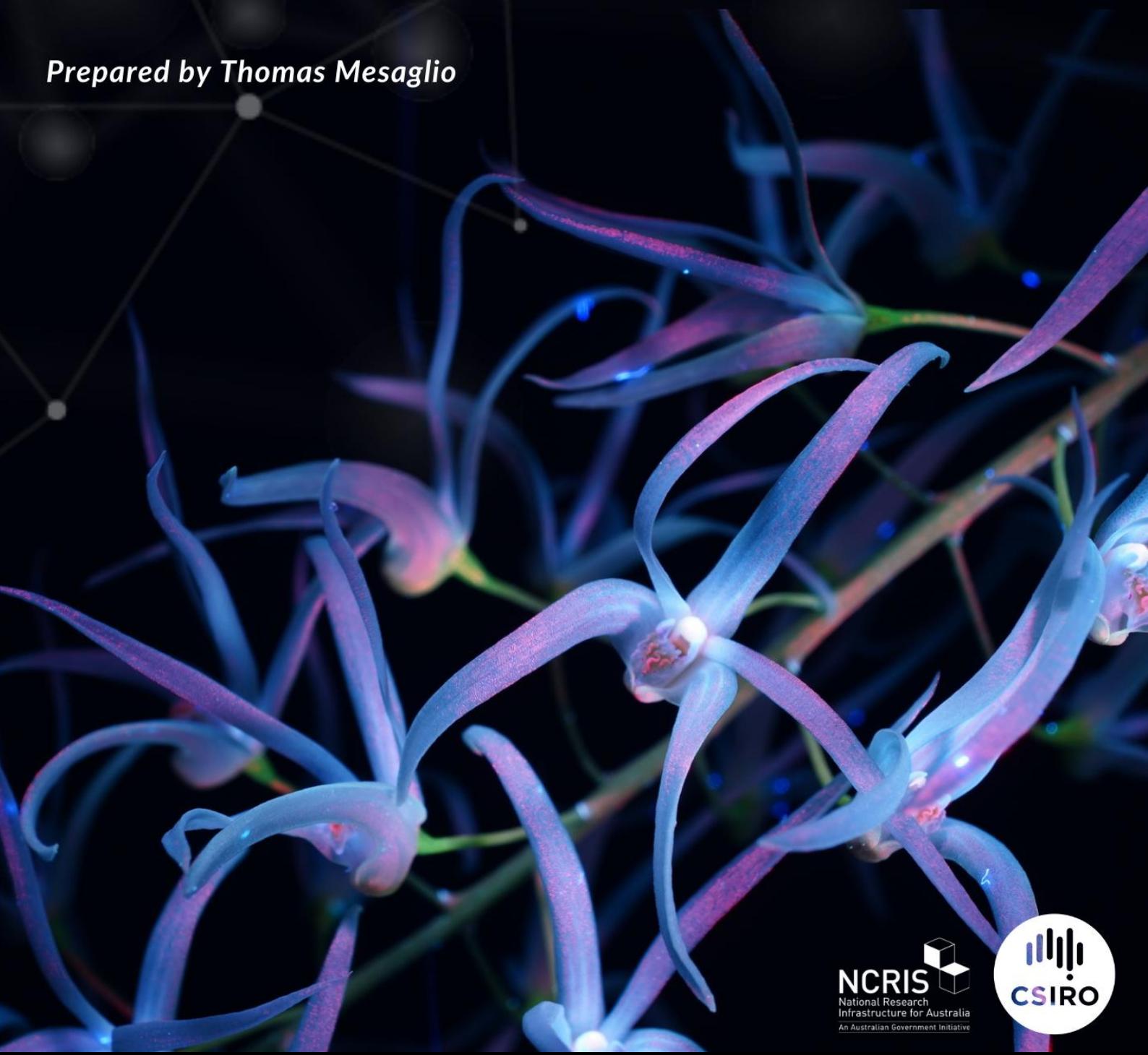


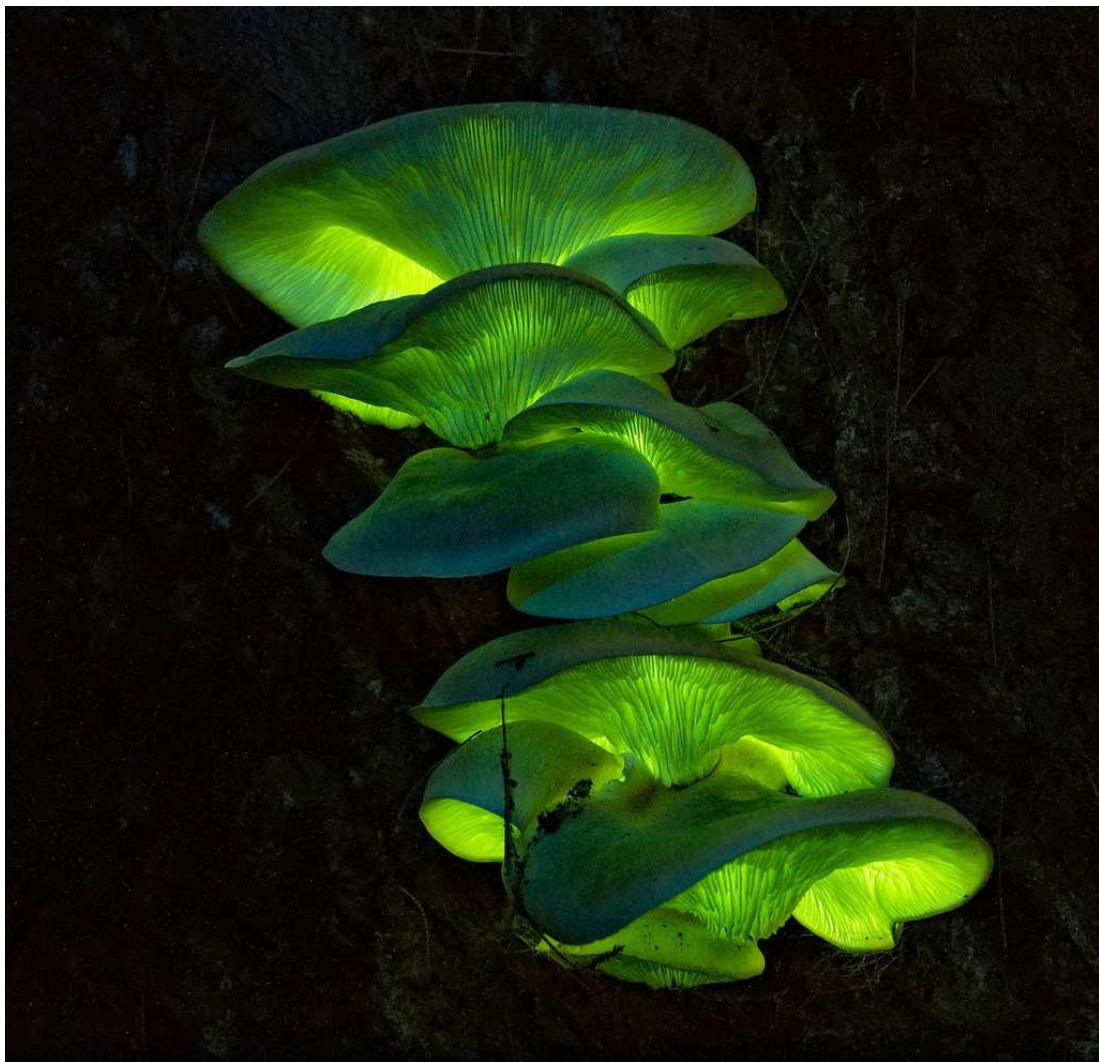


A Guide to iNaturalist

An Australian perspective

Prepared by Thomas Mesaglio





Ghost fungus ([Omphalotus nidiformis](#)). *Photograph* by Adam Fry (@frya), All Rights Reserved.

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Front cover: Tongue Orchid (*Dendrobium linguiforme*). *Photograph* by Daniel McCawley (@moocattle), CC BY-NC.

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[Eudocima iridescent](#). [Photograph](#) by David White (@davidgwhite), CC BY-NC

Overview

[iNaturalist](#), often referred to as ‘iNat’, is an online biodiversity citizen science platform contributed to by millions of users across the globe. The platform is free to use and accessible through an internet browser or as a mobile app. Each record, referred to as an ‘observation’, is typically associated with a digital voucher consisting of a photograph/photographic set and/or a sound recording. iNaturalist is taxon-agnostic, covering all known taxa (including viruses). Observations are identified and verified through a combination of user input, including from both amateur naturalists and experts, and suggestions offered by iNaturalist’s Computer Vision, a machine learning/AI tool. iNaturalist data are openly accessible and used extensively to inform scientific research, conservation programs and land management; they are an invaluable complement to professionally collected data. iNaturalist data are accessed directly through the platform, or via external biodiversity data aggregators such as the [Atlas of Living Australia](#) (ALA) or the [Global Biodiversity Information Facility](#) (GBIF), to which iNaturalist exports a subset of all observations.

Unless specified otherwise, all statistics described in this document were current as of the end of 2023, and all functionality was current as of mid-April 2024. The ever-growing nature of iNaturalist means that, with respect to specific statistics, this document was already out of date during writing. However, all hyperlinks throughout the document are ‘live’ links and redirect to dynamic pages with real time statistics. Importantly, all functionality discussed in this document relates to the browser version of iNaturalist, not the app. For differences between these versions, see page 67.

This document provides a resource for current and prospective users of iNaturalist from anywhere in the world. However, a strong focus, particularly in the latter half of the document, is placed on the ALA – Australia’s largest biodiversity database with over 133 million records – and most of the examples provided throughout the document relate to Australian observations, users and projects. The ALA has been the Australian node of iNaturalist since 2019, and Australian observations uploaded to iNaturalist are exported into the ALA, allowing their use in research, conservation and land management across the country. The ALA’s relationship with, and support of, iNaturalist Australia has been crucial for promoting greater use of iNaturalist by citizen scientists, greater engagement by expert identifiers, and an overall increase in data quality.

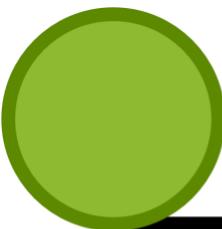
Aims

This document aims to:

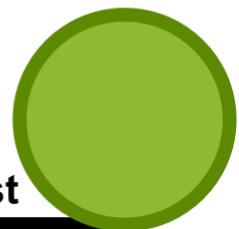
- 1) Provide a high-level, but detailed overview of all core iNaturalist features and functionality.
- 2) Answer common questions asked by new users to the platform and address common misconceptions about iNaturalist.
- 3) Explore Australian contributions to iNaturalist and explain the relationship between the Atlas of Living Australia and iNaturalist Australia.

More help documentation, including How-Tos, FAQs, and curator resources, can be found at [iNatHelp](#).

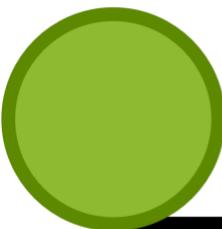
A brief history



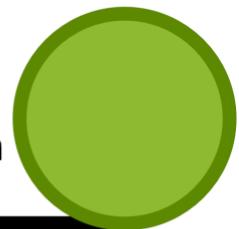
2008 — Started as a Master's project at UC Berkeley's School of Information



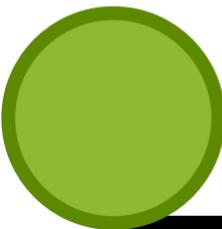
2011 — Formally organised as iNaturalist



2014 — Became an initiative of the California Academy of Sciences



2017 — Became a joint initiative with the National Geographic Society



2023 — Registered as an independent non-profit organisation, and received a \$10 million grant from the Gordon and Betty Moore Foundation

Global statistics

Since its inception in 2008, iNaturalist as a global platform has experienced incredible growth in every metric. As of the end of 2023 across all verifiable observations (throughout this document, any references to 'observations' correspond to verifiable observations, that is, Needs ID or Research Grade observations; see page 27 for an explanation of these data grades), these statistics stand at:

168,489,571 observations

456,943 observed species

2,918,946 users having contributed at least 1 observation

341,379 users having contributed at least 1 identification to another user's observation.

Including non-verifiable observations (i.e., Casual observations) adds another ~19 million to the total.

Across 2023, the number of active users (any user that has added at least one observation, identification, comment, or post in the last thirty days) fluctuated between ~150,000 (mid-January 2023) and ~375,000 (late May 2023). In late April/early May 2023, during the [City Nature Challenge](#) (a global bioblitz event), an incredible 2.74 million observations were uploaded to iNaturalist in a single week, exceeding the total number of observations uploaded in the first eight years of the platform's history.

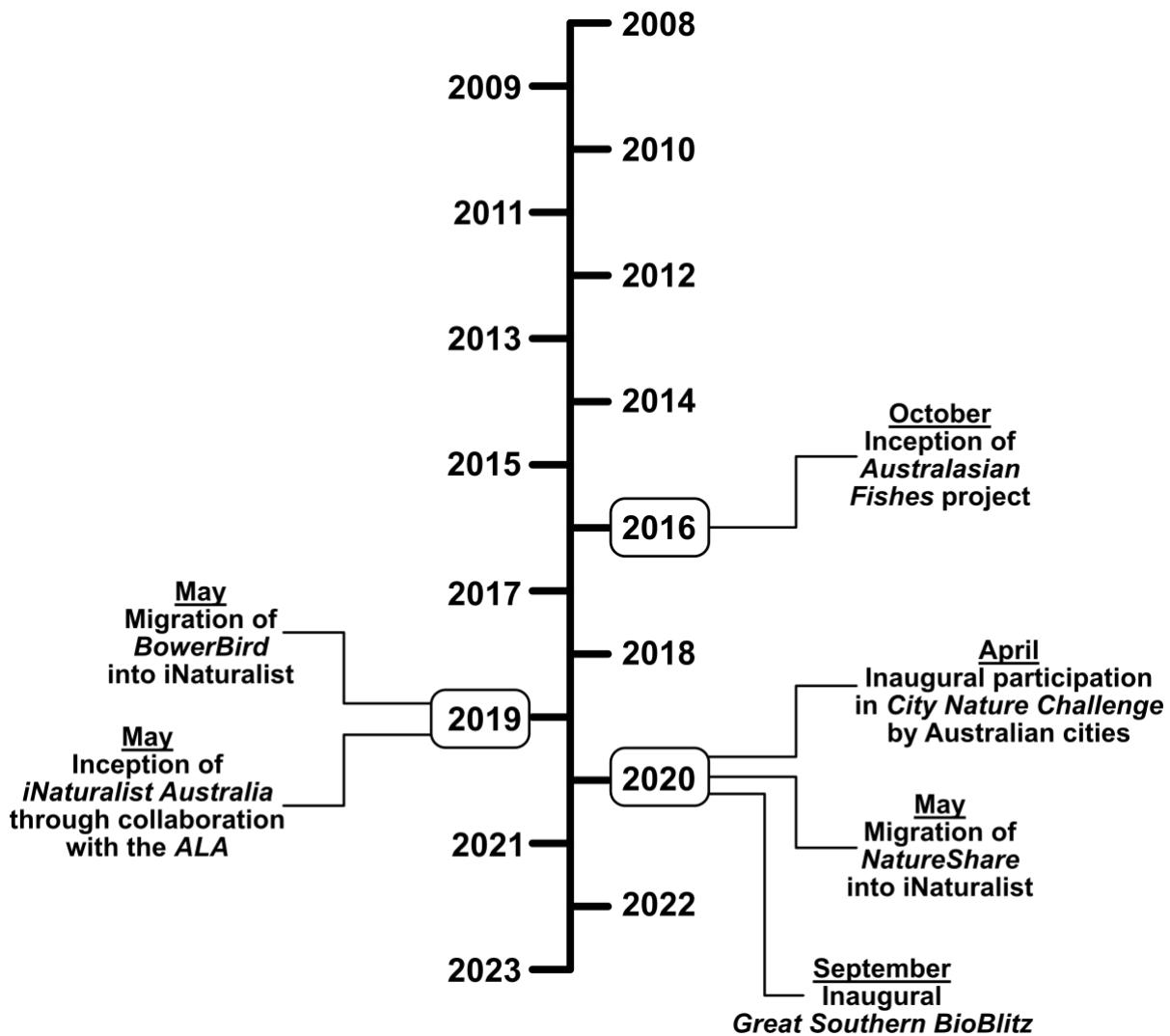
The United States dominates all metrics, but use in the rest of the world is rapidly accelerating. At least one nation from every inhabited continent is represented in the top fifteen contributors to the platform:

	Verifiable observations	Species	Identifiers	Observers
United States	77,086,469	97,806	196,901	1,520,497
Canada	12,777,078	37,737	56,208	202,694
Australia	6,947,669	55,445	28,891	82,491
Russia	6,323,349	32,410	23,861	35,598
Mexico	6,265,283	49,467	38,917	126,093
United Kingdom	4,495,956	19,968	28,936	111,635
South Africa	3,579,274	37,115	16,929	29,054
Germany	3,150,669	23,194	23,699	58,993
France	3,016,486	29,804	24,480	102,950
Spain	2,727,739	29,785	20,817	51,976
Italy	2,475,630	23,920	23,503	62,880
Taiwan	2,357,976	22,554	14,814	38,987
India	2,101,233	31,247	17,136	31,205
Brazil	2,097,210	40,740	20,658	48,731
New Zealand	2,057,581	18,614	13,734	36,197

The rise and rise of iNaturalist in Australia

History

iNaturalist started off slowly in Australia, and indeed from 2008–2015, fewer than 20,000 observations were uploaded for the nation. Fast forward to the end of 2023, and total observations have almost hit seven million. The early history of iNaturalist in Australia is explored in depth by [Mesaglio and Callaghan \(2021\)](#), including the identification of the most important events responsible for inspiring and driving greater Australian contributions to iNaturalist:



Defining Australia

In addition to the eight main states and territories, Australia administers seven remote offshore territories: Ashmore and Cartier Islands, Christmas Island, Cocos (Keeling) Islands, Coral Sea Islands, Heard and McDonald Islands, Norfolk Island, and the Australian Antarctic Territory. There are also two islands that are politically part of Australian states: Lord Howe Island (New South Wales) and Macquarie Island (Tasmania).

However, searching for ‘Australia’ in iNaturalist will not retrieve records for all of these constituent places: Norfolk Island, Christmas Island, Cocos (Keeling) Islands, and Heard and McDonald Islands are excluded. Luckily, each ‘place’ (see page 30 for an explanation of iNaturalist places) on iNaturalist is represented by a unique numerical identifier, and multiple identifiers can be strung together to conduct an aggregate search. The numerical identifier for any given place can be found by searching for said place, and checking the URL for the ‘place_id’ value. For example, the URL for all observations within Norfolk Island looks like this: https://www.inaturalist.org/observations?place_id=7333.

Here are the numerical identifiers for all Australian states and territories:

Region	Identifier
Australia	6744
New South Wales	6825
Australian Capital Territory	12986
Victoria	7830
Tasmania	6829
South Australia	6899
Western Australia	6827
Northern Territory	9994
Queensland	7308
Lord Howe Island	18651
Macquarie Island	97492
Ashmore and Cartier Islands	10460
Christmas Island	7616
Cocos (Keeling) Islands	10287
Coral Sea Islands	10461
Heard and McDonald Islands	10293
Norfolk Island	7333
Australia Exclusive Economic Zone	118147
Jervis Bay Territory	96781

This table includes a place not previously mentioned: Australia Exclusive Economic Zone. This place represents the area of ocean surrounding Australia to which it has rights regarding exploration, use, and management of natural resources such as fishes or minerals. It is a useful place to include in iNaturalist searches for Australian observations, as it captures observations such as seabirds observed on pelagic trips or fishes caught by trawlers that would otherwise be excluded.

The Australian Antarctic Territory is excluded here because an explicitly defined place for this territory does not currently exist on iNaturalist. Because of its very large size (~5.9 million km²), such a place can only be added to the platform by a staff member; place creation for non-staff users is limited to areas smaller than ~700,000 km². Given the vast majority of the area covered by this territory contains zero observations in iNaturalist, there is little incentive for its creation.

The following URL will retrieve all Australian iNaturalist observations:

https://www.inaturalist.org/observations?place_id=6744,7333,7616,10287,10293,118147.

Another important consideration within Australia is Jervis Bay Territory. Although it is located within New South Wales, it is actually an internal territory administered by the federal Department of Infrastructure, Regional Development and Cities. Searching for New South Wales in iNaturalist will therefore actually exclude Jervis Bay Territory. Retrieving all New South Wales records from a biogeographic perspective (including Lord Howe Island) thus requires the following URL:

https://www.inaturalist.org/observations?place_id=6825,96781.

By using these place identifiers, searches can also be conducted for two or more non-contiguous places. For example, all observations from Queensland and Western Australia are retrieved using the following URL:

https://www.inaturalist.org/observations?place_id=7308.6827.

Searches can also be conducted to exclude a place or places. For example, the following URL retrieves all Australian records excluding Western Australia:

https://www.inaturalist.org/observations?place_id=6744.7333.7616.10287.10293.118147¬_in_place=6827

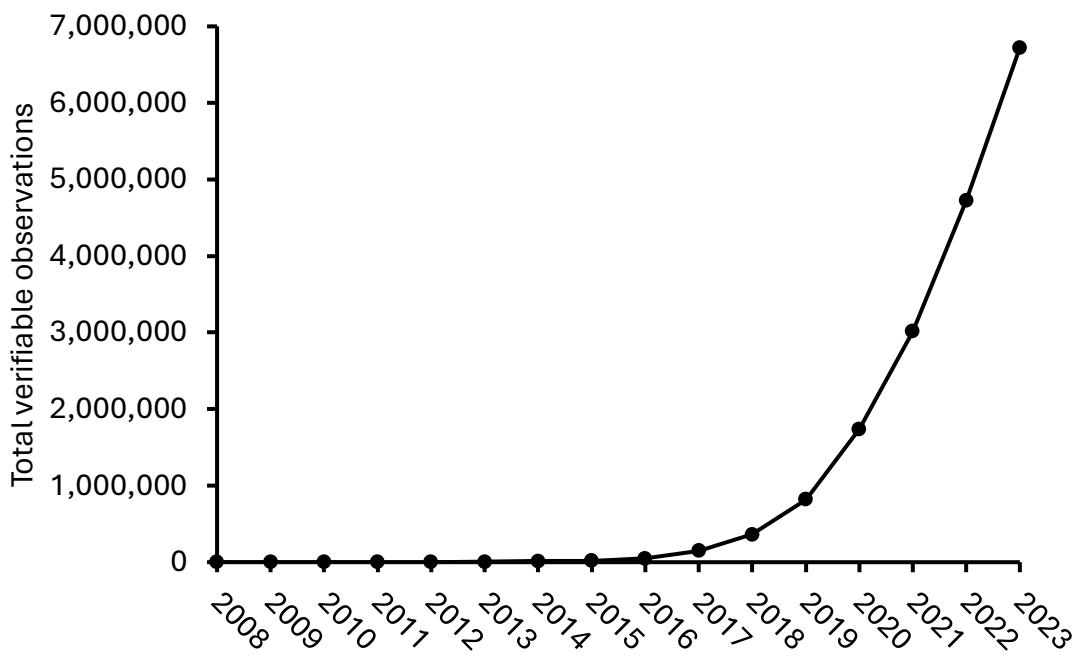


Anemone porcelain crab (*Neopetrolisthes maculatus*). [Photograph](#) by Kristin Anderson (@kjadiver), CC BY-NC.

