

Acoustic surveys for indigenous frogs in the Virgin Islands before and after two Category 5 hurricanes

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Background

The British Virgin Islands (BVI) hosts at least four indigenous anuran species: 1) the endangered endemic *Eleutherodactylus schwartzi* (Virgin Islands Coqui), 2) *E. antillensis* (Red-Eyed Coqui), 3) *E. cochranae* (Whistling Coqui), and 4) *Leptodactylus albilabris* (Caribbean White-Lipped Frog). Within the last 23 yrs, comprehensive population surveys for these species in the BVI have been conducted and published only once (Ovaska et al. 2000). Since then, there has been the spread of the invasive anuran *Osteopilus septentrionalis* (Perry & Gerber 2006), accelerated land-use changes due to development (IRF 2015), and severe habitat disturbance from the passage of two Category 5 hurricanes in 2017.

We looked at short-term acoustic survey data from the Island of Jost Van Dyke two years before and after hurricanes Irma and Maria in order to confirm the continued presence of these native four anuran species on the island, with a focus on the endangered and endemic *E. schwartzi*. We hypothesized that habitat types would influence the presence and distribution of anurans, and that habitat types would be altered between the pre- and post-hurricane periods.



Figure 1. Satellite image of the Virgin Islands before and after Category 5 Irma in 2017. The colour change from green to brown due to near complete defoliation of vegetation. Our study site is Jost Van Dyke, a hilly island of 8 km² with mostly drought-deciduous vegetation, (Photo credit: NASA Earth Observatory).

Methods

- **2015:** Acoustic surveys using a cell-phone voice-note app were conducted at 39 points along a driving transect of the island's main roads over two nights in October. Recordings were 1 min long.
- **2019:** Audiomoth passive acoustic recorders were deployed at 13 of the original 39 sites and left for to record for 1 night.
- **Analysis:** We inspected recordings for species-specific vocalizations to indicate presence and compared data from before and after the 2017 hurricanes.

Indigenous Frogs of the Virgin Islands



Figure 2. Indigenous frogs of the British Virgin Islands. A) *Eleutherodactylus schwartzi* or the Virgin Islands Coqui is the only indigenous frog that is endangered and endemic. Its range is believed to be restricted to just six islands. B) *E. antillensis* or the Red-eyed Coqui, C) *E. cochranae* or the Whistling Coqui, D) *Leptodactylus albilabris* or the Caribbean White-Lipped Frog.

