



جامعة الملك عبد الله
للعلوم والتقنية
King Abdullah University of
Science and Technology

University
Library

Curating Local Bird Observation Records while Leveraging Global Citizen Science Platforms for Biodiversity

Daryl Grenz, Rawan Karsou, Mohamed Baessa



University Background

- Opened in 2009
- Currently 7000 residents
 - 2000 active researchers
 - Including 1100 students (PhD and Masters only)
- Research focused in 4 areas
 - food, water, energy and the environment

A Changed Environment

2005



2019



Historical satellite images retrieved from Google Earth.

Land Management

- 16 square kilometers (1600 hectares)
 - With stewardship of additional 20 square km of Red Sea area
- 152 hectares of protected [natural conservation area](#), including 90+ hectares of mangroves (a 20% increase since 2005).
- 150+ hectares of parks and other green areas

Institutional Commitment

STUDY ▾ RESEARCH ▾ INNOVATE ▾ LIVE ▾ ABOUT ▾ NEWS ▾

Visit KAUST Applying to KAUST

Green Campus

Overview [Alternative Transportation](#) [Building Materials](#) [Energy Efficiency](#) [Guiding Principles](#) [Recycling and Composting](#) [Sustainable Site Planning](#) [Ventilation and Lighting](#) [Water Conservation](#)

[Home](#) > [About KAUST](#) > [Green Campus](#) > [Guiding Principles](#)

King Abdullah University of Science and Technology aspires to be a leader among the top tier higher education institutions and communities in environmental protection and sustainability.

The University aims to be a global contributor to the teaching and research that enhance the global environment through its interdisciplinary research centers and academic disciplines. KAUST also believes its operations and new developments should be a model of global environmental responsibility.

Guiding Principles

KAUST will strive to continually advance its environmental commitment by:

1. Considering the environmental impact in teaching, research, procurement, planning and construction.
2. Eliminating or minimizing the adverse environmental impact of our operations. This includes, but is not limited to: encouraging natural resources conservation, use of renewable energy, clean processes and sustainable material.
3. Establishing environmental performance indicators and a monitoring system.
4. Protecting the precious marine environment surrounding the University.
5. Facilitating environmental collaboration between academic and administration departments.
6. Making the KAUST community a "living laboratory" of environmental well-being and inquiry.
7. Actively encouraging the University's environmental public service within the surrounding local communities and the Kingdom at large.
8. Communicating personal responsibility for environmental matters.
9. Complying with applicable environmental regulations.

Learn More About KAUST

Photo Gallery

“Making the KAUST community a “living laboratory” of environmental well-being and inquiry.”

Bird Biodiversity

Mix of habitats:

- Mangroves
- Shoreline, mud flats
- Freshwater ponds (in golf course)
- Parks and gardens

Along migration routes between Eurasia and Africa

Project Timeline

Goals:

- Archive bird observation records before creator departure
- Create community resource for bird records that will continue to grow

Oct 2018

Initial meeting

Dec 2018

Review of sample records, agreement on project scope

Jan 2019

Transfer to library of past records, switch to eBird for new observations

May 2019

Completed conversion and upload of past records, switched to automated harvest for new records

June 2019

Departure of original records creator from KAUST

Existing Records

- Observations / occurrence records
- Reports / aggregated species records
- Images
- Blog Posts
- Informational materials / bird walk guides

Species Report

- Keynote (.key) file
- Summary for each species

Common Quail, *Coturnix coturnix*

Passage migrant and winter **GC, PG, M, 3**

Quail appear to migrate through and probably winter at KAUST. Many records are from the golf course but it may also be found in the gardens and the edges of the mangroves. They are usually on **or** near thick cover and most frequently seen flying off. Several records of exhausted birds being killed by cats.

