The wonders 🌈 of iNaturalist

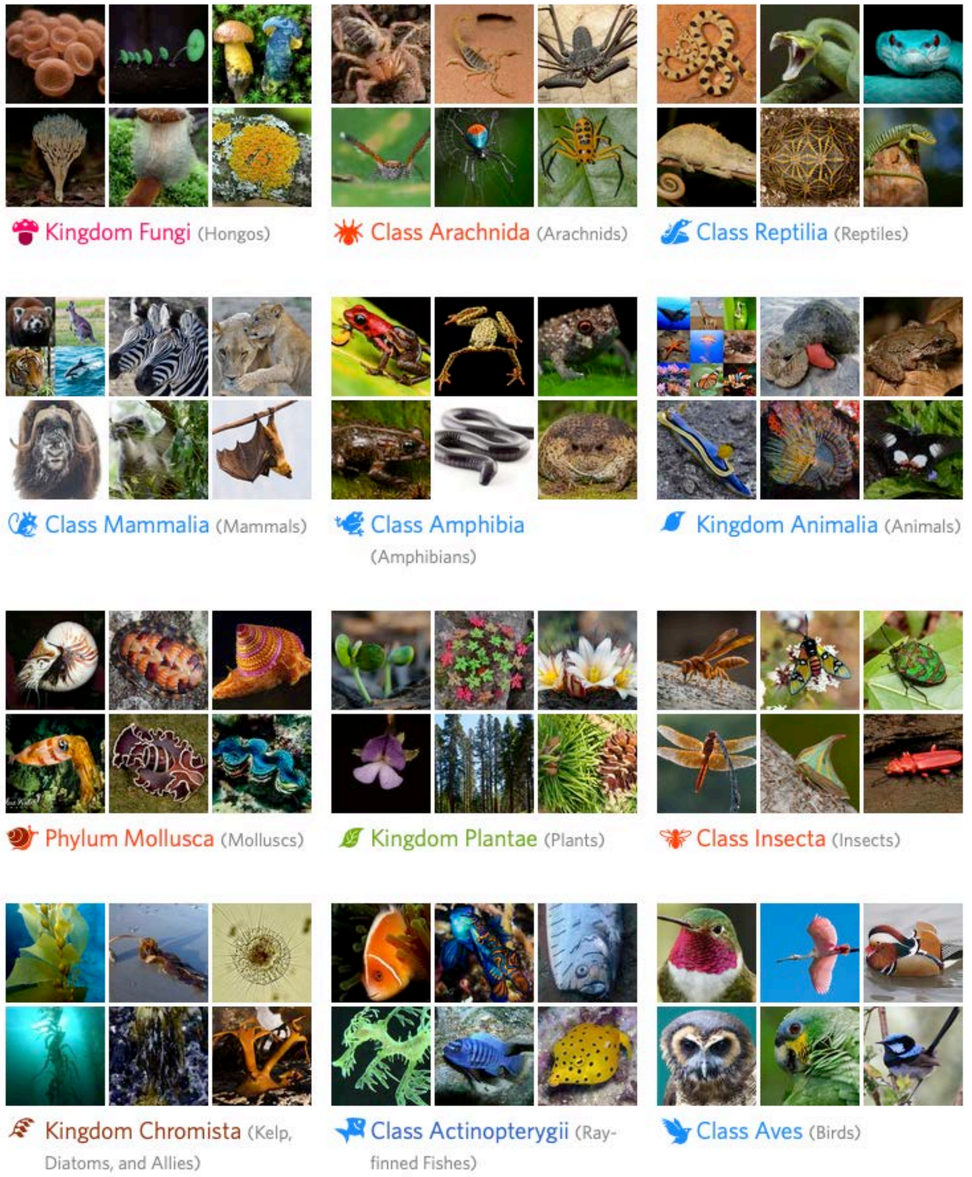
and why you should embrace community-science derived data

Florencia Grattarola | MOBI Lab | Czech University of Life Sciences in Prague

iNaturalist

inaturalist.org

- A multi-taxa platform hosted by the **California Academy of Sciences** and the **National Geographic Society**.



iNaturalist

inaturalist.org

- Its primary goal is to connect people to nature, and the secondary goal is **to generate scientifically valuable biodiversity data**.

iNaturalist.Se
SWEDEN
iNaturalistFi
FINLAND
iNaturalistUK
UNITED KINGDOM
iNaturalist.ca
CANADA
iNaturalist.LU
LUXEMBOURG
BioDiversity4All
INATURALIST PORTUGAL
iNaturalistGR
GREECE
naturalista
INATURALIST MEXICO
iNaturalistGT
GUATEMALA
iNaturalistil
ISRAEL
NaturalistaCR
INATURALIST COSTA RICA
Naturalista
INATURALIST COLOMBIA
iNaturalistPa
PANAMA
iNaturalistEc
ECUADOR
iNaturalistAU
AUSTRALIA
NaturalistaUY
INATURALIST URUGUAY
iNaturalistCL
CHILE
iNaturalist.NZ
NEW ZEALAND
ArgentíNat
INATURALIST ARGENTINA
iNaturalist
GLOBAL NETWORK
CALIFORNIA ACADEMY OF SCIENCES
NATIONAL GEOGRAPHIC

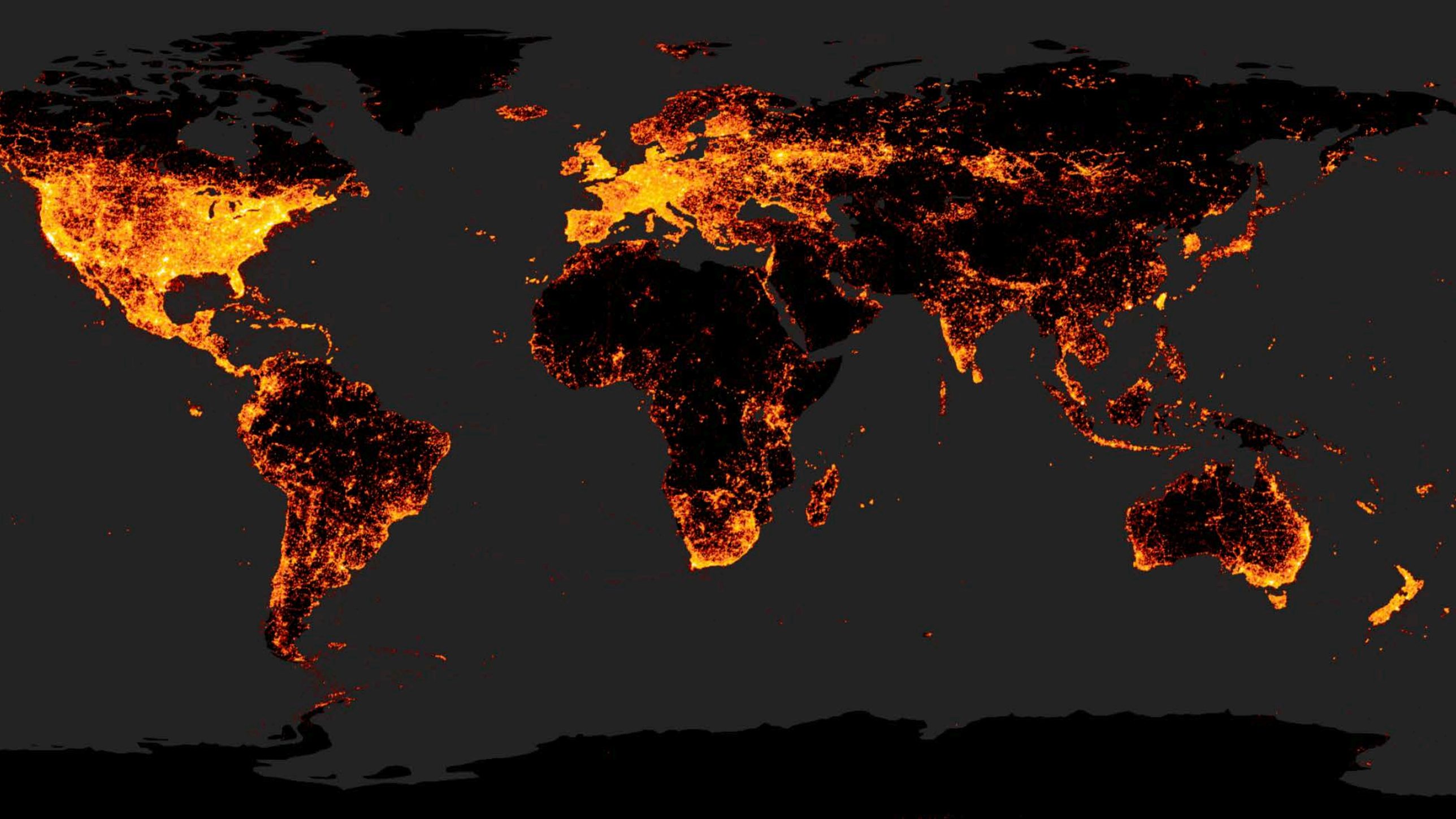
iNaturalist

Open data provider

- There are currently >1.9 billion species occurrence records in the Global Biodiversity Information Facility (GBIF).

- More than 38 million come from **iNaturalist**.

GBIF



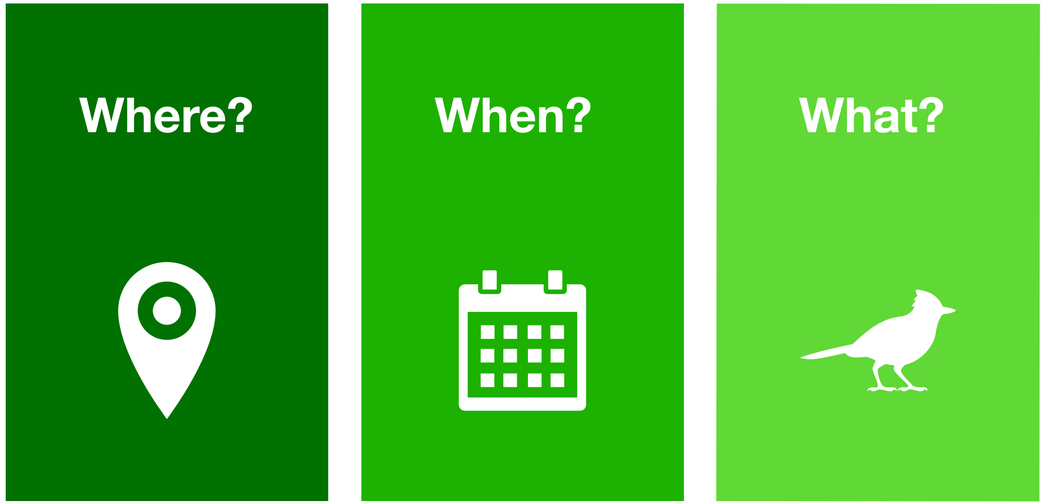
How does it work?

Making an **observation**

Making an observation

inaturalist.org/observations/upload

- Observations record an encounter with an **individual organism** at a particular **time** and **location**.



