Access to the Atlas of Living Australia's data and tools using ALA4R

eResearch Conference, Melbourne

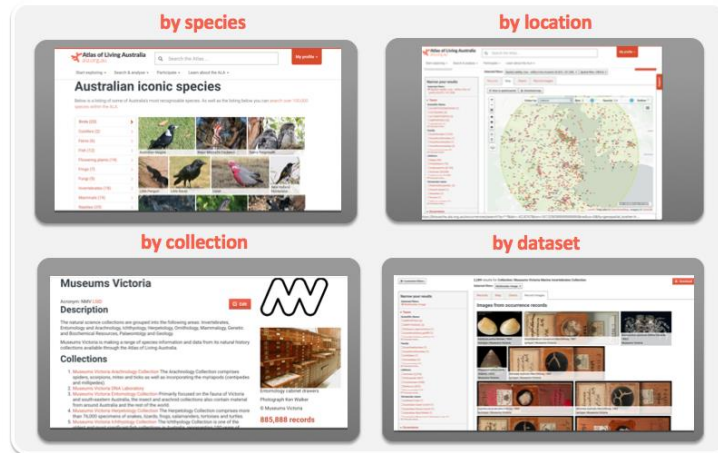**Peggy Newman |** Technical Analyst, ALA
ALA4R Authors: Ben Raymond, Jeremy VanDerWal, Lee Belbin, Michael Sumner, Tom August, John Baumgartner
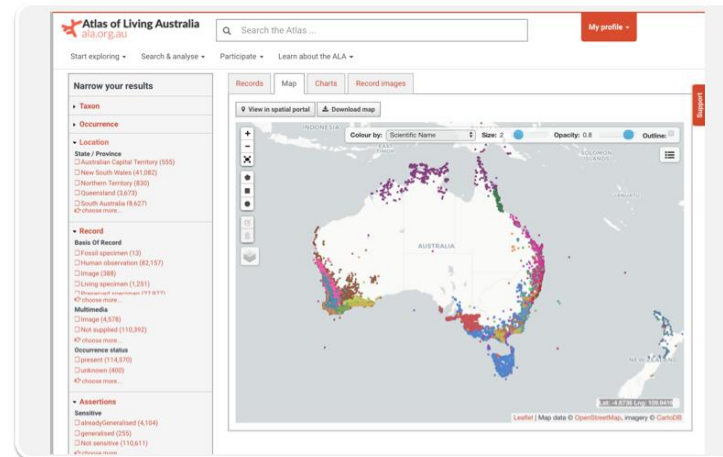18 October 2018

How do we navigate the ALA?

The **Atlas of Living Australia** is a collaborative, national project that aggregates biodiversity data from multiple sources and makes it freely available and usable online.

Web front ends ...

Spatial Portal ...

API ...

Why Use R at all?

R is the default analysis environment for ecology.

- Free!
- Publication ready graphics with high level of control
- Programming language designed for data analysis

- Scripting is reproducible & rerunnable
- Tools for reporting and publication (code and results)
- R packages (> 10K on CRAN)
- Many specialising in **ecology, biology, GIS**

[Roger Peng, https://simplystatistics.org/2017/10/30/how-do-you-convince-others-to-use-r/]

https://www.r-project.org/

R is a free software environment for statistical computing and graphics

Why Use R Now?

- The **Tidyverse** is making R easier to use
- Relatively new collection of R packages and a philosophy
- "Rectangular" datasets

  Observations = rows

  Variables = columns

- Functional programming – don't write loops!

  dplyr: human readable SQL like syntax

```
filter()     mutate()
arrange()    transmute()
select()     summarise()
rename()     sample()
```
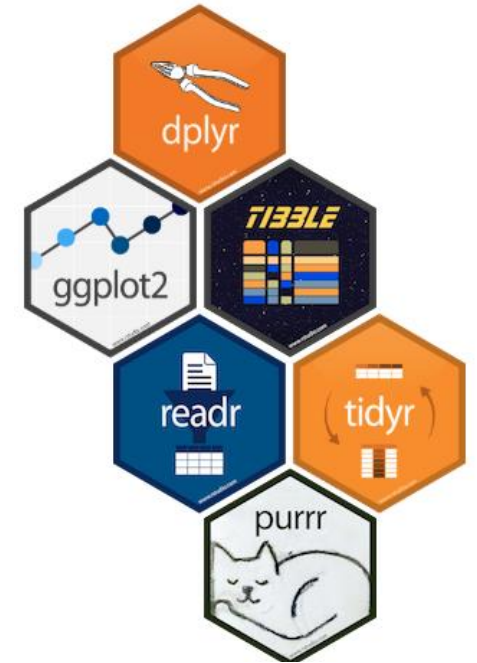
R packages for data science

The tidyverse is an opinionated collection
of R packages designed for data science. All
packages share an underlying design
philosophy, grammar, and data structures.

http://tidyverse.org

[https://tidyverse.tidyverse.org/articles/manifesto.html]

ALA4R

- First developed in 2014
- Available in CRAN repository
- Access to ALA data from within R
- Users can then apply any R tools/packages/graphics

What does ALA data look like?