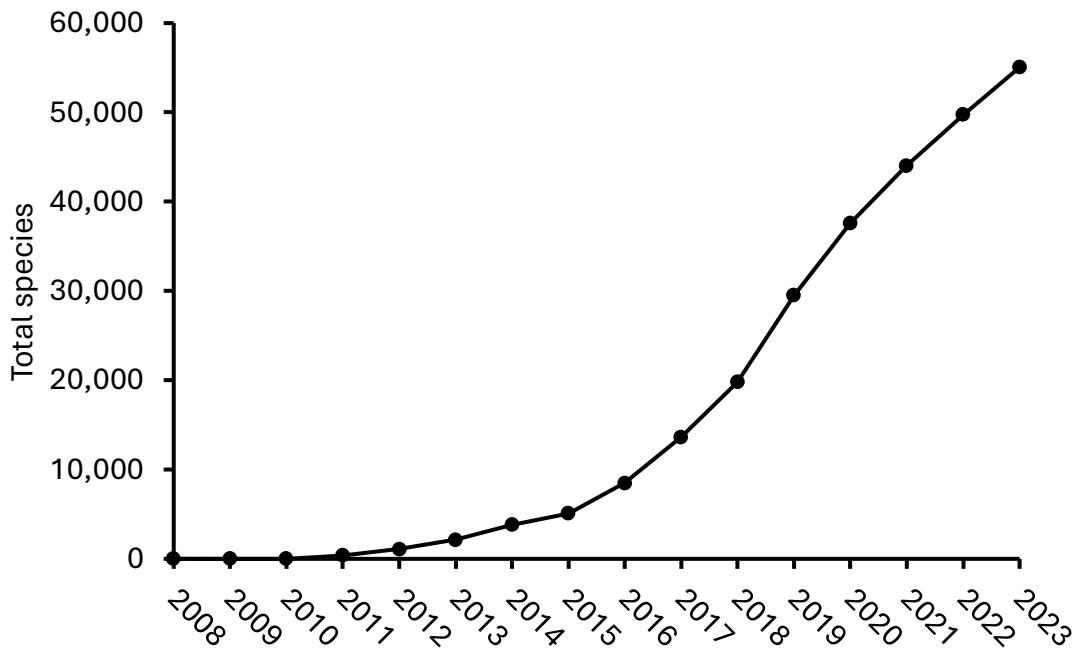
Australian observations over time

The past seven years have seen incredible growth for Australia in iNaturalist across the four major metrics.

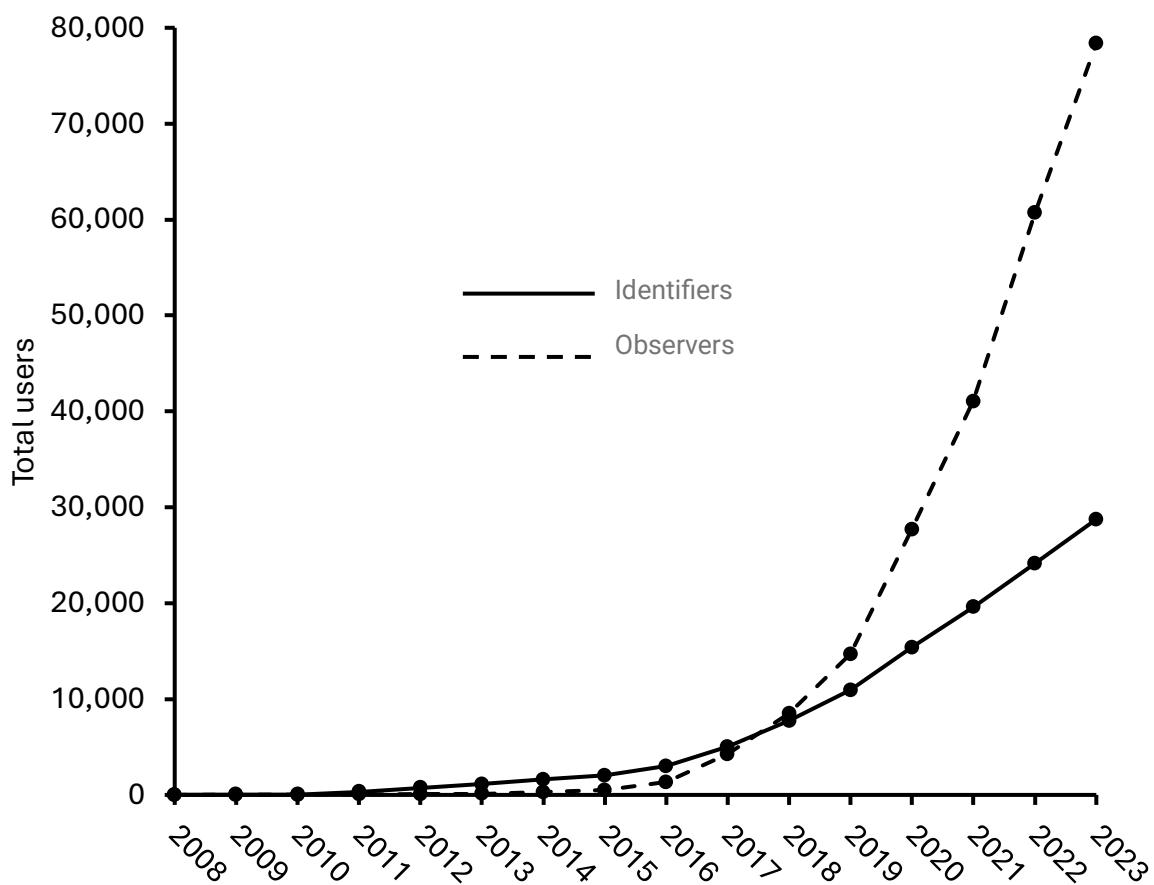
1) Total number of observations continues to increase exponentially:



2) Total number of species is still increasing steadily, although the rate of accumulation has started to slow down:



3) and 4) Total number of identifiers and observers continue to increase, although the latter is rising at a significantly faster rate:



Australian statistics

As of the end of 2023, Victoria leads all states and territories for total observations, New South Wales tops total observers, and Queensland leads total species:

	Verifiable observations	Species	Identifiers	Observers
<u>Australia</u>	6,947,669	55,445	28,891	82,491
<u>Victoria</u>	1,938,721	18,298	13,461	24,232
<u>Queensland</u>	1,700,722	26,862	13,802	21,658
<u>New South Wales</u> (incl. Jervis Bay Territory, excl. Lord Howe Island)	1,665,550	23,135	14,562	30,850
<u>South Australia</u>	617,109	11,249	7,860	8,152
<u>Western Australia</u>	479,553	18,192	7,769	7,657
<u>Tasmania (excl. Macquarie Island)</u>	254,876	8,872	5,316	5,940
<u>Australian Capital Territory</u>	126,821	5,314	3,840	3,031
<u>Northern Territory</u>	95,144	5,727	3,829	2,919
<u>Australia Exclusive Economic Zone</u>	40,574	3,811	1,852	1,734
<u>Norfolk Island</u>	9,453	1,405	812	153

Lord Howe Island	9,147	1,421	1,005	230
Christmas Island	5,936	1,147	787	101
Coral Sea Islands	1,990	391	200	34
Cocos (Keeling) Islands	1,106	423	296	45
Macquarie Island	923	132	261	38
Ashmore and Cartier Islands	99	56	80	10
Heard and McDonald Islands	40	28	51	4

Across iNaturalist's eleven 'iconic' taxa, Australian observations are dominated by plants, insects and birds:

	Verifiable observations	Species	Identifiers	Observers
Plants	2,160,402	19,838	11,085	41,364
Insects	1,974,442	18,531	11,182	43,289
Birds	1,020,643	870	10,926	29,352
Fungi including Lichens	430,605	2,843	4,707	18,774
Arachnids	303,227	1,599	4,870	20,288
Ray-finned fishes	231,310	2,992	2,998	5,868
Molluscs	208,038	3,259	2,782	9,844
Reptiles	163,157	895	5,251	18,822
Mammals	145,454	329	5,439	15,813
Amphibians	70,101	209	2,806	11,220
Protozoans	11,198	258	655	2,232

Although over 80,000 users have made at least one observation within Australia, these contributions are very long-tailed, with the top 10 accounts — 0.012% of all Australian users — contributing ~11.4% of all observations:

	Total verifiable observations	Home state/territory
@reiner Reiner Richter	264,661	Victoria
@grettasney Greg Tasney	100,694	Queensland
@nicklambert Nick Lambert	88,823	New South Wales
@questagame [group account]	61,055	
@davidsando David Sando	58,324	South Australia
@thebeachcomber Thomas Mesaglio	52,428	New South Wales
@imcmaster Ian McMaster	49,033	Queensland
@dustaway Nicholas John Fisher	43,292	New South Wales
@cinclosoma	36,970	Victoria
@deborod Deb Ralph	36,825	Australian Capital Territory

Only six individual users have uploaded observations covering more than 5,000 species:

	Total species	Home state/territory
@nicklambert Nick Lambert	9,231	New South Wales
@reiner Reiner Richter	8,109	Victoria
@thebeachcomber Thomas Mesaglio	7,102	New South Wales
@gregtasney Greg Tasney	6,452	Queensland
@nyoni-pete Pete Woodall	5,715	Queensland
@questagame [group account]	5,148	
@kenharris Ken Harris	5,023	Victoria
@arthur_chapman Arthur Chapman	4,055	Victoria
@possumpete Peter Crowcroft	4,019	Victoria
@bushbandit Michael Keogh	3,865	Victoria

Nine users have contributed more than 100,000 identifications to Australian observations:

	Total identifications	Home state/territory
@thebeachcomber Thomas Mesaglio	292,920	New South Wales
@george_seagull	253,050	Victoria
@reiner Reiner Richter	190,501	Victoria
@vicfazio3 Victor Fazio III	155,200	New South Wales
@bushbandit Michael Keogh	152,711	Victoria
@benkurek Ben Kurek	147,508	Victoria
@leoncrang Leon Crang	108,291	Queensland
@louisb Louis Backstrom	107,111	Queensland
@cesdamess Brendon Cotterill	103,543	New South Wales
@ben_travaglini Ben Travaglini	94,881	Victoria

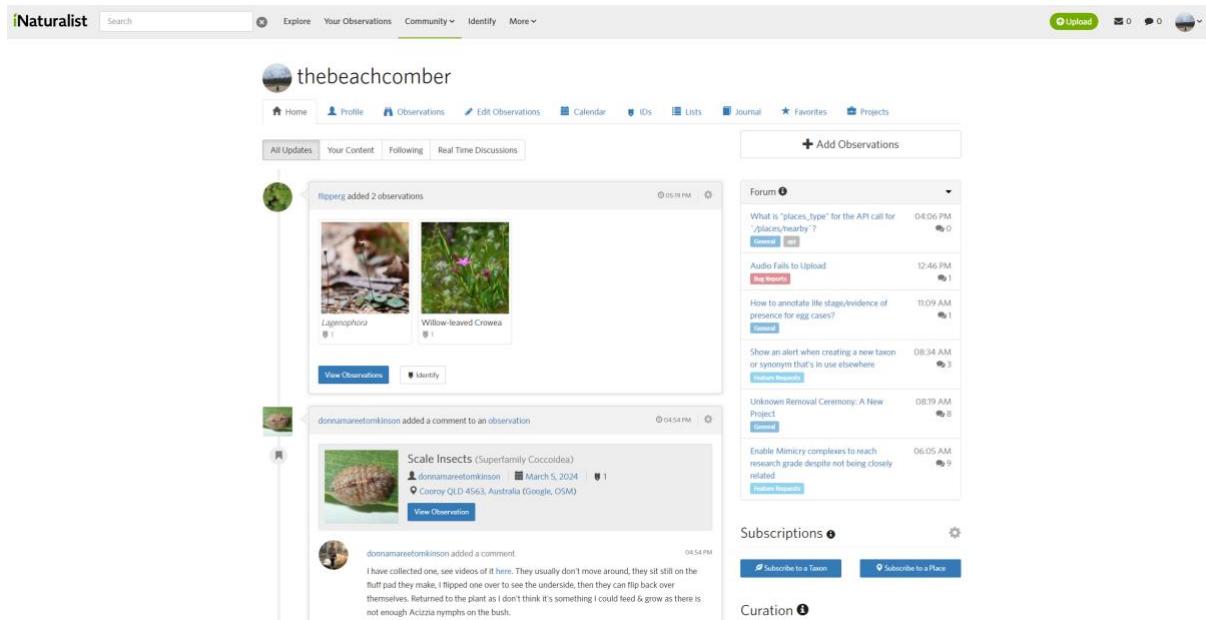
Account creation and data storage

When signing up to iNaturalist, new users are only required to provide two pieces of personal information: an email address and a username. The username can be completely anonymised, and does not need to reflect the user's actual name or contain any identifying information. No other personal information will be asked for outside a few specific circumstances. During signup, four terms and agreements, each with a check box, are presented to new users:

- 1) Yes, license my photos, sounds, and observations so scientists can use my data (recommended).** This box is ticked by default, but can be unticked and is not required to create an account. The data referred to here is not any form of personal information, but rather your observations, i.e., the coordinates, dates, photographs and other metadata contained in each record you upload to the platform. Regardless of whether you keep this box ticked, your observations will be openly accessible and usable within iNaturalist itself; however, changing the default licensing may prevent your observations from being exported into external biodiversity data aggregators such as the Atlas of Living Australia or the Global Biodiversity Facility. See page 28 for more information on licensing in iNaturalist.
- 2) I consent to allow iNaturalist to store and process limited kinds of personal information about me in order to manage my account.** This box must be ticked for a new account to be created. iNaturalist's [Privacy Policy](#) and [Terms of Use](#) explain which kinds of personal information are stored and processed by iNaturalist. In summary, for the vast majority of users, this information only includes their email address, username and some information already made available by their web browser, such as IP address and language preference. The Privacy Policy mentions details such as telephone number and credit card information, and this can sometimes cause prospective new users to be concerned. However, these data will only ever be asked for and stored in a few specific circumstances. For example, if a user wants to donate to iNaturalist, details such as credit card information will be required. However, these data are not required to create an account, and will never be asked for in any other circumstances outside those detailed above.
- 3) I consent to allow my personal information to be transferred to the United States of America.** This box must be ticked for a new account to be created. As above, the personal information referred to here is predominantly email address and username. For Australian users, a copy of these data is also stored on Australian servers. At time of writing, iNaturalist has never experienced any data breach.
- 4) I agree to the Terms of Use and Privacy Policy, and I have reviewed the Community Guidelines.** This box must be ticked for a new account to be created. See page 38 for more information on iNaturalist's [Community Guidelines](#), which relate to best practices for appropriate conduct on the platform.

Dashboard

When logging in to iNaturalist, users are taken to their dashboard. This is their main homepage where they can directly access much of the site's functionality.



Observations

Basics

Observations are the basic unit of the platform. As defined by iNaturalist, *an observation records an encounter with an individual organism at a particular time and location*. This includes not only direct encounters, but also indirect encounters such as footprints, scat or moults. iNaturalist's definition has three important implications:

1) Each observation should only represent one species. It is entirely acceptable for multiple species to be present in any given photograph, and indeed this is often helpful for depicting associations or interactions between species (e.g., insects pollinating or feeding on plants), or conveying habit and habitat information, but all photographs associated with an observation should contain the focal species. A common mistake made by new users is to photograph four or five entirely different species, with no overlap in species between photographs, and combine all photographs into a single observation. It is ok to combine photographs of multiple different individuals of the same species into one observation — assuming they were photographed at the same general time and place — but it is often easier to submit photographs of different individuals as separate observations. This is especially the case when these individuals represent different sexes or life history stages. For example, [adult male satin bowerbirds](#) (*Ptilonorhynchus violaceus*) look quite different to [females and juvenile males](#), so photographs of a male and female taken at the same time and place would ideally be uploaded as separate observations. Conversely, a photograph depicting a large flock of birds or school of fish does not need to be separated into tens or hundreds of observations.

2) All photographs of an encounter with an organism at a given time and place should be combined into a single observation. Uploading multiple photographs of an organism is certainly encouraged to aid identification, but a common mistake on iNaturalist is to submit each of these photographs as a separate observation. This creates unnecessary duplicates that may also hinder identification, especially for taxa with multiple diagnostic characters. All photographs taken of an organism at the same time and place should be combined. This can be done in the upload screen by selecting all relevant photographs and clicking the 'combine' button, or by dragging and dropping photographs onto each other.

3) Encounters with the same individual at a later date should be uploaded as new observations. Although it may seem intuitive to combine photographs of the same known individual into a single observation, even when these photographs are taken at different times, this should be avoided. This is especially the case for animals passing through different life history stages (e.g., caterpillar to chrysalis to butterfly), or plants displaying different phenology (e.g., no fertile material present to flowering to fruiting). A good rule of thumb is that, if recording the same individual more than 24 hours apart, the photographs should be uploaded as separate observations.

Each observation contains three fundamental components:

1) At least one piece of evidence for the encounter. For most observations this evidence is a photograph, or set of photographs, although sound recordings are also valid evidence. Users can also attach GIFs to observations, however, these may be phased out in future. iNaturalist does not allow the upload of video files.

Each observation can contain a maximum of twenty files (any combination of file types). Each individual file is limited to a maximum size of 20 MB. Any photographs larger than 2048 × 2048 pixels will be automatically resized so that the longest edge is within these limits.

Observations can be uploaded without a photograph or sound recording, but these will remain as Casual grade.

2) Observation date. In almost all cases, this field is auto-populated when the photograph is taken. If this field is blank, e.g., when uploading a sound file that has been converted from a video, the date can be manually entered. This field also includes the time, although this is not necessary to include.

3) Observation location. Both a set of coordinates and a text description can be entered; the latter is automatically generated by Google Maps services based on the coordinates, but can be edited or even deleted entirely. The coordinates may or may not be auto-populated depending on the device used to take the photograph. For example, photographs taken with a smartphone with location services turned on will almost always be automatically geotagged. However, many DSLR cameras do not automatically geotag photos: coordinates can be manually entered if required.

Once created, each observation is assigned a unique identifying number, similar to an accession number for a museum or herbarium specimen. The URL for an individual observation looks like this:

<https://www.inaturalist.org/observations/104387633>.

When uploading an observation, it is recommended that users enter some kind of identification, even if this is as basic as 'Plants' or 'Insects'. Adding an identification increases the chances of the observation being seen and identified sooner, as many identifiers filter their searches taxonomically. An expert searching for observations of molluscs will only see observations that have already been identified as 'Molluscs' or finer.



Musk duck (*Biziura lobata*). [Photograph](#) by Gil Ewing (@abcdefgewing), CC BY-NC.



Black-and-gold sapsucking slug (*Cyerce nigricans*). [Photograph](#) by Steve Smith (@profmollusc), CC BY-NC-ND.

Location data

In addition to coordinates, there are two other important geospatial elements in each observation:

1) **Accuracy.** The positional accuracy of an observation represents coordinate uncertainty, and is presented as both a circle on the map around the coordinates, and a numerical value (the circle's radius in metres). The accuracy value is automatically populated in some cases (e.g., most photographs taken using a smartphone), but can also be manually entered or edited. This field is not mandatory and can be left blank. The circle indicates that the observation was made somewhere inside its bounds.

Observations with very large accuracy values (any value exceeding the diagonal distance of a bounding box of 0.2° latitude and 0.2° longitude) will not be shown on maps of that taxon.

2) **Geoprivacy.** By default, observations are set to **open**: the coordinates are publicly viewable by anyone. However, geoprivacy can be applied in three different ways to restrict location to geospatial information:

i) **Taxon geoprivacy.** Taxa that are deemed to have sensitive locations have their coordinates automatically obscured when an observation is uploaded, or when an identification of that taxon is added to any observation. This is a measure designed to mask the true locations of sensitive taxa and reduce the possibility of potential negative consequences of location disclosure, e.g., rare reptiles being poached, or small threatened plants having their habitat trampled. When an observation is obscured, two changes occur:

a) The true coordinates are removed from public view and replaced with a randomly generated set of coordinates within a 0.2° x 0.2° grid cell (~500 km² at the equator) around the true coordinates. The positional accuracy is therefore increased to the diagonal of this cell, equalling ~24-31 km (depending on latitude). On individual observations, this grid cell is represented by a bounding box on the map, and the marker shown on the map is the randomly generated point.

b) The date and time are removed from public view so that only the month and year are visible. The date/time are also generalised for each added identification, and locality notes are changed to only indicate the state and country.

Observed: April 2020 Generalised datestamps Submitted: April 2020

Obscuration bounding box. The true coordinates are somewhere inside this box

Randomly generated coordinates

Generalised location: Queensland, AU (Obscured)

Lat: -19.507077 Lon: 146.952463 Accuracy: 30.56km Geoprivacy: Open

Taxon geoprivacy differs from geoprivacy

Positional accuracy equal to diagonal of obscuration bounding box

Encompassing Places

Standard:	Community Curated:
Oceania (Continent)	Townsville, Qld (Municipality)
Australia (Country)	Townsville City, Qld, AU (Municipality)
Queensland, AU (State)	General Wet Tropics and Surrounds, QL, AU (Open space)
Townsville - Pt B, QL, AU (County)	CentralNQld, QL, AU (Region)
	Tropical Asia (Unknown)

Why the Coordinates Are Obscured

- Taxon is threatened, coordinates obscured by default: One of the taxa suggested in the identifications, or one of the taxa that contain any of these taxa, is known to be rare and/or threatened, so the location of this observation has been obscured.

Who Can See the Coordinates

- The person who made the observation
- Individuals who the observer has trusted with their hidden coordinates

[View on Google](#) · [OpenStreetMap](#) · [Macrostrat](#)

Historically on iNaturalist, taxon geoprivacy has been applied somewhat idiosyncratically to Australian taxa, with a combination of [IUCN Red List](#) threatened species statuses, federal and state sensitive species statuses, and in-platform discussions among local experts all contributing to obscuration. Recent changes have been made to apply obscuration to Australian taxa more consistently and align location sharing with the [National Framework for Sharing of Restricted Access Species Data in Australia](#) (RASD; Atlas of Living Australia 2023). More can be read about these efforts [here](#).

Taxon geoprivacy is applied to taxa on iNaturalist through the creation of conservation statuses (e.g., Vulnerable or Endangered). However, statuses can be applied to taxa without also applying obscuration — for example, a species may be Critically Endangered, but be faced with threats that are not exacerbated by location disclosure, e.g., climate change or habitat destruction — and taxa that do not have any official conservation status can nonetheless still have their locations obscured if needed (through the creation of a proxy status on iNaturalist).

If a conservation status is applied to a coarse-level taxon, it will flow down and apply to all children nested within it; for example, a status applied to a genus will apply to all species in that genus. If a different status is applied to one of these species, however, it will override the genus status.