Making an observation

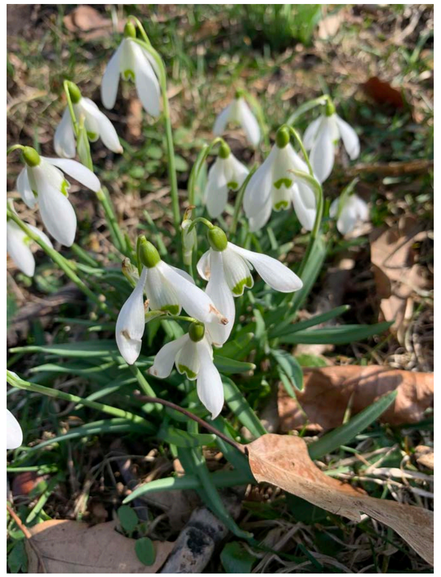
inaturalist.org/observations/upload

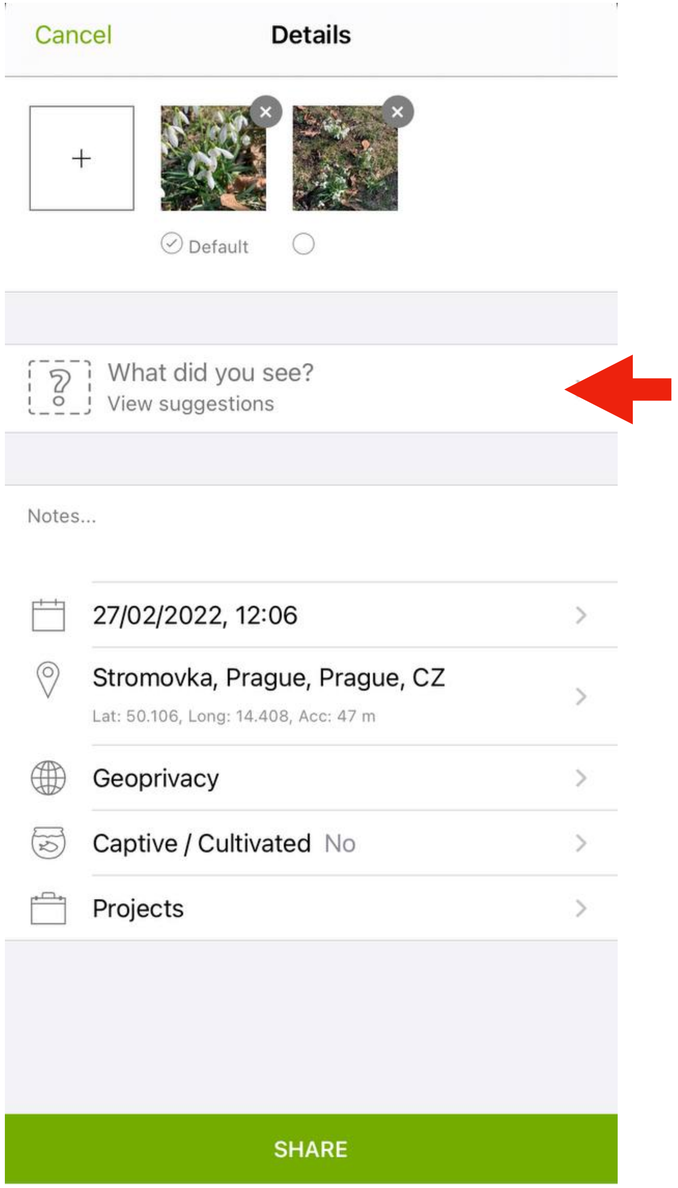
- Observations record an encounter with an **individual organism** at a particular **time** and **location**.

- Start by uploading a **photo** or a **sound** recordings.

Example

Making an **observation**





Computer Vision

Species ID Suggestions

- iNaturalist uses **computer vision systems** trained on users' photos and identifications in order to provide automated taxon identification suggestions.
- '**Seen nearby**': within 100 kilometres of the observation's coordinates and observed around that time of year (45 days before and after, in any year).

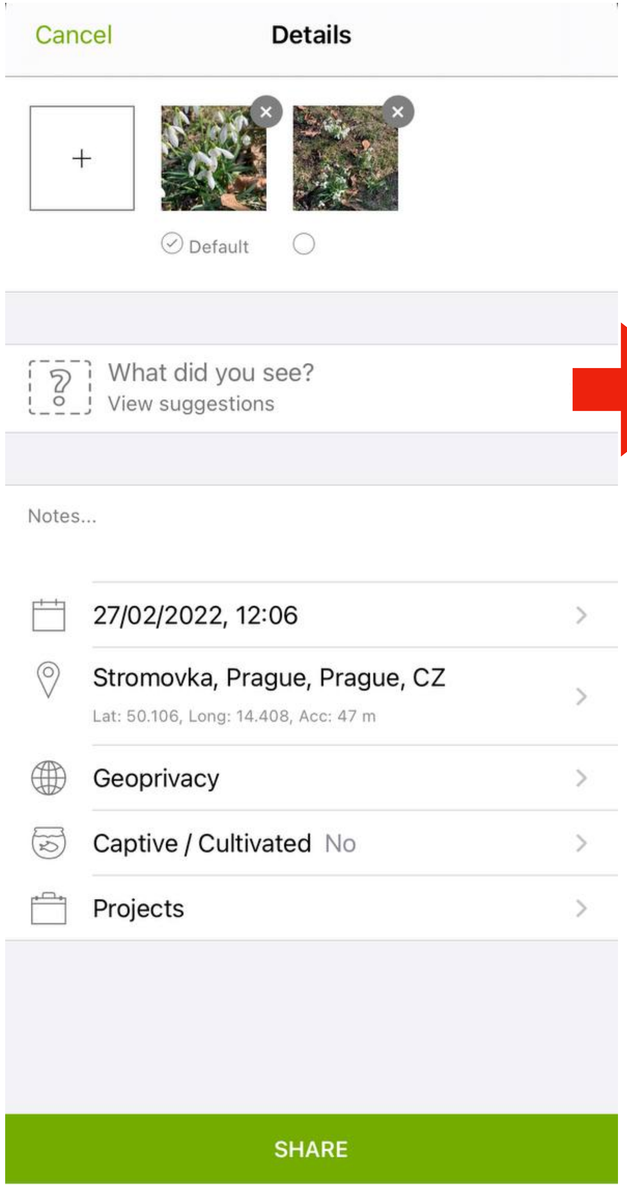
Two-spotted ladybug
Adalia bipunctata

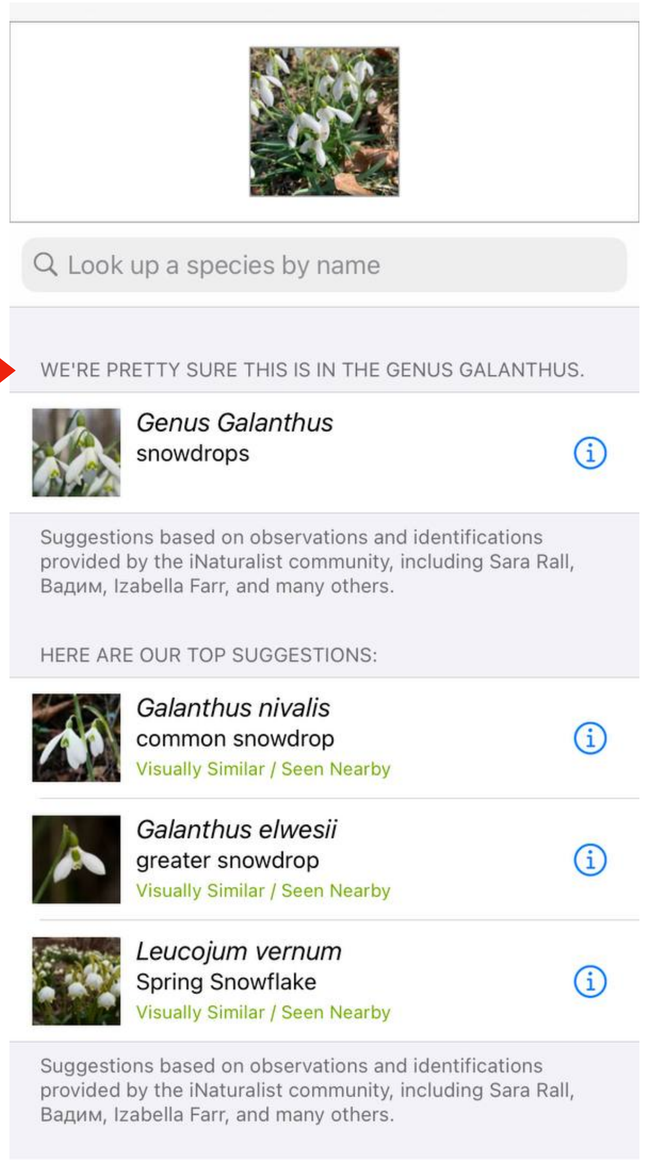
Seven-spotted ladybug
Coccinella septempunctata