J	F	M	A	M	J	J	A	S	O	N	D
2	2	2	2	2	1	0	0	7	3	0	0

Length:17cm Wingspan:27cm



photo by B James

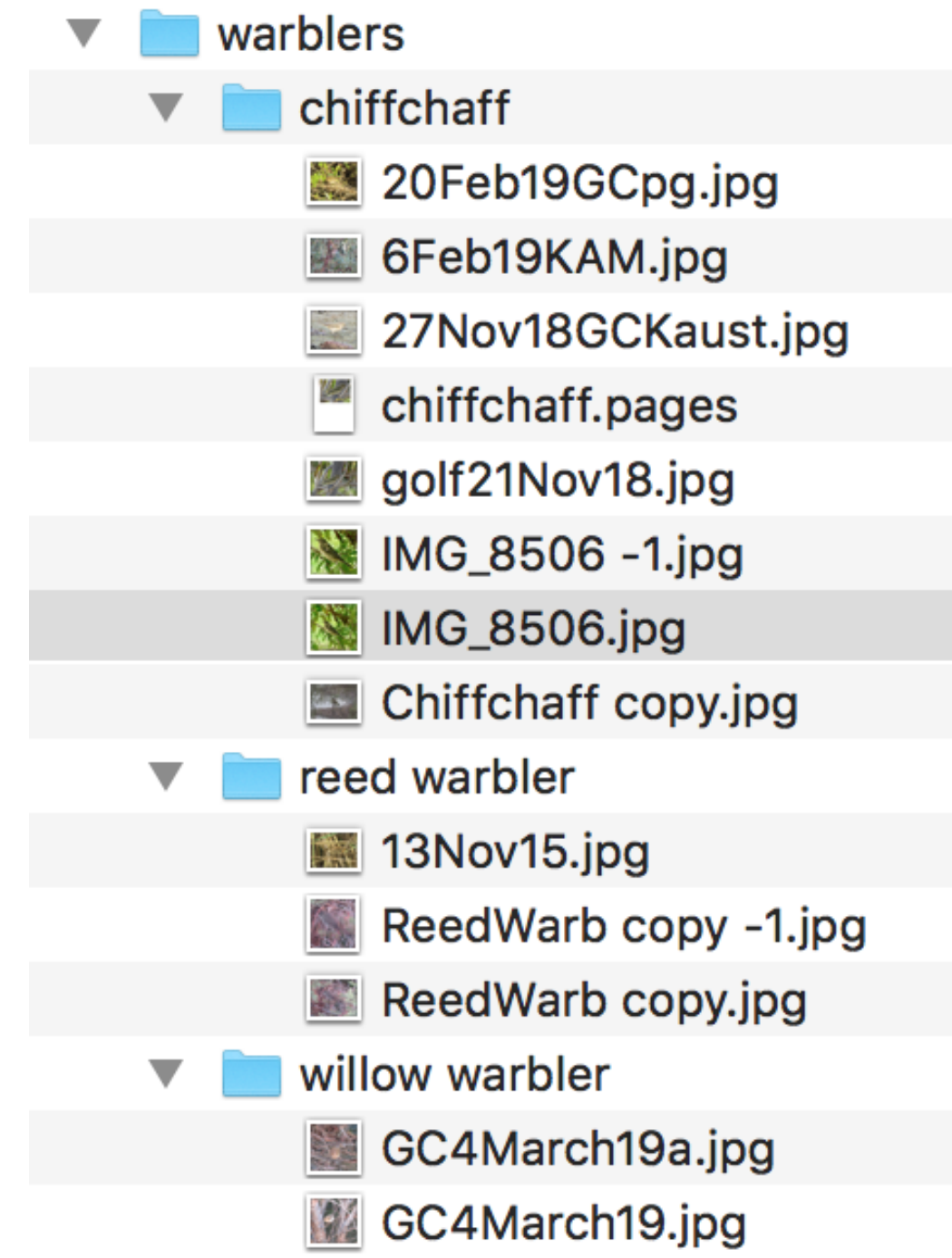
Observations

- Numbers (.numbers) file
- Columns by month, Sept. 2009 – Dec. 2018
- Rows by species, grouped by families
- Cells filled with coded locations, dates and counts

	Dec2018	Nov2018	Oct2018	Sep2018	Aug2018
Water Rail	KAM	KAM 24th			KAM
Corncrake			GC PG	PG 3r GC	
Little Crake			GC		
Baillon's Crake					
Spotted Crake		1 man 23	GC man KAn	GC 12-18th, PG, KAM	
Common Moorhen	man GC	GC man	GC	GC 15th	
Eurasian Coot		GC			

Images

- Zipped folder
- Folders by species
- Grouped by family
- Date and location in file name
- JPEG only



Future Observations and Images

The Cornell Lab of Ornithology

Donate

Create account

Sign in

Language

eBird

Submit

Explore

My eBird

Science

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News

Help



We make it better

Discover a new world of birding...

Learn more

Get started



Shining Sunbeam *Aglaeactis cupripennis* © Jory Teltser Macaulay Library | eBird

FEATURES



Find more birds

Explore birds and hotspots near you and wherever you go, all based on the latest sightings from around the world.

Learn more



Share your sightings

Join the world's largest birding community. Every sighting matters. Contribute yours.

Learn more



Track your lists

What's your latest life bird? What bird lists do you care about? eBird tallies them for you and archives your photos and sounds—all for free.

Learn more

Tool Selection

Previous Projects Used:

- PHP and R Scripting
 - Skills not shared across team
- Manipulation in Excel or OpenOffice Calc
 - Hard to iterate or troubleshoot
- Low potential to provide basis for workflow that could be used in future projects

Tool Selection

Why try KNIME?

- Successful use by a colleague on another project (see: <http://hdl.handle.net/10754/655933>)
- Relatively simple to learn
- User interface supports iteration and troubleshooting
- Potential reuse of tool, skills learned, or parts of the workflow for future projects

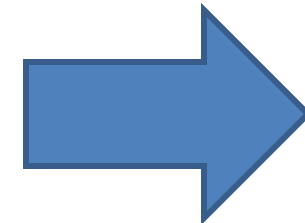
Conversion – Species Summaries

- Keynote (.key) file to PowerPoint (.pptx) file
- Unzipped PPTX file as XML

Common Quail, *Coturnix coturnix*
 Passage migrant and winter GC, P, M, 3
 Quail appear to migrate through and probably winter at KAUST. Many records are from the golf course but it may also be found in the gardens and the edges of the mangroves. They are usually on or near thick cover and most frequently seen flying off. Several records of exhausted birds being killed by cats.