Conservation statuses can be explicitly associated with a place on iNaturalist so that only observations from that place are obscured, whilst observations in other locations remain unobscured. Multiple conservation statuses can also be applied to a single taxon, each associated with a different place. Just as statuses applied to finer-level taxa will override those applied to coarser-level parent taxa, statuses applied to finer-level places will override those applied to coarser-level places. For example, a status applied to a taxon for New South Wales will override a status applied to Australia if the two differ. Importantly, however, a finer-level place status will only override a coarser status if the former is applied to a **standard place** in iNaturalist (see page 30 for an explanation of iNaturalist places).

ii) **Geoprivacy.** Users can choose to manually obscure their own observations. This is done for a variety of reasons, including a desire to mask observations made at home or work for privacy, or wanting to protect populations of species that may be targeted by collectors at localised scales. The same changes to location and date data occur as for taxon geoprivacy.

iii) **Private.** This setting is the most extreme, and is used very sparingly. All geospatial data are removed from public view; not even the continent is visible. The date and time are removed, like the two forms of geoprivacy, but locality notes are also completely removed. Spatial-based searches within iNaturalist will not retrieve these records. This setting is largely used for taxa with a very high risk of collection or disturbance where locations may still be interpolated even if obscured. This setting is also sometimes applied by new users that misunderstand its consequences, instead interpreting its intended use to indicate an observation was made on private property such as their backyard. The private setting is almost always applied manually to individual observations, but in exceedingly rare cases, some taxa have their locations set to be automatically made private upon upload. The only such Australian example is the [Wollemi pine](#) (*Wollemia nobilis*), although currently all observations of this species on iNaturalist are of plants in cultivation in gardens.

No matter which geoprivacy setting is applied, each user can always see the true coordinates of their own observations when viewing any given individual observation. When viewing maps, however, a user's own observations will appear as obscured.

There are three main ways for researchers or other trusted users to access true coordinates of obscured observations (with the third only relevant for Australian observations):

1) **Trusting users.** After 'following' another user on iNaturalist, you can choose to tick a *Trust with hidden coordinates* box in your account settings. This allows that user to see the true locations of your obscured observations.

2) **Trusting projects.** Any user can set up a project on iNaturalist (see page 58 for an explanation of iNaturalist projects) such that prospective members, when joining the project, will be prompted with a question asking whether they trust the project administrators with their hidden coordinates. The options are different for **traditional** and **collection projects**, and are explained in detail from page 58.

3) **Requesting coordinates from the Atlas of Living Australia.** As of the end of 2023, twenty-one countries (or ‘nodes’) have signed up to the [iNaturalist Network](#). As explained by iNaturalist:

The iNaturalist Network is a collection of localized websites that are fully connected to the global iNaturalist community. Network sites are supported by local institutions that promote local use and facilitate the use of data from iNaturalist to benefit local biodiversity. They have access to true coordinates within their geographic areas that are automatically obscured from public view in order to better protect threatened species.

The Australian node of this network, **iNaturalist Australia**, is affiliated with, and connected to, the ALA (see page 69 for an explanation of the relationship between iNaturalist Australia and the ALA). Once every six months, the ALA receives the true coordinates for Australian observations that have had their locations obscured on iNaturalist. Access to these true coordinates can then be requested through the ALA for uses such as research and conservation. Importantly, the ALA only provides true coordinates for observations affected by taxon geoprivacy; any observations that have been manually obscured do not have their locations disclosed.

In some cases, true coordinates may also be provided through directly contacting iNaturalist staff, although it is still only the true coordinates of taxon geoprivacy-obscured observations that are provided.

Additional metadata fields

Each observation can have additional fields appended to provide valuable secondary data such as life history and phenology, species interactions, or traits. These fall into three categories:

1) **Tags.** Users can add any text string to one of their own observations as a tag.

2) **Annotations.** Six annotation types are available:

i) **Life Stage:** *adult, teneral, pupa, nymph, larva, egg, juvenile, subimago*

ii) **Sex:** *female, male, cannot be determined*

iii) **Plant Phenology:** *flowering, fruiting, flower budding, no evidence of flowering* (note that more options will be added in the near future)

iv) **Alive or Dead:** *alive, dead, cannot be determined*

v) **Evidence of Presence:** *feather, organism, scat, track, bone, molt, gall, construction, hair, leafmine, egg* (the [last four values were added on 27 March 2024](#), and at time of writing are not yet available in taxon page graphs)

vi) **Not Established:** *not established* ([this annotation was added on 27 March 2024](#), and at time of writing is only available for reptiles and amphibians)

Any user can add an annotation to any observation, but users can remove annotations from their own observations if they are incorrect. The five types are [not universally available across all taxa](#) (e.g., the plant phenology annotation is only available for plants); similarly, some individual options are only available for specific taxa (e.g., ‘teneral’ is only available for some insect groups). In some cases, multiple annotations within the same type can be added to the same observation (e.g., a plant observation can be annotated as flowering, fruiting, and flower budding simultaneously).

3) **Observation fields.** There are currently [more than 16,000 observation fields](#) on iNaturalist, and any user can create new fields (but checking existing fields for suitability is advised to avoid duplicates). They are similar to annotations, but offer complete flexibility and allow the addition of any kind of metadata to an observation. When creating an observation field, different datatypes can be specified, including text, numeric, and taxon, and allowed values can also be specified. Any user can add an observation field to any observation, although users can opt out of allowing other users to add one of these fields to their own observations.

Data Quality Assessment

Every observation has a Data Quality Assessment section where any user, including the observer, can up- or downvote qualifications. There are six qualifications that users can vote yes/no on:

- 1) **Date is accurate.** An uncommonly voted on qualification. Mostly used for out-of-season observations of taxa with well-understood, largely invariable phenology or life history. Inaccurate observation dates are usually human error rather than falsification.
- 2) **Location is accurate.** Used when the coordinates of an observation are clearly inaccurate. Use cases include when the satellite imagery on the map mismatches the background of a photograph (e.g., dense forest vs. suburban street, although caution should be exercised when making such a judgement given Google Maps imagery is often outdated for many locations), or when it mismatches the observed species (e.g., a terrestrial species far offshore in the ocean). These cases are often the result of GPS drift or similar errors.
- 3) **Organism is wild.** iNaturalist's focus is on wild organisms; although observations of captive or cultivated organisms are acceptable, they should be explicitly marked as not wild. This is the most used qualification by a significant margin, and also the most debated, as the distinction between wild and not wild is not always clear. When uploading an observation that, whilst qualifying as wild per iNaturalist's definition may nonetheless be ambiguous and possibly interpreted as non-wild by other users, it is useful to pre-emptively add a brief comment to provide context. [Common examples of captive/cultivated observations](#) include:

- i) Zoo animals.
- ii) Pets.
- iii) Clearly cultivated plants in pots or gardens that have been intentionally planted by someone. Importantly, a cultivated plant will remain as such for its entire lifetime, even if no longer tended to.
- iv) Physical specimens for which the observation date and/or location do not correspond to the original collection. For example, if an observer takes a photograph of a pinned butterfly, but sets the date and location to when/where the photograph was taken rather than when/where the butterfly was collected (and the two are different), this should be voted as not wild, as the observation does not represent an in situ encounter with the organism.

Examples of wild observations include:

- i) Any free-living organism in any location.
- ii) Parasites or epiphytes in/on a non-wild organism.
- iii) Organisms temporarily placed into captivity to allow photography. For example, fishes are often caught and placed into small tanks in the field to allow photographs to be easily taken.
- iv) Plants that have naturalised of their own accord from a cultivated parent plant. For example, a sapling that has self-seeded from a cultivated tree is considered wild.

4) **Evidence of organism.** This qualification is used when no organism is present in a photograph. This includes photographs of inorganic objects such as rocks, or landscape imagery such as photographs of the sky.

5) **Recent evidence of an organism.** iNaturalist's focus is not only on wild organisms, but also 'recent' organisms. Observations of fossils or sub-fossils are therefore voted as no recent evidence of organism.

6) **Evidence related to a single subject.** This qualification was first added in 2024, and is used when an observation contains photographs of multiple, unrelated species. For example, if an observation contains two photographs, one of a butterfly and one of a bird, with neither species appearing in both photographs, this qualification should be used.

There are five other data qualifications that are automatically voted on by the system: **Date specified**, **Location specified**, **Has photos or sounds**, **Has ID supported by two or more**, and **Community Taxon at species level or lower** (see page 27 for an explanation of the Community Taxon).

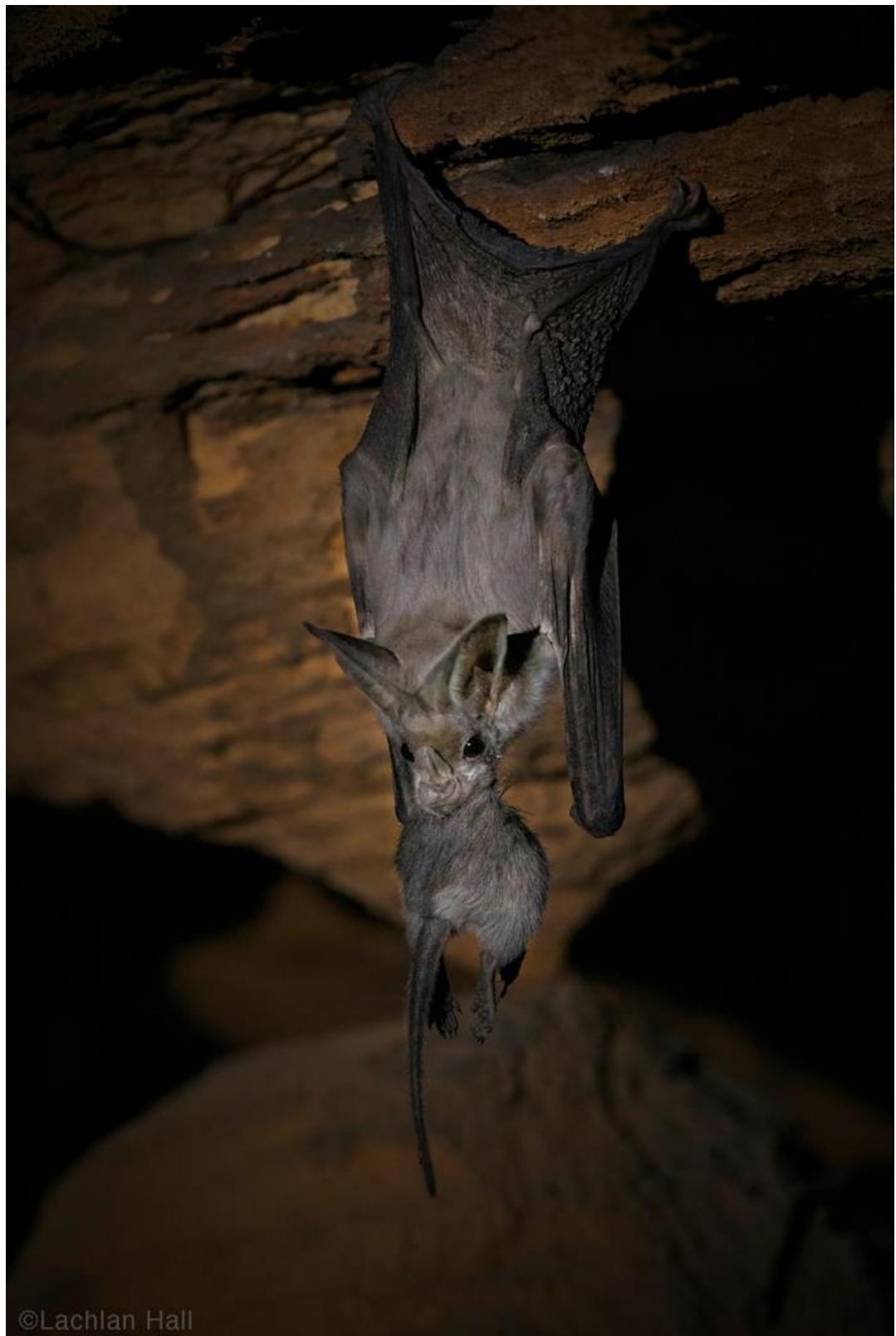
The Data Quality Assessment also contains a twelfth qualification, asking *Based on the evidence, can the Community Taxon still be confirmed or improved?* Users can vote Yes or No, it's as good as it can be. Voting on this qualification can influence the data grade of an observation (see *Data Grades* section below).

Data Quality Assessment [i](#)

Quality Grade: Research

The Quality Grade summarizes the accuracy, precision, completeness, relevance, and appropriateness of an iNaturalist observation as biodiversity data. Some attributes are automatically determined, while others are subject to a vote by iNat users. iNaturalist shares licensed "Research Grade" observations with a number of data partners for use in science and conservation.

Research Grade Qualification	Yes	No
 Date specified	✓	
 Location specified	✓	
 Has Photos or Sounds	✓	
 Has ID supported by two or more	✓	
 Date is accurate	✓ 	
 Location is accurate	✓ 	
 Organism is wild	✓ 	
 Evidence of organism	✓ 	
 Recent evidence of an organism	✓ 	
 Evidence related to a single subject	✓ 	
 Community Taxon at species level or lower	✓	
 Based on the evidence, can the Community Taxon still be confirmed or improved?		
<input type="checkbox"/> Yes	<input type="checkbox"/> No, it's as good as it can be	



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Australian false vampire bat ([Macroderma gigas](#)) feeding on a Kimberley rock rat ([Zyzomys woodwardi](#)).
[Photograph](#) by Lachlan Hall (@wild_lachie), All Rights Reserved.

Data Grades

All iNaturalist observations are categorised as one of three grades:

1) **Casual**. If an observation is missing one of the three fundamental components — **evidence, i.e., at least one photograph or sound file; an observation date; a set of coordinates** — it becomes Casual grade (represented by a grey label) and is considered **non-verifiable**. Equally, if any of the six votable data qualifications are downvoted, the observation becomes Casual, however, this only occurs if there are more downvotes than upvotes; if votes are equal, the observation will not be graded as Casual. Observations will also be graded as Casual if:

- i) The entire observation is flagged (see page 38 for an explanation of flags), or any individual file associated with the observation is flagged.
- ii) The option *No, it's as good as it can be* has more votes than counter-votes, and the **community ID** is at or above the rank of family. It is useful here to explain what the community ID (also referred to as the **community taxon**) is, and how it differs from the observation ID.

The **observation ID** is the identification displayed at the top of the observation, and the one used for that observation in searches and on maps. Consider an observation that has just been uploaded and only has a single identification (made by the observer) of *Banksia*. Currently, the observation does not have a community ID as no other users (the community) have added an identification yet. In this case, the observation ID is *Banksia*. A second user then identifies the observation as *Banksia integrifolia*; the observation ID now shifts to *Banksia integrifolia*. However, the observation now also has a **community ID**: in this case, the community ID is *Banksia*, as that is the identification that the community (all contributing identifiers) agrees on. In most cases the observation ID and the community ID eventually become the same thing.

Returning to point ii) above, consider an observation uploaded by an observer with an initial identification of Myrtaceae. A second user adds an identification of *Eucalyptus*, and votes *No, it's as good as it can be* to the question *Based on the evidence, can the Community Taxon still be confirmed or improved?* Although the observation ID in this case is *Eucalyptus*, the community ID for this observation is currently at a family level, Myrtaceae, so the observation will become Casual grade.

iii) The option *No, it's as good as it can be* has more votes than counter-votes, the observer has opted out of community ID, and the observation's community ID is not an ancestor or descendant of the observer's identification. Users can edit their account settings and choose to opt out of community ID universally, i.e., automatically opt out for all of their observations, or opt out manually on an individual observation basis. When a user opts out of community ID for an observation, identifications added by other users will not influence the observation ID; an observation initially identified as *Banksia* by the observer, and with an identification of *Banksia integrifolia* added by a different user, will remain as *Banksia* until the user chooses to agree with that identification. The pros and cons of this functionality are extensively discussed in [this iNatForum thread](#).

The system can also automatically render an observation Casual grade: *if there are at least 10 other observations of a genus or lower in the smallest county-, state-, or country-equivalent place that contains this observation and 80% or more of those observations have been marked as not wild/naturalized, the system will automatically apply a downvote for the qualification organism is wild*. This can be countervoted if the observation does indeed depict a wild organism.

2) **Needs ID**. If an observation contains all three fundamental components, and none of the data qualifications have been invoked, it will start its life as Needs ID (represented by a yellow label) when first uploaded. Needs ID is one of the two data grades that constitute **verifiable** observations. As long as an observation only has a single identification, it will remain at Needs ID. Once two or more identifications have been added to an observation, it may shift to Research Grade depending on a number of conditions.

3) Research Grade. This is the second grade (represented by a green label) constituting verifiable observations. It is important to note that attaining Research Grade does not necessarily mean that an observation will be used in any form of research, and of course nor does it guarantee that it is correctly identified. However, given Research Grade observations have been reviewed, by definition, at a bare minimum by at least one other user in addition to the observer, identification reliability is usually (but not always) higher across large sample sizes. Broadly, observations will shift from Needs ID to Research Grade when **at least two identifications have been added (including the observer's original identification), the community ID is at a species-level or finer, and more than two-thirds of identifiers agree on the taxon** (2/2, 3/3, 3/4, 4/5, 5/6, 5/7, etc.). Thus, if an observation has two agreeing identifications and a third identification that disagrees with these, it will **not** be Research Grade.

If new identifications are added to a Research Grade observation such that the ratio becomes equal to or drops below 2/3, it will revert to Needs ID. Equally, if a user votes Yes to the question *Based on the evidence, can the Community Taxon still be confirmed or improved?* in the Data Quality Assessment, a Research Grade observation will also revert to Needs ID until that vote is retracted, or countervoted with a No vote. For users that have opted out of community ID, their observations will only shift to Research Grade once the community agrees with their identification.

It is perfectly valid to add additional agreeing identifications to observations even if they have already reached Research Grade; these provide greater support for, and confidence in, the observation ID, especially if made by experts in that taxon.

If an observation has a community ID at any rank finer than family or coarser than species, it can still shift to Research Grade if a user votes No to the question *Based on the evidence, can the Community Taxon still be confirmed or improved?* in the Data Quality Assessment.

Provided they are also licensed appropriately, Research Grade observations are exported to the [Global Biodiversity Information Facility](#) (GBIF), the largest biodiversity data aggregator in the world. This export usually occurs approximately once per week.

Copyright licensing

Eight different [copyright license options](#) can be applied to observations and media:

- i) CC0 – No Copyright
- ii) CC BY – Attribution
- iii) CC BY-NC – Attribution-NonCommercial
- iv) CC BY-NC-SA – Attribution-NonCommercial-ShareAlike
- v) CC BY-NC-ND – Attribution-NonCommercial-NoDerivs
- vi) CC BY-ND – Attribution-NoDerivs
- vii) CC BY-SA – Attribution-ShareAlike
- viii) No license – All Rights Reserved

When a new account is first created, the default license is CC BY-NC for observations and media (photographs, sound files). Photographs, sound files, and the observations themselves have separate licensing, and users can edit each of these licenses independently at any time in their account settings. Users also have the choice to either only apply the new licensing to all future observations and/or media, or also change the licensing retrospectively for all of their existing observations and/or media.

License selection has important implications for the use of observations and media outside of iNaturalist:

- i) CC0, CC BY and CC BY-SA allow media to be used in Wikimedia.
- ii) CC0, CC BY and CC BY-NC allow observations to be exported to GBIF.

If a user sets their observations to a less restrictive license, and their photographs and/or sound files to a more restrictive license, their observations will still be exported to GBIF, but without any media (see page 72 for an explanation of how licensing choice influences data sharing with the Atlas of Living Australia). For example, professional photographers that sell their images outside iNaturalist can choose to retain the rights to their photographs, but set a less restrictive license for their observations and thus still contribute observation data to GBIF and the ALA.

Licensing

Licensing your content gives anyone the legal right to use it without asking your permission if they abide by the terms of the license. In addition, iNaturalist includes your Creative Commons-licensed content in regularly-updated archives produced for select partner organizations interested in our data. For example, we include No Copyright (CC0), Attribution (CC BY), and Attribution-NonCommercial (CC BY-NC) records in the archive we generate for the Global Biodiversity Information Facility (GBIF), an international, inter-governmental organization that compiles and distributes biodiversity information from around the world. [Learn what these licenses mean](#)

Default observation license



Update existing observations with new license choices

Default photo license



Update existing photos with new license choices

Each of these boxes must be ticked to retrospectively apply any new copyright license to existing observations

Default sound license



Update existing sounds with new license choices

Places

There are two types of geographic place in iNaturalist used in spatial searches that are represented by explicitly defined, saved boundaries:

1) **Standard Places.** This is a set of existing, standardised places. They fall into three main types:

i) **Continents.** iNaturalist follows the widely used seven continent scheme, including the splitting of Russia across Europe and Asia. Each continent on iNaturalist also includes a 0.05° coastal buffer.

ii) **Administrative units.** These include three types of unit:

a) '**Countries**'. Defined by ISO country codes, and thus external territories such as Norfolk Island or Christmas Island are counted as countries. There are 253 of these units on iNaturalist.

b) '**States**'. These include both states and their equivalents (regions, provinces, etc.). There are ~3,000 of these units on iNaturalist.

c) '**Counties**'. These include both counties and their equivalents (e.g., shires). There are ~40,000 of these units on iNaturalist.

Most of the polygons used for these three units are derived from the [Database of Global Administrative Areas](#) (GADM), except for the United States and Mexico where national data were used. All administrative units have a 0.05° coastal buffer included around their borders.

iii) **Partner places.** These include the 429 national parks within the United States.

2) **Community Curated Places.** These are custom-made places imported into iNaturalist by users via KML file, with many thousands currently on the platform.

