ECHOES OF ENDANGERMENT:

A **Visual and Machine Learning Analysis** of the Rose-Crested Blue Pipit's Decline in Boonsong Lekagul Wildlife Preserve

Rowan University [NOV 2022]
Information Visualization Course Project

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VAST CHALLENGE (2018 MC 1)

TOOLS AND TECHNIQUES

- **OpenRefine:** A powerful tool for cleaning and transforming bird call data to ensure consistency before analysis.

- **Data Analysis:** Used to explore patterns in bird call recordings and detect trends or anomalies across the preserve.

- **Data Validation:** Applied to ensure the accuracy and integrity of the bird call datasets and metadata provided by Mistford College and Kasios.

- **Machine Learning:** Leveraged to classify bird species from audio data and detect misclassifications in the Pipit recordings claimed by Kasios.

- **Statistical Analysis:** Used to quantify population trends and movement patterns of the Rose-Crested Blue Pipit and other species.

- **Audacity:** Employed for audio analysis and editing of bird call recordings to filter noise and enhance call quality for further classification.
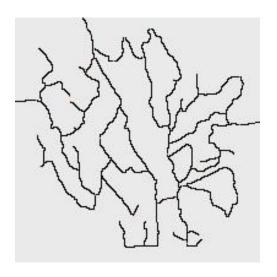
- **Tableau:** Utilized for creating dynamic visualizations that showcase trends and geographic distribution of bird species over time.

- **Python & Libraries:** Python, along with libraries such as Pandas, Scikit-learn, and Matplotlib, was used for data manipulation, machine learning models, and generating analytical visuals.

- **Jupyter Notebook:** An interactive platform to combine code, data visualization, and narrative text, facilitating real-time analysis, experimentation, and documentation of the bird call classification and geospatial trends.

- **GeoPandas:** Used within Python for geospatial analysis to map bird call locations across the preserve and analyze migration or habitat shifts.

- **Librosa:** A Python library used for analyzing and classifying bird calls from audio recordings to identify discrepancies in species identification.
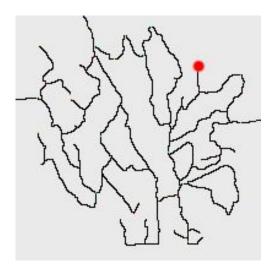
Project Overview

- **Mistford** is a mid-size city located to the southwest of the **Boonsong Lekagul Wildlife Preserve.**

- The city has a small industrial area with four light-manufacturing endeavors.

- Mistford and the wildlife preserve are struggling with the possible endangerment of the **Rose-Crested Blue Pipit**, a locally loved bird.

- The bird's nesting pairs seem to have decreased alarmingly, prompting an investigation last year implicating **Kasios Office Furniture,** a Mistford manufacturing firm.

- Since the initial investigation, the situation has evolved: **Kasios** insists that they have done nothing wrong!

- They assert that grad student **Mitch Vogel** and his professors are mere media-seekers trying to draw attention away from their lackadaisical research.

- **Kasios** presents itself as an extremely eco-friendly organization. They have launched their own very public **investigation** into the issues raised last year and are reporting very different results!

Overview of Lekagul Roadways Location & Mapping Dumping site

- "**Lekagul Roadways 2018**" is a 200 x 200 pixel map of the Preserve, with general indications of roadways through the site.

- The alleged dumping site for the Kasios waste products was centered around coordinates (148,159).

- To illustrate this Dumping site we used a website which helped us mark the location with coordinates.

- Website Reference: https://www.mobilefish.com/services/record_mouse_coordinates/record_mouse_coordinates.php

Mitch's Dataset & Files

AllBirdsv4.csv

|	A	B	C	D	E	F	G	H
1	File ID	English_name	Vocalization_type	Quality	Time	Date	X	Y
2	402254	Rose-crested Blue Pipit	call	no score	13:30	2/8/18	49	63
3	406171	Rose-crested Blue Pipit	call	A	7:48	6/7/17	125	133
4	405901	Rose-crested Blue Pipit	call	A	12:00	2/8/18	58	76
5	405548	Rose-crested Blue Pipit	song	A	11:00	3/10/18	55	125
6	401782	Rose-crested Blue Pipit	song	A	6:00	6/29/08	129	123
7	401720	Rose-crested Blue Pipit	call	A	13:00	12/28/16	132	121
8	401719	Rose-crested Blue Pipit	call	A	13:00	12/28/16	106	107
9	387404	Rose-crested Blue Pipit	call	A	10:00	9/18/17	149	115
10	377874	Rose-crested Blue Pipit	song	A	7:43	6/11/00	134	118