J	F	M	A	M	J	J	A	S	O	N	D
2	2	2	2	2	1	0	0	6	2	0	0

Length:17cm Wingspan:27cm
 photo by B James



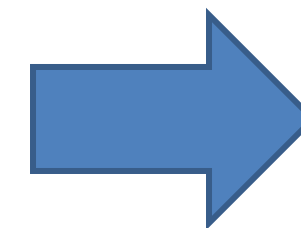
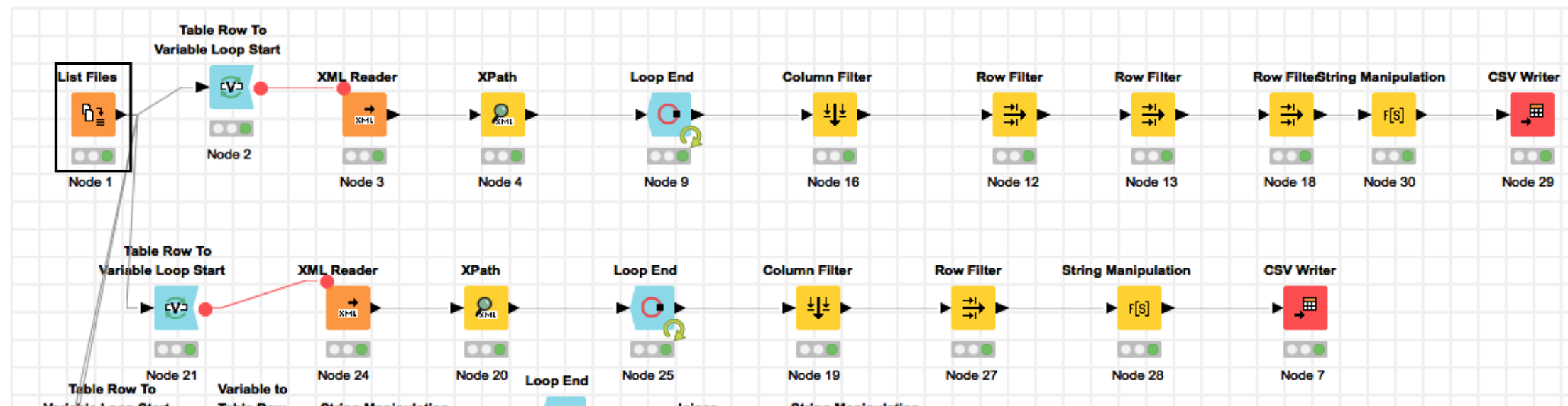
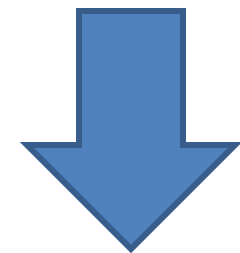
```
<p:nvPr/></p:nvSpPr><p:spPr><a:xfrm><a:off x="167052" y="126610"/><a:ext
cx="4515992" cy="2402841"/></a:xfrm><a:prstGeom
prst="rect"><a:avLst/></a:prstGeom><a:ln w="12700"><a:miter
lim="400000"/></a:ln><a:extLst><a:ext uri="{C572A759-6A51-4108-AA02-
DFA0A04FC94B}"><ma14:wrappingTextBoxFlag val="1"
xmlns:ma14="http://schemas.microsoft.com/office/mac/drawingml/2011/mai
n"/></a:ext></a:extLst></p:spPr><p:txBody><a:bodyPr llns="45719"
rlns="45719"> <a:spAutoFit/></a:bodyPr><a:lstStyle/><a:p><a:pPr
defTabSz="457200"><a:lnSpc><a:spcPts val="3700"/></a:lnSpc>
<a:spcBef><a:spcPts val="1200"/></a:spcBef><a:defRPr sz="1600"><a:latin
typeface="Times"/><a:ea typeface="Times"/><a:cs typeface="Times"/><a:sym
typeface="Times"/></a:defRPr></a:pPr><a:r><a:rPr b="1"/><a:t>Common
Quail,</a:t></a:r><a:r><a:rPr i="1"/><a:t>Coturnix coturnix
</a:t></a:r><a:r><a:t>Passage migrant and winter </a:t></a:r><a:r><a:rPr
b="1"/><a:t>GC, PG, M, 3 </a:t></a:r><a:r><a:t> </a:t></a:r><a:br><a:rPr
b="1"/></a:br>
```

Extract italics text in each section as scientific name

Conversion – Species Summaries

- Enhance with eBird family names and species codes
- Align fields with the Darwin Core metadata schema
- Use controlled result to support observation record handling

Unzipped PPTX

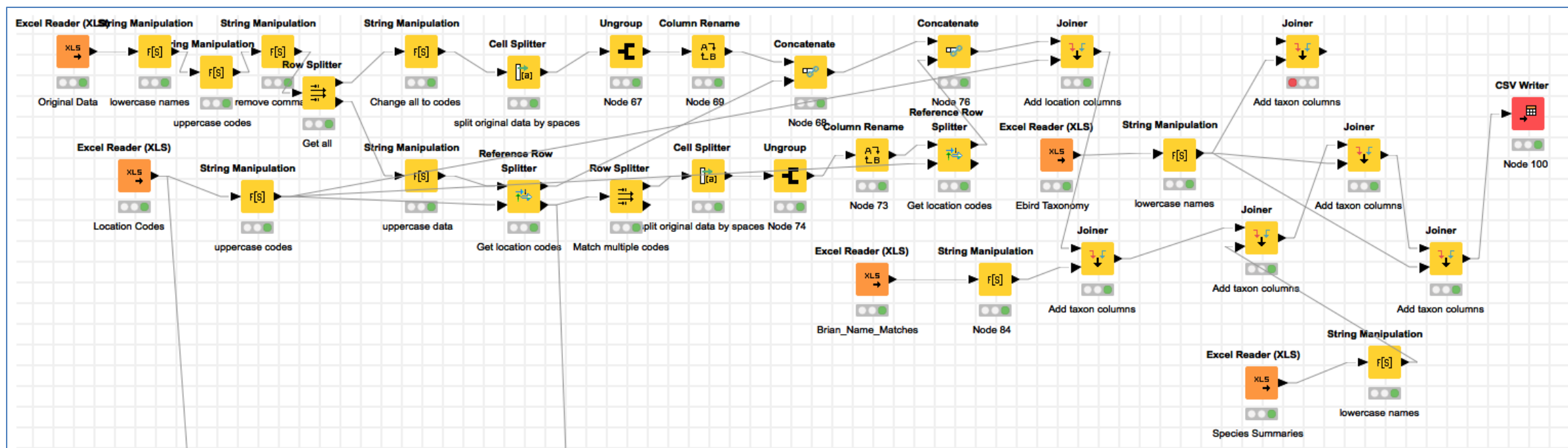


dwc.taxon.scientificName	Coturnix coturnix
kaust.presence.status	Passage migrant
ebird.family.commonName	Pheasants, Grouse, and Allies
ebird.species.code	comqua1
dwc.taxon.vernacularName	Common Quail
dwc.location.locality	Golf Course
dwc.location.locality	Island mangroves
dwc.location.locality	Island parks and gardens
dwc.location.locality	King Abdullah Monument
dwc.taxon.family	Phasianidae
dwc.taxon.order	Galliformes