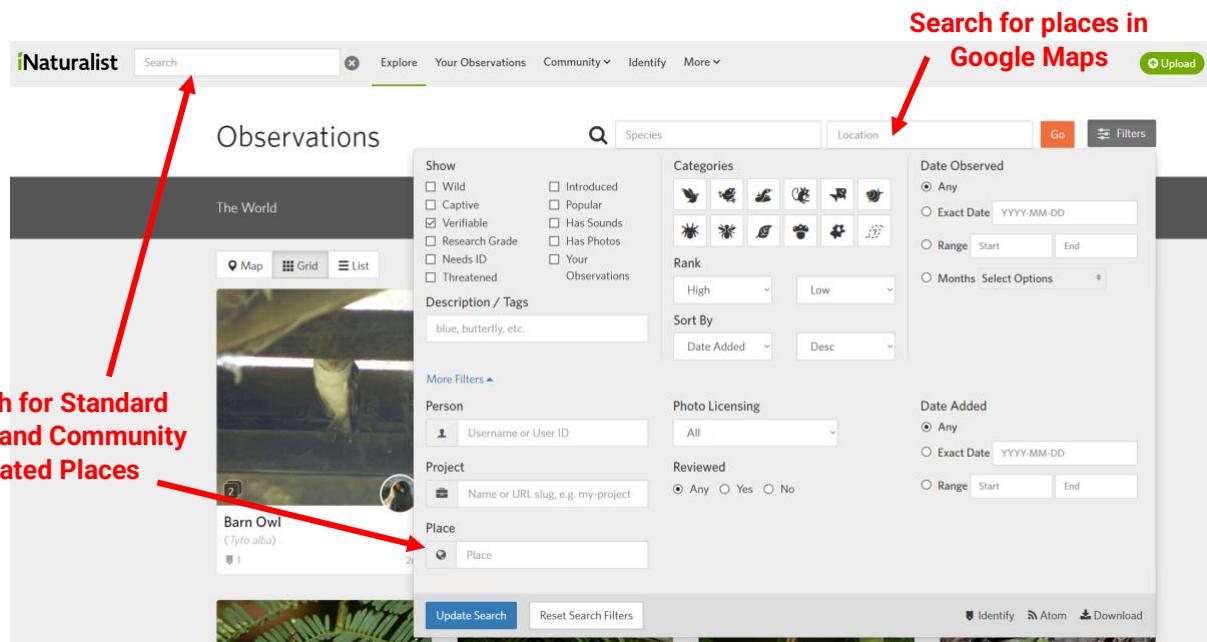
There are a number of important differences between standard and community curated places:

	Standard Places	Community Curated Places
Creation	New places may be added in future by staff (e.g., units such as national parks), but otherwise all standard places are already loaded.	New places can be added by any user, albeit with some restrictions. Before adding a new place, users must have uploaded at least fifty verifiable observations to iNaturalist (these are not required to be within the place). Newly created places cannot contain more than 100,000 existing observations, and cannot exceed an area roughly equivalent to the size of Texas (~700,000 km ²). New places are created by importing a KML file (which is easily created in software such as Google Earth or QGIS) into iNaturalist; this file cannot exceed 1 MB for non-curators, with curators having a 5 MB allowance. Users are restricted to creating a maximum of three new places per day.
Editing	Only editable by staff.	Editable by the place creator or by any curator. Edits by curators should be discussed before execution given these may have important implications for functionality such as obscuration.
Definition	Standardised places representing continents, administrative units, and US national parks.	Provided the restrictions listed above are adhered to, community curated places have no limitations and can be uploaded for any area, anywhere in the world; whilst they often represent explicitly defined places

Indexing	If an observation falls within the boundaries of a standard place, it will always be indexed within that place and appear in searches, regardless of how large the accuracy circle is, or indeed even if the observation's public coordinates are 'bounced out' of the place's borders due to obscuration.	such as islands, reserves or plots of land, they can be idiosyncratic. Observations may not be indexed within, or appear in searches for, community curated places under some conditions. Each community curated place has an imaginary bounding box around the actual place boundaries that touches all of the place's extremities. If an observation is made within the place, but its accuracy circle breaks this boundary box, it will not be indexed within the place. Equally, if an observation is obscured and its obscuration rectangle breaks the bounding box, it will not show as occurring in that place. After a new place is created, it may take up to a day, especially for large places containing many observations, for it to be processed.
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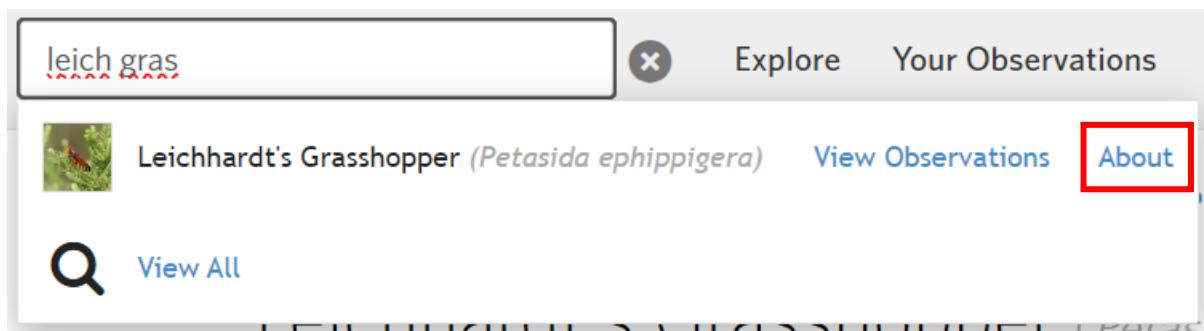
All iNaturalist places are represented by a unique numerical identifier. The identifier for any given place can be found by searching for said place, and checking the URL for the 'place_id' value. For example, the URL for all observations within Norfolk Island looks like this:

https://www.inaturalist.org/observations?place_id=7333. Standard and community curated places are only searchable within iNaturalist through the major search bar at the top left of any page, or through the *Place* filter under the Explore tab (see page 43 for an explanation of the Explore tab). The main *Location* search bar under the Explore tab only searches within Google Maps, and thus represents an additional set of places usable in searches. This search bar will not return results for any community curated place that is not also recognised within Google Maps.



Taxa

Every taxon at every rank in iNaturalist has its own page; this page is accessed by clicking *About* when searching for that taxon.



Just as each place on iNaturalist is represented by a unique numerical identifier, so too is each taxon represented by a unique numerical identifier, which can be found by checking the URL. For example, the URL for Leichhardt's grasshopper (*Petasida ephippigera*) looks like this:

<https://www.inaturalist.org/taxa/761409-Petasida-ephippigera>. Each taxon page contains a wealth of information:

1) **Photographs.** The main, large photograph is the representative thumbnail image. This is the default photograph that is shown when searching for that taxon in any part of iNaturalist. When the first observation of a taxon on iNaturalist becomes Research Grade, the thumbnail image will be automatically populated after ~24 hours, but this photograph can be changed at any time by any user. A thumbnail image can also be manually assigned for taxa that do not yet have at least one Research Grade observation. It should ideally be in focus and legible, including at the small size it will appear in many parts of iNaturalist (e.g., next to identifications), and show the most diagnostic features possible. The other photographs shown in a row beneath the thumbnail image (up to five) should ideally showcase any morphological variation that may exist within the taxon, including different life stages, phenology, or sexual dimorphism. For coarse-level taxa such as phylum or family, eight small thumbnail images are shown here. The *View More* button allows users to browse all photographs of that taxon across the platform, and filter them based on annotations (life stage, sex, etc.), photo licensing, and quality grade.

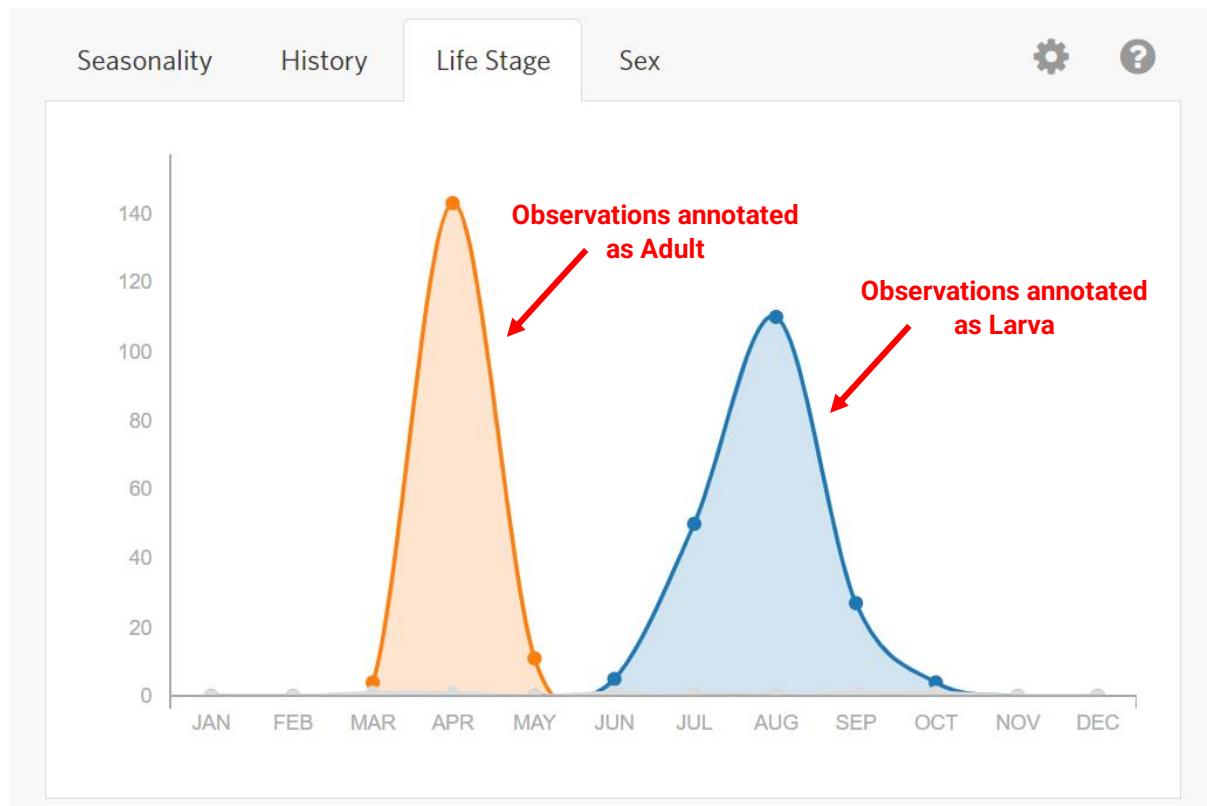
2) **User statistics.** The top observer, top identifier, datestamp of the most recent observation, and total number of all observations for the taxon are displayed.

3) **Charts.** All taxa have two charts, with some having three or four:

i) **Seasonality.** This chart plots total number of observations against each month. This chart is displayed for all taxa.

ii) **History.** This chart plots total number of observations against each year, starting from the first year of observation on iNaturalist. This chart is displayed for all taxa.

iii) **Annotations.** Depending on the taxon, a taxon page can also have an additional one or two charts from a pool of three: **Life Stage**, **Sex** and **Plant Phenology**. These are constructed based on annotations added to individual observations, and plot total number of observations for each annotation value against each month. These charts can provide valuable insights into life history. For example, the Life Stage chart for the [pasture day moth](#) (*Apina callisto*) shows that observations of adult moths and observations of larvae are mutually exclusive in time, with adults being observed from March to May, and larvae from June to October. There are currently no iNaturalist observations of pupae of this species as they pupate underground.



4) **Map.** The map displays all verifiable observations of the taxon that have an accuracy value not exceeding the diagonal of a bounding box of 0.2° latitude and 0.2° longitude (usually ~ 30 km). Observations with a geoprivacy of Private are not mapped. A green overlay will appear on the map over all countries with at least one Research Grade observation of that taxon; zooming into the map will cause this overlay to shift to states (or equivalent) and then to counties (or equivalent). When zoomed out, all individual observations appear as squares on the map. When zooming in, they resolve into one of two marker types:

- i) **Pins.** These represent observations with open geoprivacy.
- ii) **Circles.** These represent observations that have been obscured.

Solid markers represent Needs ID observations, whilst markers with a white dot in their centre represent Research Grade observations.

Multiple different map layers can also be turned on or off to display or hide additional records, including non-verifiable observations, observations without media, captive/cultivated observations, and records from GBIF.

5) **About.** If a Wikipedia article exists for the taxon, it will be automatically imported and displayed here. This tab also provides links to other biodiversity databases, such as [Biodiversity Heritage Library](#), [GBIF](#), and [BOLD Systems](#), and indicates whether the taxon is included in the current Computer Vision model (see page 51 for an explanation of Computer Vision).

6) **Taxonomy.** This tab contains three main sections:

- i) **Full taxonomy.** All of the taxon's parent taxa are displayed here in a nested hierarchy. All children taxa contained within the immediate finer taxonomic level are also listed (e.g., all species within the genus, or all subspecies within the species).

ii) **Taxonomic details and changes.** Links are provided to the Taxon Framework Relationship (see page 39 for an explanation of Taxon Framework Relationships) for the taxon (if one exists), and to all taxon swaps (both drafted and committed) that include the taxon as either an input or output.

iii) **Names.** This section displays all names that have been created in iNaturalist for the taxon, including synonyms (denoted by strikethrough text) and common names in each language. When adding a new common name, users have the option to add that name to a specific country or region on iNaturalist where multiple languages may be spoken. Multiple common names can also be added under the same language; specifying different countries or regions for each name will ensure that name is displayed to relevant users. For example, the plant species *Tetragonia tetragonoides* currently has four common names listed under English, each set to display for different places: warrigal greens (Australia), native spinach and kōkihi (New Zealand), and New Zealand spinach (North America, Southern Africa, United Kingdom). Names should only have a place associated with them if differences in usage across regions actually exist. Where multiple common names are added under the same language and the same place, or no places are specified, the names can be ranked to dictate which is displayed. Whilst any user can add a new common name for a taxon, only curators can edit or re-prioritise existing names. Users can edit their account settings to view common names from up to three different languages anywhere a name is displayed (e.g., individual observations). Settings can also be changed to view scientific names before common names, or scientific names only.

Names

Language / Type	Name	Action
Chinese (simplified)	紫茎泽兰	Edit
Chinese (simplified)	破坏草	Edit
Chinese (traditional)	假藿香薺	Edit
Danish	Rudebladet Hjortetrøst	Edit
English	Crofton Weed	Edit
English	sticky snakeroot	Edit
English	canyon kelp	Edit
English	Maui pamakani	Edit
English	Thoroughwort	Edit
English	Sticky eupatorium	Edit
English	Mexican devil	Edit
Portuguese	Abundância	Edit
Russian	Агератина желёзконосная	Edit
Scientific Names	Ageratina adenophora	Edit
Scientific Names	Eupatorium adenophorum Synonym	Edit
Spanish	Flor de espuma	Edit
Thai	สาวบทม	Edit

7) **Status.** This tab only appears for taxa at a species level or finer, and contains two main sections:

i) **Conservation Status.** Listed here are all conservation statuses that have been added to iNaturalist for this taxon. For each status, the associated place, the listing, the source, and whether taxon geoprivacy has been set to open, obscured or private are all indicated, as well as whether the status has cascaded down from a parent taxon (any status will cascade to all children taxa, although statuses applied directly to a child will override any existing parent status).

Conservation Status

Place	Conservation Status	Source	Taxon Geoprivacy 
 Globally	 near threatened (NT) Updated by thebeachcomber on December 22, 2023	IUCN Red List 	Open
 New South Wales, AU	 Vulnerable Added by craig-r on January 18, 2022	New South Wales Office of Environment and Heritage	 Open
 Queensland, AU	 VU Added by craig-r on January 18, 2022	Queensland Nature Conservation Act 1992	 Obscured
 South Australia, AU	 Endangered Added by peggydnew on February 10, 2023 Updated by peggydnew on February 10, 2023	South Australia Department for Environment and Water	 Open

ii) **Establishment Means.** Listed here are all establishment means derived from iNaturalist **checklists**. Each standard place, and many community curated places, has its own checklist (although when creating the latter, it is possible to leave the *Check lists allowed?* box unticked). Once a species has at least one Research Grade observation within a place, it will automatically be added to that place's checklist. Species with only Needs ID observations can be manually added to checklists. Additional checklists can be created for any place with an existing checklist, although these are not automatically populated. Once a taxon has been added to a checklist, any user can set an establishment means for that taxon in that place: **native**, **endemic**, or **introduced**. Establishment means can also be cascaded into descendant places: if a user sets a species to introduced for the [Australian checklist](#), all checklists for places within Australia (states, local government areas, etc) that also contain that species and for which the establishment means is currently set to unknown, will inherit the introduced status. Alternatively, curators have access to a button that will actively override all establishment means of descendant places, and replace them with the designated status for the parent place.

A maximum of 100 establishment means can be displayed on a taxon page, although some taxa have establishment means set for hundreds, or even thousands, of checklists. Two establishment means are shown on individual observations: endemic as a white star within a green oval, and introduced as a white exclamation mark inside a pink oval. Just as conservation statuses applied to finer-level places or taxa will override those applied to coarser-level places or taxa, so too will establishment means applied to finer-level places override those applied to coarser-level places (e.g., for Western Australian observations of the plant species [sweet pittosporum](#) (*Pittosporum undulatum*), the introduced status set for Western Australia overrides the native status set for Australia).



[Acanthanura sp.](#) [Photograph](#) by Nick Porch (@invertophiles), CC BY-NC.



[Cibraria cancellata.](#) [Photograph](#) by Sarah Lloyd (@sarahlloyd), All Rights Reserved.

- 8) **Trends.** This tab only appears for taxa at a level coarser than species, and shows the most-observed children taxa in the last month.
- 9) **Similar Taxa.** This tab only appears for taxa at the ranks of genus or species. For species, it will show other species commonly misidentified on iNaturalist as that species, and for genera it will show other taxa (both genera and species) commonly misidentified on iNaturalist as that genus.
- 10) **Curation.** This button expands to show a maximum of six options, two of which are only visible to curators (see next section):
- i) **Flag for Curation.** Allows any user to flag the taxon for a variety of requests, including the addition/deletion/reprioritisation of common names, conservation statuses, or establishment means, obscuring or deobscuring the taxon, adding new children taxa, or initiating a discussion about taxonomic changes.
 - ii) **View Flags.** Allows any user to view all flags ever created for the taxon, both resolved and unresolved. This option will only appear if at least one flag has ever been made for the taxon.
 - iii) **Edit Photos.** Allows any user to select a new thumbnail image, and rearrange the other photographs displayed on the taxon page (or select new photographs).
 - iv) **Create an Atlas.** Allows curators to define the countries and regions in which this species is known to occur, facilitating atlased taxon swaps (see page 40 for an explanation of taxon swaps). This option only appears for taxa at a species level or finer.
 - v) **Edit Taxon.** Allows curators to directly edit numerous taxon attributes, including regrafting the taxon to a new parent (e.g., changing its direct parent from a genus to a subgenus to facilitate more precise classification), inactivating the taxon, and adding new conservation statuses. Taxon names with minor spelling or typographical errors can only be edited by the user who created them and must otherwise be amended via a taxon swap.
 - vi) **History.** Allows any user to view a comprehensive edit history for the taxon dating to February 2022 (when this functionality was introduced), including explanatory notes provided with each change (for some edits, a brief explanation is mandatory) and the user who executed the change.

There is also a ‘secret’ hidden tab, *Interactions*, that can be viewed by appending the text string `?test=interactions` to the end of a taxon page URL for taxa at a species level or finer. For example, the URL for the [great white shark](#) (*Carcharodon carcharias*) would look like this:
<https://www.inaturalist.org/taxa/50873-Carcharodon-carcharias?test=interactions>. This tab shows species interactions involving the taxon, with data derived from the platform [Global Biotic Interactions](#) (GloBI). GloBI’s data are in part drawn from some observation fields on iNaturalist.

[Map](#)
[About](#)
[Interactions](#)
[Taxonomy](#)
[Status](#)
[Similar Species](#)

⚙️ Curation ▾

- preysOn: 10 Species
 - *Arctocephalus pusillus*
 - *Mirounga angustirostris*
 - *Bathypterosa physalus*
 - *Phoca vitulina richardii*
 - *Vertebrata*
 - *Arctocephalus forsteri*
 - *Phocoidea*
 - *Aptychotrema rostrata*
 - *Zalophus californianus*
- eatenBy: 1 Species
 - *Orcinus orca*
- preyedUponBy: 1 Species
 - *Orcinus orca*
- eats: 2 Species
 - *Mirounga angustirostris*
 - *Zalophus californianus*

About Interactions

Most organisms interact with other organisms in some way or another, and how they do so usually defines how they fit into an ecosystem. These interactions come to us from Global Biotic Interactions (GloBI), a database and webservice that combines interaction data from numerous sources, including iNaturalist. You can actually contribute to this database by adding the "Eating", "Eaten by", and "Host" observation fields to observations that demonstrate those interactions.

Learn More

Global Biotic Interactions (GloBI)

About Biological Interactions

Curators

Several hundred iNaturalist users hold the role of **site curator**. Curators have privileges not available to non-curators, such as the ability to change site taxonomy (including adding new taxa or editing existing taxa), add conservation statuses to taxa, and obscure or deobscure taxa. In addition to these responsibilities, curators also act as moderators: among numerous roles, they can resolve flagged content, hide inappropriate content such as insulting or sexually explicit comments or photographs, and suspend other users for breaching iNaturalist's [Terms of Use](#) or [Community Guidelines](#). Curators are not obliged to perform both taxonomic and moderator duties, with many curators specialising only in the former, and some only performing the latter. Identifications made by curators do not hold extra weight. Curators can have their role revoked by staff if they breach the guidelines themselves. Users must fill out an [application form](#) to apply to become a curator.

Two other roles with special privileges also exist: **staff**, who can change anything on the platform, and **network site admins**, who help administer each iNaturalist Network node.

Flags

Any user, curator or otherwise, can flag content on iNaturalist; these flags are reviewed and resolved by curators. Flags are generally used for two main purposes:

1) Bring attention to content that breaches iNaturalist's Terms of Use or Community Guidelines.

These flags are usually added to content such as photographs or sound files, comments, or observations themselves. When flagging such content, users can choose from four reasons:

i) **Spam**. Content is considered spam if it is clearly intended to make money, such as advertisements for products or services, or links that redirect users to spurious websites. Content flagged as spam will automatically be hidden from public view, and users with three records flagged as spam will be automatically suspended.

ii) **Offensive/Inappropriate**. Any content that is insulting, threatening, hate speech, sexually explicit involving humans, violates a user's privacy, or is defamatory or libelous should be flagged. If sufficiently inappropriate, curators can hide such content, and staff can delete such content.

iii) **Copyright Infringement**. Unless explicitly given permission, users must only upload photographs and sound files taken by themselves. Content created by other users but uploaded without their permission, such as passing images taken from the Internet as your own, will be flagged.

Any media file flagged for copyright infringement is automatically hidden from public view and replaced with the text **COPYRIGHTED MEDIA REMOVED**.

iv) **Other.** This category allows the flagging of content that does not necessarily fall under one of the previous three categories. Examples include the creation and use of a sock puppet account — that is, an additional account created to confirm your own identifications, circumvent suspensions, or anonymously abuse other users — or uploading machine generated content (e.g., images created by generative AI).

2) **Bring attention to taxonomic or taxon-related content that requires addition, editing or updating.** iNaturalist is an observational database, not a nomenclatural database; consequently, some taxa are missing from the platform, especially more esoteric or recently described taxa. If a user encounters a missing taxon, they can flag the parent taxon and request its addition. Similarly, users can flag taxa to request the implementation of taxonomic changes such as splitting, lumping, or transferrals, the addition or reprioritisation of common names, and the addition or removal of conservation statuses and obscuration. These flags not only bring these requests to the attention of curators, but also facilitate public discussions on their merits and how they should be implemented.

Taxonomic authorities

Because iNaturalist is a global platform, standardised taxonomic authorities are designated for many taxa to try maintain as much consistency as possible. Consider the plant species [bitou bush](#). In Australia, where it is an invasive species, the accepted scientific name is *Chrysanthemoïdes monilifera*; in its native range in South Africa, the accepted scientific name is instead *Osteospermum moniliferum*. For any given taxon in any given database, one name must be chosen as the accepted name; iNaturalist takes the approach of, where possible, referring to global databases rather than regional databases to make decisions on which scientific names to use and maximise consistency. External authorities used by iNaturalist include [Plants of the World Online](#) (POWO), [The Clements Checklist of Birds of the World](#), and [The World Spider Catalog](#). A list of the current external taxonomic authorities referred to by iNaturalist is available [here](#). For some taxa, especially many invertebrate groups, there is no prescribed authority as, in many cases, one does not exist. For these taxa, curators refer to regional authorities or the primary literature.

From an Australian perspective, the use of global authorities can sometimes raise concerns by taxonomists and other researchers when the names used by iNaturalist do not match names used in Australia, particularly in relation to Australia's two major databases: the [Australian Plant Census](#) (APC) and the [Australian Faunal Directory](#) (AFD). However, there are two important points to make here:

1) Whilst there are some taxonomic conflicts between Australian and global authorities, most of these are at a rank of genus or finer, with high concordance at coarser ranks. Even for finer ranks, the actual number of discrepancies is objectively quite low for the large majority of taxa; these differences can sometimes seem more extensive than they truly are due to some infrequent, but high profile, exceptions where large discrepancies do genuinely exist. For example, whilst the APC accepts all of the 'bottlebrush' genera — such as *Calothamnus*, *Callistemon*, and *Regelia* — as valid names, POWO and iNaturalist lump all of them into *Melaleuca*.

