Pilot study of acoustic recordings of the Golden Cheeked Warbler in Balcones Canyonlands preserves from March 15–June 30 2016

Authors: David. P. Knobles[1] and Preston S. Wilson[2]

[1] KSA, LLC [dpknobles@yahoo.com] and the University of Delaware, [dknobles@udel.edu]

[2] The University of Texas at Austin [pswilson@mail.utexas.edu]

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Point of Contact: Lisa O'Donnell, City of Austin

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Executive Summary

Four acoustic sensors were deployed at four locations in the Balcones Canyonland preserve. Three were located at the Wild Basin preserve and one at the Kent Butler preserve. The four sensors recorded from approximately sunup to sundown every day from mid March to the end of June. About 1.6 terabytes (TB) of acoustic data were collected. The purpose of these recordings was to facilitate a correlation between the recorded acoustic responses of the Golden Cheeked Warbler and the physical observations of the field biologists, and to begin to use the acoustic data to enhance the understanding of the effect of road noise, and more generally noise due to increased urbanization, on the breeding success of the warblers. This report serves to document the data that was collected. It is not the intention of this report to document data analysis or results. Significant data analysis remains to be conducted at this time.

TABLE 1: Deployment locations

Site	Lat-deg	Long-deg	Deployed	Signature types recorded
Wild Basin 1	30.306099 N	97.822666 W	03/03/2016	A
Wild Basin 2	30.305993 N	97.81930 W	03/03/2016	A
Wild Basin 3	30.307483 N	97.8172667 W	03/15/2016	A and B
Kent Butler 1	30.398483 N	97.8100833 W	03/03/2016	A and B

Overview of Activity at Deployment Sites

Table 1 and Figures 1 and 2 show the locations of the four acoustic recorders (various Songmeter models by Wildlife Acoustics) in the Balcones Canyonland Preserve. The site selection for the pilot study was made with the assistance of field biologist Darrell Hutchinson on 3 March 2016. Three recorders were deployed in the Wild Basin Preserve and one recorder at Kent Butler Preserve. Each recorder possessed two microphones. The recorders were programmed to record from sunup to sundown from early March to mid June. About 1.6 TB of data were collected with a sampling rate of 24 kHz. Analysis thus far has concentrated on days where biological reports were made. MATLAB and RAVEN are signal processing tools that have been used to identify and classify song types and variants along with noise characteristics. On October 06, 2016, Wilson and Knobles conducted a transmission loss experiment at Site 1 of the Wild Basin.

Figures 3 and 4 show Type A and Type B song signatures, respectively, recorded at the Kent Butler site. The Type A signature is rather typical of GCWA A signatures. The Type B signature is a 3-note variant of the more common 5-note variant.[1,2]

The Butler site was unique in that it was a low noise environment. At the recorder location



FIGURE 1: Wild Basin Preserve showing locations of the three acoustic recorders, at sites 1, 2 and 3.



FIGURE 2: Kent Bulter Preserve showing the locations of the single acoustic recorders.

a GCWA (band YE/SI:BK/YE) quickly claimed and defended the territory. Type A and B songs started in mid March and indicated that the male was paired with a female. The field biologist reported a successful breeding pair did indeed occur for YE/SI:BK/YE.

Site 3 at the Wild Basin was claimed by OR/YE:NB/SI (*codename GAIT*). This male has been successful in producing offspring with a female for several years. The nest location, reported by the field biologists was over 350 meters from the recorder. There was a territorial boundary with NB/WH:MV/SI (*codename CANDY*) about 50 m from the recorder. Field biologists noted that GAIT sang two TYPE B songs. An initial examination of the data clearly identified a Type B song for GAIT and possibly an additional Type B, which is in agreement with the field biologist reports. The details of the correlation between the recorded songs and the field reports require a detailed analysis.

CANDY and GAIT could be recognized by the variations of the their Type B songs. CANDY had more of the traditional 4-5 note TYPE B, whereas GAIT sang more of the 3-4 note TYPE B

variant. CANDY, while paired with a female, had a failed nest.

For SITE 2 Wild Basin, Type A appears in the data, with very infrequent TYPE B. It was reported by the field biologists that the male (YE/BK:NB/SI) never found a female and left the area on April 12. This is consistent with the fact that, while many Type A's were detected, very few Type B's were detected in the recordings, and that there were no detected Type A's detected after about mid April.