Conversion – Observation Records

- Numbers file to CSV
- Extraction of metadata from CSV using Knime

	Oct2018
Quail	GC

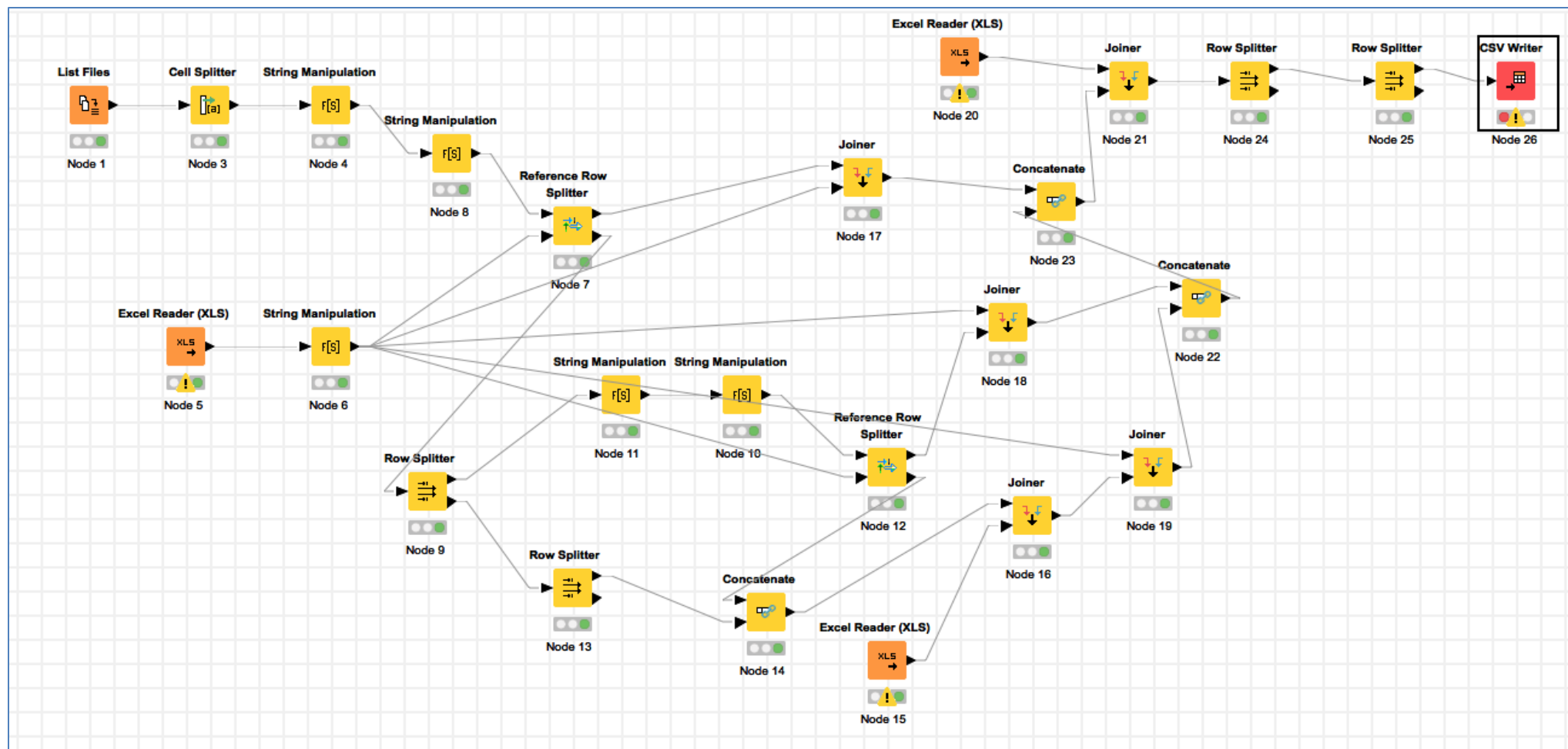


dwc.taxon.scientificName	Coturnix coturnix
kaust.presence.month	October
dwc.location.locality	Golf Course
dwc.taxon.vernacularName	Common Quail
dwc.occurrence.recordedBy	Brian James
dwc.basisOfRecord	HumanObservation
dc.date.observed	2018-10
kaust.presence.year	2018

Conversion – Image Records

- Metadata from directory and file name

White-throated Kingfisher/20Feb19GC.jpg



dc.contributor.photographer	Brian James
dwc.taxon.scientificName	Halcyon smyrnensis
dc.rights.uri	https://creativecommons.org/licenses/by/4.0/
dc.title	Photo of White-throated Kingfisher
dc.type	Image
ebird.family.commonName	Kingfishers
ebird.species.code	whtkin2
dwc.taxon.vernacularName	White-throated Kingfisher

Conversion – eBird Checklist

eBird Submit Explore My eBird Science About News Help

Donate Create account Sign in Language

CHECKLIST S55379310

Wed 24 Apr 2019 6:20 AM

KAUST--Safaa Golf Club (restricted access) Makkah, Saudi Arabia

Brian James

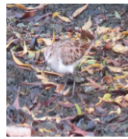
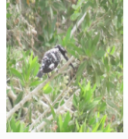
Traveling Complete