Results

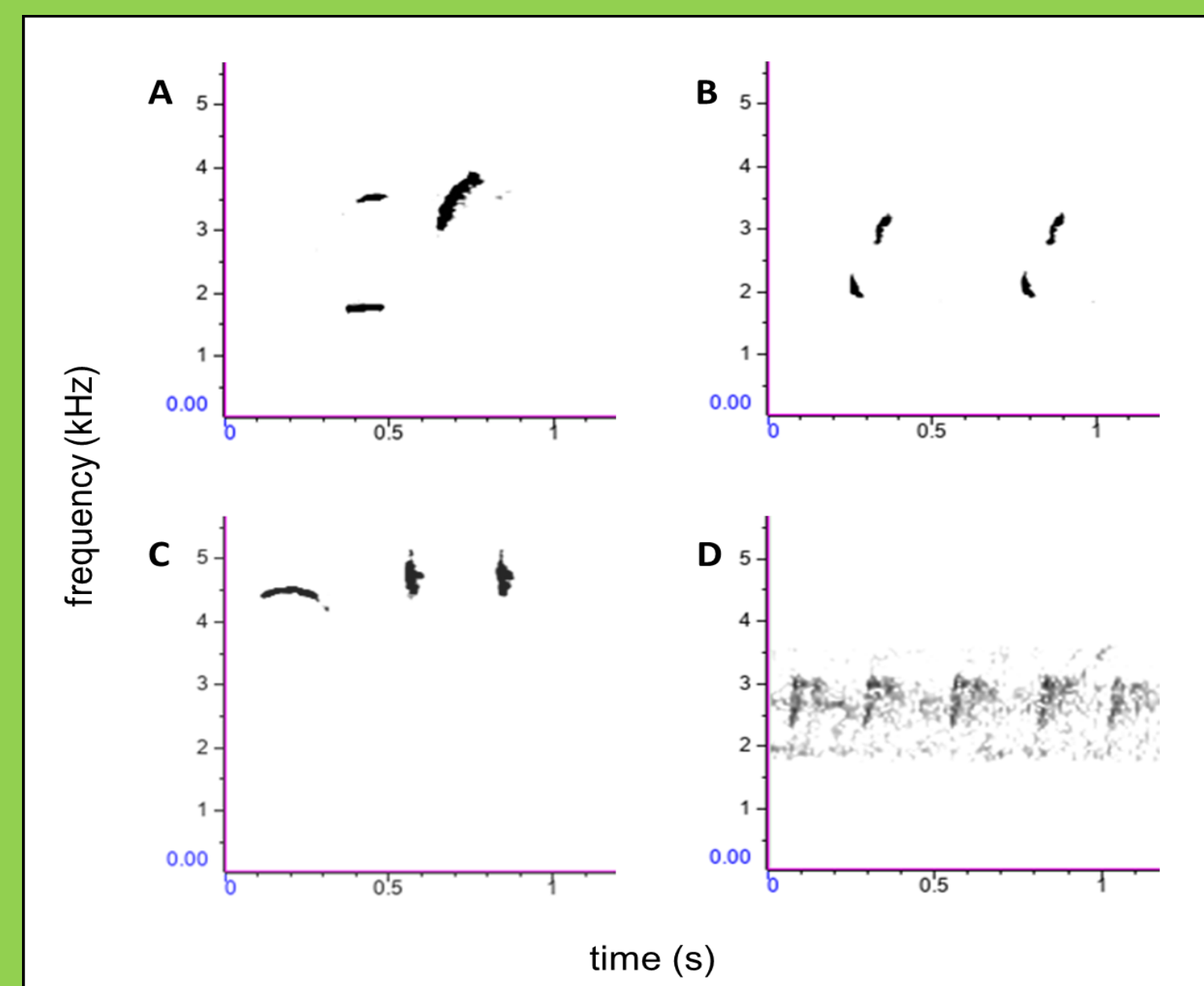


Figure 3. Spectrogram of vocalizations specific to the four target anurans. These are advertisement or courtship calls used by males to attract and court females. A) *E. schwartzi*, B) *E. antillensis*, C) *E. cochranae*, D) *L. albilabris*.