ALA4R Core Functions

Function	Description
`occurrences()`	retrieve occurrence data (by location, taxa or other facet)
`specieslist()`	retrieve a list of taxa and their occurrence counts (by location, taxa or other facet)
`sites_by_species()`	retrieve grid cells by species with the number of occurrences of each species
`search_layers()`	search for environmental and contextual data layers
`intersect_points()`	sample environmental/contextual layers at arbitrary point locations
`search_names()`	taxonomic classification, and other information for a list of names

ALA4R Occurrences in an Area

```
occ <- occurrences(wkt=wkt)
```
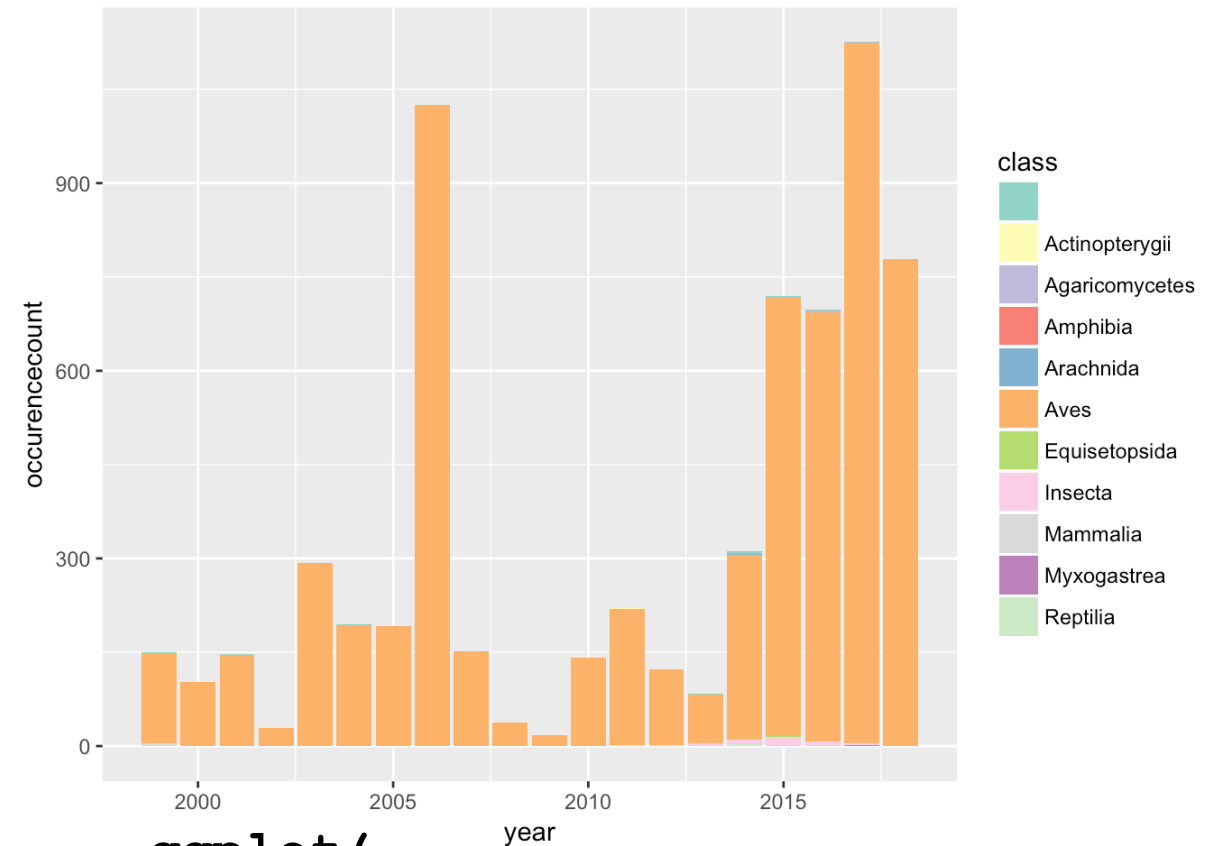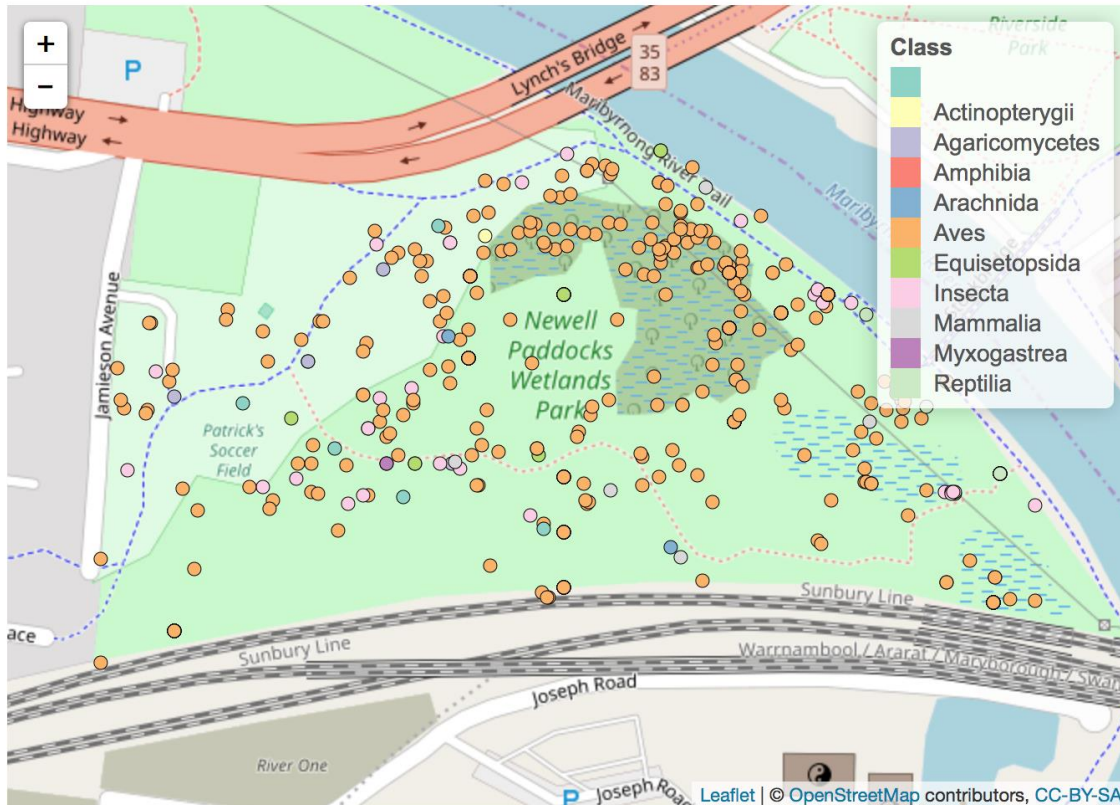


```
leaflet() %>%
    addCircleMarkers(data=occ$data)
```



```
ggplot(
    data=count(occ$data, class, year)
```