1 hr, 40 min 3 km

MEDIA POWERED BY MACAULAY LIBRARY

36 Species observed
285 individuals

5 Species with photos

2	Rock Pigeon (Feral Pigeon)
7	Eurasian Collared-Dove
20	Laughing Dove
11	Spur-winged Lapwing
1	Ruff
1	Little Stint
	
1	Common Sandpiper
2	Green Sandpiper
1	Caspian Tern
6	Great Cormorant
1	Gray Heron
1	Western Reef-Heron
45	Cattle Egret
1	Pied Kingfisher
single bird on the main lake again. All black and white, plunge diving for fish	
	

20 Laughing Dove



Observation : Laughing Dove at Golf Course on 24th April 2019

Summary

Laughing Dove (*Streptopelia senegalensis*) eBird

Number of individual birds seen

20

Location

Golf Course eBird

Observation Date

2019-04-24

Observation Time

06:20

Observed By

Brian James

This observation was made as part of eBird checklist S55379310

Type

Observation Record

Date

2019-04-24

Permanent link to this record

<http://hdl.handle.net/10754/653947>

Collections

Birds

Knime workflow



CHECKLIST

The diagram features a horizontal bar at the top, divided into three segments. The left segment is orange and points down to the 'CHECKLIST' label. The middle segment is grey and points down to the 'OBSERVATION' label. The right segment is grey and points down to the 'IMAGE' label. The background is a solid dark blue.

OBSERVATION

IMAGE

Knime Workflow – Checklist

https://ebird.org/hotspot/L5728118

KAUST--Safaa Golf Club (restricted access)
Makkah, SA — Get Directions

Overview Recent Visits Illustrated Checklist

176 Species | 78 Checklists Updated 2 sec ago.

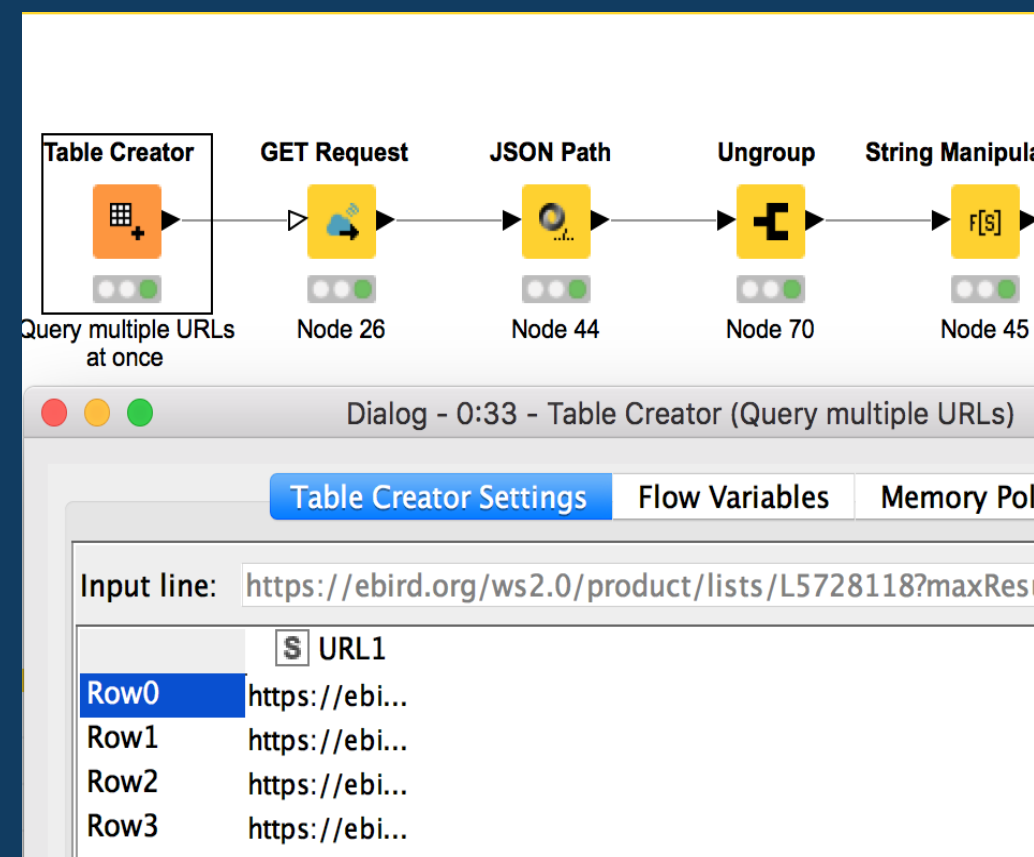
Species List:

SPECIES NAME	COUNT	DATE	BY
1 Little Grebe	1	23 Nov 2019	Szilard B
2 Laughing Dove	9	23 Nov 2019	Szilard B
3 Eurasian Coot	1	23 Nov 2019	Szilard B
4 Black-winged Stilt	2	23 Nov 2019	Szilard B
5 Spur-winged Lapwing	9	23 Nov 2019	Szilard B
6 Bar-tailed Godwit	1	23 Nov 2019	Szilard B
7 Common Sandpiper	X	23 Nov 2019	Szilard B
8 Common Greenshank	3	23 Nov 2019	Szilard B
9 Common Redshank	4	23 Nov 2019	Szilard B
10 Gull-billed Tern	3	23 Nov 2019	Szilard B
11 Great Cormorant	29	23 Nov 2019	Szilard B
12 White-spectacled Bulbul	X	23 Nov 2019	Szilard B
13 Common Myna	X	23 Nov 2019	Szilard B
14 Black Scrub-Robin	1	23 Nov 2019	Szilard B
15 Nile Valley Sunbird	3	23 Nov 2019	Szilard B
16 Rüppell's Weaver	2	23 Nov 2019	Szilard B
17 White Wagtail	8	23 Nov 2019	Szilard B
18 Cattle Egret	4	1 Oct 2019	Ricardo Ramalho
19 Glossy Ibis	6	1 Oct 2019	Ricardo Ramalho