All Birds Audio Folder
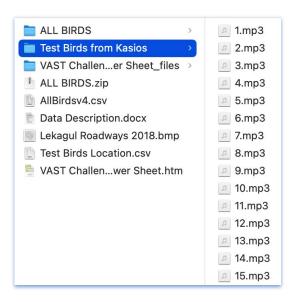
1. "AllBirdsv4.csv" is the metadata file for the bird sounds files.
2. This dataset containing the birdcalls collected by Mistford College.
3. The File ID is the index to the file names in the ALL BIRDS audio file collection.
4. The English_name is the common English name for the particular bird.
5. The Vocalization_type is the kind of bird sound.
6. Quality is a score of recorded audio A, B, C, D, or E.
7. Time and Date are for the capture of the sound.
8. Finally, X and Y are the coordinates on the enclosed map of where the sound was recorded.
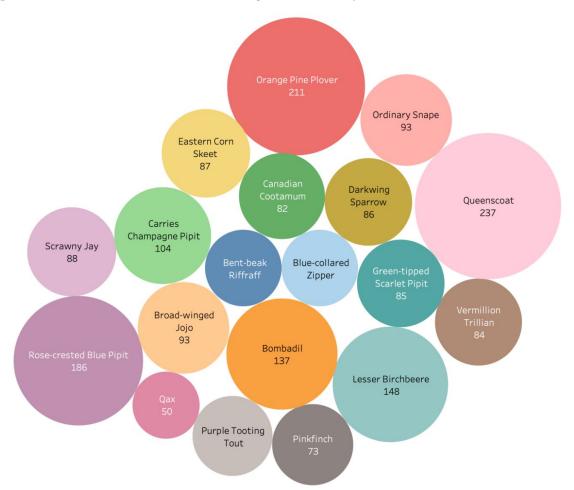
Kasios Dataset & Files

Test Bird Locations.csv | Test Birds Audio-Kasios Folder

	A	B	C
1	ID	X	Y
2	1	140	119
3	2	63	153
4	3	70	136
5	4	78	150
6	5	60	90
7	6	126	103
8	7	71	121
9	8	78	62
10	9	61	145
11	10	45	39
12	11	132	106
13	12	61	20
14	13	35	160
15	14	40	125
16	15	110	121

Files	Audio
ALL BIRDS	1.mp3
Test Birds from Kasios	2.mp3
VAST Challen...er Sheet_files	3.mp3
ALL BIRDS.zip	4.mp3
AllBirdsv4.csv	5.mp3
Data Description.docx	6.mp3
Lekagul Roadways 2018.bmp	7.mp3
Test Birds Location.csv	8.mp3
VAST Challen...wer Sheet.htm	9.mp3
	10.mp3
	11.mp3
	12.mp3
	13.mp3
	14.mp3
	15.mp3

- "Test Birds from Kasios" are the bird sounds Kasios claims as Pipits from across the Preserve.
- All of these recording were taken over the past couple of months.
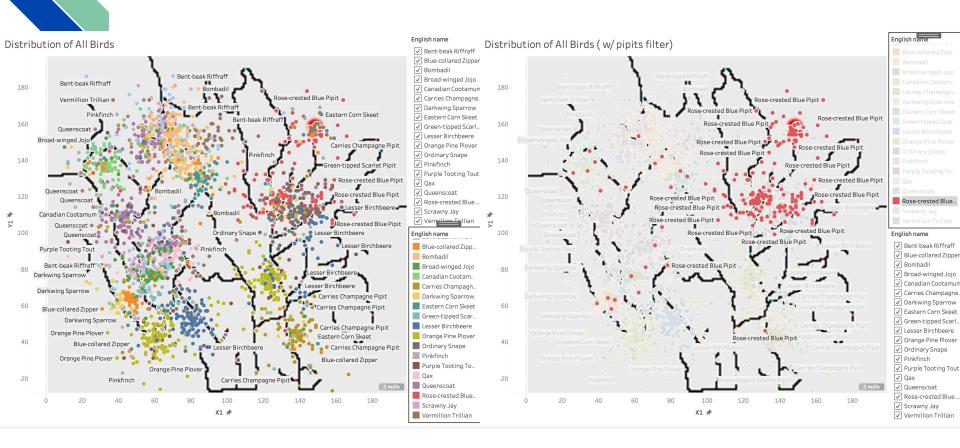- "Test Bird Locations" indicate where in the pixel map the bird sounds were recorded.