ALA4R Occurrences in an Area

Occurrence by Data Source

dataResourceName
- ALA species sightings and OzAtlas
- BirdLife Australia, Birdata
- BowerBird
- eBird Australia
- Fungimap
- NatureShare
- Victorian Biodiversity Atlas
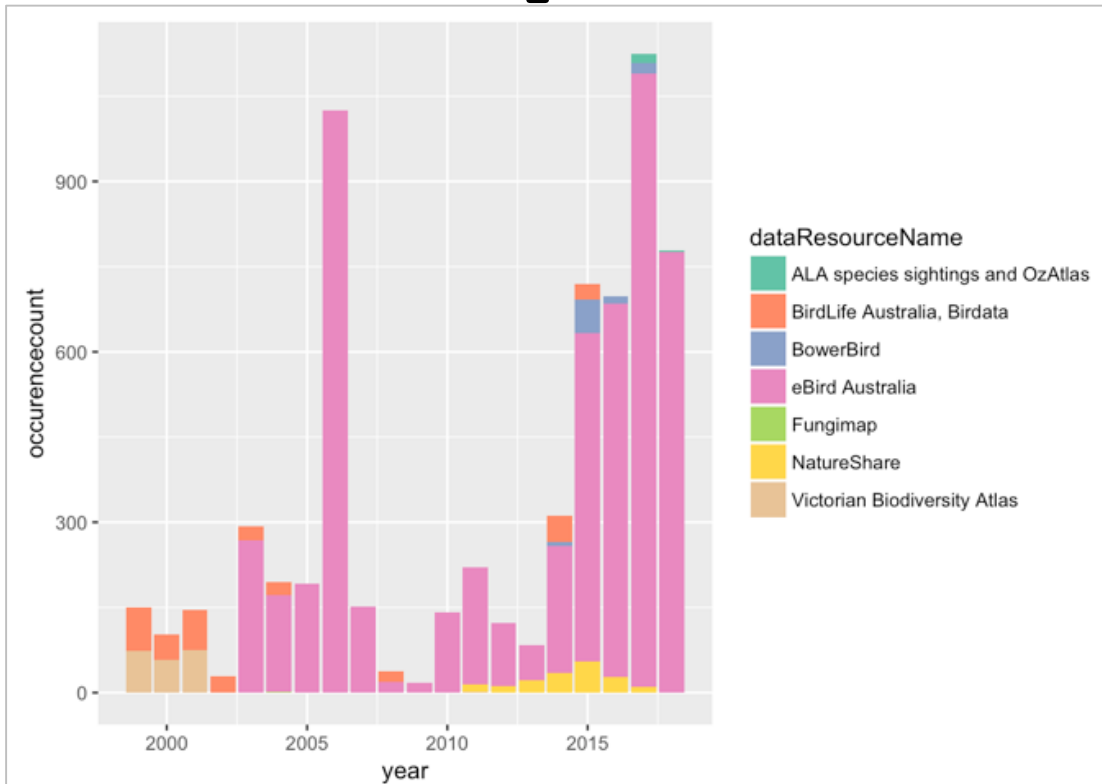
Occurrences counts for species with a Conservation Status

```
cons=specieslist(wkt=wkt,fq="state_conservation:*")
cons_tbl <- select(cons, speciesName, commonName, occurrenceCount)
cons_tbl %>%
  kable() %>%
  kable_styling(bootstrap_options = c("striped", "hover", "condensed", "responsive", full_width = F))
```

speciesName	commonName	occurrenceCount
Aythya (Nyroca) australis	Hardhead	120
Platalea (Platalea) regia	Royal Spoonbill	12
Phalacrocorax (Phalacrocorax) varius	Pied Cormorant	12
Gallinago (Gallinago) hardwickii	Latham's Snipe	5
Anas (Spatula) rhynchotis rhynchotis	Australian Shoveler	2
Ardea (Mesophoyx) intermedia intermedia	Intermediate Egret	1
Actitis hypoleucos	Common Sandpiper	1
Larus (Larus) pacificus pacificus	Pacific Gull	1

Images supplied by Arthur Chapman

ALA4R Taxonomic Information

```
search_fulltext("cormorants")
```


Image: Arthur Chapman
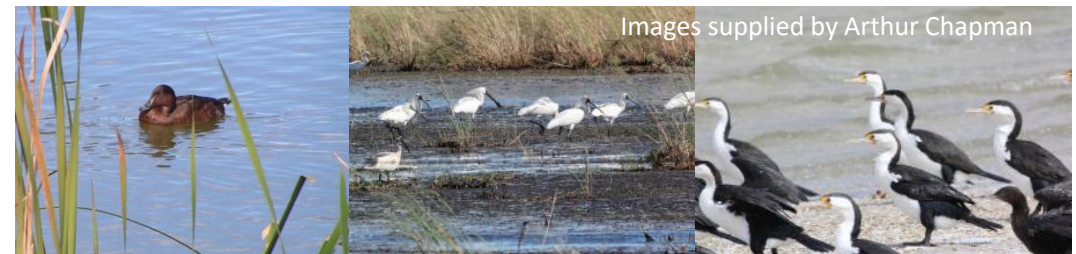
Taxonomy Lookup - Cormorants

```
crm <- search_fulltext("cormorants")
crm$data %>% select(name, rank, commonNameSingle) %>%
  kable() %>%
  kable_styling(bootstrap_options = c("striped", "hover", "condensed", "responsive", full_width = F))
```

name	rank	commonNameSingle
PHALACROCORACIDAE	family	Cormorants
Phalacrocorax melanoleucos	species	Little Cormorant
Phalacrocorax (Phalacrocorax) carbo	species	Great Cormorant
Suloidea	superfamily	Gannets, Cormorants, Darters
PELECANI	suborder	Pelicans, Gannets, Cormorants, Darters
PELECANIFORMES	order	Pelicans, Gannets, Cormorants and Allies
Phalacrocorax (Phalacrocorax) sulcirostris	species	Little Black Cormorant
Phalacrocorax melanoleucos	species	Little Pied Cormorant
Phalacrocorax (Phalacrocorax) carbo novaehollandiae	subspecies	Black Cormorant
Phalacrocorax varius varius	subspecies	Karuhiruhi