https://www.inaturalist.org/pages/computer_vision_demo

Example

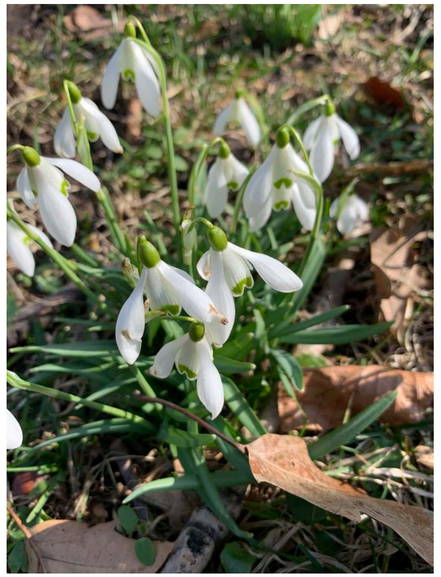
Making an **observation**

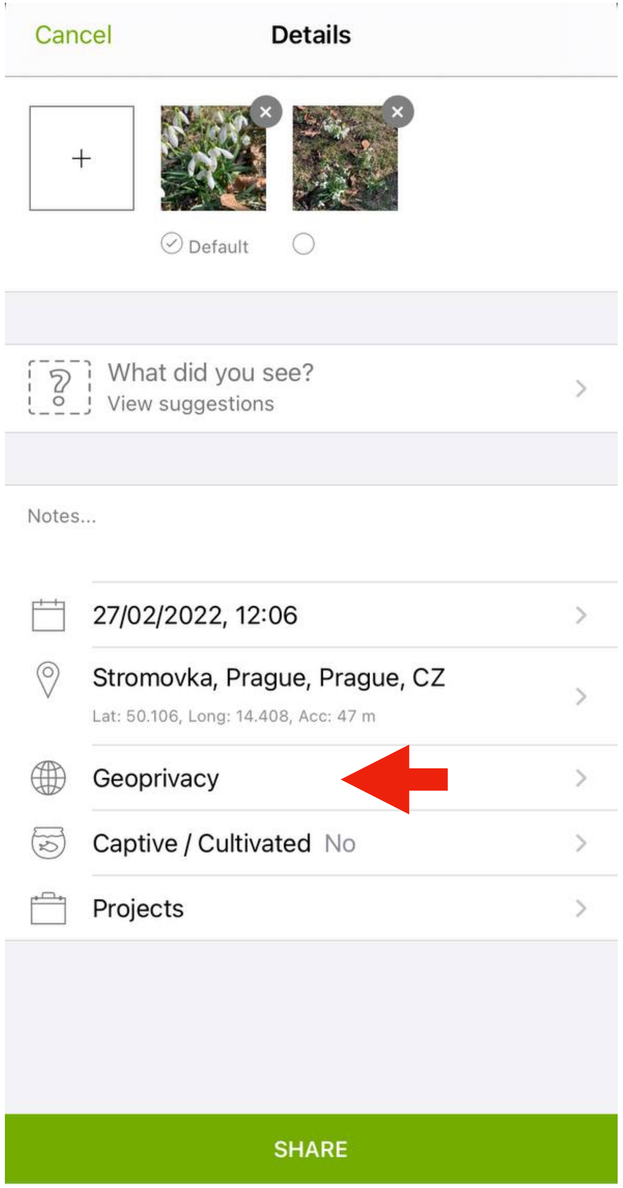




Example

Making an **observation**

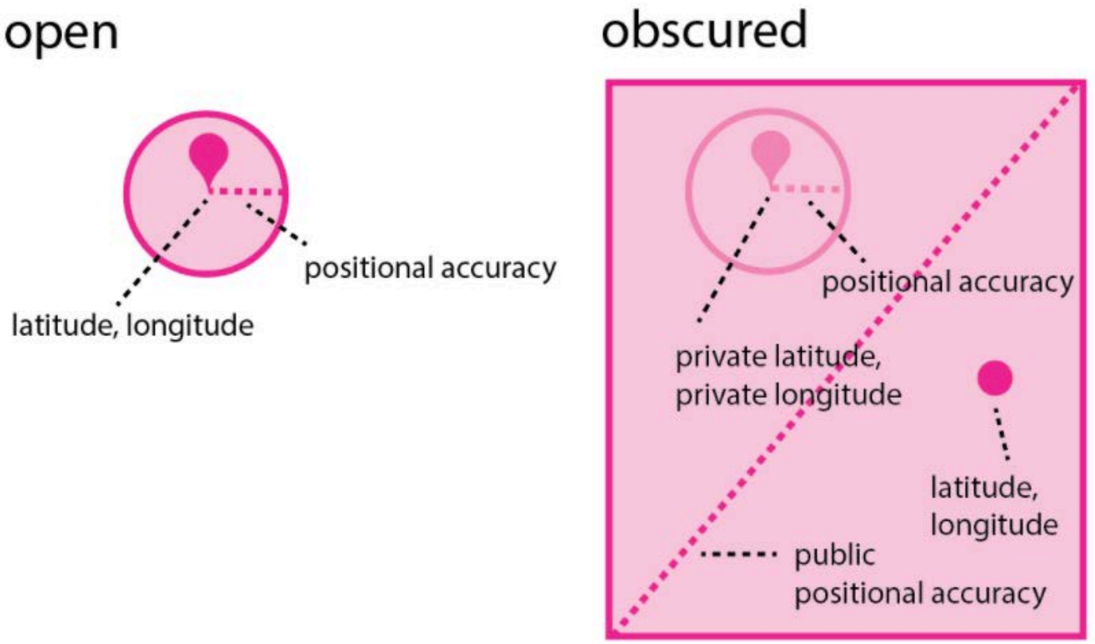




Obscure location

Geoprivacy

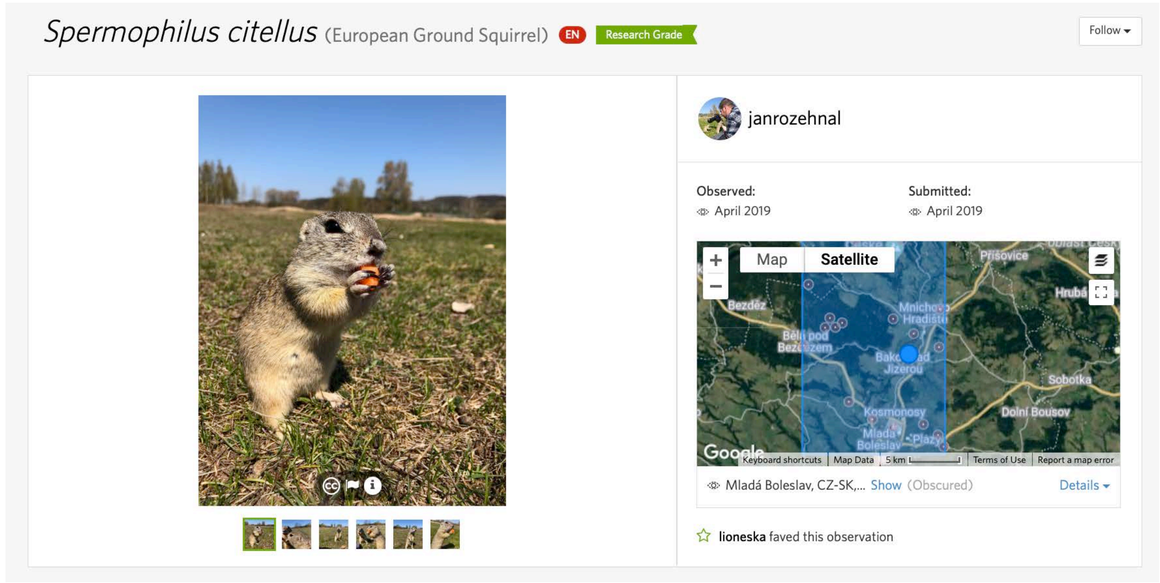
- The **individual observer decides** when information is restricted and when restricted information is shared.
- The public positional accuracy is increased to the diagonal of a 0.2 x 0.2-degree cell (~500km2).
- Public latitude and longitude are replaced with a random point within this cell.



Sensitive species

Taxon geoprivacy

- Geoprivacy is automatically applied to all observations of a **threatened taxon**, globally or in the place specified by the conservation status.
- The **real** coordinates can be accessed (e.g., projects, agreements with national nodes).

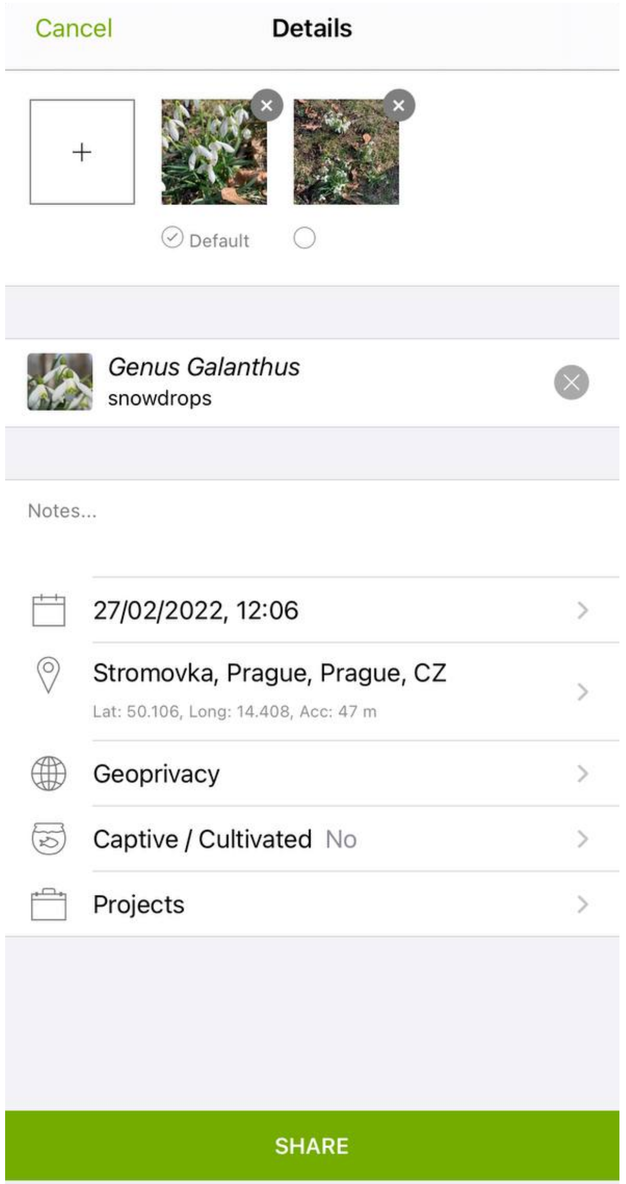


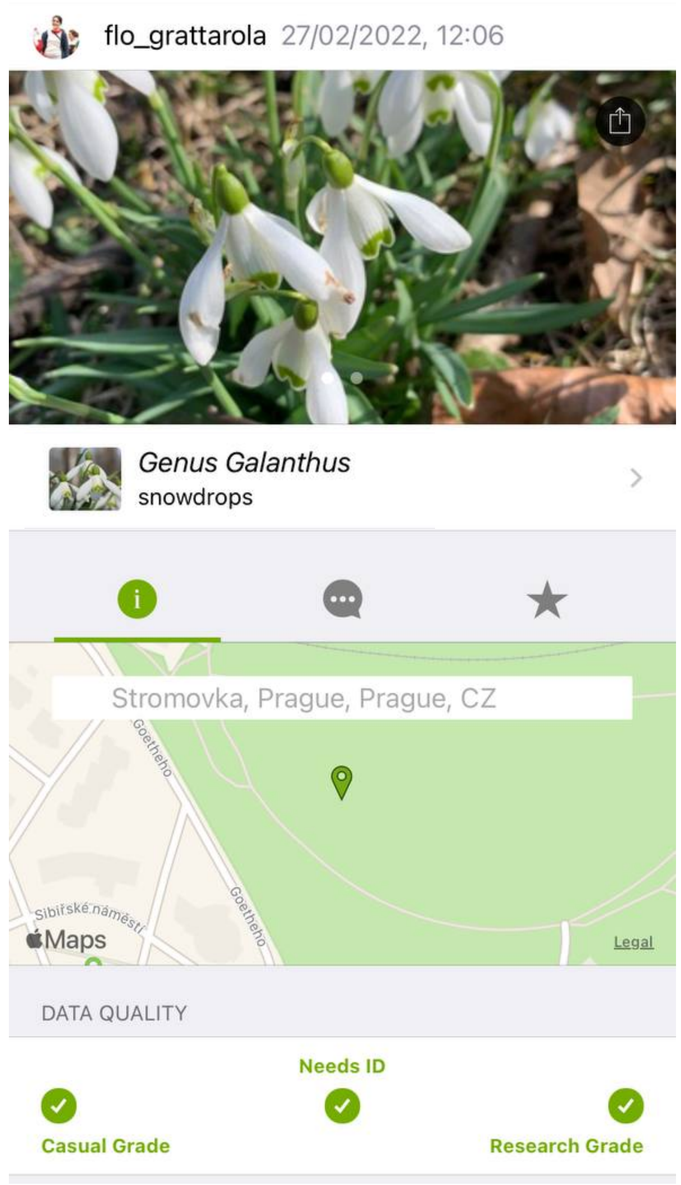
Conservation Status

Place	Conservation Status	Source	Taxon Geoprivacy
Globally	Endangered (EN) Added by bobby23 on February 16, 2013	IUCN Red List	Obscured
Germany	Ausgestorben oder verschollen Added by bobby23 on April 04, 2020 Updated by bobby23 on April 04, 2020	Rote-Liste-Zentrum	Open
Poland	Wymagający ochrony czynnej Added by e150a on July 21, 2020 Updated by e150a on July 21, 2020	Minister Środowiska	Obscured

Example

Making an **observation**





How does it work?