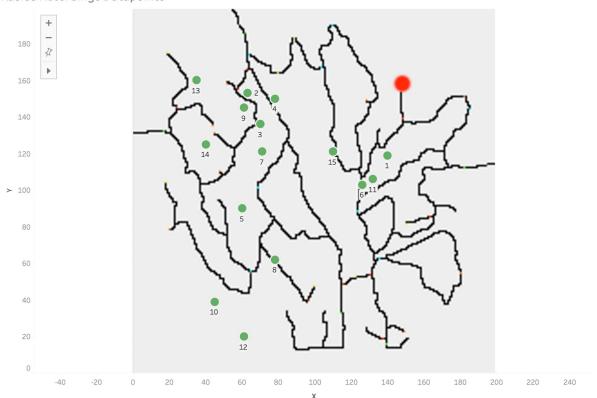# Visualising Overall Bird count by each species

Questions

1. Do we detect any trends or anomalies in the patterns?

2. Does Kasios set support the claim of Pipits being found across the Preserve?

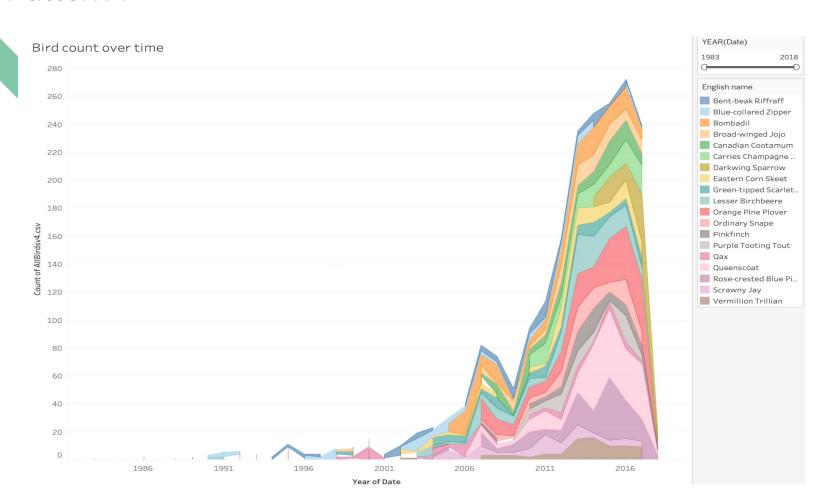# Mitch's Data Distribution of All birds vs Blue pipits
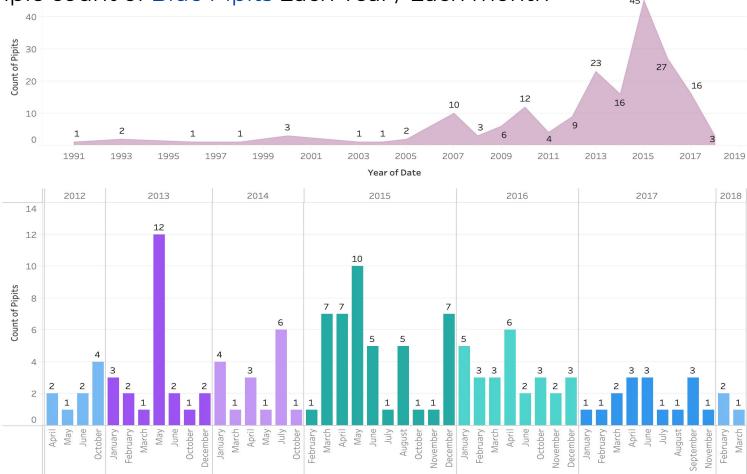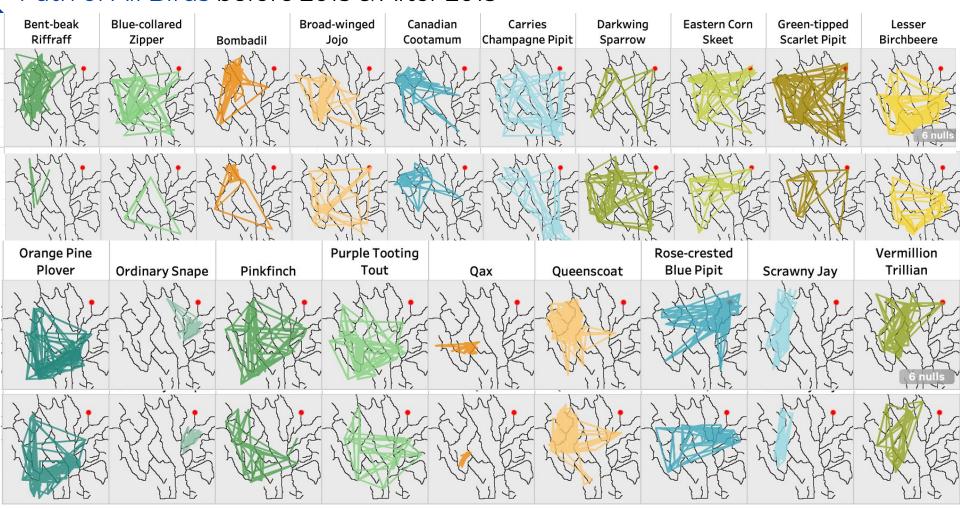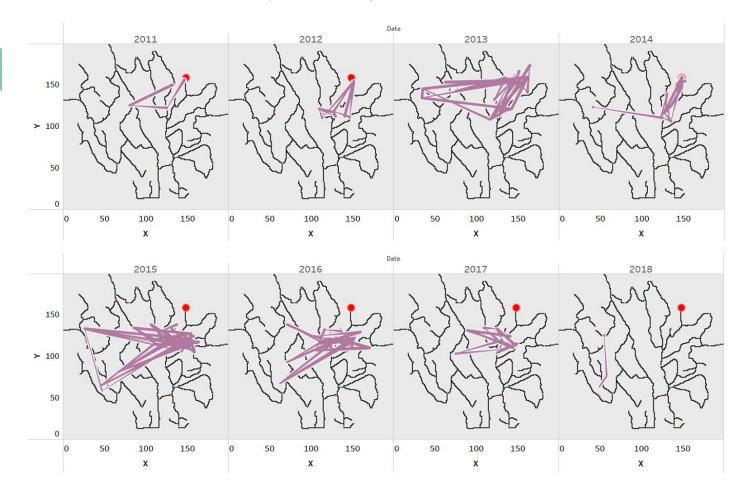
Kasios Data Distribution of Blue Pipits