2) Whilst external authorities are ideally adhered to where possible, deviations are acceptable as long as they have been discussed, have strong support, and are clearly documented on iNaturalist. This documentation is done through [Taxon Framework Relationships](#), which show the relationship between iNaturalist and an external authority for a given taxon. Any user wanting to either add a new taxon or edit an existing taxon in iNaturalist to deviate from an external authority should create a flag to facilitate a discussion.

Taxonomic changes/taxon swaps

Where possible, changes to iNaturalist's taxonomy should be discussed before implementation to ensure that the change is robust and well-supported. These discussions usually occur on flags. Curators can also create draft taxon swaps to facilitate additional feedback and visualise the exact consequences of the swap, including the ability to analyse unintended disagreements (e.g., consider an observation where one user has added an identification of *Genus1* and a second user has added an identification of *Genus1 species1*. If a taxon swap transfers *species1* into *Genus2*, and assuming *Genus1* is still a valid genus containing other species, then the swap will create an unintended disagreement between the two identifications).

Taxon swaps can also be **atlased** to facilitate more complex changes in an automated, biogeographically-informed way. For example, the crested shrike-tit (*Falcunculus frontatus*), a strikingly coloured Australian bird, was previously considered a single species with three geographically mutually exclusive subspecies: one in southwestern Western Australia (*Falcunculus frontatus leucogaster*), one in the Top End and the Kimberley (*Falcunculus frontatus whitei*), and one broadly distributed in eastern and southeastern Australia (*Falcunculus frontatus frontatus*). Recently, each subspecies was recognised as a full species: [western shrike-tit](#) (*Falcunculus leucogaster*), [northern shrike-tit](#) (*Falcunculus whitei*), and [eastern shrike-tit](#) (*Falcunculus frontatus*). Because the three entities have non-overlapping distributions, an [atlased taxon swap](#) could be executed on iNaturalist such that observations of crested shrike-tits were automatically assigned new identifications based on their location, removing the need to manually reidentify hundreds of observations. Atlased swaps can also be used to push observations back to a coarser identification where multiple taxa are sympatric; if the atlases for two or more output taxa of a swap overlap in space, these observations will be automatically reidentified to the finest common denominator taxon.

Whenever a taxonomic change occurs and an entity is updated to a new name, the old name is retained as a synonym and is fully searchable. Synonyms can also be manually added to taxa independent of changes.

Taxonomic Split 118985 (Committed on 2022-12-24)

[Update your content](#)
[Edit](#)

Each of the three monotypic groups is recognized as a species, based on differences in plumage and on morphometrics (Schodde and Mason 1999). The group Crested Shrike-tit (Eastern) *Falcunculus frontatus frontatus* becomes Eastern Shrike-tit *Falcunculus frontatus*; the group Crested Shrike-tit (Western) *Falcunculus frontatus leucogaster* becomes Western Shrike-tit *Falcunculus leucogaster*; and the group Crested Shrike-tit (Northern) *Falcunculus frontatus whitei* becomes Northern Shrike-tit *Falcunculus whitei*.

Reference:

Schodde, R., and I.J. Mason. 1999. The directory of Australian birds. Passerines. CSIRO Publishing, Canberra.

Source: Clements Checklist v2022 (Citation) | Group : *Falcunculus frontatus* split

Added by maxkirsch on December 25, 2022 09:54 AM | Committed by maxkirsch on December 24, 2022

 <p><i>Falcunculus frontatus</i> 8585 0 observations  Range Inactive </p> <p>Covered by a taxon framework for Class Aves Sourced to Clements Checklist v2021 Relationship: Unknown</p>	<p>split into</p> <table border="0"> <tr> <td style="vertical-align: top;">  <p><i>Falcunculus frontatus</i> 1435879 600 observations  Range Active  </p> <p>Covered by a taxon framework for Class Aves Sourced to Clements Checklist v2021 Relationship: match</p> </td> <td style="vertical-align: top; padding-left: 10px;">  <p><i>Falcunculus whitei</i> 1435880 2 observations  Range Active  </p> <p>Covered by a taxon framework for Class Aves Sourced to Clements Checklist v2021 Relationship: match</p> </td> <td style="vertical-align: top; padding-left: 10px;">  <p><i>Falcunculus leucogaster</i> 1435881 37 observations  Range Active  </p> <p>Covered by a taxon framework for Class Aves Sourced to Clements Checklist v2021 Relationship: match</p> </td> </tr> </table>	 <p><i>Falcunculus frontatus</i> 1435879 600 observations  Range Active  </p> <p>Covered by a taxon framework for Class Aves Sourced to Clements Checklist v2021 Relationship: match</p>	 <p><i>Falcunculus whitei</i> 1435880 2 observations  Range Active  </p> <p>Covered by a taxon framework for Class Aves Sourced to Clements Checklist v2021 Relationship: match</p>	 <p><i>Falcunculus leucogaster</i> 1435881 37 observations  Range Active  </p> <p>Covered by a taxon framework for Class Aves Sourced to Clements Checklist v2021 Relationship: match</p>
 <p><i>Falcunculus frontatus</i> 1435879 600 observations  Range Active  </p> <p>Covered by a taxon framework for Class Aves Sourced to Clements Checklist v2021 Relationship: match</p>	 <p><i>Falcunculus whitei</i> 1435880 2 observations  Range Active  </p> <p>Covered by a taxon framework for Class Aves Sourced to Clements Checklist v2021 Relationship: match</p>	 <p><i>Falcunculus leucogaster</i> 1435881 37 observations  Range Active  </p> <p>Covered by a taxon framework for Class Aves Sourced to Clements Checklist v2021 Relationship: match</p>		



Southern green python (*Morelia viridis*). *Photograph* by Christina Zdenek ([@cnzdenek](#)), CC BY-NC.

User Profiles

All accounts have a personal profile displaying user information and site usage statistics, including:

- 1) **Username and name.** Most users choose a username that either matches their real name (e.g., [@ben_travaqlini](#), [@jackiemiles](#), [@dnicolle](#)) or reflects an interest or area of expertise (e.g., [@thebeachcomber](#), [@pennywort_man](#), [@eremophila](#)). Although there is no obligation for a user to include their real name on their profile, it can be useful to do so (e.g., allowing other users to verify the credentials of professional taxonomists).
- 2) **Dates.** Include the user's account creation date, and date last active. A *Monthly Supporter* badge indicates users that support iNaturalist through donations.
- 3) **Network affiliation.** Indicates whether a user is affiliated with one of the twenty-one nodes of the iNaturalist Network, such as iNaturalist Australia.

4) **Bio.** Although not required, users can fill out a personal bio detailing their area(s) of expertise, interests, general background and experiences, and any other information they deem relevant. Users can also embed a link in their bio to their ORCID profile.

5) **Following.** Displays the total number of other accounts being followed by the user, and a sample of eight recently followed accounts. Users can visit another user's profile and choose to follow them; doing so will ensure all of their observations appear on your dashboard when uploaded, allowing you to closely follow their records.

6) **Favourite Taxa.** Users can select up to eight taxa to display here.

7) **User statistics.** Include number of observations, species observed, identifications made (including identifications of both verifiable and non-verifiable observations), journal posts (see page 57 for an explanation of Journal Posts), lists, and followers.

8) **Admin Tools.** Curators have access to an admin button on the profile of any user, allowing them to *Suspend User*, *Flag As Spammer*, view the user's *Moderation History*, or view all *Comments* made by that user. Curators only have access to the *Comments* page on their own profile.

Users can also edit their account settings to update or change their personal details, relationships with other users, and various site functionalities.

dnicolle Message Follow dnicolle Mute

Profile Observations Calendar IDs Lists Journal Favorites Projects



Dean Nicolle

Joined: Apr 15, 2020 Last Active: Mar 8, 2024 iNaturalist Australia

Botanist, arborist and ecologist, specialising in the eucalypts (the genera *Angophora*, *Corymbia* and *Eucalyptus*). Creator/curator of *Currency Creek Arboretum* in South Australia. Published numerous peer-reviewed articles and books on eucalypts - see <http://www.dn.com.au/dean-nicolle.html>

I've taken over 8000 herbarium specimens and/or photographic records of eucalypts in the wild, including of every Australian species.

In a project supported by *Eucalypt Australia* beginning in July 2023, I will be uploading all of my photographic records of eucalypts to iNaturalist. I will also be upgrading all my existing observations on iNat to include their field notes and additional diagnostic photos including leaf venation, coppice leaves, and seedlings grown from the observation. It will include representatives from every eucalypt species and subspecies. A full list of eucalypt species can be found here: <http://www.dn.com.au/Classification-Of-The-Eucalypts.pdf>

Following 15 People

 tonyrddd 445	 devito 286	 russellcummie 16479	 montgomeryh 3266
 bean_ar 1216	 sandy_horne 957	 russellbarrett 1443	 cveld 454
View All			

Observations 4612
Species 885
Identifications 27786
Journal Posts 0
Lists 1
Followers 179

Explore tab

The [Explore tab](#) is the main interface used to search for and view observations from anywhere in the world. When first visiting Explore, only **verifiable observations** are shown by default, that is, all Needs ID and Research Grade observations. By default, observations are shown in descending order by date added to iNaturalist. There are three ways to view observations in Explore:

1) **Map.** Shows a world map, with satellite imagery (provided by Google Maps) toggleable on or off. Observations are shown on the map as orange squares, which then resolve into pins (open records) or circles (obscured records) when zooming in. When sufficiently zoomed in, these markers also change colour to indicate higher taxonomy: green (plants), pink (fungi), brown (Chromista), purple (protozoans), orange (molluscs, arachnids, insects), blue (amphibians, birds, ray-finned fishes, mammals, reptiles, other animals) or grey (bacteria, 'unknowns' [no identification added]). Users can draw a rectangle or circle on the map as a temporary spatial filter, or choose the filter *Redo search in map*, which filters to a box representing the current map view. Observation thumbnails are also shown in a narrow inset window.

2) **Grid.** This is the default view when visiting Explore for the first time, although each view is sticky. This view provides access to four main subviews/metrics:

i) **Observations.** Total number of observations for the current set of search filters. This is the main subview, with observations organised into pages of thumbnails. Each page shows 96 observations in rows of four. In this view, each observation thumbnail has a number in the bottom left corner of the photograph; this indicates the total number of photographs attached to the observation. The luggage tag symbol and associated number indicates the number of active identifications, including from the observer, on the observation. The time or datestamp at the bottom right of each thumbnail indicates when the organism was originally observed, not when the observation was added to iNaturalist.

Explore Your Observations Community Identify More

Observations

Banksias Location Go Filters

Western Australia 7,496 OBSERVATIONS 136 SPECIES 380 IDENTIFIERS 1,098 OBSERVERS

Map Grid List

Observation	Species	Research Grade	Observation Date
	Parrot Bush (<i>Banksia sessilis</i>)	Research Grade 4	5mo
	Banksias (Genus <i>Banksia</i>)	Research Grade 1	7y
	Oak-Leaved Banksia (<i>Banksia quercifolia</i>)	Research Grade 3	4d
	Pine Banksia (<i>Banksia tricuspis</i>)	Research Grade 1	Oct '23
	Prickly Dryandra (<i>Banksia armata</i>)	Research Grade 2	5mo
	Giant Banksia (<i>Banksia grandis</i>)	Research Grade 2	3mo
	Scarlet Banksia (<i>Banksia coccinea</i>)	Research Grade 2	4mo
	Giant Banksia (<i>Banksia grandis</i>)	Research Grade 2	4mo

ii) **Species.** Total number of ‘species’ for the current set of search filters. Here, ‘species’ are actually equivalent to ‘leaves’, i.e., distinct tips of the taxonomic tree. Thus, taxa that have not been identified to species, but are nonetheless unique within the current search parameters, are counted as species. For example, a set of three observations in Explore with identifications of *Banksia integrifolia*, *Banksia serrata* and *Eucalyptus* would count as three ‘species’. A set of four observations with identifications of *Banksia integrifolia*, *Banksia serrata*, *Eucalyptus* and Myrtaceae would also only count as three species, as in this case ‘Myrtaceae’ is not a distinct tip/leaf because *Eucalyptus* is a descendent taxon of Myrtaceae. The only exception in these calculations is any rank finer than species; taxa such as subspecies are ‘rolled’ up into their parent species, such that a set of two observations, each identified to a different subspecies under the same species, would only display a species count of one.

Under this subview, species are shown as a single page of thumbnails in rows of four, in descending order by number of observations. A maximum of 1000 species can be viewed here at once, so any searches returning more than 1000 species must be further refined to view all entities.

iii) **Identifiers.** Total number of identifiers (users who have added at least one identification to at least one observation) for the current set of search filters. The top 500 identifiers are listed here in descending order by number of identifications.

iv) **Observers.** Total number of observers (users who have uploaded at least one observation) for the current set of search filters. The top 500 observers are listed here in descending order by

number of observations. This list can be reordered to rank these same 500 observers by the number of species they have observed. This particular list is therefore not necessarily equivalent to the true top 500 observers by number of species, as observers with relatively few observations but nonetheless a high species count may not be included.

3) **List**. This view shows observations in a list of 96 per page, with each observation given its own row. For each observation, in addition to the first photograph attached to the record and the observer's profile picture, this view also displays the observer's username, the full observation date and time, the observation location, and the full date and time of when the observation was uploaded to iNaturalist.

Filters

The Explore tab provides a range of different filters allowing users to subset observations. There are two main basic filters:

- 1) **Species**. This filter allows users to search for any taxon at any rank by either scientific name or common name (if one exists). This search box is user-friendly; beginning to type a name prompts an autocomplete dropdown list. Also, if you cannot remember the full name or correct spelling of a taxon, partial substrings can be typed and still retrieve the taxon of interest. For example, searching for 'yellow-tailed black cockatoo' only requires an actual search string of 'ye t bla' or similar.
- 2) **Location**. This filter searches for places in Google Maps. Places such as street addresses will return a bounding box around the focal point rather than exact boundaries.

The *Filters* button and the *More Filters* link provide access to a wide range of additional search filters:

- 1) **Show**. The checkboxes in this section allow users to filter to observations that: are **Wild** (i.e., not marked as captive/cultivated), **Captive[/cultivated]**, **Verifiable**, **Research Grade**, **Needs ID**, **Threatened** (have any conservation status above Least Concern), **Introduced**, **Popular** (has been favourited at least once; users can 'favourite' any observation, similar to liking posts on social media. Favouriting is usually done as an expression of appreciation for the observation, and is often used for observations with high quality photographs or photographs depicting rare, spectacular or otherwise interesting organisms and/or interactions. Favouriting is also used as a bookmarking tool, with all observations a user has favourited available in a tab on their home page), **Has Sounds**, **Has Photos**, or **Your Observations**. Multiple checkboxes can be ticked to combine these filters, although certain combinations will not have any effect (for example, ticking the *Captive* box after already ticking the *Verifiable* box will have no effect, as captive observations are non-verifiable by definition).
- 2) **Description/Tags**. From the entered search string, returns observations with matching text (exact and partial) in the Notes section, tags, names of taxa with active identifications (scientific and common names), or place description. Comments on observations are not searched.
- 3) **Person**. Filters to observations made by a single user.
- 4) **Project**. Filters to observations contained in a single project.
- 5) **Place**. Filters to observations within a single standard or community curated place.
- 6) **Categories**. Filters to one of iNaturalist's eleven 'iconic' taxa: Birds, Amphibians, Reptiles, Mammals, Ray-Finned Fishes, Molluscs, Arachnids, Insects, Plants, Fungi Including Lichens, and Protozoans. A twelfth category is available which filters for Bacteria and 'Unknown' observations (i.e., no current identification at any rank). Some taxa, such as myriapods or crustaceans, are not searchable using these particular filters, but are easily searched using the **Species** search bar mentioned above.

7) **Rank.** This paired filter allows users to set high and low taxonomic ranks. By default these are set to *High* and *Low*, i.e., inclusive of all observations. Observations identified to a rank coarser than the selected high rank and finer than the selected low rank will be omitted. For example, setting the low rank to *Genus* will omit observations identified to any rank finer than genus within the searched-for taxon. Setting both filters to the same rank, e.g. *Species* and *Species*, will return observations currently identified to that exact rank.

8) **Sort By.** By default this filter is set to arrange observations by *Date Added* in *Descending* order, but these can be changed to *Date Observed* or *Faves*, and *Ascending* order. The *Faves + Descending* filter combination is designed to show the most favoured observations first.

9) **Photo Licensing.** Filters to observations with photographs under the specified copyright license.

10) **Reviewed.** Filters to observations that have or have not been ‘reviewed’ by the user. An observation is automatically deemed to be reviewed by a user when they have added an identification to it and/or marked it as captive/cultivated. Observations can also be manually marked as reviewed by any user. An observation becoming reviewed only applies to that specific user, and it will remain unreviewed for all other users until they review it themselves.

11) **Date Observed.** Allows users to filter to observations from an exact date, date range, or one or more entire months. For the date range filter, only setting a start date will exclude all observations with an observation date preceding this date, and only setting an end date will exclude all observations with an observation date after this date.

12) **Date Added.** As above for date added to iNaturalist.



[Torymidae](#). *Photograph* by Matt Reid (@mattreidphotography), All Rights Reserved.



© Thilo Krueger

[Stylidium eriopodum](#). *Photograph* by Thilo Krueger (@thilokrueger), CC BY-NC.

These direct filters in the user interface are just the tip of the iceberg: a huge number of additional filters and searches can be executed by directly editing the URL, including searching for multiple unrelated taxa and/or places simultaneously, retrieving observations with specific annotations and/or observation fields, and the ability to exclude observations. A useful example to illustrate this utility is the order [Lepidoptera](#), i.e., butterflies and moths. Whilst all butterflies are contained within a single taxon on iNaturalist, the superfamily [Papilioidea](#), there is no single monophyletic taxon that includes all moths. However, it is possible to execute a search for only moths by searching for Lepidoptera excluding Papilioidea, such that the URL for all observations of moths in Australia looks like this:

https://www.inaturalist.org/observations?place_id=6744,7333,7616,10287,10293,118147&taxon_id=7157&without_taxon_id=47224

Many different search filters can be strung together into a single complex search through URL editing. For example, the following link returns all observations from Australia, but excluding the Northern Territory, that have been identified as a parrot to a species level or finer, that have been observed in December, January or February, and which have been annotated as depicting only a feather:

https://www.inaturalist.org/observations?rank=species&month=1,2,12¬_in_place=9994&place_id=6744,7333,7616,10287,10293,118147&taxon_id=18874&term_id=22&term_value_id=23

A comprehensive guide to URL editing is available [here](#).

Export tool

The *Filters* button also provides access to a *Download* link, which redirects users to the [Export tool](#). Any user can export iNaturalist data as a CSV file, with a maximum of 200,000 records per download. When redirecting from an Explore search, the download will automatically be filtered to the observations retrieved via that search, but the export parameters can be filled in from scratch. Some of the Explore filters are not carried over to the Export tool after clicking download, so these should always be checked.

Identify

The Identify tab is also accessible via the *Filters* button; following the link to this tab will copy across all filters from the executed search in Explore.

Identify tab

Although observations can be identified via the Explore tab, with users able to click the thumbnail for each observation to navigate to it, this can be a time-consuming process when intending to identify more than a handful of observations. The [Identify tab](#) allows for the most efficient review and identification of observation sets.

When navigating directly to the Identify tab, only Needs ID observations are shown by default, and only observations that have not been reviewed by the user (although both of these filters can be changed). Most of the filters available in Identify are the same as for Explore, with some notable additional filters:

- 1) **Sort By.** In addition to sorting observations by *Date Added*, *Date Observed* or *Faves*, users can also sort observations by *Date Updated* (with ‘updates’ including any comment, identification, or change to metadata for a given observation) or set them to *Random* order.

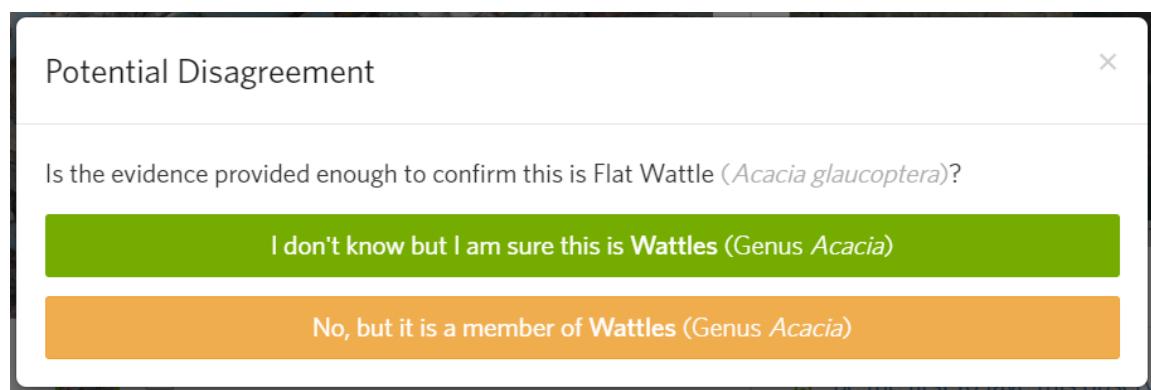
2) **With Annotation** and **Without Annotation**. Filters to observations with or without the six annotation types (*Plant Phenology, Alive or Dead, Life Stage, Sex, Established, Evidence of Presence*).

3) **Account Creation**. Filters to observations uploaded by accounts created within the last week, or more than a week ago.

Thirty observations are displayed on each Identify page. Observations currently identified to species or finer will display an Agree button which can be clicked to add a confirming identification without having to open the observation. Clicking on an observation thumbnail will open it in a nested window that does not take users to an entirely new page (an advantage over identifying observations in Explore). An extensive set of keyboard shortcuts are available in Identify for a number of actions, including paging between observations and adding annotations. Users also have access to a tool for adjusting the brightness of photographs, although this only makes a change on their end.

iNaturalist currently does not support identifications of undescribed taxa. This is particularly relevant for Australian observations given the large number of phrase name plant taxa: these are formal ‘placeholder’ names used to document currently undescribed but putatively new plant taxa, usually at a species level or finer. For example, *Leucopogon* sp. Torrington (L.M.Copeland 3720) is an undescribed, putative new species of *Leucopogon*, with the original specimen collected at Torrington by L.M.Copeland, and this specimen being Copeland’s 3720th overall herbarium collection. Observations of these or similar entities should be identified to the appropriate parent taxon until they are formally described. For Australian plants, these observations can be added to the traditional project [Undescribed Australian Plants – Phrase Name Species and Other Entities](#) to easily keep track of them.

In some cases, users adding an identification to an observation will be prompted with a pop-up box containing two options. Consider an observation of a wattle that has been identified as *Acacia glaucoptera*. If a user adds an identification of a coarser taxon that is a direct ancestor of the currently identified taxon (such as *Acacia* or *Fabaceae*), they will be prompted with a *Potential Disagreement* box and asked the question *Is the evidence provided enough to confirm this is Flat Wattle (*Acacia glaucoptera*)?* If the green option (see below) is selected, the observation ID will remain as *Acacia glaucoptera*, i.e., the newly added identification does not explicitly disagree with the existing identification. This can be treated as an agreeing identification at a coarser rank. Alternatively, if the orange option is selected, the existing identification will be explicitly disagreed with and overridden, pushing the observation ID back to the rank of the new identification. The orange option is typically used when the identifier is certain that (in this example) the observation **does** depict an *Acacia*, but is also certain that it is **not** *Acacia glaucoptera* specifically, and they are unable to offer a different species identification.