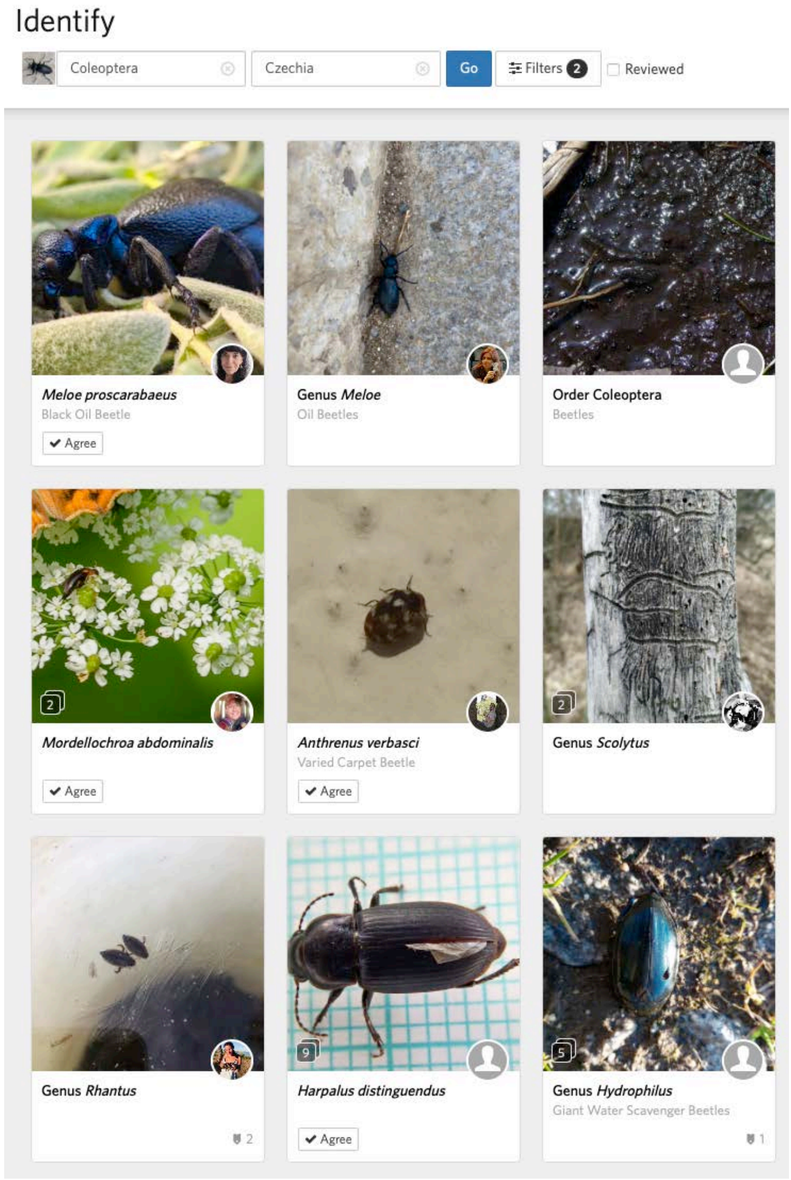
Making an **identification**

Making an identification

inaturalist.org/observations/identify

- An **identification** is an assessment of the type of organism that was observed.

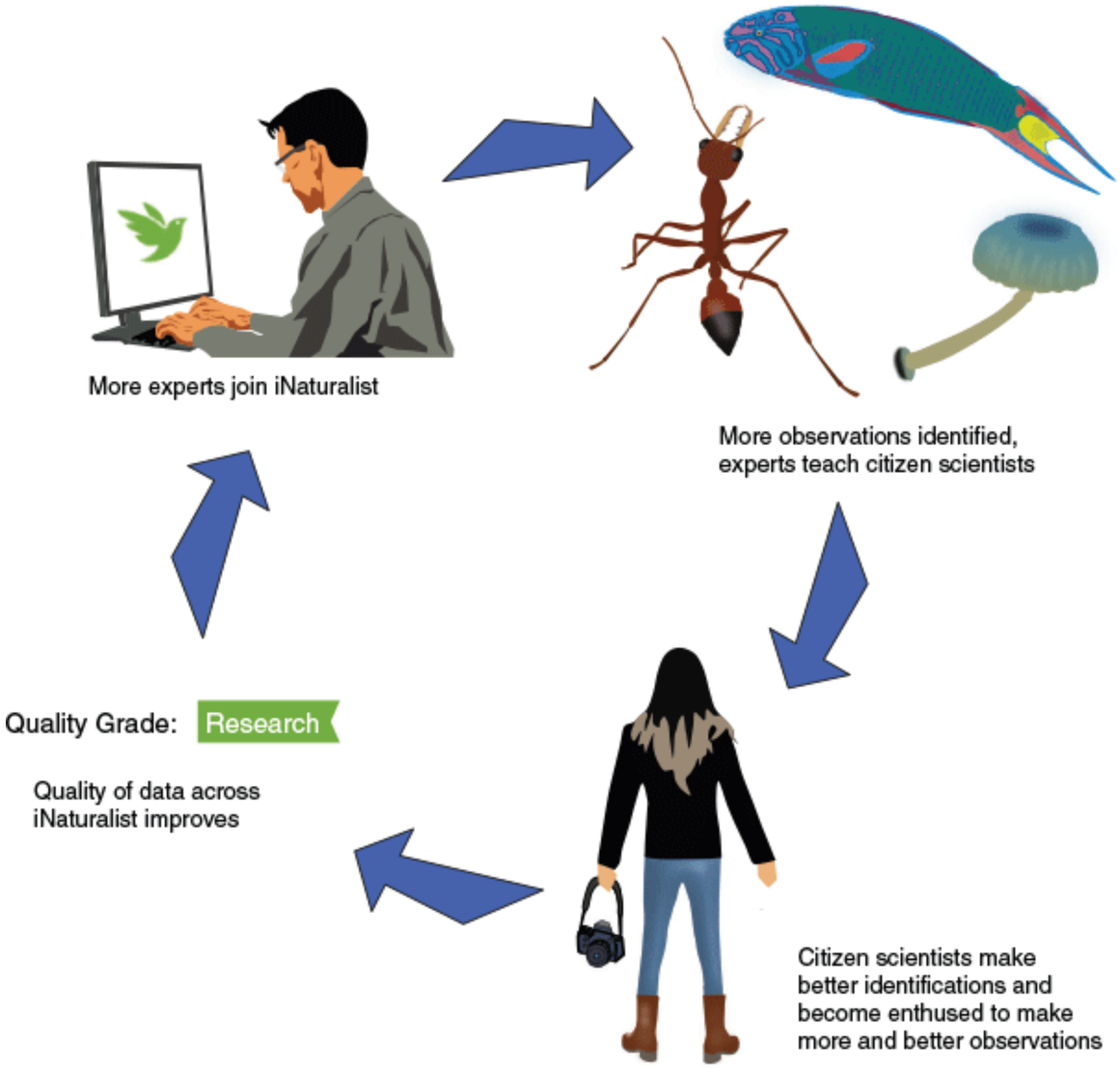
- There's a specific site in which you can filter **taxa** and **location**.



Making an identification

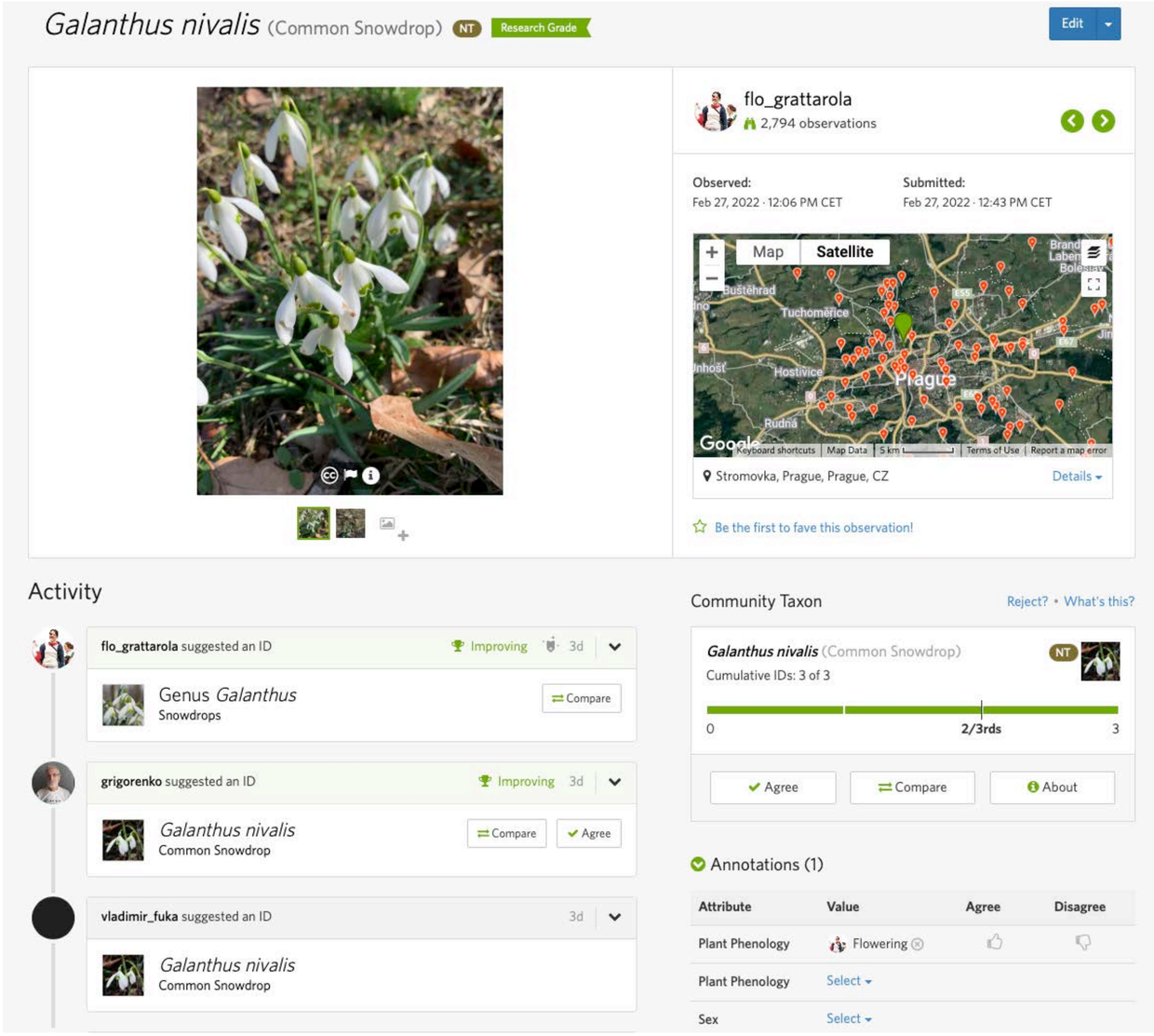
inaturalist.org/observations/identify

- An **identification** is an assessment of the type of organism that was observed.
- There's a specific site in which you can filter **taxa** and **location**.
- **Identifiers are needed!**



