Download biodiversity data with galah : : CHEAT SHEET

galah is an interface to biodiversity data hosted by the [Atlas of Living Australia (ALA)](). It enables users to locate and download species occurrence records (observations, specimens, eDNA records, etc.), taxonomic information, or associated media such as images or sounds, and to restrict their queries to particular taxa or locations.

Build a query

No matter what kind of data you want to return in [R-Studio](), **every download query** consists of the **same building blocks**.

1. Start a query with **galah_call()**
2. **Modify a query** with **galah_** functions
3. **Return data** with **atlas_** functions

AN EXAMPLE QUERY:

```
galah_call() |>
  galah_identify("reptilia") |>
  galah_filter(year > 2010,
               cl22 == "Victoria") |>
  atlas_occurrences()
```

Start a query

Modify a query

Return data

dplyr syntax

galah supports many common dplyr functions to be used in queries. These can directly replace the equivalent galah functions, highlighted in **aqua.**

Download data

COUNTS

atlas_counts() | count() |> collect() Return the number of records that match a query

Return number of observations

count
40284

```
galah_call() |>
  galah_identify("reptilia") |>
  galah_filter(year == 2020) |>
  atlas_counts()
```

Return number of species

count
537

```
galah_call(type = "species") |>
  galah_identify("reptilia") |>
  galah_filter(year == 2020) |>
  atlas_counts()
```

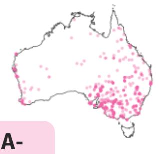
Return grouped counts

```
galah_call() |>
  galah_identify("reptilia") |>
  galah_filter(year == 2020) |>
  galah_group_by(order) |>
  atlas_counts()
```

order	count
Squamata	40284
Crocodylia	6388
Testudines	4301
Rhynchocephalia	1

OCCURRENCES

atlas_occurrences() | collect() Return species occurrence records that match a query



```
galah_config(email = "your-email-here")

galah_call() |>
  galah_identify("perameles") |>
  galah_filter(year > 2021) |>
  atlas_occurrences()
```

Must use an ALA-registered email

Register at ala.org.au/

recordID	scientificName	taxonConceptID	decimalLongitude	decimalLatitude	eventDate
31cdb19…	*Perameles gunnii*	https://biodiver…	-43.2	148.	2023-01-06 12:46:00
d0e0e16…	*Perameles gunnii*	https://biodiver…	-43.1	147.	2022-10-07 10:38:26
4b44551…	*Perameles gunnii*	https://biodiver…	-43.1	148.	2022-09-18 10:13:00
6c35085…	*Perameles gunnii*	https://biodiver…	-43.1	148.	2022-01-15 13:39:00

i = 1,658 more rows

SPECIES LISTS

atlas_species() | collect() Return species information for each species that matches a query

```
galah_config(email = "your-email-here")

galah_call() |>
  galah_identify("perameles") |>
  galah_filter(year > 2021) |>
  atlas_species()
```

Must use an ALA-registered email

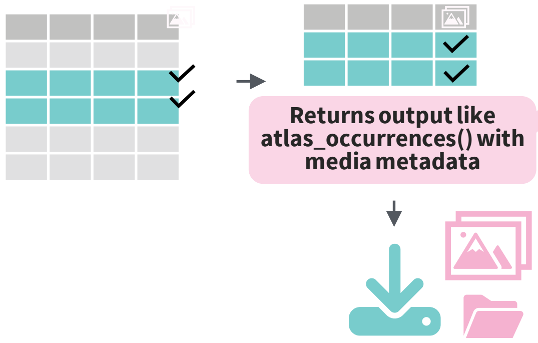
Register at ala.org.au/

kingdom	phylum	class	order	family	genus	species
Animalia	Chordata	Mammalia	Peramelemorphia	Peramelidae	Perameles	*Perameles nasuta*
Animalia	Chordata	Mammalia	Peramelemorphia	Peramelidae	Perameles	*Parameles gunnii*
Animalia	Chordata	Mammalia	Peramelemorphia	Peramelidae	Perameles	*Perameles notina*
Animalia	Chordata	Mammalia	Peramelemorphia	Peramelidae	Perameles	*Perameles fasciata*

i = 1 more row

MEDIA & IMAGES

atlas_media() |> collect_media() Return species occurrence records with associated images, sounds or media that match a query. Return matching records with atlas_media(), then use collect_media() to download locally