When a user has previously identified an observation, and then either adds a new identification (whether refining or corrective) or withdraws their old identification, the old identification will remain

publicly visible, but greyed and crossed out to indicate it is no longer active. This facilitates a transparent, clearly documented identification history, akin to multiple det slips being added to a herbarium specimen over time.

Activity

The screenshot shows the iNaturalist activity feed with two entries:

- thebeachcomber suggested an ID** (greyed out) - Imperial Hairstreak (*Jalmenus evagoras*)
- thebeachcomber suggested an ID** (greyed out) - Stencilled Hairstreak (*Jalmenus ictinus*)

Each entry includes a small profile picture of the user, a timestamp (1mo ago), and a dropdown menu icon.

Placeholder identifications

Users will sometimes encounter observations that are labelled with a *Placeholder* identification in small, greyed out text. There are multiple ways that placeholders are created, including adding identifications that are not equivalent to any actual taxon (e.g., ‘feather’ or ‘caterpillar’), adding identifications of taxa which have not yet been added to iNaturalist, or including infraspecific abbreviations — such as ‘ssp.’, ‘subsp.’, ‘var.’ — or author names in the identification (neither should be included). Regardless of how they are created, placeholders are important to be aware of as they are entirely overridden by subsequent identifications. The best practice when encountering a placeholder is to add the finest possible identification, but also replicate the placeholder as a comment so that it is still preserved.

This screenshot shows an observation page for an unknown species:

- Placeholder ID**: Unknown ((Placeholder: Grona brownii))
- Status**: Needs ID
- Geoff Byrne** (7,429 observations) submitted the observation on Sep 7, 2005, at 11:36 AM AEDT.
- Location**: Derby, Western Australia (Map view).
- Image**: A close-up photograph of a plant with white flowers and green leaves.

Computer Vision/AI

In addition to the extensive community of human identifiers, iNaturalist also offers users the option to use Computer Vision. Simply, Computer Vision refers to a field of artificial intelligence (AI) where computers are trained to recognise patterns in images: iNaturalist's Computer Vision (CV) is employed as a tool to offer automated identification suggestions for observations. The first demo was launched in April 2017, and a few months later the CV was formally integrated into the platform. During the upload process, an observer can click in the *Species name* bar and a dropdown menu showing a list of taxa will appear: these are the CV suggestions. Once an observation has been uploaded, other users can click in the *Species name* bar on any observation to activate the suggestions.

Suggestions

The identification suggestions offered by the CV are based on visual similarity between the photograph being uploaded, and photographs contained within the CV's training dataset (see below). The suggestion list is usually segregated into two sections:

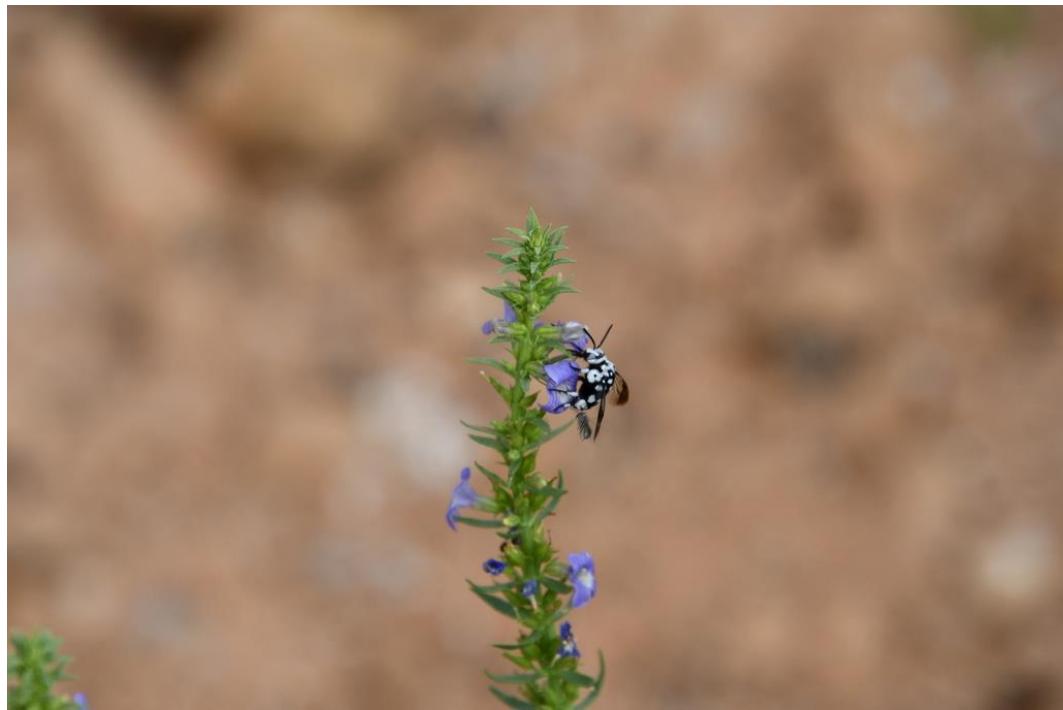
- 1) **'We're pretty sure this is in the...'**. The top suggestion will usually be a taxon coarser than species, such as genus or family, with the provision that '*We're [the CV] pretty sure this is in the genus [or other coarse taxon]*'. However, this section may sometimes be absent, with the message instead that *We're not confident enough to make a recommendation, but here are our top suggestions*. This uncertainty is driven by a number of factors, many of which relate to image quality.
- 2) **'Here are our top suggestions'**. The CV will then suggest anywhere between one and eight different identifications, with greater uncertainty resulting in more suggestions. These suggestions are usually at the rank of species, but coarser suggestions (e.g., genera or subfamilies) can also be made. The CV cannot suggest taxa at a rank finer than species and does not suggest hybrid taxa.

Any identifications that have been added by clicking a CV suggestion are marked with a sparkling luggage tag symbol. However, because many users use the CV suggestions as a time-saving tool to avoid typing out the full name, the presence of this tag is often uninformative if trying to gauge whether the user knew what the taxon was, or whether they simply 'blindly' selected one of the suggestions.

Activity

The screenshot shows a mobile application interface for iNaturalist. At the top, there is a circular profile picture of a person standing in a field. To the right of the profile picture, the text "thebeachcomber suggested an ID" is displayed. Next to this text are three icons: a trophy icon labeled "Improving", a sparkly luggage tag icon labeled "5d", and a downward arrow icon. A red rectangle highlights the luggage tag icon and its associated text "5d". Below this header, there is a card with a small thumbnail image of a flowering plant on the left. To the right of the thumbnail, the text "Shrubby Platysace" is displayed above the scientific name "Platysace lanceolata". To the right of the card, there is a button with a double-headed arrow icon labeled "Compare".

CV suggestions can be manipulated by first providing a coarser identification, which can be useful when multiple species are present in a photograph but the CV is focusing on the 'wrong' species with respect to what the observer wants to identify. For example, consider [this photograph](#) of the native Australian bee species *Thyreus waroonensis* feeding on the plant species *Stemodia florulenta*:



When first uploading the observation, with no existing identification, the CV suggestions look like this:



Species name

We're pretty sure this is in the genus:

 Cloak-and-Dagger Bees
Genus *Thyreus* [View](#)

Notes Here are our top suggestions:

 Waroon Cloak-and-dagger Bee
Thyreus waroonensis [View](#)
Visually Similar / Expected Nearby

 Blue-spotted Cloak-and-dagger Bee
Thyreus caeruleopunctatus [View](#)
Visually Similar / Expected Nearby

[Include suggestions not expected nearby](#)

However, say that the observer was instead interested in what the CV suggestions are for the plant. Here, they can upload the observation with an identification of 'Plantae' (or a similar coarse taxon that is a descendent of Plantae), and then check the suggestions again. In this case, the CV has been 'pre-conditioned' to suggest identifications for the plant instead.

Activity

The screenshot shows a mobile application interface for iNaturalist. At the top, it says "thebeachcomber suggested an ID". To the right is a green flower icon with the text "Leading 1s" and a dropdown arrow. Below this, there's a "Plants" category icon with "Kingdom Plantae" text and a "Compare" button. A large search bar at the bottom left contains the placeholder "Species name". To its left are buttons for "Comment" and "Suggest an Identification". On the far left, there are three vertical buttons: "B" (highlighted in blue), "Tell", and "Done". The main content area shows a suggestion for the genus "Stemodia" with a small image of purple flowers and a "View" button. Below that, under "Top suggestions", is "Bluerod" with the scientific name "Stemodia florulenta", described as "Visually Similar / Expected Nearby", and another "View" button. There are also "B" and "Tell" buttons on the left side of this section.

Geomodel

The Geomodel introduces a geospatial element to the CV's pattern matching. Previously (before mid-2023), a different process was used to apply *Seen Nearby* labels and weight CV suggestions, with the presence of a given taxon in the nine 1° grid cells on and surrounding the location of an observation informing the tool. Instead of a grid of observations, the *Expected Nearby* label applied by the Geomodel comes from a model prediction (see [Cole et al. 2023](#) and [this blog post](#) for more details).

By default when using the CV, suggested taxa will be both *Visually Similar* and *Expected Nearby*, provided that some visually taxa **are** expected nearby; if there are none, visually similar taxa will be suggested regardless of their expected distribution. Users can also toggle the Geomodel off.

CV training

To be included in the CV, a taxon must have at least 100 photographs across at least 60 observations on iNaturalist, although a maximum of five photographs from any given observation will be used to train the model; some taxa with 100 photographs/60 observations may therefore not be included yet. Photographs from both verifiable and non-verifiable observations are included. Taxa with observations dominated by one or very few observers may also influence a taxon's exclusion from the model, as the model's learning may be biased by that observer's idiosyncratic photographic style. The

model is sometimes trained on taxa coarser than species, such as genus or family, if there are no species within these taxa that meet the requirements.

Strengths and limitations

Unsurprisingly, the CV excels at identifying some taxa, but struggles with others. Broadly, the CV tends to be exceptional at recognising common taxa with many observations (and with many photographs from different angles, under different lighting, and of different life stages, sexes or forms to maximise the variation captured), and taxa that are large, colourful, distinct, and/or charismatic. Thus, for many parts of the world, CV suggestions for groups such as birds, many flowering plants, or megafauna such as large mammals are highly accurate. Conversely, the CV struggles to recognise many groups characterised by smaller, more cryptic taxa with many similar species. This is the case for many invertebrate taxa and groups such as algae, fungi, and less charismatic plants. There are also often [differences in suggestion accuracy across different countries or regions](#); for some taxa, observations from the Southern Hemisphere will often have suggestions for Northern Hemisphere species given the dominance of the United States in the global observation and observer pools. Thus, for some taxa and some regions, the CV suggestions can be very inaccurate.

Typically, 1,000+ new species are added to the CV with each new model released monthly: as of 5 April 2024, [86,861 taxa were included in the CV model \(v2.12\)](#). The CV continues to improve over time and increasingly includes more esoteric and non-charismatic taxa.

There are a few important considerations to keep in mind when using the CV:

- 1) The offered taxa are not definitive identifications, but rather suggestions as explicitly noted: "*Here are our top suggestions*". Thus, any suggestion should be carefully assessed before being accepted. Users are not obligated or forced to accept any CV suggestion.
- 2) If the number of observations and photographs for a taxon have not reached the minimum threshold to be included in the model, it is literally impossible for the CV to suggest the taxon. The CV therefore cannot correctly identify esoteric or rare taxa with very few observations in iNaturalist.
- 3) In many cases where the species suggestions offered by the CV are incorrect, the relevant higher-level taxon (whether this be a coarser taxon explicitly suggested by the CV in the *We're pretty sure this is in the...* section, or simply the finest common denominator of all suggested species) is nonetheless very often correct. This makes the CV an especially useful field tool. Consider a situation where an observer encounters a plant in the field which they do not recognise even to family or genus, and for which they are unsure what the important diagnostic characters are to photograph. The CV can be used in the following workflow:
 - 1) Take a photograph of the plant with your phone, and start to create an observation using the iNaturalist app.
 - 2) Tap the species name bar and generate the CV suggestions.
 - 3) Assess the suggestions and especially take note of the taxon in the *We're pretty sure this is in the...* section. If this section is not filled out, and even if none of the offered species seem correct, they will often share a common genus or family. Note that the user does not need to upload the observation; it is only started here to leverage the CV.
 - 4) Search a relevant online regional flora to confirm the suggested coarse taxon, and learn the important diagnostic characters for this taxon.
 - 5) These characters can now be focused on and photographed to maximise chances of identification when later uploading an observation for the plant.

Notifications

When users interact with content on iNaturalist, or are interacted with, they receive notifications. When a user has at least one unopened notification, the speech bubble symbol at top right of all pages will turn red, with the number beside it indicating the number of notifications. Clicking on the speech bubble will open a dropdown menu showing all unopened notifications. If a user has more than ten unopened notifications, clicks on one and directly navigates to that observation, the dropdown will only show the most recent ten notifications when the speech bubble is clicked again. However, all content associated with notifications is also displayed on the user's dashboard on their homepage, and thus these can be accessed even if notifications are lost. If a large number of unopened notifications are active at any point, one recommendation is to click the speech bubble and then right click on each to open in a new tab. Users will receive notifications when:

- 1) Another user tags them in a comment.** Any user can tag another user in a comment or in a journal post by typing the @ symbol directly followed by their username. This will generate a notification for the tagged user. This is a great way to solicit feedback, ask for identification assistance, and alert users to content they may be interested in (whether from a personal or professional perspective).

thebeachcomber commented 10mo

@karenwilsonau am I correct in saying this is Persicaria prostrata? Also see photos at <https://www.inaturalist.org/observations/153025175>

karenwilsonau suggested an ID 10mo

Creeping Knotweed *Persicaria prostrata* Compare

Yes, it has this low-growing habit and green 'collar' to the ocrea.

- 2) Another user interacts with one of their observations.** Once a user uploads an observation, any interactions with that record by other users will generate a notification for the observer. This includes comments, identifications, favouriting the observation, adding observation fields, and adding the observation to a project. Adding annotations or marking any of the qualifications in the Data Quality Assessment will not generate a notification. Similarly, notifications are generated for users when other users comment on their journal posts.

- 3) Another user interacts with an observation they have followed.** If a user comments on, adds an identification to, or favourites an observation uploaded by someone else, they are automatically registered to 'follow' that observation; any further identifications or comments made by other users will generate a notification. Users can also manually follow an observation without needing to add a comment or identification if they feel they cannot contribute anything to it, but are still interested in updates to the observation. Similarly, notifications are generated for users when other users comment on any journal post or blog post that they themselves have previously commented on. Users can unfollow an observation or post at any time.



Crucifix frog (*Notaden bennettii*). *Photograph* by Gary Wilson (@garywwilson), CC BY-NC.



Tasmanian masked owl (*Tyto novaehollandiae castanops*) with common ringtail possum (*Pseudocheirus peregrinus*). *Photograph* by Kenton Reeder (@sirkendizzle), CC BY-NC.

Direct Messages

Users can also communicate with others by sending a direct, private message, which will also generate a notification. These appear next to the speech bubble as a red envelope symbol. Users must have uploaded at least three verifiable observations, or made three identifications for other users, before they can send a direct message. The direct message function does not exist for the iOS app.



Subscriptions

Via the right hand-side of their dashboard, users can choose to subscribe to all observations of a particular taxon, from a particular place, or a combination thereof. Observations fitting these criteria do not generate notifications for subscribers when uploaded, but they do appear on their dashboard along with observations from users they follow, and content that is connected to notifications. Observations will only appear on a user's dashboard if they were identified as the subscribed taxon by the observer when first uploaded, not if identified at a later point.

Account settings

Users can edit their account settings to modify their notifications in three ways:

- 1) **Tags.** Users can choose to turn off notifications when another user tags them in a comment.
- 2) **Confirming identifications.** Users can choose to turn off notifications when another user adds an identical identification to their own on an observation they uploaded or are following. This setting is useful for preventing a large influx of notifications, especially for users that add many identifications, and particularly many identifications for taxa such as birds, for which observations often receive many identical agreeing identifications.
- 3) **Email notifications.** When users first create an account, they are automatically signed up to receive a daily email summarising all notifications they have received, in addition to updates such as new journal posts associated with projects they have joined, changes to project curators, and taxonomic changes. This email can be modified to only include one or several notification types and updates, or can be turned off entirely.

Journal posts

Any user can write and publish journal posts on iNaturalist, which function similarly to blog posts or social media posts. These are a powerful tool for communicating with other users, with uses including [summarising surveys](#), expeditions or bioblitzes, [explaining taxonomic changes](#), [advertising events](#) such as workshops, and [creating identification resources](#) among many. Indeed, many of the identification resources created by users in journal posts are publication quality; consider for example, [this comprehensive, illustrated guide to Australian katydids in the subfamily Pseudophyllinae](#) by

entomologist Matthew Connors ([@matthew_connors](#)). Tens of thousands of journal posts have been written by users across the globe, all accessible [here](#), or by visiting individual user profiles. Most journal posts are associated with individual users, but they can also be written through projects by project admins; project journal posts are an invaluable way of communicating with project members.

iNaturalist staff also regularly publish journal posts as part of the [iNaturalist blog](#); these posts are used to highlight the [Observation of the Week](#), present [significant news and updates](#), including new functionality and new Computer Vision models, present [interviews with identifiers and observers](#) from around the world, and showcase [monthly highlights relating to research, conservation, and other events](#) that have used iNaturalist and its data.

Projects

Simply, projects are platforms within a platform. Any user can create a project and use it to collate observations with a common theme into a central, publicly displayed repository within iNaturalist. Projects can be used to [collect data for research](#), [collate observations for bioblitzes](#) and other surveys, [highlight records from interesting locations](#), and [assist with identification](#) among a broad diversity of uses.

Collection Projects

When creating a new collection project, there are four main sections to address:

1) **Project Details.** Five elements are included here:

- i) **Project Name.** This is a mandatory field.
- ii) **Project Summary.** This is a mandatory field. The summary should describe the main focus(es) and scope of the project. Only the first 200 characters are visible on the project's home page, with the remainder accessed via a *Read More* button.
- iii) **Project Icon.** An optional thumbnail image. Will be automatically cropped to a square if dimensions are different.
- iv) **Project Banner.** An optional image. Should ideally be twice as long as tall.
- v) **Project Summary Background Colour.** By default set to 'iNaturalist green' (#74ac00)

2) **Project Type.** There are two types of collection project that users can select from:

i) **Collection Project.** 'True' collection projects collate individual observations based on their defined filters. They essentially function as a saved search with additional features for data display and interaction between users.

ii) **Umbrella Project.** Instead of collecting observations, umbrella projects collect other projects. Users manually enter project names to be included in the umbrella; they can collect collection projects, traditional projects, or a combination thereof. Umbrella projects are useful for comparing statistics across multiple projects, and display leaderboards showing number of observations, species and observers across all constituent projects. Umbrella projects cannot collect other umbrella projects.

3) **Observation Requirements.** Users can select a filter, or any combination of multiple filters, to define which observations the project should collect. These filters fall under a number of categories:

- i) **Include Taxa.** Select one or more taxa at any rank.

ii) **Include Places.** Select one or more places, including both standard and community curated places.

iii) **Include Users.** Select one or more users to only include their observations. Any users specified here are automatically made members of the project.

iv) **Exclusion Filters.** These can be added for all three of the above filters.

v) **Project Members Only.** Ticking this box ensures that, for a user's observations to be included, they must have actively joined the project. Users who have joined a project will also have project journal posts appear automatically on their dashboard.

vi) **With Annotation.** Select one of the six annotation types. Users can choose to include all observations with that annotation regardless of value, or specify an annotation value.

vii) **Data Quality.** Select one or more of *Research Grade*, *Needs ID*, and *Casual*. By default, both *Research Grade* and *Needs ID* are ticked.

viii) **Media Type.** Select from one of *Any* (default), *Has Sound*, *Has Photo*, or *Has Both Photo and Sound*.

ix) **Establishment Means.** Select from one of *Any* (default), *Native* or *Introduced*. Note that *Native* also includes *Endemic*.

x) **Date Observed.** Select from *Any* (default), an exact date, a date range, or one or more months.

4) **Members.** This section is relevant to obscured observations, and access to them:

i) **Trust.** Project creators are presented with the option to *Allow members to trust this project with hidden coordinates*.

Members

Trust

If you want access to the hidden coordinates of obscured observations, this option will allow people who have joined this project to trust the project admins with access to those hidden coordinates. Project members will be able to grant access to the hidden coordinates of any of their observations that appear in this project, or just the observations that are obscured because of threatened taxa.

However, this will also notify all trusting project members every time you change the project observation requirements, so they can reassess whether they want to continue trusting you given the new requirements. Your access to hidden coordinates will be revoked for one week after changing the observation requirements so members have time to do this.

Allow members to trust this project with hidden coordinates

If this box is ticked, users joining the project will be prompted with three options:

a) **No.** Project admins will not have access to that user's hidden coordinates.

b) **Yes, for any of my observations.** This includes both obscured and private observations.

c) **Yes, but only for my observations of threatened taxa, not when I've set the geoprivacy.** Only observations obscured through taxon geoprivacy will have their hidden coordinates made available to the project admins.

Other

Receive updates from this project

Receive updates about this project on your dashboard and in the daily updates email.

Trust this project with hidden coordinates?

Granting access to your hidden coordinates will allow the managers of this project to see the true, unobscured location of your observations in this project. This is extremely important in situations where scientists or resource managers need access to exact coordinates for analysis and decision-making.

No

Yes, for any of my observations

This includes observations where you have set the geoprivacy to "obscured" or "private," e.g. observations from your backyard or spots you don't want other people to know about.

Yes, but only for my observations of threatened taxa, not when I've set the geoprivacy

Many projects just need access to coordinates that are obscured because the observation depicts a threatened taxon.

Please Be Careful!

Coordinate access is important for scientists, but can also be abused by poachers. Make sure you trust all the project curators before trusting this project.

Yes, I want to join

Cancel

ii) Admin(s). By default, the project creator is initially the sole admin. If the *Include Users* filter has been used to specify one or more users other than the project creator, they can also be added as admins during the project creation process. Otherwise, other users can only be made admins after the project has been created, and after they have joined the project. Project admins can edit or delete the project, and write journal posts.

Each collection project is effectively a bookmarked Explore search. Technically, the observations that meet a collection project's filters are not 'stored' in the project, but rather each time the project is opened and loaded by any user, all observations meeting the filters are displayed. Observations cannot be manually added to or removed from a collection project; they either fulfil the project's requirements or they do not. Collection projects are thus entirely automated once created.

On any given observation that is included in a particular collection project, a project badge will appear if the user has joined that project. All traditional projects to which the observation has been added will also display badges.

The screenshot shows the iNaturalist platform interface. On the left, there's a vertical activity feed with three items:

- thebeachcomber suggested an ID**: Field Madder (*Richardia stellaris*). Status: Improving, 1mo ago. Includes a 'Compare' button.
- ilovethebush suggested an ID**: Field Madder (*Richardia stellaris*). Status: 1mo ago. Includes a 'Compare' button.
- A comment section with a WYSIWYG editor and a 'Comment' button.

On the right, there's a 'Community Taxon' panel for **Field Madder (*Richardia stellaris*)**. It shows 2 cumulative IDs, a progress bar at 2/3rds, and buttons for 'Agree', 'Compare', and 'About'.