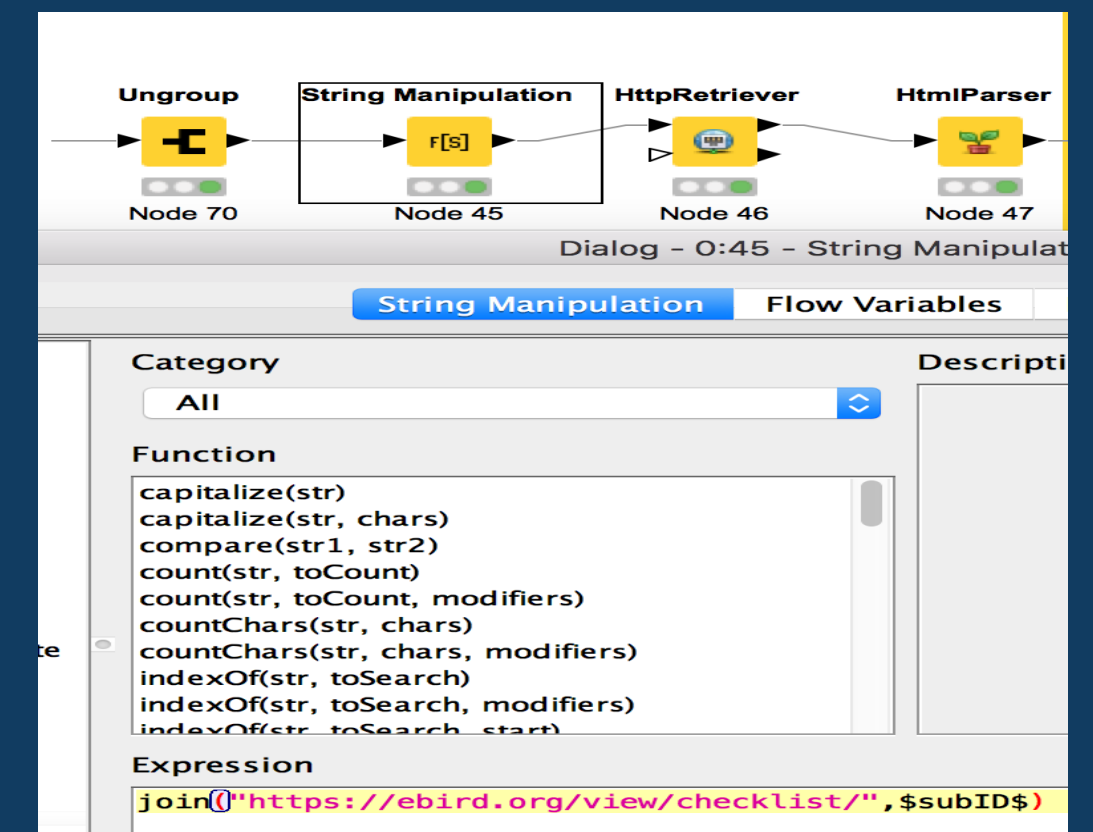
Recent Visits

OBSERVER	DATE	SPECIES
Szilard B	23 Nov 2019	17
Ricardo Ramalho	1 Oct 2019	3
Brian James	5 Jun 2019	20
Brian James	4 Jun 2019	18
Brian James	15 May 2019	24
Brian James	13 May 2019	32
Brian James	11 May 2019	30
Brian James	8 May 2019	23
Brian James	29 Apr 2019	27
Brian James	24 Apr 2019	36

eBird Checklist
by hotspot



Get checklists from
eBird API by
hotspot id



eBird checklists
details

Knime workflow



CHECKLIST

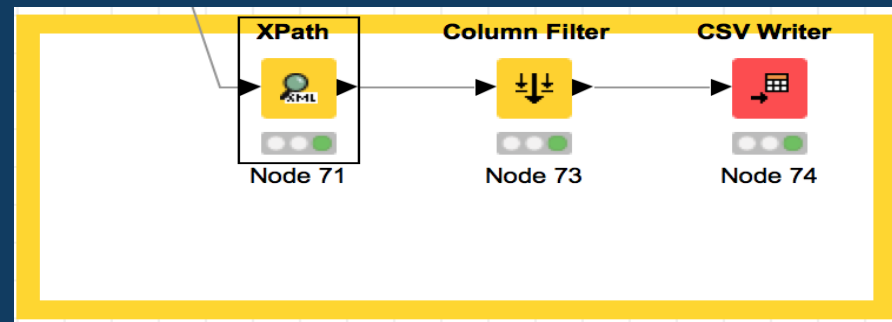
The diagram features a horizontal bar at the top, divided into three segments. The first segment is orange and contains the text 'CHECKLIST'. The second segment is also orange and contains the text 'OBSERVATION'. The third segment is grey and contains the text 'IMAGE'. Below this bar, the background is a solid dark blue color. The text 'CHECKLIST' is in orange, 'OBSERVATION' is in orange, and 'IMAGE' is in light grey.