Site 1 Wild Basin was a very high noise site due to its proximity to Loop 360. The male (NB/BL:WH/SI) paired with a female and established a nest about 250 m from the recorder. Type A songs were detected, but no Type B songs were detected. The nest failed. This is somewhat consistent with the observation that NB/BL:WH/SI vacated the area around May 16, but it is not clear why no Type B were detected.

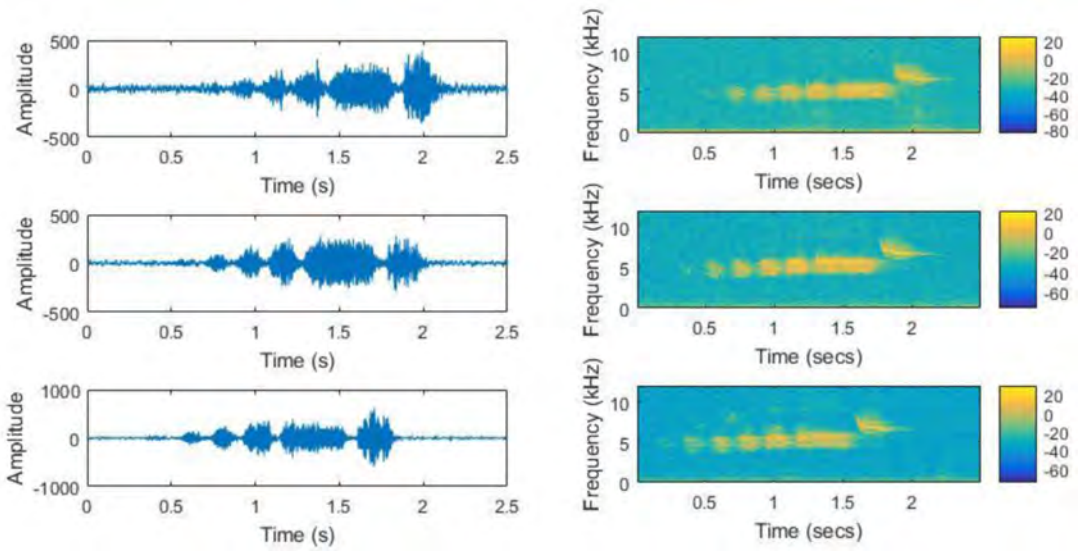

FIGURE 3: Measured Type A song Golden Cheeked Warbler at Butler Site. Banded GCWA YE/SI:BK/YE

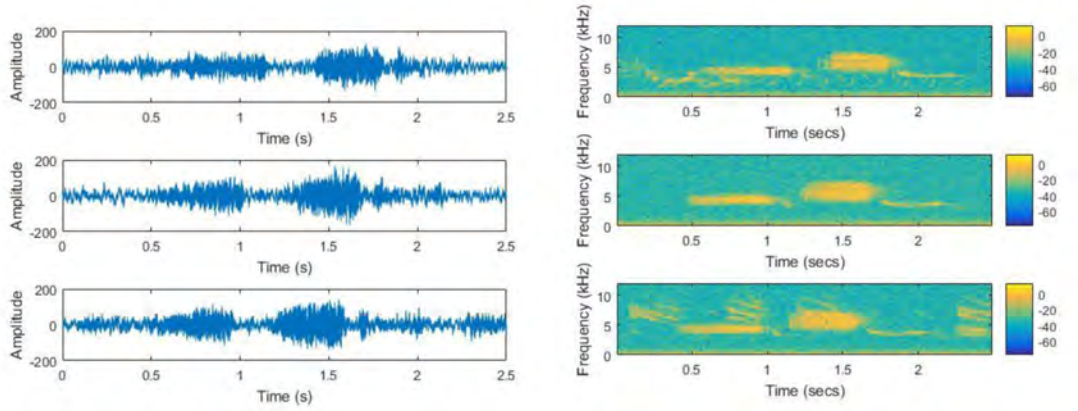

FIGURE 4: Measured Type B song of Golden Cheeked Warbler at Butler Site. Banded GCWA YE/SI:BK/YE

Future Work

As mentioned previously, the purpose of this report is to document the data that was collected, rather than to describe the initial data analysis. Additional data analysis is underway and the authors still need to analyze the acoustic propagation measurements that were conducted on 6 October 2016. Results of this data analysis will be documented in a subsequent report.

References

[1]J. Bolsinger, "Use of two song categories by Golden-Cheeked Warblers," The Condor **102**, 539–522 (2000).

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