Below these are sections for 'Annotations' (with Plant Phenology and Sex dropdowns) and 'Projects (5)' (highlighted with a red border). The projects listed are:

- Backyard Species Discovery with Bush Blitz (Australia)
- Biodiversity of Sydney
- Flora of Australia
- GSBiogroup
- Wategora Reserve - Cooks River Clay Plain Scrub Forest

Among several, there are three key reasons to create a collection project, even though any such project can be replicated with a simple Explore search:

1) Create a customised, easily shared, well-designed landing page. Unlike an Explore link, a collection project provides a name, icon and banner image, all of which help create a 'brand' and public front for the project. It is also far easier to share a project name or project URL with prospective members compared to a long Explore URL that provides no obvious indication of how the observations are related. Consider the difference between the URL for the project *Australian Galls* — <https://www.inaturalist.org/projects/australian-galls> — and the URL for the exact same set of filters executed in an Explore search —

https://www.inaturalist.org/observations?photos&place_id=6744,7333,7616,10287,118147,18651&term_id=22&term_value_id=29&verifiable=any. An Explore URL must also be bookmarked somewhere if a user wants to return to it without having to manually enter all filters each time; a project page is conveniently and easily accessed through the Projects tab on a user's homepage, or can be searched for at any time.

2) Promote communication with project members. Collection projects allow admins to write journal posts that are displayed on the project home page. These posts will automatically appear on the dashboard of all project members, and any users that receive the daily email update will also see project journal posts through that channel. Project journal posts are particularly effective for researchers that want to communicate with their project members. Two great examples are [Gum Tree Guardians](#), a project tracking the destructive introduced fungus [myrtle rust](#) (*Austropuccinia psidii*), and [Christmas Beetle Count](#), a project monitoring Christmas beetles (*Anoplognathus* spp., *Repsimus* spp., *Calloodes* spp.).

3) Allow admin access to obscured observations. This is perhaps the fastest/most efficient method for researchers to access the true locations of observations that have been obscured, and indeed is

one of only two methods (in addition to ‘trusting’ individual users) to access the coordinates for observations that have been manually obscured by users.

Traditional Projects

Whilst collection projects are designed to automatically collate observations, traditional projects require all observations to be manually added. A user must have uploaded at least 50 verifiable observations to iNaturalist before they can create a traditional project. Whilst collection projects must, by definition, have some kind of central theme tied to at least one explicitly defined filter, such as a taxon, date range or place, traditional projects can be used to compile observations that are otherwise ‘unfilterable’. A good example is the traditional project [*First Known Photographs of Living Specimens*](#). This project compiles observations for which the image(s) are the first [known] photographs of living individuals of that species (anywhere, not just in iNaturalist; [Mesaglio et al. 2021](#)). There is no possible filter available in a collection project that could collate these observations, and thus they must be manually added to a traditional project. Observations can be added to a traditional project by any user who has joined the project, although users can edit their account settings so that only they can add their own observations to a traditional project. There are a number of other important differences between traditional and collection projects:

1) **Access to obscured observations.** The options provided to newly joining users are different to those for collection projects:

- i) Yes, but only if I added the observation to the project myself.
- ii) Yes, no matter who adds the observation to the project.
- iii) No.

Other

Receive updates from this project

Receive updates about this project on your dashboard and in the daily updates email.

Do you want to make your private/obscured observation coordinates visible to the project curators?

Yes, but only if I add the observation to the project myself.

Yes, no matter who adds the observation to the project.

No.

Note: You can also choose to share the hidden coordinates of observations in this project on a case-by-case basis. These are just the defaults for new observations added to the project.

[Yes, I want to join](#)

[Cancel](#)

2) **Admin roles.** Whilst collection projects only have a single admin role, traditional projects have three different roles:

i) **Curators.** Can remove observations from projects (otherwise, an observation can only be removed from a traditional project by the user who originally added it) and see true coordinates of private or obscured observations. Project curators are different to site curators (although users can be both).



 [Nick Volpe](#)

[Carenum elegans](#). Photograph by Nick Volpe ([@nickvolpe](#)), CC BY-NC.

ii) **Managers.** As above, but can also edit project settings and write journal posts.

iii) **Admin.** As above, but can also delete the project. The project creator is, by default, the admin, and there can only be one admin. The admin can transfer their role to one of the managers or curators.

These roles can be viewed by clicking the [View All Members](#) hyperlink on a traditional project's homepage.

Curators

Curators can remove observations from the project and their identifications are shown alongside the observations on project-specific views. Curators can also see the true coordinates of private and obscured contributions to this project.



atronox



borisb



neontetraploid



gcwarbler

Managers

Managers can do everything curators can do as well as editing project settings and write project journal posts.



thebeachcomber

Admin

The admin is the person who created the project. They can do everything managers and curators can do, as well as delete the project.



thebeachcomber

3) **Filters.** For traditional projects, filters exist as *Observation Rules*, which are designed to prevent the addition of observations. Most of these rules align with the filters used in collection projects. Whilst collection projects must have at least one defined filter, traditional projects can be created without specifying any rule.

4) **Observation Fields.** When creating a traditional project, the admin can choose to associate one or more observation fields with the project. When a user adds an observation to the project, they will be prompted with a pop-up window displaying the observation field(s). The project admin can choose to either make these optional, or make them mandatory for the observation to be added to the project. This feature is a powerful tool that allows researchers to easily collect additional metadata with observations added to their projects. For example, the [Environment Recovery Project](#) was created after

Australia's record-breaking 2019-2020 Black Summer bushfires, during which more than 24 million ha of land were burnt ([Binskin et al. 2020](#)). The project was designed to compile observations from areas that had recently burnt to help track recovery after the fires. When adding an observation to the project, users were prompted to fill out up to five observation fields, including burn height and fire severity at the observation's location. These data provided invaluable insights into fire severity across a broad spatial range, and correlated well with satellite sensor data, highlighting the value of citizen science data for ground truthing remote sensing data ([Kirchhoff et al. 2021](#)).

Another example is the traditional project [Australia's Untold Roadtoll - Recording Roadkill and Road Trauma](#). When adding an observation to the project, users are required to fill out four mandatory observation fields:

Australia's Untold Roadtoll - Recording Roadkill and Road Trauma X

Please complete the following to add this observation to the project:

State of decay *

Freshly killed (24-48hrs) Add

Approximately how long has the animal been deceased?

Type of roadside habitat *

farmland Add

Is there any habitat or features near the road? ie forest, bushland, wetland, cleared pasture, residential housing etc

Speed Limit of Road (km/hr) *

80 Add

What is the speed limit of the road/street where the injured/killed animal was hit?

Did the animal have pouch young, and if so did the young survive? *

Unable to determine Add

* Required

Cancel Add to Project

Australasian Fishes

The project *Australasian Fishes* (originally a traditional project, but converted to a collection project in March 2024) is an exemplar project and a model for how to run a highly successful project in any region. Created in October 2016 by then Australian Museum curator of fishes Mark McGrouther (@markmcg), the project compiles observations of fishes, sharks and rays from Australia and New Zealand. As of 3 April 2024, the project contains over 303,000 observations of more than 3,400 species contributed by over 9,600 users.

Activity

The screenshot shows the activity feed for the 'Australasian Fishes' project on iNaturalist. The feed is a vertical timeline of events:

- lizhawk123 suggested an ID** (3d ago): A user suggestion for a Dusky Butterflyfish observation. Includes a profile picture of a diver, the species name, its scientific name (*Chaetodon flavirostris*), and two buttons for 'Compare' and 'Agree'.
- markmcg suggested an ID** (3d ago): A user suggestion for a Dusky Butterflyfish observation, identical to the first one.
- markmcg commented** (3d ago): A comment from Mark mcg to lizhawk123, inviting them to join the project and expressing interest in their fish observations.
- lizhawk123 commented** (3d ago): A response from lizhawk123, expressing interest in joining and mentioning a planned marine bioblitz.
- markmcg commented** (3d ago): A final comment from Mark mcg, thanking lizhawk123 for their response.

The project's success has been a product of many factors, but in particular two key elements: the strong communication driven by Mark, and the welcoming, knowledgeable, and diverse community that he has helped to build. For the first 4–5 years of the project, each and every time a user uploaded an observation that fulfilled the project's criteria for the first time, Mark would comment on it thanking them for their observation, inviting them to join *Australasian Fishes*, and welcoming them to upload more observations of fishes. Over the last few years, Mark has compiled a larger team of project

curators and admins who now share some of this welcoming party workload (especially important given the exponential growth of iNaturalist), but he still personally welcomes many new contributors. The project also maintains a highly active journal, with more than 180 journal posts published in the project since its inception, written mostly by Mark or fellow project power user Harry Rosenthal ([@harryrosenthal](#)). These journal posts cover a wide range of topics, including monthly interviews [profiling the project's top contributors](#), reports on the [many new range extensions or rare sightings](#) unearthed through the project, and celebrating [project milestones](#). These journal posts are a highly effective way to communicate with project members and maintain interest in and engagement with the project over time.

Indeed, observations compiled in the project have contributed to a number of research projects and published papers, including the addition of numerous new species to the Sydney Harbour checklist ([DiBattista et al. 2022](#)); highlighting the importance of iNaturalist data for better understanding species richness at surveyed reefs, especially for rare or cryptic species ([Roberts et al. 2022](#)); and, allowing habitat composition to be assessed from the background of photographs ([Bolt et al. 2022](#)).

Mark and his colleagues have also spent years recruiting not only a broad diversity of observers for the project — drawing on contributors across both the freshwater and marine worlds, and including divers, snorkellers, beachcombers, indigenous rangers, anglers, ecologists, and commercial trawlers — but also a large community of identifiers and experts from across Australia and New Zealand. These efforts have ensured that not only are the project's observations representative of the huge diversity of aquatic life, but that they are well-identified. Engaging many experts with the project, especially experts that are very generous with their time and knowledge, has also facilitated a tremendous learning process for the broader community; not only are individual observations identified at the time, but observers are then also better-informed for future.

Browser vs. mobile apps

This document focuses on the browser version of iNaturalist, however, the platform is also accessible via mobile app. Notably, functionality differs not only between the browser version and the app, but also between the two versions of the app; less functionality is available when using the app on an iOS device compared to an Android device (e.g., the iOS app does not include the direct messaging function, annotations, the Data Quality Assessment, or the ability to withdraw identifications), and the browser version has considerably more functionality than either app. At time of writing, a universal app is in development.

Observations uploaded using the iNaturalist app or via Seek (see page 78 for an explanation of Seek) have a badge indicating their origin.

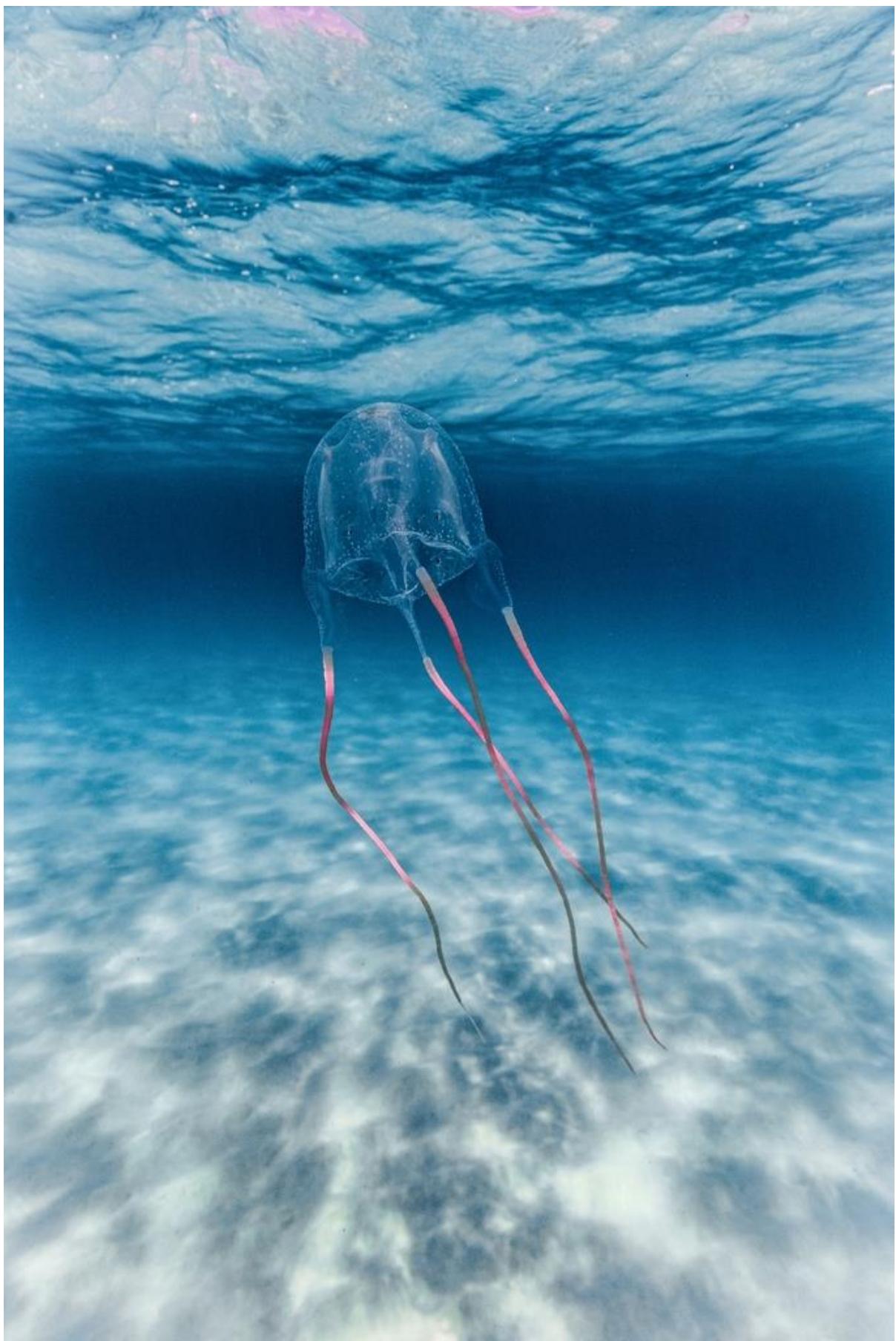
Copyright Info and More

Observation © Thomas Mesaglio · some rights reserved



This observation was created using:

iNaturalist iPhone App



Jimble (Carybdea rastonii). *Photograph* by Lewis Burnett (@huntingforparadise), All Rights Reserved.

iNaturalist Australia and the Atlas of Living Australia

The [Atlas of Living Australia](#) (ALA) is a collaborative, digital, open infrastructure that compiles Australian biodiversity data from a diverse range of data sources and providers, including institutes such as museums and herbaria, government and consultant surveys, and citizen science platforms ([Belbin et al. 2021](#), [Roger et al. 2023](#)). The ALA is the Australian node of GBIF, and is Australia's largest biodiversity database, with over 133 million records from thousands of datasets at time of writing; these data are used extensively in research, conservation and land management across the country.

In May 2019, the ALA signed an agreement with iNaturalist for Australia to join the iNaturalist Network, and in October 2019, iNaturalist Australia was officially publicly launched, with the ALA becoming the eighth organisation to join the network. There are several important aspects of the partnership between the ALA and iNaturalist for users to be aware of.

Affiliation with iNaturalist Australia

When creating an iNaturalist account for the first time, Australian users have two options: create an account directly through the iNaturalist Australia portal — <https://inaturalist.ala.org.au> — or through the global iNaturalist portal — <https://www.inaturalist.org>. Accounts created through the Australian portal are automatically affiliated with iNaturalist Australia, and those created through the global portal can manually affiliate their account with iNaturalist Australia at any time by editing their account settings. Once a user has affiliated their account with iNaturalist Australia, the ALA will have access to their email address to enable any necessary communication. Users that affiliate their account with iNaturalist Australia can choose to log into either portal at any time; they are not required to use the iNaturalist Australia portal.

Site usage

When using iNaturalist Australia, there are actually very few functional differences compared to iNaturalist. One difference is that all observations are automatically filtered to Australia only when using *Explore* or *Identify*. Importantly, however, this place filter **does not include all of 'Australia'**: as explained earlier in this document, the standard place for 'Australia' in iNaturalist does not include Norfolk Island, Christmas Island, Cocos (Keeling) Islands, Heard and McDonald Islands, or the Australian Exclusive Economic Zone. If any user wants to browse observations from outside Australia, this filter is also easily removed with a single click.

The screenshot shows the homepage of iNaturalist AU. At the top, there's a search bar and navigation links for 'Explore', 'Your Observations', 'Community', 'Identify', and 'More'. On the right, there are buttons for 'Upload', '0 messages', '0 notifications', and a user profile. Below the header, the word 'Observations' is displayed. To the right of the header are search and location filters. The main content area shows a grid of four images: 'Australian Scrub Python (Simia kinghorni)', 'Eastern Water Dragon (Intellagama lesuerii lesuerii)', 'Tribe Dasymutillini', and 'Pseudabispa bicolor'. Each image has a small circular icon with a number and a person's face.

Another difference is that, when visiting the [Projects page using iNaturalist Australia](#), users are only shown Australian-relevant projects, whereas visiting the same page on iNaturalist will show projects from across the globe. A few other pages (e.g., [People](#) and [Guides](#)) are similarly automatically filtered to only show Australian users or content.

Thus, with respect to direct site functionality, there is little difference between iNaturalist and iNaturalist Australia.



[Myrmecodia platytyrea subsp. antoinii. Photograph](#) by Jesse de Vries (@jessster78), CC BY-NC.



Spider Crab Watch

Projects

Projects let you pool your observations with other people on iNaturalist Australia. Whether you're starting a citizen science effort or keeping tabs on the birds in your neighborhood, Projects are the way to go.

[Start a Project](#)

Go

[Manage Your Projects ▾](#)

Featured



Australasian fishes



Mozzie Monitors - Australia



The Field Naturalists Club of Victoria (FNCV)



Great Southern Bioblitz 2021 Umbrella

Recently Active



Home Projects Umbrella



Yellingbo and surrounds



Budawang Coast Atlas of Life



Native Hybrid Orchids of Western Australia



Gum Tree Guardians



Great Southern Bioblitz 2023 Umbrella



Melbourne Sea Slug Census January 2024



Reptiles of NSW

iNaturalist-ALA link

Approximately once per week (usually on a Tuesday), all new observations uploaded to iNaturalist from anywhere in Australia, including Norfolk Island, Christmas Island, Cocos (Keeling) Islands, Heard and McDonald Islands, and the Australian Exclusive Economic Zone, are exported into the ALA. This occurs regardless of whether a user is affiliated with iNaturalist Australia or not. Importantly, any observation that had already previously been exported into the ALA, but had any of its associated data updated in any way during that preceding week, will also be automatically updated within the ALA. Thus, if an observation that was misidentified on iNaturalist is corrected, that correction will be automatically reflected in the ALA within the next week. Similarly, if an observation is deleted from iNaturalist after having previously been exported into the ALA, it will also be automatically deleted from the ALA. If an iNaturalist observation that has been exported into the ALA is misidentified or has some other issue such as incorrect location data, the best practice is to add a corrective identification or leave a comment directly on the iNaturalist observation, rather than flag the record in the ALA. Interacting directly with iNaturalist will ensure faster resolution of the issue, and any changes will be automatically reflected in the ALA.

All Needs ID and Research Grade records are exported from iNaturalist into the ALA, but Casual observations are not. Although some users advocate for the exclusion of Needs ID observations from the ALA as well, these constitute important records to include. For some taxa, especially many invertebrate or plant groups, only a single Australian expert currently contributes identifications to iNaturalist observations. Thus, there are many observations graded as Needs ID that have nonetheless been reviewed by an expert and are reliably and correctly identified, but have yet to move to Research Grade as they currently lack a corroborating identification. Any misidentified Needs ID observations that are exported into the ALA can be easily corrected on iNaturalist, and the change will be automatically reflected within the ALA within one week. The recruitment of more expert identifiers to iNaturalist will help to reliably shift more observations to Research Grade ([Callaghan and Mesaglio et al. 2022](#)).

In addition to the exclusion of Casual observations, any observation with a copyright license of All Rights Reserved will not be exported into the ALA. If an observation is set to any of the other copyright licenses, but the photographs and/or sound files associated with it have been licensed as All Rights Reserved, the observation itself will be exported into the ALA but without any of its media.

Once every six months, the ALA receives the true coordinates for Australian observations that have had their locations obscured on iNaturalist. Access to these true coordinates can then be requested through the ALA for uses such as research and conservation. If a user has uploaded observations from Australia to iNaturalist, but they haven't affiliated their account with iNaturalist Australia, then the ALA will receive the true locations for their observations obscured via taxon geoprivacy, and the ALA can share these data with researchers. However, the ALA will not receive the true locations of any manually obscured records for users that have not affiliated with iNaturalist Australia. For users that have affiliated their account with iNaturalist Australia, the ALA will receive the true locations of **all** obscured observations, whether they were automatically or manually obscured. However, even though the ALA does store the true locations of manually obscured records, they do not share these with researchers: it is only the true locations of taxon geoprivacy-affected taxa that are shared. Thus, **the ALA will never share the true locations of any observations that a user has manually obscured**, and the only way for researchers to access these true locations is through contacting individual users, or utilising projects as explained earlier in this document.

Users have the option to delete their iNaturalist account. Account deletion results in the deletion of all content ever made by that user on iNaturalist, including all observations they have uploaded, identifications they have made, and comments and journal posts they have written. This has additional flow-on effects for other users as well, e.g., Research Grade observations uploaded by other users may revert to Needs ID when these identifications disappear. Within one week, these observations will also be removed from the ALA. If a user does not want to contribute to iNaturalist any further, the least destructive approach is to simply stop logging in to their account.

Identification accuracy

It is useful to briefly comment here on identification accuracy. One criticism sometimes made of iNaturalist, and used to justify the omission of iNaturalist data from research projects or conservation activities such as environmental assessments, is that data quality is poor due to misidentifications. However, this is an increasingly untenable mischaracterisation of data quality across the platform. Broadly, the iNaturalist dataset in its entirety is analogous to any professional, vouchered natural history dataset stored in a museum or herbarium; some taxa are very well-curated, having been comprehensively reviewed by one or more experts (and indeed for some taxa, world experts regularly contribute identifications to iNaturalist), and identification accuracy is high. Conversely, some taxa are poorly curated, including some with records that have never been reviewed by a regional expert since collection/observation, and unsurprisingly these have a lower, and sometimes poor, identification accuracy. Identification accuracy in iNaturalist, and indeed in any biodiversity dataset, professional or

citizen science, is thus often dependent on the taxon or region, or a combination of the two; many taxa are well-curated in some regions of the world, but poorly-curated in others.

Some taxa in some regions of the world are exceptionally well-curated in iNaturalist, with sometimes five or six (or even more) taxonomists and other experts (both professional and amateur) regularly reviewing and identifying observations, facilitating identification accuracies close to 100%. Any decision to include or exclude iNaturalist data from any research or conservation-related project should therefore be made on an informed, case-by-case basis rather than casting aspersions on iNaturalist data universally based on the data quality of specific poorly-curated taxa. However, even initially poorly-curated taxa can provide valuable complementary data to other data sources if reviewed and corrected in preparation for use in research or conservation assessments.

Concurrently, more and more experts continue to join iNaturalist, both in Australia and globally, and thus, in conjunction with the broader community constantly learning, the identification accuracy of an increasingly larger number of taxa has improved, and will continue to improve, over time ([Callaghan and Mesaglio et al. 2022](#), [Campbell et al. 2023](#)). Perhaps the most crucial point is that iNaturalist is a dynamic database for which all records are available for constant peer review: any observation in existence, from the moment it is uploaded to the platform, can be reviewed at any time by anyone from anywhere in the world. Designation of an observation as Research Grade does not prevent it from being scrutinised or corrected at any point in time, and many users systematically review old observations to reassess identifications.