Returns output like atlas_occurrences() with media metadata

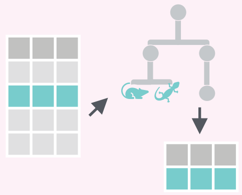
```
galah_config(email = "your-email-here")

galah_call() |>
  galah_identify("perameles") |>
  galah_filter(year > 2021) |>
  atlas_media()
```

```
galah_call() |>
  galah_identify("perameles") |>
  galah_filter(year > 2021) |>
  atlas_media() |>
  collect_media(thumbnail = TRUE)
```

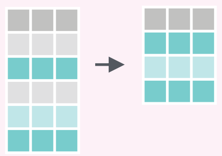
Download "thumbnail" size images

MODIFY QUERY ON THE SERVER BEFORE DOWNLOADING:



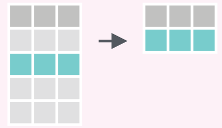
galah_identify() | identify()
Filter query to specific identified taxa

```
galah_call() |>
  galah_identify("mammalia","reptilia") |>
  atlas_counts()
```



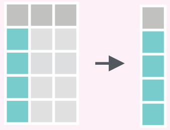
galah_apply_profile()
Apply a set of data quality filters to narrow a query

```
galah_call() |>
  galah_apply_profile(ALA) |>
  atlas_counts()
```



galah_filter() | filter()
Filter query to rows that meet a logical criteria

```
galah_call() |>
  galah_filter(year == 2020) |>
  atlas_counts()
```

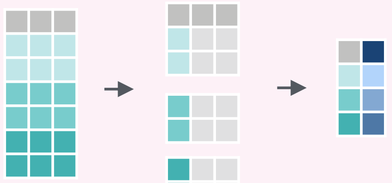


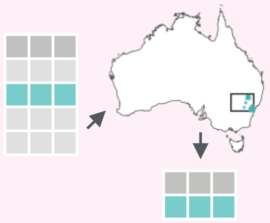
galah_select() | select()
Filter query to return specified columns

```
galah_call() |>
  galah_select(scientificName,eventDate) |>
  atlas_occurrences()
```

galah_group_by() | group_by()
Filter query to rows that meet a logical criteria

```
galah_call() |>
  galah_group_by(year, species) |>
  atlas_counts()
```





galah_geolocate() | st_crop()
Specify the location of data returned with a polygon or bounding box

```
bbox <- tibble(xmin = xx, xmax = dd,
               ymin = xx, ymax = dd)
galah_call() |>
  galah_geolocate(bbox,
                  type = "bbox") |>
  atlas_occurrences()
```

Atlas of Living Australia
ala.org.au

Choose an atlas

The Global Biodiversity Information Facility (GBIF) network consists of a series of 'nodes' — **Living Atlases**—that collate biodiversity data from their own countries. GBIF acts as an umbrella organisation to store data from all nodes.

galah supports data downloads for more than 10 Living Atlases and GBIF.

See full list: https://galah.ala.org.au/R/articles/choosing_an_atlas.html

```
galah_config(atlas = "Austria")

galah_config(atlas = "GBIF")
```

Advanced downloads

lifecycle experimental

Data queries with many rows and columns (i.e. fields) can become very large. Large queries can take a long time to download, and sometimes timeout in R if a session is closed for any reason.

galah supports **dplyr collapse()**, **compute()** & **collect()** functions to **break up building, sending and downloading a query into separate steps.** This allows for larger or more complex queries to download without timing out in R.

collapse(x, …**)** Create the query to be sent to the atlas

```
request_data(type = "occurrences") |>
  galah_identify("coleoptera") |>
  galah_filter(
    year == 2022,
    occurrenceStatus == "PRESENT") |>
  collapse()
```

compute(x, …**)** Send the query to the specified atlas. Sent queries can download without timing out in R

```
request_data(type = "occurrences") |>
  galah_identify("coleoptera") |>
  galah_filter(
    year == 2022,
    occurrenceStatus == "PRESENT") |>
  compute()
```

collect(x, …, wait = FALSE, file = NULL**)** Once a query is complete, download data locally

```
request_data(type = "occurrences") |>
  galah_identify("coleoptera") |>
  galah_filter(
    year == 2022,
    occurrenceStatus == "PRESENT") |>
  collect()
```

collect() runs collapse() & compute() under the hood to create and send a query

Atlas of Living Australia
ala.org.au

Lookup information

— galah provides look-up functions to help users find ways to modify their queries