OBSERVATION

IMAGE

Knime Workflow – Observation

Converted from eBird JSON to CSV with Darwin Core fields where possible, and enhanced with additional eBird taxonomy and local location information



```
{  
  "speciesCode": "rocpig",  
  "comName": "Rock Pigeon",  
  "sciName": "Columba livia",  
  "locId": "L8133092",  
  "locName": "KAUST--South Beach (restricted access)",  
  "obsDt": "2018-12-09 10:30",  
  "howMany": 7,  
  "lat": 22.2926157,  
  "lng": 39.0902466,  
  "obsValid": true,  
  "obsReviewed": false,  
  "locationPrivate": false  
},
```

The screenshot shows the 'XPath' dialog box in Knime. The 'XML column' is set to 'observation'. A warning message states 'Namespace has probably changed.' There is an unchecked checkbox for 'Remove source column.' The 'XPath summary' table is as follows:

Column name	XPath query	Type
data-species-code	/dns:li/dns:section/dns:...	String(SingleCell)
span	/dns:li/dns:section/dns:...	String(SingleCell)

The 'Selected XPath' is set to '/*'. Below the summary are buttons for 'Add XPath', 'Edit XPath', and 'Remove XPath'. The 'XML-Cell Preview' shows a snippet of XML code:

```
1 <?xml version="1.0" encoding="UTF-8"?>  
2 <li data-observation="" xmlns="http://www.w3.org/1999/xhtml">  
3   <section class="Observation Observation--flushInPageSection">  
4     <div class="Observation-species">  
5       <h3 class="Heading Heading--h5 u-margin-none">  
6         <a data-species-code="cater" href="https://eb...>  
7           <span class="Heading-main">Cattle Egret</span>  
8         </a>  
9       </h3>  
10    </div>  
11    <div class="Observation-numberObserved">  
12      <span>  
13        <span class="is-visuallyHidden">Number observed</span>  
14        <span>4</span>  
15      </span>  
16    </div>  
17  </section>  
18 </li>
```

Knime workflow

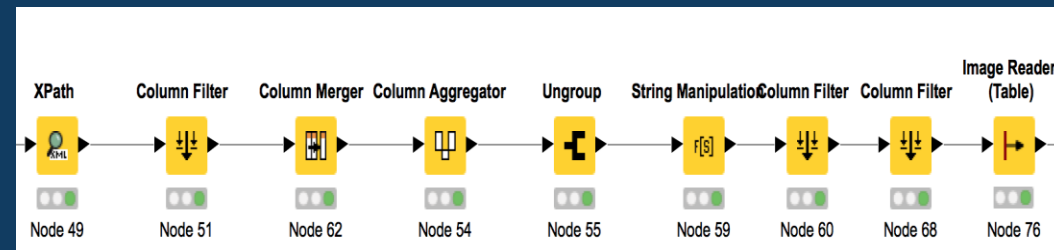
CHECKLIST

OBSERVATION

IMAGE

Knime Workflow – Image

use XPath node to extract Macauley Library media id from HTML, allows link to original and display of embedded image in repository



Settings Namespace Flow Variables Memory Policy

XML column: `observation`

Namespace has probably changed.

Remove source column.

XPath summary

Column name	XPath query	Type
data-media-speciescode	/dns:li/dns:section/dns:...	String(SingleCell)
data-media-id	/dns:li/dns:section/dns:...	String(SingleCell)
data-media-speciescod...	/dns:li/dns:section/dns:...	String(SingleCell)
data-media-id(#0)	/dns:li/dns:section/dns:...	String(SingleCell)
data-media-id(#1)	/dns:li/dns:section/dns:...	String(SingleCell)

Selected XPath: `/*`

Add XPath Edit XPath Remove XPath

XML-Cell Preview

```
<div class="observation-number-observed">
12 <span>
13 <span class="is-visuallyHidden">Number observe
14 <span>1</span>
15 </span>
16 </div>
17 <div class="Observation-media u-hideForPrint" style="m
18 <span class="is-visuallyHidden">Media: </span>
19 <div data-media-commonname="Corn Crake" data-media-
20 </div>
21 <div data-media-commonname="Corn Crake" data-media-
22 </div>
23 <div class="ResultsGallery u-stack-md">
24 <div data-resultsgallery-caption="checklist" d
25 </div>
```

Photo of Black-crowned Night Heron at Golf Course on 5th June 2019 Export

Summary
Black-crowned Night Heron (*Nycticorax nycticorax*)
eBird

Location
Golf Course eBird

Photographed By:
Brian James

This image is part of eBird checklist S57133047



Black-crowned Night-Heron *Nycticorax nycticorax*
© Brian James
Makkah, Saudi Arabia | 5 Jun 2019
Macauley Library | eBird S57133047 | The Cornell Lab

Knime Experience

Flexibility

Extract data from varied formats (csv, xml, json, html) and sources (local file, website, REST API) and transform and combine it in many ways

Iteration

Run multiple variations of a transformation on a set of data and see where there are problems

Automation

Difficult to automate the deposit of the output of a Knime workflow to DSpace via POST requests to the DSpace REST API

Reusability

Difficult to reuse steps developed for one part of this project to another part, or from this project to another



New Data Harvesting

Automated Update to the Collection
based on New eBird Checklists

Automated Updates

Replicate entire process ... in PHP

- Same as other cron tasks
- Reuse existing functions for working with DSpace
- Support for generating HTML snippets for display

Resulting Collection

10 YEARS OF KAUST BIRDS



KAUST Bird Observation Records

<https://repository.kaust.edu.sa/handle/10754/631995>

Navigation and Display

African Collared Dove

Export

Summary

A pair at golf course on January 25, 2013 and in 2016 started to appear near the King Abdullah Monument. Less common than European Collared Dove. Is whiter on belly than European.

African Collared Dove (*Streptopelia roseogrisea*) [eBird](#) Example Image

Status in KAUST

Summer visitor

Abundance in KAUST

4 - Uncommon

Places seen in KAUST

Golf Course [eBird](#)

King Abdullah Monument [eBird](#)

Island mangroves [eBird](#)



Image from Brian James

Seasonality in KAUST (number of years since KAUST's founding when this species was observed in a given month):

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	3	2	1	2	1	2	3	3	3	3	3

Golf Course Self Guided Bird Walk Booklet

Printable checklist, generated by eBird.