Although there are not yet any published studies assessing identification accuracy of iNaturalist observations from Australia (several studies are in preparation by Thomas Mesaglio at time of writing), there are two significant recent studies from the United States. Across a dataset of over 11,000 Research Grade observations of the large milkweed bug (*Oncopeltus fasciatus*), 98.3% were correctly identified ([Garretson et al. 2023](#)). The remaining 1.7% were corrected by the study authors.

[White et al. \(2023\)](#) assessed 10,000 records from ten plant families — Gentianaceae, Ericaceae, Melanthiaceae, Ulmaceae, Fabaceae, Asteraceae, Fagaceae, Cyperaceae, Juglandaceae, Apocynaceae — across the southeastern United States, and compared photographic identification accuracy between iNaturalist Research Grade observations and digitised herbarium specimens. For all ten families, the proportion of correctly identified records was higher for iNaturalist observations, which had an overall identification accuracy of 84.3%, including two families (Apocynaceae and Fabaceae) exceeding 90% identification accuracy on iNaturalist.

Three small-scale [identification accuracy experiments](#) were also recently conducted on iNaturalist. From a random sample of 1000 observations across the globe, covering all taxa, accuracy was estimated as 90% across all 1000 observations — increasing to 95% for the subset of Research Grade observations — during the [first experiment](#), whilst the [second experiment](#) indicated 79% accuracy for the Needs ID observations subset and 97% for the Research Grade subset. For the [third iteration](#), the sample size was increased to 10,000 observations; identification accuracy was 88% for all verifiable observations and 95% for Research Grade observations. It is important to note that, whilst these numbers are promising, these samples are not strongly representative of all records from many regions or taxa, such as Africa or fungi, and are generally biased towards more common species. These experiments will continue to be replicated on a monthly basis, with improved parameters and design, to help increase representativeness.

Another important consideration that may not be immediately obvious to those unfamiliar with iNaturalist is that some observations uploaded to the platform are associated with voucher specimens that have already been identified by a taxonomist or other expert. For example, naturalists Geoff and Ruth Byrne ([@geoffbyrne](#)) have uploaded over 5,000 observations of plants from Western Australia, all of them associated with physical vouchers they collected and deposited at the Perth Herbarium, and that have been identified by professional botanists and taxonomists. Thus, there are many datasets within iNaturalist with exceptional identification accuracy.

Overall, many of the criticisms levelled at iNaturalist data (and similar citizen science platforms) highlight a ‘data double standard’ whereby many of the limitations and biases present in iNaturalist data are also present in professionally collected datasets ([Binley and Bennett 2023](#)). Given thousands of taxonomists, biologists, curators and other experts now contribute their knowledge and identifications to iNaturalist, many taxa in many regions of the world have exceptional quality, well-curated data. iNaturalist data provide an invaluable complement to professional data, and any data subset should therefore be assessed on its merits for specific projects and uses.



Graphic flutterer ([Rhyothemis graphiptera](#)). [Photograph](#) by Jono Dashper (@jonodashper), All Rights Reserved.



[Actaecia thomsoni](#). [Photograph](#) by Simon Grove (@simongrove), CC BY-NC.

Significant Australian records

There are now thousands of scientific papers and research projects using iNaturalist data across the globe, in addition to an increasingly prominent role played by iNaturalist observations to inform conservation assessments and land management. Indeed, in South Africa, the protocol for conducting specialist assessments of terrestrial animals and plants mandates that an assessment must “provide evidence (photographs or sound recordings) of each SCC [species of conservation concern] found or observed within the study area, which must be disseminated by the specialist to a recognized online database facility”, with the explicit recommendation that “**The preferred platform is iNaturalist.org**” ([DFFE 2020](#)). These records are all verified by experts.

Australian iNaturalist observations are also increasingly being used in a diverse range of research and conservation applications, including understanding biodiversity responses to bushfires ([Kirchhoff et al. 2021](#), [Gorta et al. 2023](#)), establishing new national records and significant range extensions ([Douch and Poupa 2021](#), [Smith and Nimbs 2022](#)), and tracking the spread of non-native species ([Mata et al. 2021](#), [Connors et al. 2022](#)). As Australian use of iNaturalist continues to grow exponentially, more and more significant records are uploaded to the platform. Importantly, many of these records are only recognised thanks to the dedicated efforts of the increasing number of experts, Australian or otherwise, engaging with Australian observations ([Mesaglio and Callaghan 2021](#), [Callaghan and Mesaglio et al. 2022](#)).

Presented here are a small handful of highly significant Australian observations, or sets of observations, uploaded to iNaturalist over the last few years that highlight the value of the platform for contributing to our understanding of Australia’s incredible biodiversity, and indeed the value of expert engagement with iNaturalist.

1) *Aedes shehzadae*: <https://www.inaturalist.org/observations/76876488>

Conservation photographer John Lenagan ([@johnlenagan](#)) photographed an unusual mosquito at a light sheet in the remote Kutini-Payamu (Iron Range) National Park (CYPAL) on Cape York Peninsula, Queensland in February 2021. After uploading the photograph as an observation to iNaturalist in May 2021, he tagged medical entomologist and mosquito expert Cameron Webb ([@mozziebites](#)) asking for an identification. Following two weeks of checking literature and specimens with other experts external to iNaturalist, in particular fellow medical entomologist and mosquito expert John Clancy, the mosquito was identified as [*Aedes shehzadae*](#). This observation represented the first time this species has been recorded since the type was collected in 1934, the first time a live individual has been photographed, and the first record of this species in Australia, with the type collected in Papua New Guinea ([Webb et al. 2022](#)).

This observation also contributes to the project [*Mozzie Monitors – Australia*](#), which has now collated over 6,600 Australian observations of 95 mosquito species ([Braz Sousa et al. 2022](#)).

2) *Caesia walalbai*: https://www.inaturalist.org/observations?taxon_id=1518563

Whilst identifying Queensland observations of the native grass-lily [*Caesia parviflora*](#) on iNaturalist, taxonomist Aiden Webb ([@atwebb](#)) noticed that a number of observations were morphologically distinct. Webb contacted the observers and requested a specimen to be collected, which was done by naturalist Ted Johansen ([@tedjohansen](#)), and additional specimens were then located at several Australian herbaria, leading to the description of [*Caesia walalbai*](#) as a new species from the *Caesia parviflora* complex ([Webb et al. 2023](#)). Many of the necessary diagnostic characters in the genus *Caesia* are either rarely collected (e.g., roots) or are lost in preserved specimens (e.g., colour of floral parts). The iNaturalist observations of living individuals of this species, most of which depicted flowers, were crucial for its recognition as a new species: *C. walalbai* is the only eastern Australian

Caesia with fully yellow staminal filaments, one of the important features (among several) that indicated to Webb this was likely a new species, and a feature that is lost in herbarium vouchers after pressing and drying.

3) *Viola improcera*: <https://www.inaturalist.org/observations/194322111>

An observation of a violet (genus *Viola*) from Ben Lomond National Park in Tasmania, uploaded to iNaturalist by master's student Juliette Gaynor-Brown ([@jggbrown](#)) in December 2023, caught the eye of Miguel de Salas ([@mftasp](#)) — senior curator of botany with the Tasmanian Museum and Art Gallery and the current most prolific identifier of Tasmanian plants on iNaturalist — as something he didn't recognise from Tasmania. de Salas tagged Western Australian botanist and taxonomist Kevin Thiele ([@kevinthiele](#)); *Viola* is one of his areas of expertise. Serendipitously, Thiele was in Tasmania on holiday at the time, and used the observation to re-locate the population himself. He identified it as *Viola improcera*, a federally listed endangered species, and collected specimens have since confirmed the identification. This was the first ever record of this species from Tasmania, a huge range extension from its previously known range in eastern Victoria and southern NSW. As explained by de Salas in the [media coverage](#) the observation received:

"Eyes on the ground are a really precious resource, and the fact that these citizen scientist platforms exist means we have a lot more eyes on the ground doing the looking for us".

"It takes relatively little time for me to review the observations that come through".

4) *Megabruchidius tonkineus*: <https://www.inaturalist.org/observations/86670187>

Melbourne entomologist and psyllid expert Francesco Martoni ([@f_martoni](#)) uploaded an observation of a beetle from the Royal Botanic Gardens in Melbourne on 12 July 2021. In just eight hours, the record had already been reviewed and identified as *Megabruchidius tonkineus* by Boris Büche ([@borishb](#)), a German coleopterist and one of the most prolific identifiers on the entire iNaturalist platform, having added identifications to more than 680,000 observations of beetles. Büche's identification was significant as this species, native to Southeast Asia, had never been recorded in Australia at the time. However, given *M. tonkineus* is already naturalised in Europe and South America, and *Gleditsia* — its host plant genus — is a common garden ornamental in Australia, the presence of this beetle species in Australia was clearly a possibility. The observation was quickly followed up on, specimens were collected by botanist Val Stajsic and examined by Australian entomologist and beetle expert Chris Reid, and the identification was confirmed ([Fow et al. 2023](#)). More observations of this beetle from Australia have since been uploaded to or identified on iNaturalist, including a New South Wales record pre-dating the observation discussed here, a recent record from Sydney, and records from Adelaide in South Australia.

Studies have shown that larval seed drilling by the closely related beetle *Megabruchidius dorsalis* is crucial for stimulating germination of some *Gleditsia* species in Asia and Europe ([Takakura 2002](#), [Horvat and Sajna 2021](#)); it is possible that *M. tonkineus* may have similar interactions with *Gleditsia triacanthos*. Given *G. triacanthos* is widely naturalised in NSW and Queensland, the beetle could have the potential to contribute further to the spread and success of this serious weed, highlighting the importance of this observation for rapidly alerting Australian biosecurity agencies to its presence.

This case study also reinforces the high value of iNaturalist's global identifier pool, and the ability for any expert to review observations from anywhere in the world at any time.

5) *Paraselina brunneri*: <https://www.inaturalist.org/observations/19947697>,
<https://www.inaturalist.org/observations/19373510>

Pygmy grasshoppers (Tetrigidae) are a family of small, usually cryptic grasshoppers often found in tropical rainforests on tree trunks, camouflaging against bark, mosses and lichens. One Australian species, *Paraselina brunneri*, was described in 1887 (as *Diotarus brunneri*) from a specimen collected in the 1860s ([Bolívar 1887](#)). This species then went unrecorded for seventy years until four more females were collected in the 1930s from northern NSW (these specimens were described as a new species, *Paraselina multifora*, by [Rehn \(1952\)](#), but synonymised under *P. brunneri* by [Skejo et al. 2020](#)). Another ninety years then elapsed with no further known records of this species, until one appeared on iNaturalist.

Naturalist Nick Lambert ([@nicklambert](#)), the current most prolific species observer for Australia on iNaturalist, uploaded an observation he identified to Orthoptera on 29 January 2019, and tagged entomologist Matthew Connors ([@matthew_connors](#)), who identified it as Tetrigidae. Lambert subsequently tagged Josip Skejo ([@skejo](#)), a Croatian entomologist and tetrigid expert, and the current most prolific identifier of Tetrigidae on iNaturalist globally. Skejo immediately recognised the significance of the observation: this was the first known observation of *Paraselina brunneri* since the 1930s, and the first known photographs of a live individual. Connors then explored other Australian grasshopper observations and found another record of *P. brunneri* that had been uploaded almost one month earlier by naturalist Griffin Chong ([@grisper1](#)), but had not been identified yet. Chong's record was also the first ever record of a male of the species, with Lambert's observation still holding the mantle as the first ever photographs of a living female ([Skejo et al. 2020](#)).

Remarkably, as of 3 April 2024, there are now [132 observations](#) (96 of them uploaded by Lambert alone) of *P. brunneri* on iNaturalist across northern NSW and southeastern Queensland observed across just five years, compared to five known specimens collected across a span of 160 years.

6) *Inimia nat*: https://www.inaturalist.org/observations?taxon_id=1514466

On 19 May 2022, entomologist Matthew Connors — the current most prolific identifier of orthopteroid insects in Australia — was alerted to an unusual mantis observation from Queensland uploaded by naturalist Glenda Walter ([@glendawalter](#)). Connors did not recognise the species, and contacted Walters for more information. Walters collected a number of specimens for Connors, and just over eighteen months later the mantis was described as a new species, *Inimia nat* ([Connors et al. 2023](#)). As explained by Connors in his publication:

"As demonstrated by the discovery of *I. nat*, however, this greater surveying ability can result in the discovery of entirely new species and genera. Although some of these new taxa are indeed rare, many of them are simply highly localised or come from areas that are under-surveyed by traditional methods. Thus, once a new species has been photographed it is often not difficult to collect specimens with the help of citizen scientists. Glenda Walter's discovery of *I. nat* perfectly exemplifies how streamlined this process can become. From the date the mantis was first photographed, it took just a month to collect specimens and begin the descriptive process. This more 'active' approach to citizen science has proven to be a valuable means of discovering new taxa, and *Inimia* joins a small number of new genera that have been discovered with the aid of citizen science..."

Related platforms and tools

iNatForum

iNaturalist has its own dedicated discussion forum, the [iNatForum](#). Here, users can discuss iNaturalist- and nature-related topics, report software bugs and other technical issues, request new features, and share tutorials. Major updates and announcements are also made here by staff. The forum is managed by a small team of moderators.

Seek by iNaturalist

[Seek](#) is a sister app to iNaturalist, available as a mobile app. Whilst the fundamental principle behind Seek is the same as iNaturalist, i.e., a tool to connect users with nature and allow them to identify the organisms they encounter, there are a number of fundamental differences between the two. Seek is only available as a mobile app, and whilst iNaturalist users must be 13+ years old to create an account, Seek is child-friendly and indeed a recommended alternative to iNaturalist for kids. Seek does not facilitate any identifications from other users; users are provided with identifications in real time (without needing an internet connection or needing to take a photograph) by the Computer Vision (although an older model is used in Seek compared to iNaturalist). Seek does not require any login or account details, and no personal details are collected by the app. However, it is possible to log into iNaturalist from Seek and post observations. Seek is also more gamified than iNaturalist, with users able to earn badges and complete challenges by observing target taxa.

iNaturalist API

iNaturalist has its own [API](#) (Application Programming Interface) that allows users to fetch large amounts of data, edit their own observations in bulk, and build customised maps, software, and other tools and apps among a wide range of applications. For example, [here is a map](#) showing the top observers in Australia, with the size of their profile picture scaled to the number of observations submitted, and the picture placed on the map as a centroid of the locations of all their observation.



[Mesothrombium](#) sp. [Photograph](#) by Bruno Bell (@tasmanian_cryptofauna), CC BY-NC.

References

Atlas of Living Australia, 2023. National Framework for the Sharing of Restricted Access Species Data in Australia 2023, Atlas of Living Australia, Publication Series No. 6, Canberra, Australia.
<https://doi.org/10.54102/ala.94894>

Belbin, L., Wallis, E., Hobern, D. and Zerger, A., 2021. The Atlas of Living Australia: History, current state and future directions. *Biodiversity Data Journal*, 9, e65023.

Binley, A.D. and Bennett, J.R., 2023. The data double standard. *Methods in Ecology and Evolution*, 14(6), pp.1389-1397.

Binskin, M., Bennett, A. and Macintosh, A., 2020. Royal Commission into Natural Disaster Arrangements. Commonwealth of Australia.

Bolívar, I., 1887. Essai sur les Acridiens de la tribu des Tettigidae. Imprimerie C. Anoot-Braeckman ad. Hoste, Sucr..

Bolt, M.H., Callaghan, C.T., Poore, A.G., Vergés, A. and Roberts, C.J., 2022. Using the background of fish photographs to quantify habitat composition in marine ecosystems. *Marine Ecology Progress Series*, 688, pp.167-172.

Braz Sousa, L., Fricker, S., Webb, C.E., Baldock, K.L. and Williams, C.R., 2022. Citizen Science Mosquito Surveillance by Ad Hoc Observation Using the iNaturalist Platform. *International Journal of Environmental Research and Public Health*, 19(10), p.6337.

Callaghan, C.T., Mesaglio, T., Ascher, J.S., Brooks, T.M., Cabras, A.A., Chandler, M., Cornwell, W.K., Cristóbal Ríos-Málaver, I., Dankowicz, E., Urñi Dhiya'ulhaq, N., Fuller, R.A. et al., 2022. The benefits of contributing to the citizen science platform iNaturalist as an identifier. *PLoS Biology*, 20(11), p.e3001843.

Campbell, C.J., Barve, V., Belitz, M.W., Doby, J.R., White, E., Seltzer, C., Di Cecco, G., Hurlbert, A.H. and Guralnick, R., 2023. Identifying the identifiers: How iNaturalist facilitates collaborative, research-relevant data generation and why it matters for biodiversity science. *BioScience*, 73(7), pp.533-541.

Cole, E., Van Horn, G., Lange, C., Shepard, A., Leary, P., Perona, P., Loarie, S. and Mac Aodha, O., 2023. Spatial Implicit Neural Representations for Global-Scale Species Mapping. arXiv preprint arXiv:2306.02564.

Connors, M.G., Chen, H., Li, H., Edmonds, A., Smith, K.A., Gell, C., Clitheroe, K., Miller, I.M., Walker, K.L., Nunn, J.S. and Nguyen, L., 2022. Citizen scientists track a charismatic carnivore: Mapping the spread and impact of the South African Mantis (Miomantidae, *Miomantis caffra*) in Australia. *Journal of Orthoptera Research*, 31, pp.69-82.

Connors, M.G., Yeeles, P., Lach, L. and Rentz, D.C., 2023. A revision of the genus *Ima* Tindale (Mantodea: Nanomantidae: Fulciniinae) with the description of a new genus. *Zootaxa*, 5380(3), pp.201-226.

Department of Forestry, Fisheries and the Environment (DFFE), 2020. National Environmental Management Act, 1998 (Act No. 107 of 1998). Government Gazette, 30 October 2020.

DiBattista, J.D., Shalders, T.C., Reader, S., Hay, A., Parkinson, K., Williams, R.J., Stuart-Smith, J. and McGrouther, M., 2022. A comprehensive analysis of all known fishes from Sydney Harbour. *Marine Pollution Bulletin*, 185, p.114239.

Douch, J.K. and Poupa, A.M., 2021. Citizen science data opens multiple avenues for iridovirus research and prompts first detection of Invertebrate iridescent virus 31 in Australia. *Journal of Invertebrate Pathology*, 183, p.107619.

Eow, L., Rako, L., Selleck, C. and Valenzuela, I., 2023. First record of *Megabruchidius tonkineus* (Pic, 1904)(Coleoptera: Chrysomelidae, Bruchinae) in Australia. *BioInvasions Records*, 12(2), pp.581-592.

- Garretson, A., Cuddy, T., Duffy, A.G., iNaturalist Citizen Scientists and Forkner, R.E., 2023. Citizen science data reveal regional heterogeneity in phenological response to climate in the large milkweed bug, *Oncopeltus fasciatus*. *Ecology and Evolution*, 13(7), p.e10213.
- Gorta, S.B., Callaghan, C.T., Samonte, F., Ooi, M.K., Mesaglio, T., Laffan, S.W. and Cornwell, W.K., 2023. Multi-taxon biodiversity responses to the 2019–2020 Australian megafires. *Global Change Biology*, 29(23), pp.6727-6740.
- Horvat, E. and Sajna, N., 2021. Exploring the impact of a non-native seed predator on the seed germination of its non-native host. *Biological Invasions*, 23(12), pp.3703-3717.
- Kirchhoff, C., Callaghan, C.T., Keith, D.A., Indiarto, D., Taseski, G., Ooi, M.K., Le Breton, T.D., Mesaglio, T., Kingsford, R.T. and Cornwell, W.K., 2021. Rapidly mapping fire effects on biodiversity at a large-scale using citizen science. *Science of the Total Environment*, 755, p.142348.
- Mata, L., Vogel, B., Palma, E. and Malipatil, M., 2021. The arrival and spread of the European firebug *Pyrrhocoris apterus* in Australia as documented by citizen scientists. *Urban Naturalist Notes*, 9(3).
- Mesaglio, T. and Callaghan, C.T., 2021. An overview of the history, current contributions and future outlook of iNaturalist in Australia. *Wildlife Research*, 48(4), pp.289-303.
- Mesaglio, T., Soh, A., Kurniawidjaja, S. and Sexton, C., 2021. 'First Known Photographs of Living Specimens': the power of iNaturalist for recording rare tropical butterflies. *Journal of Insect Conservation*, 25, pp.905-911.
- Rehn J.A.G., 1952. The grasshoppers and Locust (Acridoidea) of Australia. vol. I: Tetrigidae and Eumastacidae. Commonwealth Scientific and Industrial Research Organization, Australia, Melbourne, 326 pp.
- Roberts, C.J., Vergés, A., Callaghan, C.T. and Poore, A.G., 2022. Many cameras make light work: opportunistic photographs of rare species in iNaturalist complement structured surveys of reef fish to better understand species richness. *Biodiversity and Conservation*, 31(4), pp.1407-1425.
- Roger, E., Kellie, D., Slatyer, C., Brenton, P., Torresan, O., Wallis, E. and Zerger, A., 2023. Open Access Research Infrastructures are Critical for Improving the Accessibility and Utility of Citizen Science: A Case Study of Australia's National Biodiversity Infrastructure, the Atlas of Living Australia (ALA). *Citizen Science: Theory and Practice*, 8(1), pp.1-35.
- Skejo, J., Connors, M., Hendriksen, M., Lambert, N., Chong, G., McMaster, I., Monaghan, N., Rentz, D., Richter, R., Rose, K. and Franjević, D., 2020. Online social media tells a story of *Anaselina*, *Paraselina*, and *Selivinga* (Orthoptera, Tetrigidae), rare Australian pygmy grasshoppers. *ZooKeys*, 948, p.107.
- Smith, S.D. and Nimbs, M.J., 2022. Citizen Scientists Record Significant Range Extensions for Tropical Sea Slug Species in Subtropical Eastern Australia. *Diversity*, 14(4), p.244.
- Takakura, K., 2002. The specialist seed predator *Bruchidius dorsalis* (Coleoptera: Bruchidae) plays a crucial role in the seed germination of its host plant, *Gleditsia japonica* (Leguminosae). *Functional Ecology*, pp.252-257.
- Webb, A., Birch, J. and Barrett, R., 2023. *Caesia walabai* AT Webb, Birch & RL Barrett (Asphodelaceae, Hemerocallidoideae), a new species from south-east Queensland. *Telopea*, 26, pp.159-168.
- Webb, C., Clancy, J., Doggett, S.L., McAlister, E., Williams, C., Fricker, S., van den Hurk, A., Lessard, B., Lenagan, J. and Walter, M., 2022. First record of the mosquito *Aedes (Downsiomyia) shehzadae* (Diptera: Culicidae) in Australia: A unique discovery aided by citizen science. *Journal of Vector Ecology*, 47(1), pp.133-137.
- White, E., Soltis, P.S., Soltis, D.E. and Guralnick, R., 2023. Quantifying error in occurrence data: Comparing the data quality of iNaturalist and digitized herbarium specimen data in flowering plant families of the southeastern United States. *Plos One*, 18(12), p.e0295298.



Tasselled leatherjacket (*Chaetodermis penicilligerus*). *Photograph* by Glen Whisson (@glen_whisson), CC BY-NC.