Example

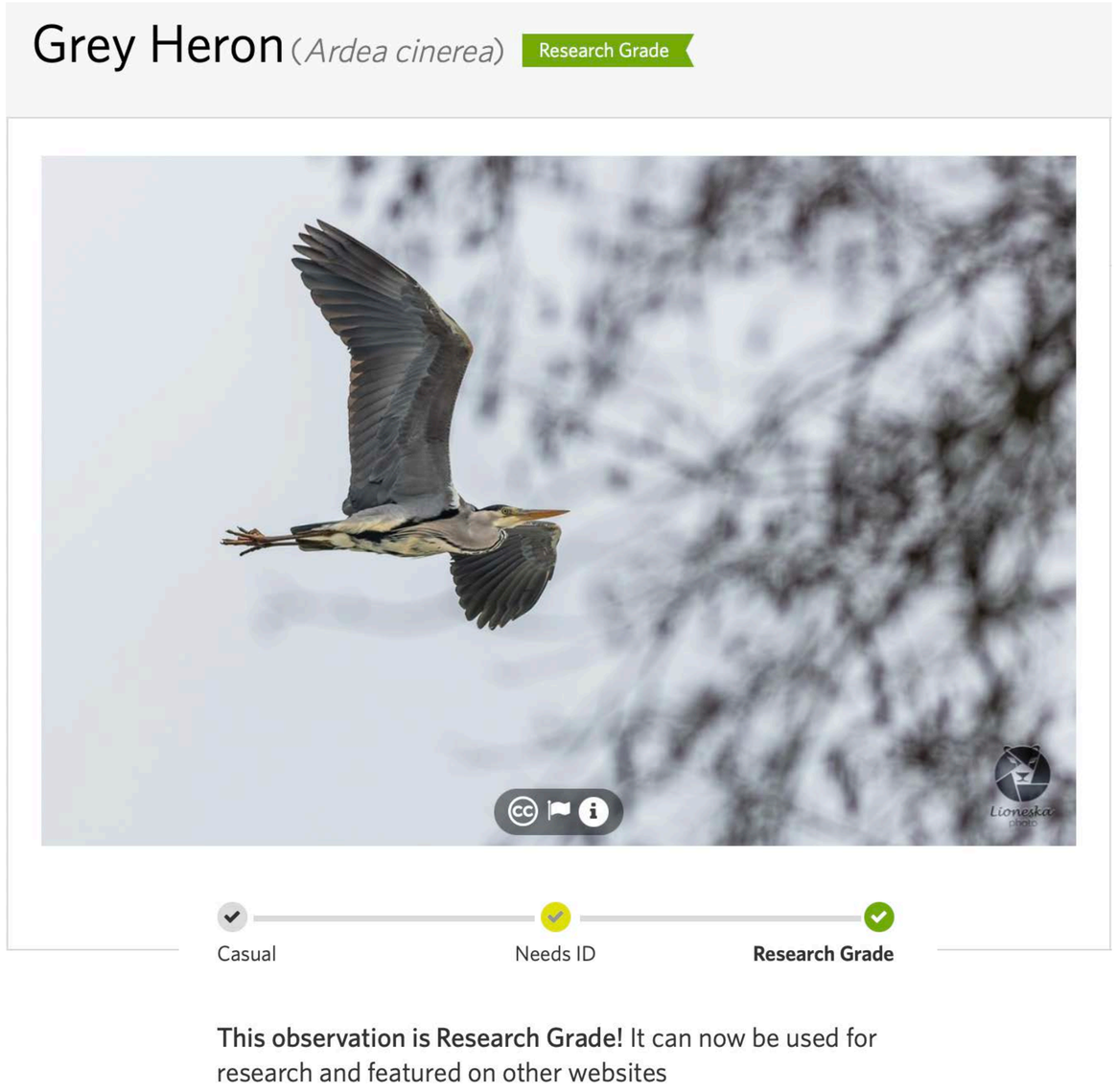
Making an **identification**



Research Grade

Community ID

- An observation is deemed ‘**Research Grade**’ when it has two or more suggested identifications and more than two-thirds of these identifications agree.

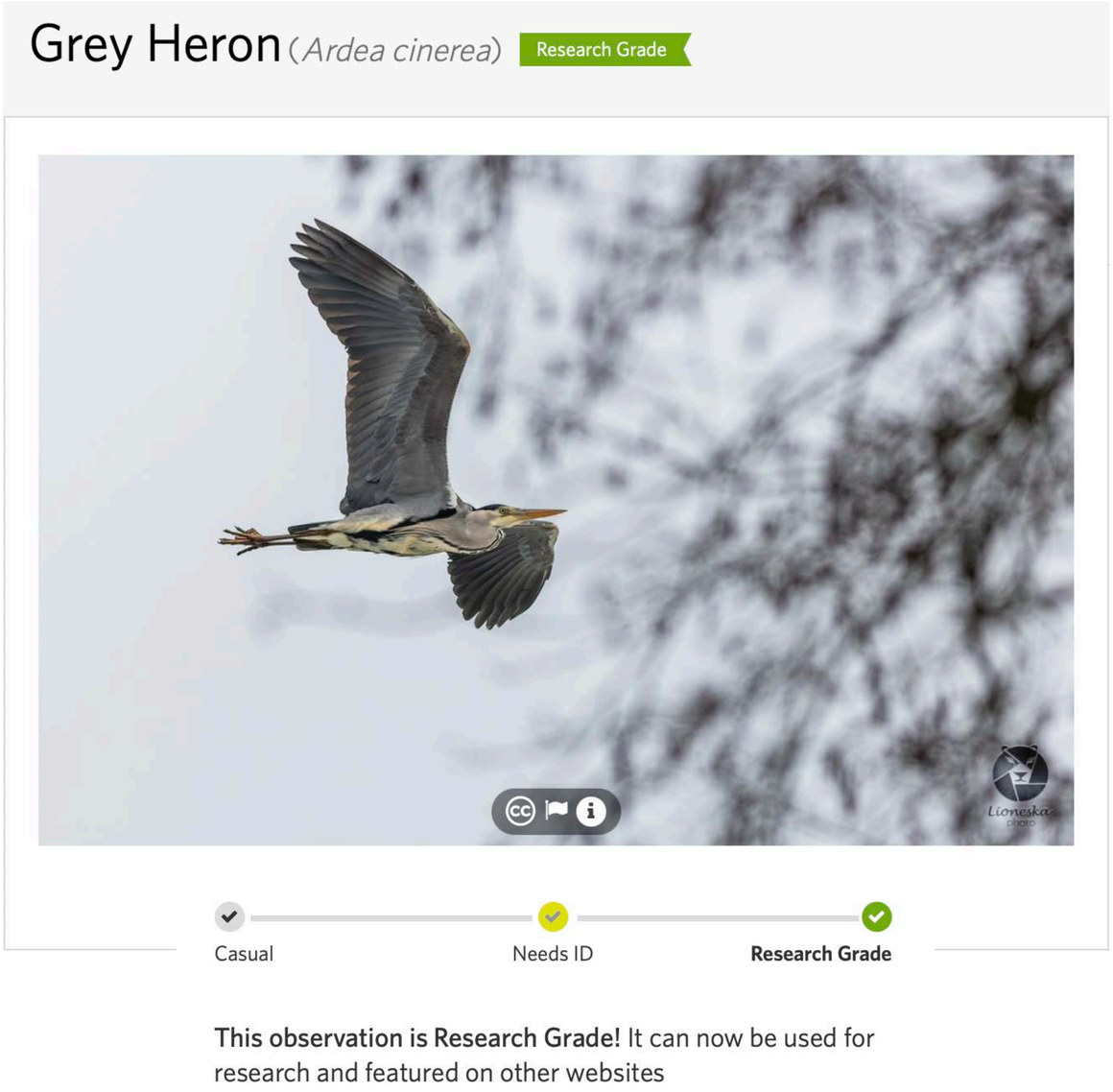


Research Grade

Community ID

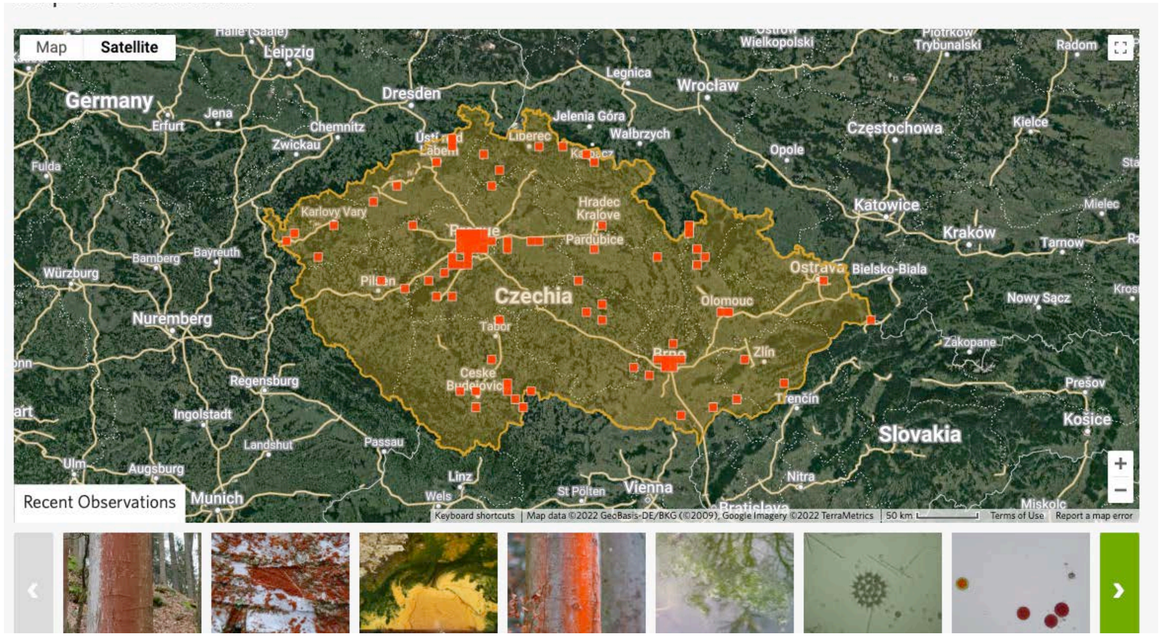
- An observation is deemed ‘**Research Grade**’ when it has two or more suggested identifications and more than two-thirds of these identifications agree.

- Research Grade records are then regularly exported to **GBIF**, provided the observation is published under a CC0, CC BY, or CC BY-NC license.



Some cool stuff about iNat

Some cool stuff about iNat



Projects

Where?

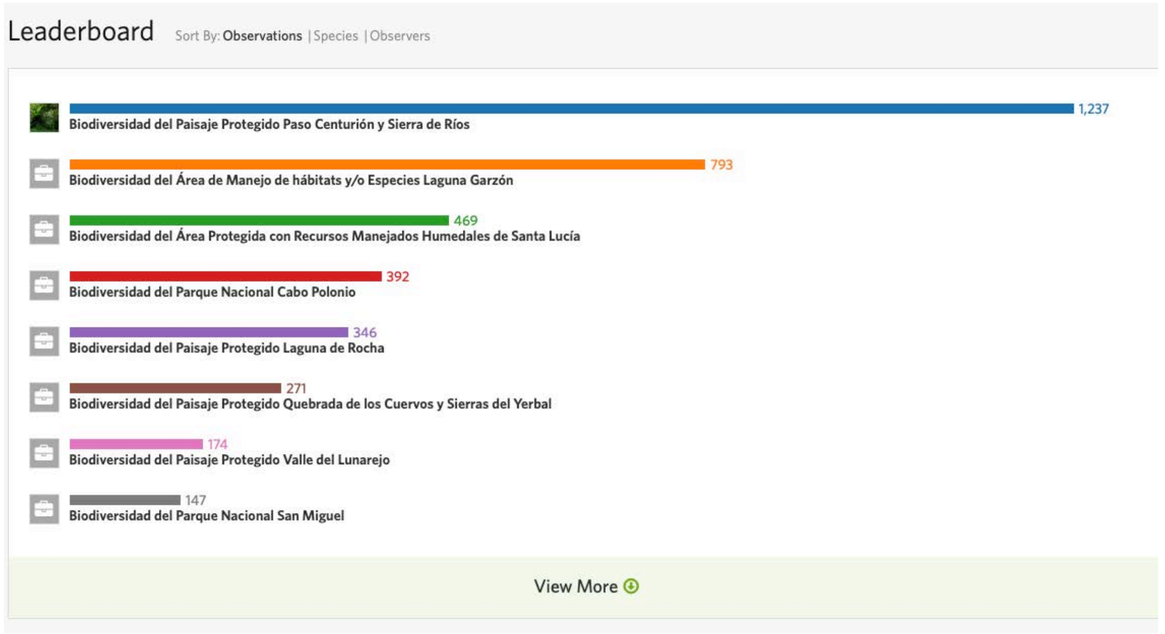
When?