ALA4R Taxonomic Information

`taxinfo_download("rk_family:PHALACROCORACIDAE")`

Image: Arthur Chapman
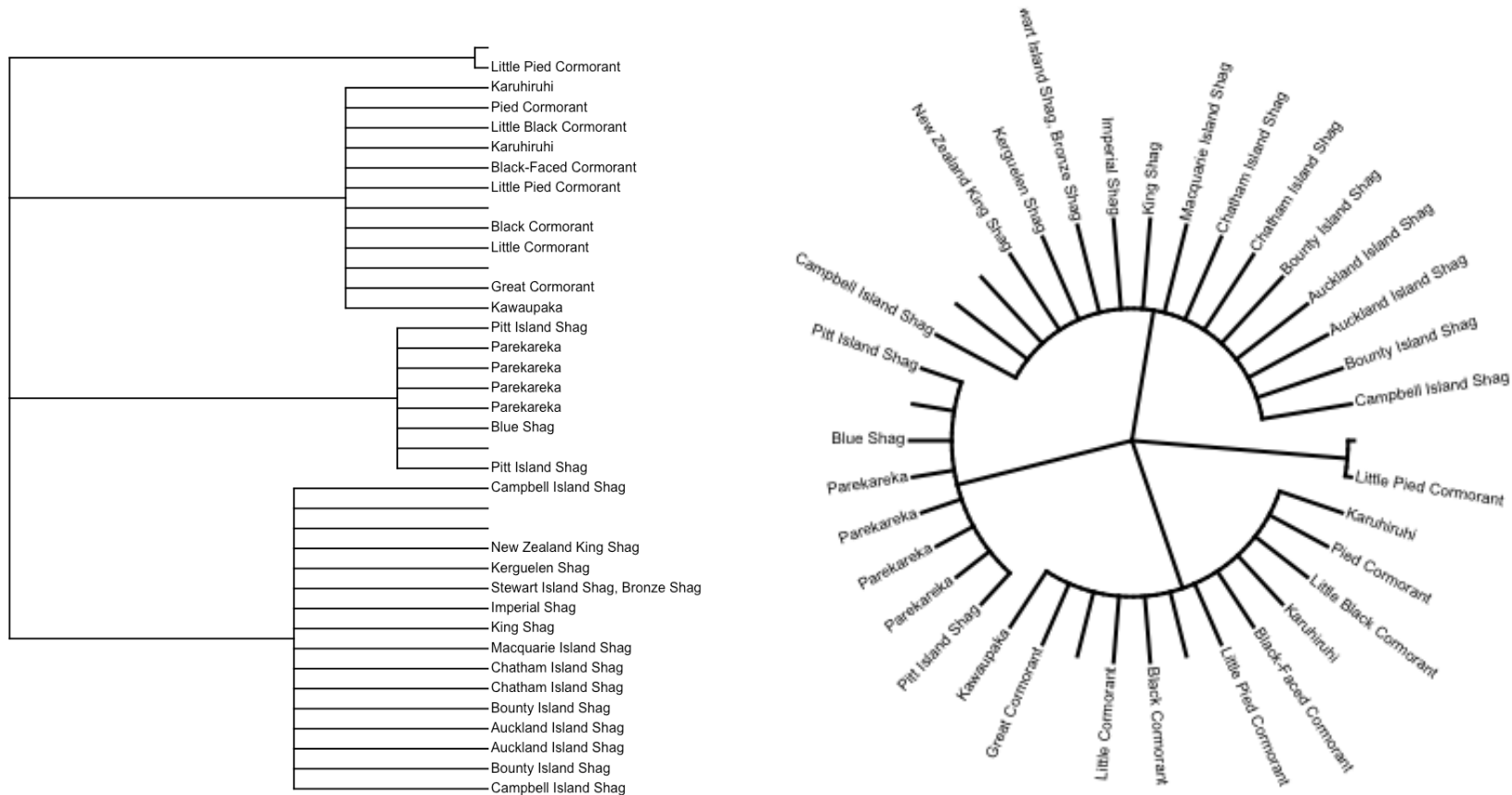
Visualisations using the `phytools` Package

What's next?

Using ALA4R in ecocloud

- RStudio instance accessed via a Jupyter server
- Cloud vm performance
- AARNET network
- Integrate other datasets using the Knowledge Network

Thank you

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