The living atlases store a huge amount of information, above and beyond only occurrence records. This information can be useful for modifying queries.

show_all(…, limit = NULL**)** Show all available options or categories for a specified type of information

search_all(type, query**)** Search for a specific option or category for a specified type of information

Taxonomic information

Look up taxonomic names before downloading data from the ALA using **atlas_** functions.

search_taxa(…**)** Search for valid taxonomic names, look up taxonomic information, disambiguate homonyms

```
search_taxa("reptilia", "mammalia")
```

Specify taxonomic levels in a tibble using "specificEpiphet"

```
search_taxa(tibble::tibble(
  class = "aves",
  family = "pardalotidae",
  genus = "pardalotus",
  specificEpithet = "punctatus"))
```

Specify taxonomic levels in a tibble using "scientificName"

```
search_taxa(tibble::tibble(
  family = c("pardalotidae", "maluridae"),
  scientificName = c("Pardalotus striatus striatus",
                     "malurus cyaneus")))
```

search_identifiers(…**)** Search for unique identifiers of a taxon. Identifiers are assigned by atlases to identify all taxonomic clades.

```
search_identifiers(
  query =
https://id.biodiversity.org.au/node/apni/2914510
  )
```

Configuration

atlases Show what atlases are available

```
show_all(atlases)
search_all(atlases, "Brazil")
```

apis Show what APIs & functions are available

```
show_all(apis)
search_all(apis, "counts")
```

reasons Show what values are acceptable as "download reasons" for a specified atlas

```
show_all(reasons)
search_all(reasons, "research")
```

Filters

fields Show fields that are stored in an atlas

```
show_all(fields)
search_all(fields,
           "australian states")
```

assertions Show data quality checks run by each atlas

```
show_all(assertions)
search_all(assertions, "longitude")
```

licenses Show what copyright licenses are applied to media

```
show_all(licenses)
search_all(licenses, "CC BY")
```

Taxonomy

ranks Show valid taxonomic ranks (eg Kingdom, Class)

```
show_all(ranks)
search_all(ranks, "suborder")
```

Group filters

profiles Show what data profiles (sets of data quality filters) are available

```
show_all(profiles)
search_all(profiles, "ALA")
```

lists Show what species lists are available

```
show_all(lists)
search_all(lists, "EPBC")
```

Data providers

providers Show which institutions has provided data

```
show_all(providers)
search_all(providers, "botanic")
```

collections Show the specific collections within those institutions

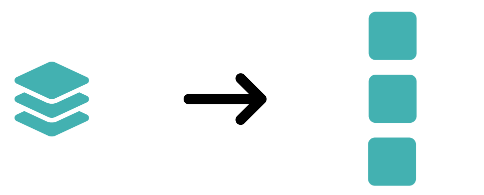
```
show_all(providers)
search_all(collections,
           "antarctic")
```

datasets Show all the data groupings within those collections

```
show_all(datasets)
search_all(datasets, "river")
```

Values

Users may wish to see what values are **within** a chosen field, profile or list to modify a query or understand more about the information of interest. The **values functions can be piped from supported search_all() functions** to see this information.



Specified field

Field values

show_values(df**)** Search for valid taxonomic names, look up taxonomic information, disambiguate homonyms

```
search_all(fields, "cl22") |>
  show_values()
```

field	count
cl22	New South Wales
cl22	Victoria
cl22	Queensland
cl22	South Australia
cl22	Western Australia
cl22	Northern Territory
cl22	Australian Capital Territory
cl22	Tasmania
cl22	Ashmore and Cartier Islands
Cl22	Coral Sea Islands

search_values(df, query**)** Search for valid taxonomic names, look up taxonomic information, disambiguate homonyms

```
search_all(fields, "cl22") |>
  search_values("territory")
```

field	count
cl22	Northern Territory
cl22	Australian Capital Territory

Want ideas on how to visualise your data?

For more information, including tutorials & examples, check out **ALA LABS.**

Atlas of Living Australia • support@ala.org.au • ala.org.au• Learn more at **galah.ala.org.au or galah.ala.org.au/Getting-Started** • package version 2.0.0 Updated: 2023-11