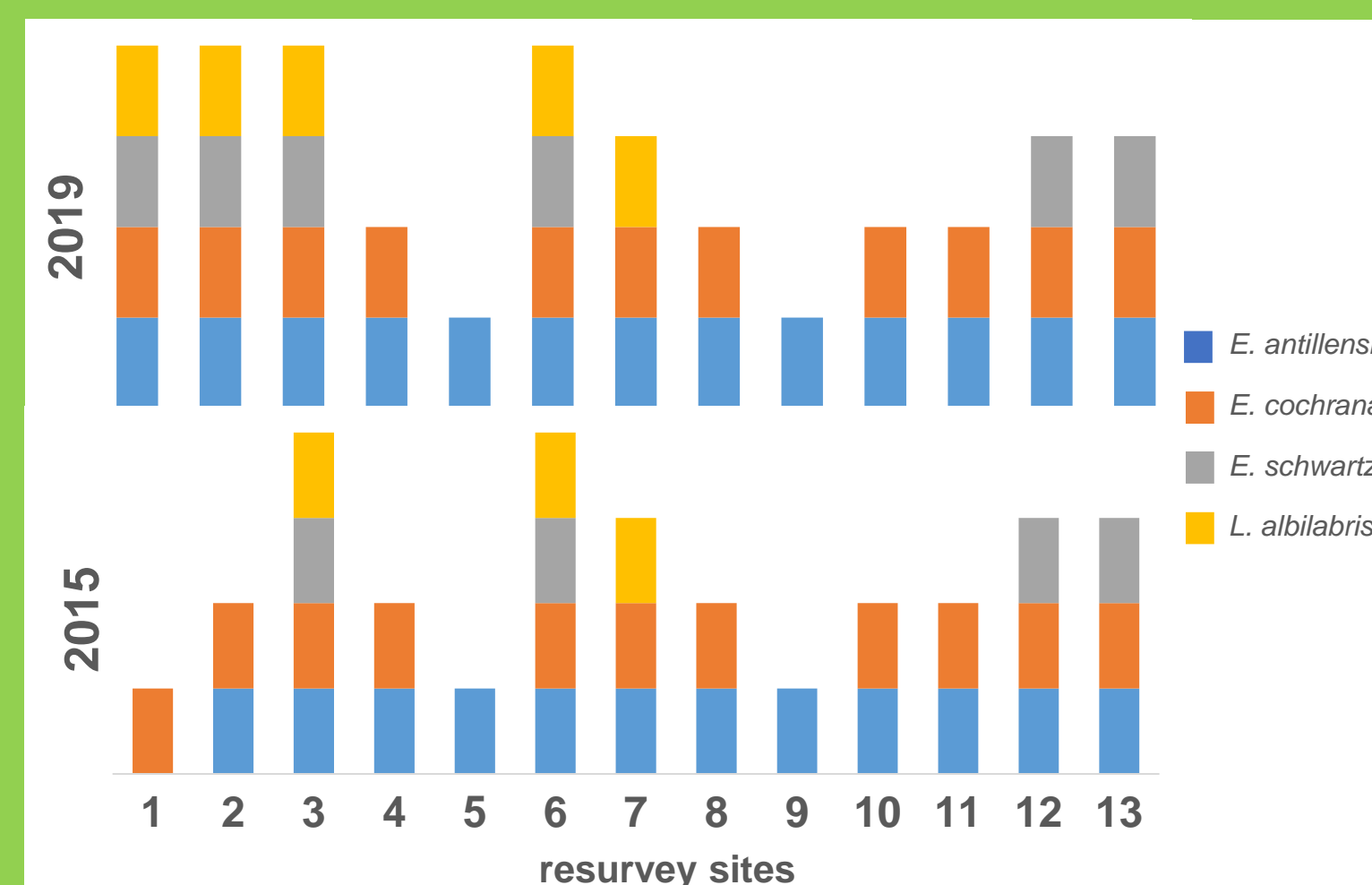


Figure 4. Presence of species vocalizations in recordings at each of the 13 sites on Jost Van Dyke surveyed before (2015) and after (2019) Hurricanes Irma and Maria.

Resurvey Result	Total	Percentage
Re-confirmed	4	31%
New Detection	2	15%
Absent Both Years	7	54%
Total	13	100%

Table 1. Summary of resurvey results for *E. schwartzi*

Conclusions and Future Directions

- We were able to confirm the continued presence of all 4 native frog species on Jost Van Dyke Island 15 yrs after the last published surveys and 2 yrs after major hurricane disturbances to habitat
- There were no resurveyed sites where species were found in 2015 but not in 2019. There were, however, sites where species were newly found in the post-hurricane period that were not found pre-hurricane.
- The short survey periods and differing survey methodologies used in this study limit the conclusions that we can make, particularly regarding species presence or absence

Further research aims to:

- Repeat acoustic monitoring over longer periods to investigate diurnal and seasonal, variations in activity, as well as changes in occupancy
- Conduct habitat surveys to determine potential trends in plant community type and frog presence
- Expand surveys to other islands



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