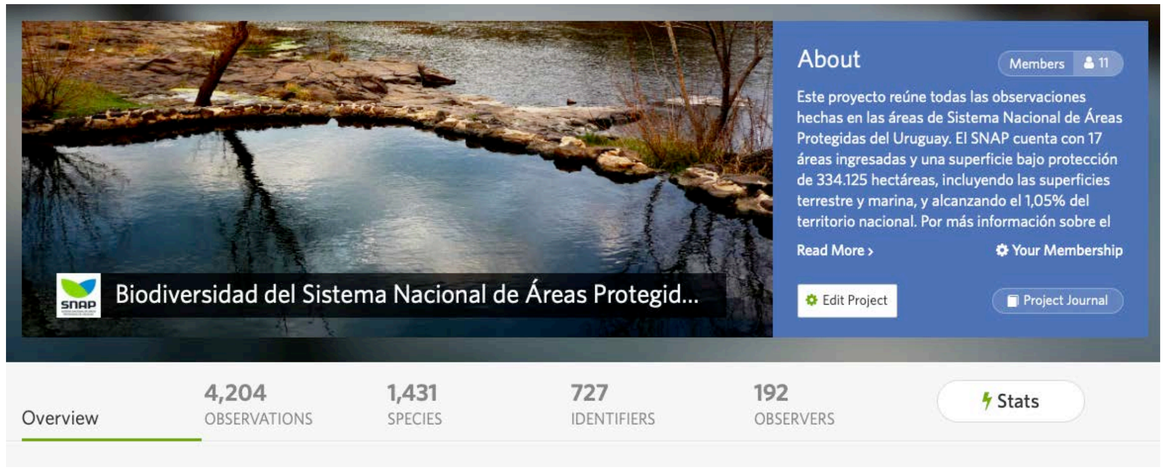
What?

Algae of the Czech Republic

Some cool stuff about iNat

Projects





National System of Protected Areas of Uruguay

Some cool stuff about iNat

Projects

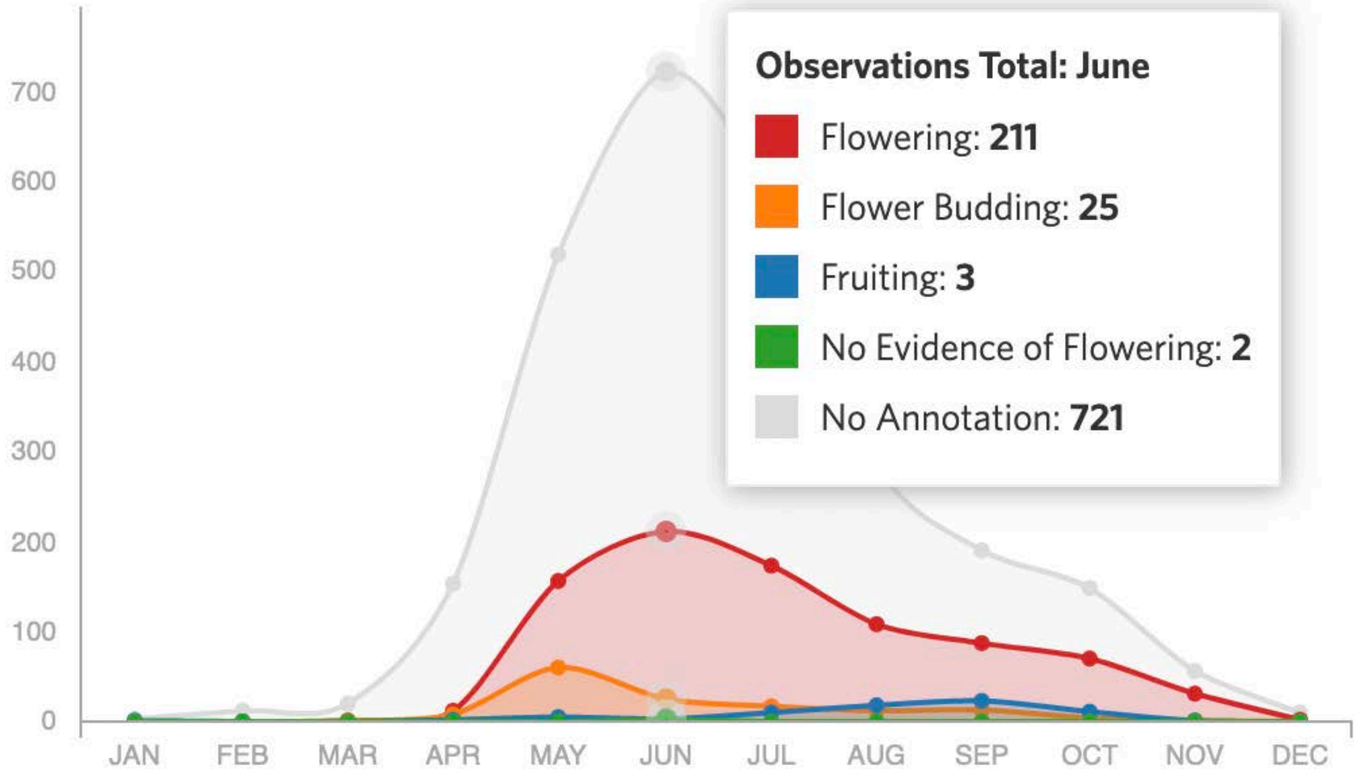
Global roadkill observations

Some cool stuff about iNat

Annotations: Phenology

Dianthus carthusianorum

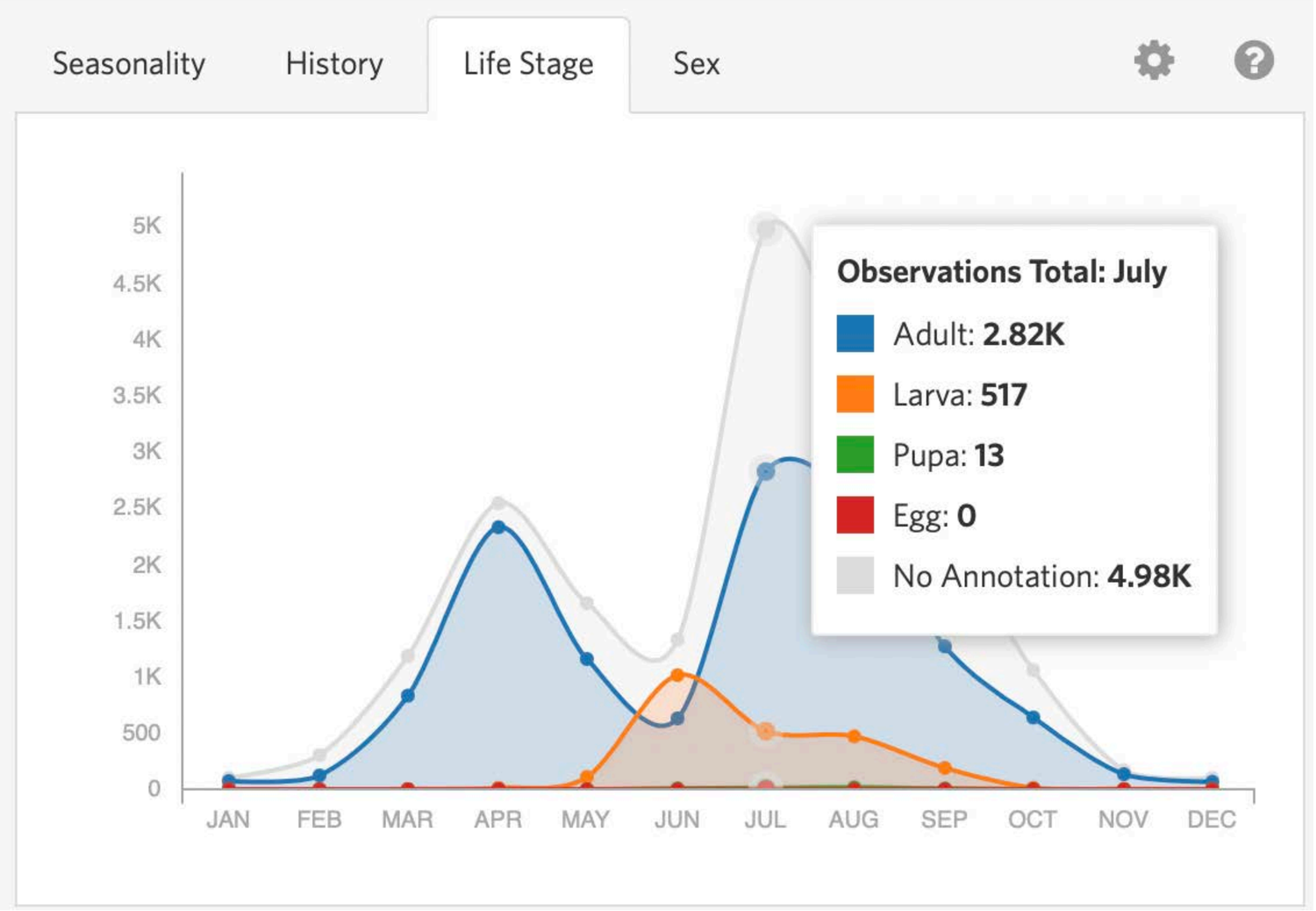
Seasonality | History | Sex | Plant Phenology