Kasios Recordings Datapoints

Pattern 1

Bird count over time

Pattern 2 :
Sample count of Blue Pipits Each Year / Each month
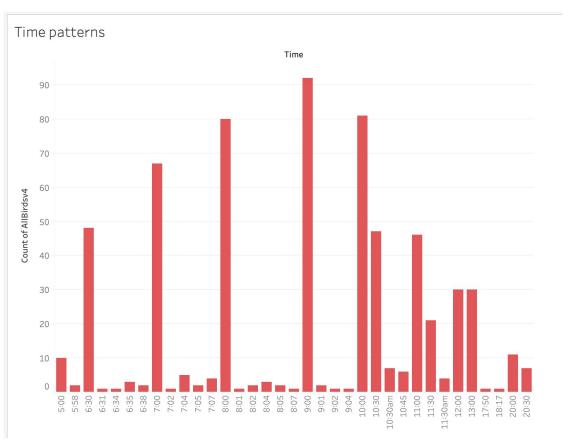
Path of All Birds before 2015 & After 2015

Bent-beak Riffraff	Blue-collared Zipper	Bombadil	Broad-winged Jojo	Canadian Cootamum	Carries Champagne Pipit	Darkwing Sparrow	Eastern Corn Skeet	Green-tipped Scarlet Pipit	Lesser Birchbeere

6 nulls

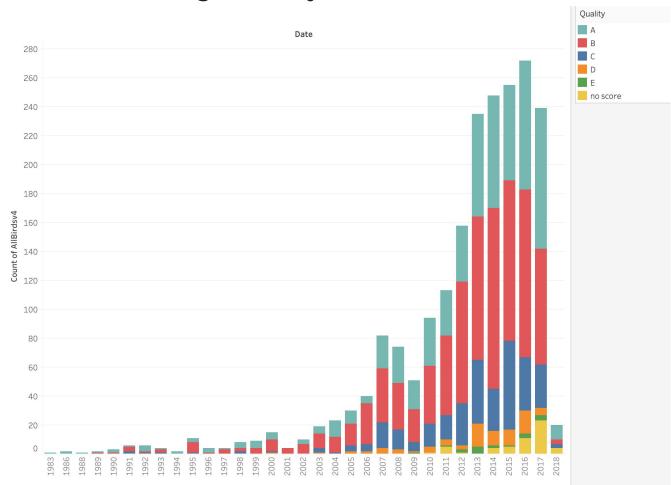| Orange Pine Plover	Ordinary Snape	Pinkfinch	Purple Tooting Tout	Qax	Queenscoat	Rose-crested Blue Pipit	Scrawny Jay	Vermillion Trillian

6 nulls

Pattern 3 : Path of Blue Pipits each year

Pattern 4 : Recordings Time Pattern

Time patterns

Pattern 5 : Recordings Quality Pattern

Q2.
Kasios vs Mitch Data
Patterns plotting Blue pipits

All Bird's (Mitch's Data)

Blue Pipit's (Kasios Data)

Blue Pipits (Mitch's Data)

Thank You