Illustrated checklist, generated by eBird.

Search bird photos taken at the Golf Course.

Search all species seen at the Golf Course.

Submitting observations from this location:

You can contribute your own bird observations via the eBird system by clicking the button below. You will first have to create an account with eBird, but will then be able to enter observations that will show in eBird and will also be used to update the KAUST bird records collection.

Submit Bird Observations at the Golf Course via eBird

Structured Data -> Faceted Search

Filter by Category

Type

Species Summary (160)

Family

- Sandpipers and Allies (18)
- Gulls, Terns, and Skimmers (17)
- Old World Flycatchers (14)
- Hérons, Egrets, and Bitterns (12)
- Plovers and Lapwings (8)
- [View More](#)

Species

- African Collared Dove (1)
- African Silverbill (1)
- Arabian Warbler (1)
- Bar-tailed Godwit (1)
- Barn Swallow (1)
- [View More](#)

Location

- King Abdullah Monument (160)
- Golf Course (149)
- Island mangroves (141)
- South Beach (112)
- Island parks and gardens (70)

Search

Type: Species Summary * Location: King Abdullah Monument *

[Show Advanced Filters](#)

Now showing items 1-12 of 160



African Collared Dove

A pair at golf course on January 25, 2013 and in 2016 started to appear near the King Abdullah Monument.



African Silverbill

Fairly common in the gardens or at the golf course in small busy flocks. Usually associated with tall grasses.



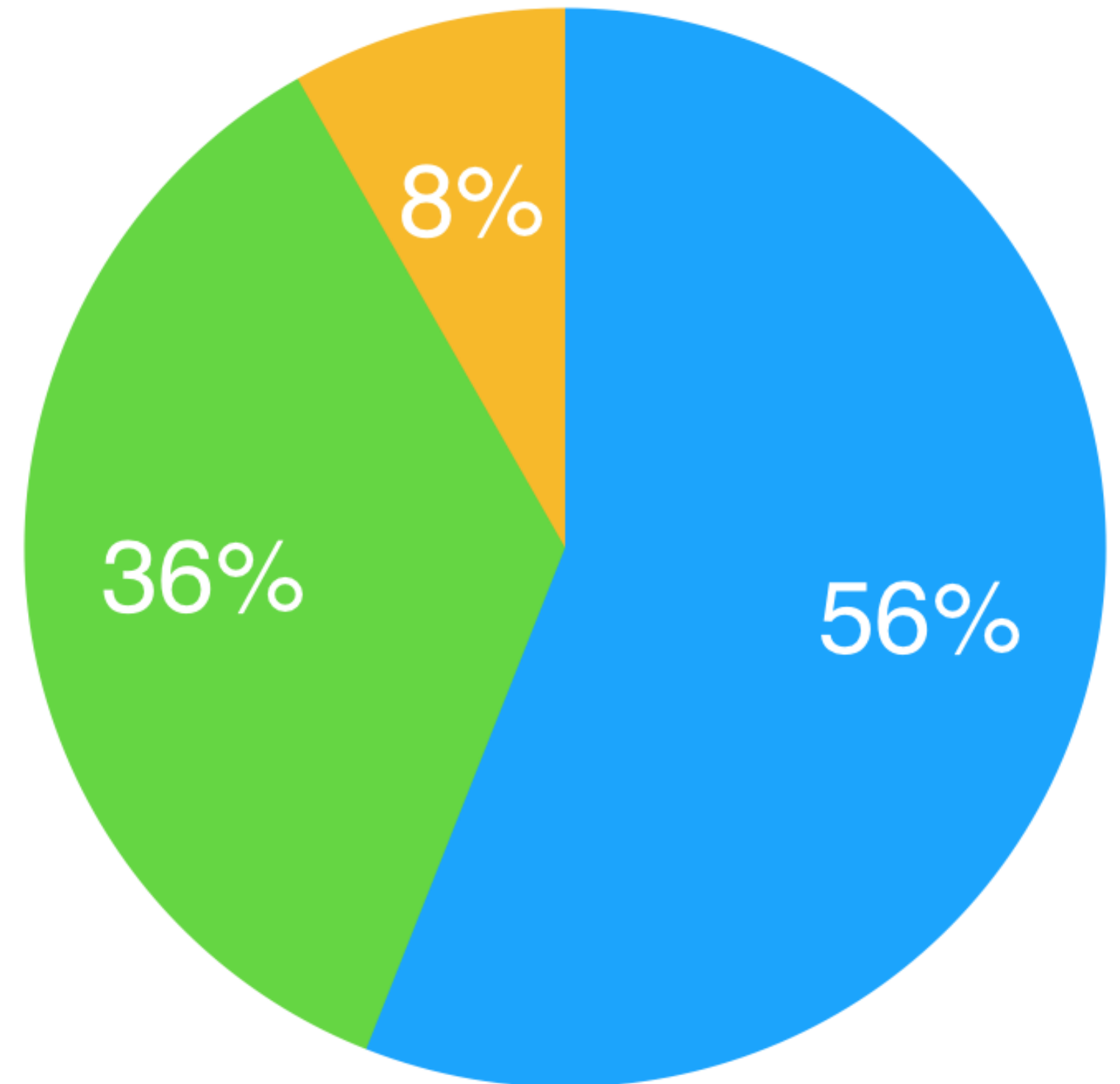
Arabian Warbler

From February 2010 recorded infrequently in the garden area but no recent records. Outside KAUST usually in

By the Numbers

- Collection :
 - 20793 observation records
 - 2062 images
- Contributors :
 - Observations from 9 community members

- Converted from table
- Batch harvest from eBird
- Automated daily harvest





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للعلوم والتقنية
King Abdullah University of
Science and Technology

University
Library

Thank you!