Some cool stuff about iNat

Annotations: Life stage

Aglais io

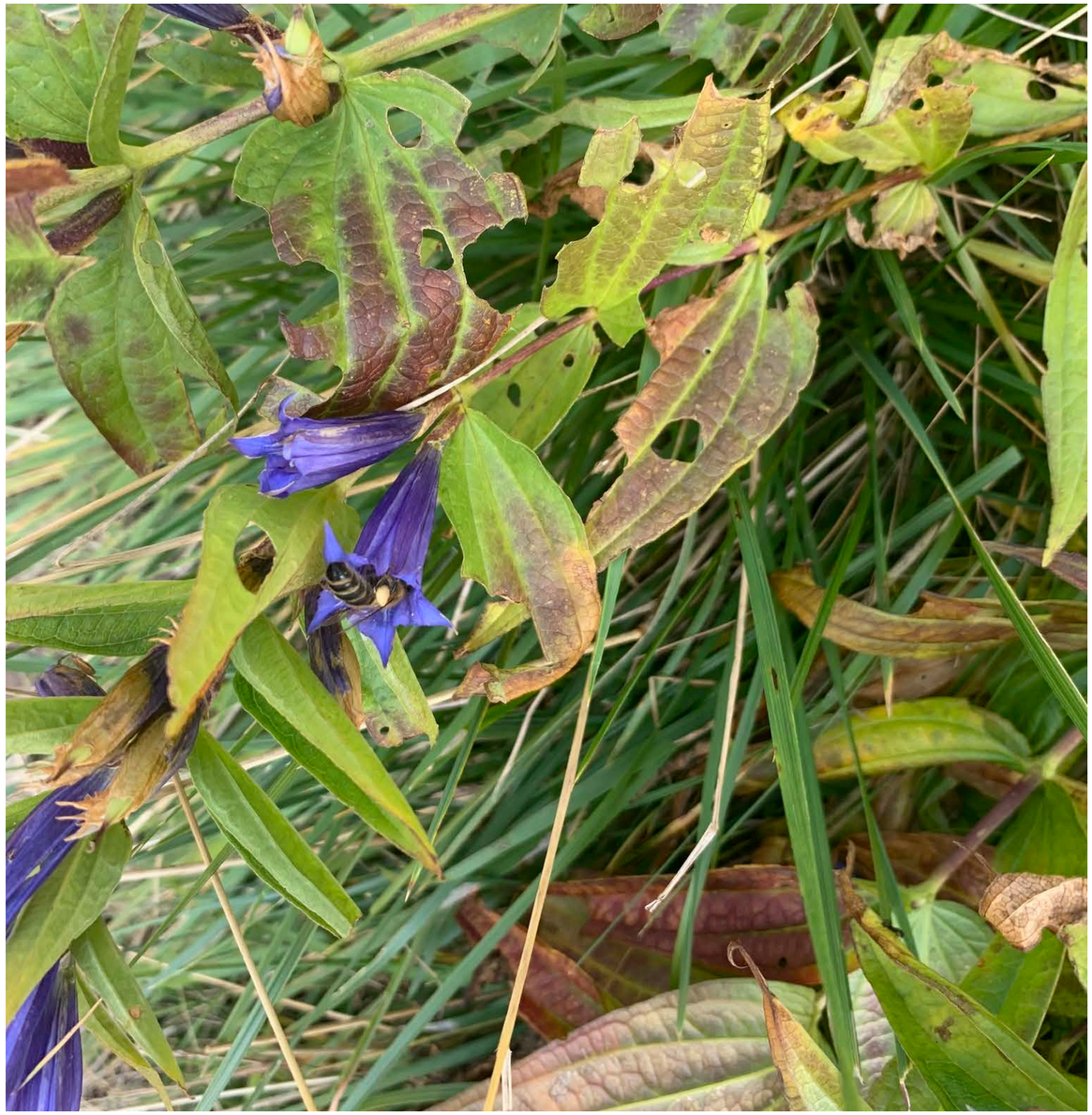


Annotations (1)

Attribute	Value
Life Stage	Adult

Some cool stuff about iNat

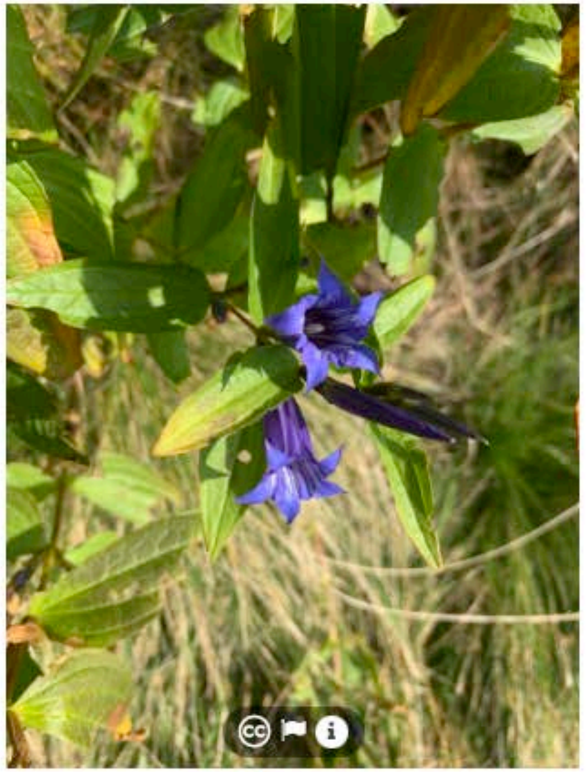
Observation fields

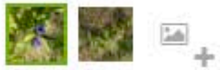


Krkonošský národní park

Gentiana asclepiadea (Willow Gentian) Research Grade

Edit



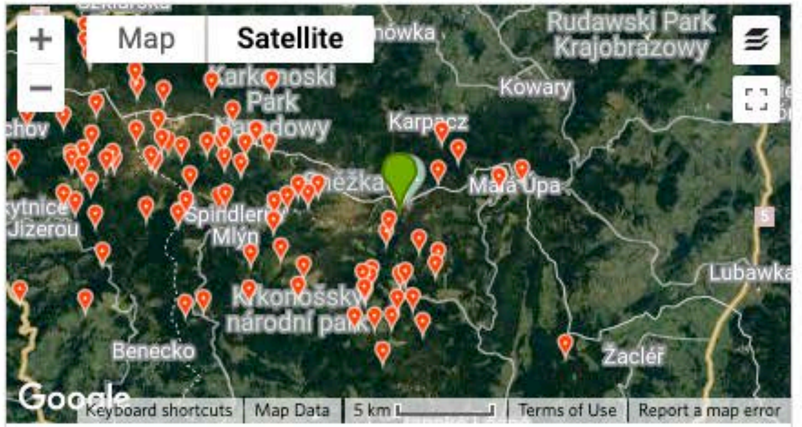


flo_grattarola

2,794 observations

Observed:
Sep 26, 2021 · 12:31 PM EEST

Submitted:
Sep 27, 2021 · 8:50 AM CEST



Krkonošský národní park, Pec pod... Show

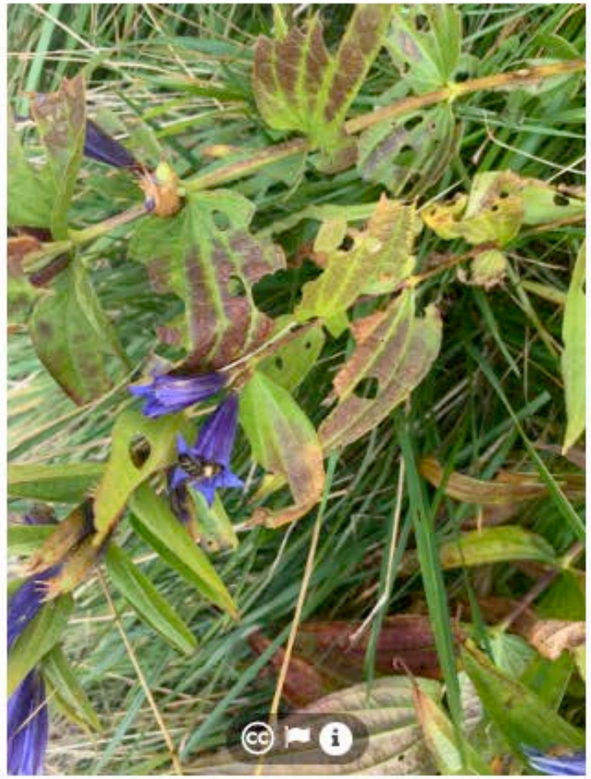
Details

Be the first to fave this observation!

Plant

Apis mellifera (Western Honey Bee) Research Grade

Edit

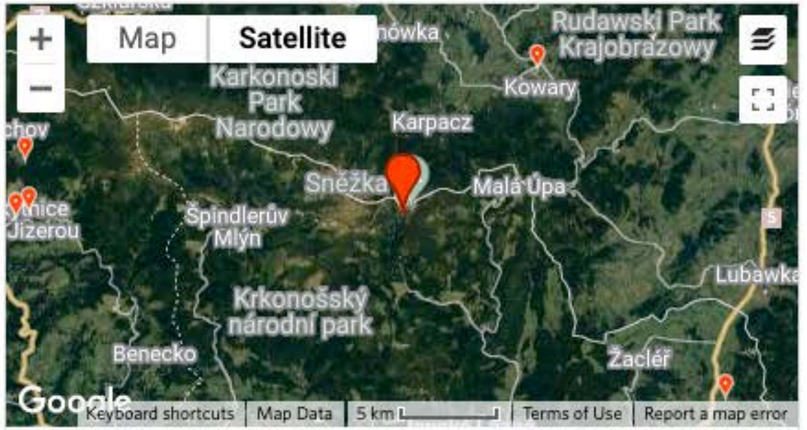


flo_grattarola

2,794 observations

Observed:
Sep 26, 2021 · 12:31 PM EEST

Submitted:
Sep 27, 2021 · 8:51 AM CEST



Krkonošský národní park, Pec pod... Show

Details

Be the first to fave this observation!

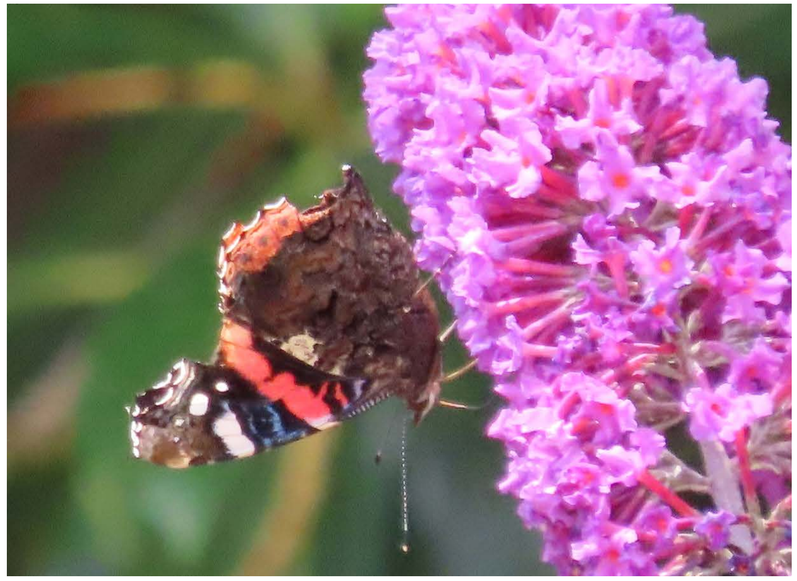
Pollinator

GloBI

Observation Fields (1)

Pollinator: *Apis mellifera* (Western Honey Bee)

Choose a field



How can these data be used?

