Pro to the folder where you want the analysis output stored.
3. On the Cluster Analysis tab, select “Use existing kcs to sort new recordings and create a new cluster csv” and then direct Kaleidoscope to the location of Houston toad Classifier 1.
 - a. Kaleidoscope Pro applies the signal detection parameters of the classifier when it is loaded, so there is no need to adjust setting on that tab.
4. However, on the Cluster Analysis tab, the user must set the “Max distance from cluster center to include outputs in cluster.csv” to 2.0.
5. Select “process files” to begin the analysis.
6. After the analysis is complete, conduct a post-analytical review of all the detections made by Kaleidoscope Pro.
7. If no Houston toads were detected, repeat steps 2 through 4, this time using Houston toad Classifier 4.

It is recommended that the user become familiar with the “visual” representation of a Houston toad call on a spectrogram prior to conducting the analysis. To this end, the audio file containing a very clear (e.g. “Single example Houston toad audio”) is supplied. Finally, a second file (e.g. “Chorus example Houston toad audio”) is provided that contains a heterogeneous chorus of Houston toads to assist with the analytical and post-analytical visual recognition of these distinct calls within user supplied audio data.

Resource files required for the workflow:

- Houstontoad_Classifier_1.kcs
- Houstontoad_Classifier_4.kcs
- Single example Houston toad audio.wav
- ChorusHoustontoadaudio.wav