Discovery of new species

Example

Phytotaxa 472 (3): 249–258
https://www.mapress.com/j/pt/
Copyright © 2020 Magnolia Press

Article

ISSN 1179-3155 (print edition)
PHYTOTAXA
ISSN 1179-3163 (online edition)

https://doi.org/10.11646/phytotaxa.472.3.3

Gonolobus naturalistae (Apocynaceae; Asclepiadoideae; Gonolobeae; Gonolobinae), a New Species From México

LEONARDO O. ALVARADO-CÁRDENAS[1,3]*, MARÍA G. CHÁVEZ-HERNÁNDEZ[1,4] & JUAN F. PÍO LEÓN[2,5]

[1] *Departamento de Biología Comparada, Laboratorio de Plantas Vasculares, Facultad de Ciencias, Universidad Nacional Autónoma de México, Apartado Postal 70-282, 04510, Ciudad de México, México.*
[2] *Universidad Politécnica del Mar y la Sierra, Código Postal 82700, La Cruz de Elota, Sinaloa, México.*
[3] *leonardo.oac77@gmail.com; https://orcid.org/0000-0002-4938-8339*
[4] *mariagchavezh@ciencias.unam.mx; https://orcid.org/0000-0003-1071-9994*
[5] *d1j17kk@hotmail.com; https://orcid.org/0000-0002-1926-110X*
**Correspondence author: leonardo.oac77@gmail.com*

Invasive species

Example

NOVITATES CARIBAEA 17: 179–183, 2021 179

NOTA

SPILOSTETHUS PANDURUS (HEMIPTERA: HETEROPTERA: LYGAEIDAE), NUEVO REGISTRO PARA REPÚBLICA DOMINICANA Y EL CARIBE INSULAR

***Spilostethus pandurus* (Hemiptera: Heteroptera: Lygaeidae), new record for Dominican Republic and the insular Caribbean**

Ruth H. Bastardo[1*] y Daniel E. Perez-Gelabert[2]

[1]Instituto de Investigaciones Botánicas y Zoológicas, Universidad Autónoma de Santo Domingo; orcid.org/0000-0003-1564-0724. [2]Integrated Taxonomic Information System (ITIS) and Department of Entomology, National Museum of Natural History, Smithsonian Institution, P.O. Box 37012, Washington, DC 20013-7012, USA; orcid.org/0000-0003-3270-9551; perezd@si.edu. *Para correspondencia: rbastardo40@uasd.edu.do.

early detection of an exotic (invasive) species

Phenology

Example

scientific reports

Check for updates

OPEN

Analyzing a phenological anomaly in *Yucca* of the southwestern United States

Laura Brenskelle[1,2]✉, Vijay Barve[1], Lucas C. Majure[1], Rob P. Guralnick[1] & Daijiang Li[3,4]

studying of normal and anomalous blooming events

Phenology

Example

ECOGRAPHY

Research

Continent-scale phenotype mapping using citizen scientists' photographs

Jonathan P. Drury, Morgan Barnes, Ann E. Finneran, Maddie Harris and Gregory F. Grether

studying phenotypic variation in damselfly wings

Species interactions

Example

Received: 2 September 2021 | Accepted: 12 October 2021
DOI: 10.1111/2041-210X.13762

Methods in Ecology and Evolution | BRITISH ECOLOGICAL SOCIETY

RESEARCH ARTICLE

MetaComNet: A random forest-based framework for making spatial predictions of plant–pollinator interactions

Markus A. K. Sydenham[1] | Zander S. Venter[1] | Trond Reitan[2] | Claus Rasmussen[3] | Astrid B. Skrindo[1] | Daniel I. J. Skoog[4] | Kaj-Andreas Hanevik[4] | Stein Joar Hegland[5] | Yoko L. Dupont[6] | Anders Nielsen[7,2] | Joseph Chipperfield[8] | Graciela M. Rusch[9]

predicting plant–pollinator interaction networks over space and time

Species interactions

Example

scientific reports

Check for updates

OPEN

The power of community science to quantify ecological interactions in cities

Breanna J. Putman[1,2]✉, Riley Williams[1], Enjie Li[1] & Gregory B. Pauly[1]

quantifying interactions with predators and parasites

Species distribution

Example

Official journal website:
amphibian-reptile-conservation.org

Amphibian & Reptile Conservation
15(2) [General Section]: 228– 237 (e290).

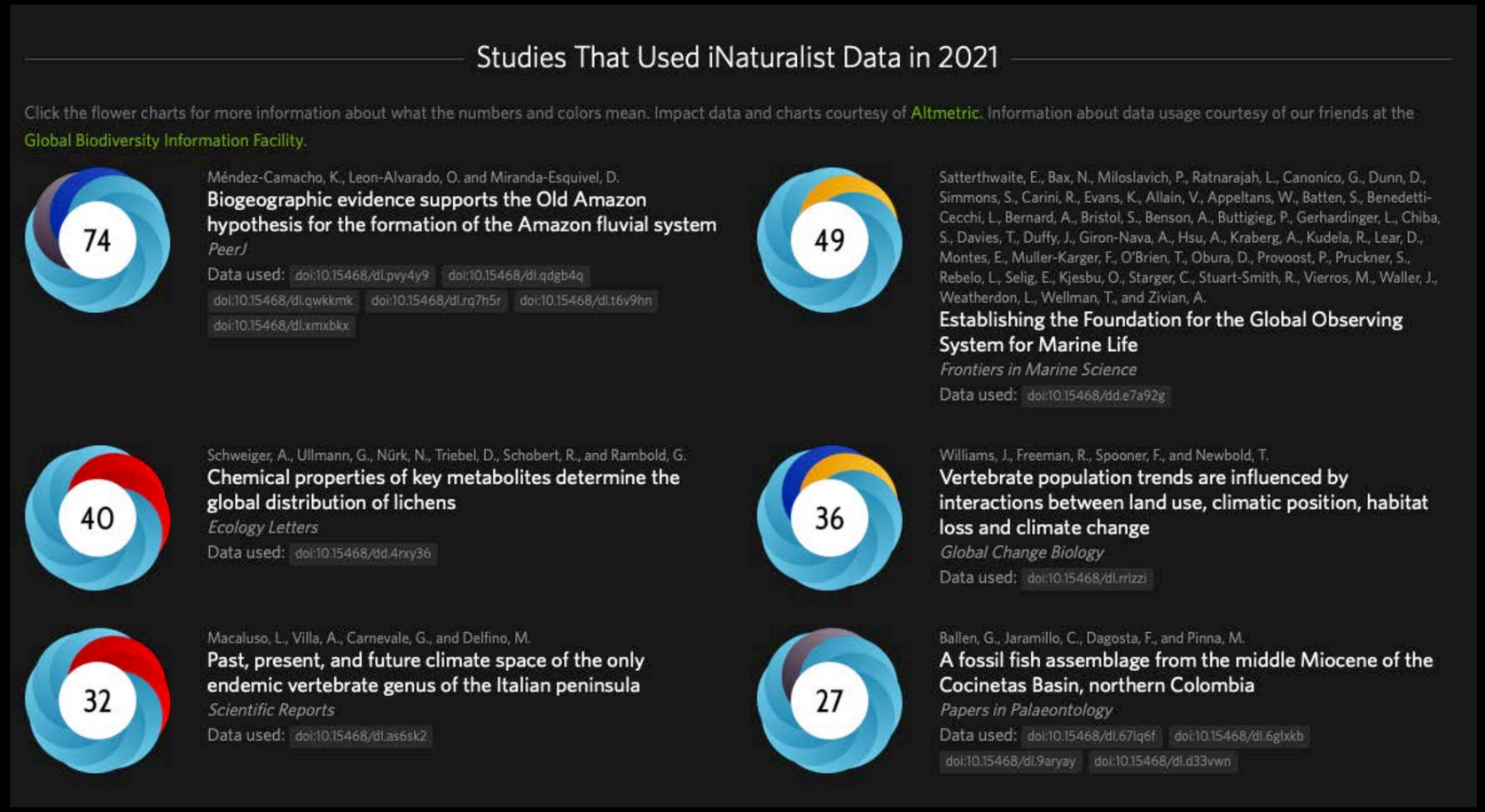
Updating the distributions of four Uruguayan hylids (Anura: Hylidae): recent expansions or lack of sampling effort?

[1,2]Gabriel Laufer, [1,3]Noelia Gobel, [1,4]Nadia Kacevas, [1]Ignacio Lado, [1,5]Sofía Cortizas, [2]Magdalena Carabio, [6]Diego Arrieta, [6]Carlos Prigioni, [6]Claudio Borteiro, and [6,*]Francisco Kolenc

[1]Área Biodiversidad y Conservación, Museo Nacional de Historia Natural, MEC, Miguelete 1825, 11800 Montevideo, URUGUAY [2]Vida Silvestre Uruguay, Canelones 1198, 11100 Montevideo, URUGUAY [3]Sistema Nacional de Áreas Protegidas, DINAMA-MVOTMA, Galicia 1133, 11100 Montevideo, URUGUAY [4]Departamento de Ecología y Biología Evolutiva, Departamento de Biodiversidad y Genética, Instituto de Investigaciones Biológicas Clemente Estable, Av. Italia 3318, 11600 Montevideo, URUGUAY [5]Instituto Tecnológico Regional Centro Sur, Universidad Tecnológica del Uruguay, Francisco Antonio Maciel s/n, 97000 Durazno, URUGUAY [6]Sección Herpetología, Museo Nacional de Historia Natural, MEC, Miguelete 1825, 11800 Montevideo, URUGUAY

expanding species distribution ranges and proposed conservation status reassessment

In 2021 more than 600 studies used data from iNaturalist



Studies That Used iNaturalist Data in 2021

Click the flower charts for more information about what the numbers and colors mean. Impact data and charts courtesy of Altmetric. Information about data usage courtesy of our friends at the Global Biodiversity Information Facility.

74

Méndez-Camacho, K., Leon-Alvarado, O. and Miranda-Esquivel, D.
Biogeographic evidence supports the Old Amazon hypothesis for the formation of the Amazon fluvial system
PeerJ
Data used: doi:10.15468/dl.pvy4y9 doi:10.15468/dl.qdgb4q doi:10.15468/dl.qwkkmk doi:10.15468/dl.rq7h5r doi:10.15468/dl.t6v9hn doi:10.15468/dl.xmxbkx

49

Satterthwaite, E., Bax, N., Miloslavich, P., Ratnarajah, L., Canonico, G., Dunn, D., Simmons, S., Carini, R., Evans, K., Allain, V., Appeltans, W., Batten, S., Benedetti-Cecchi, L., Bernard, A., Bristol, S., Benson, A., Buttigieg, P., Gerhardinger, L., Chiba, S., Davies, T., Duffy, J., Giron-Nava, A., Hsu, A., Kraberg, A., Kudela, R., Lear, D., Montes, E., Muller-Karger, F., O'Brien, T., Obura, D., Provoost, P., Pruckner, S., Rebelo, L., Selig, E., Kjesbu, O., Starger, C., Stuart-Smith, R., Vierros, M., Waller, J., Weatherdon, L., Wellman, T., and Zivian, A.
Establishing the Foundation for the Global Observing System for Marine Life
Frontiers in Marine Science
Data used: doi:10.15468/dd.e7a92g

40

Schweiger, A., Ullmann, G., Nürk, N., Triebel, D., Schobert, R., and Rambold, G.
Chemical properties of key metabolites determine the global distribution of lichens
Ecology Letters
Data used: doi:10.15468/dd.4rxy36

36

Williams, J., Freeman, R., Spooner, F., and Newbold, T.
Vertebrate population trends are influenced by interactions between land use, climatic position, habitat loss and climate change
Global Change Biology
Data used: doi:10.15468/dl.rrlzzi

32

Macaluso, L., Villa, A., Carnevale, G., and Delfino, M.
Past, present, and future climate space of the only endemic vertebrate genus of the Italian peninsula
Scientific Reports
Data used: doi:10.15468/dl.as6sk2

27

Ballen, G., Jaramillo, C., Dagosta, F., and Pinna, M.
A fossil fish assemblage from the middle Miocene of the Cocinetas Basin, northern Colombia
Papers in Palaeontology
Data used: doi:10.15468/dl.67lq6f doi:10.15468/dl.6glxkb doi:10.15468/dl.9aryay doi:10.15468/dl.d33vwn

iNaturalist data is the second most downloaded source of data from GBIF

Challenges

List of challenges for the use of citizen science data for monitoring biodiversity

Category	Challenge
1. Observer behaviour	1.1 Spatial bias
	1.2 Observer differences
	1.3 Reporting preferences
	1.4 False positive errors
2. Data structures	2.1 Validation
	2.2 Detectability
3. Statistical models	3.1 Multi-species models
	3.2 Data integration
	3.3 Computational limitations
4. Communication	4.1 Communication

Johnston et al. (2022)
https://doi.org/10.1111/2041-210X.13834

Observer bias

Example

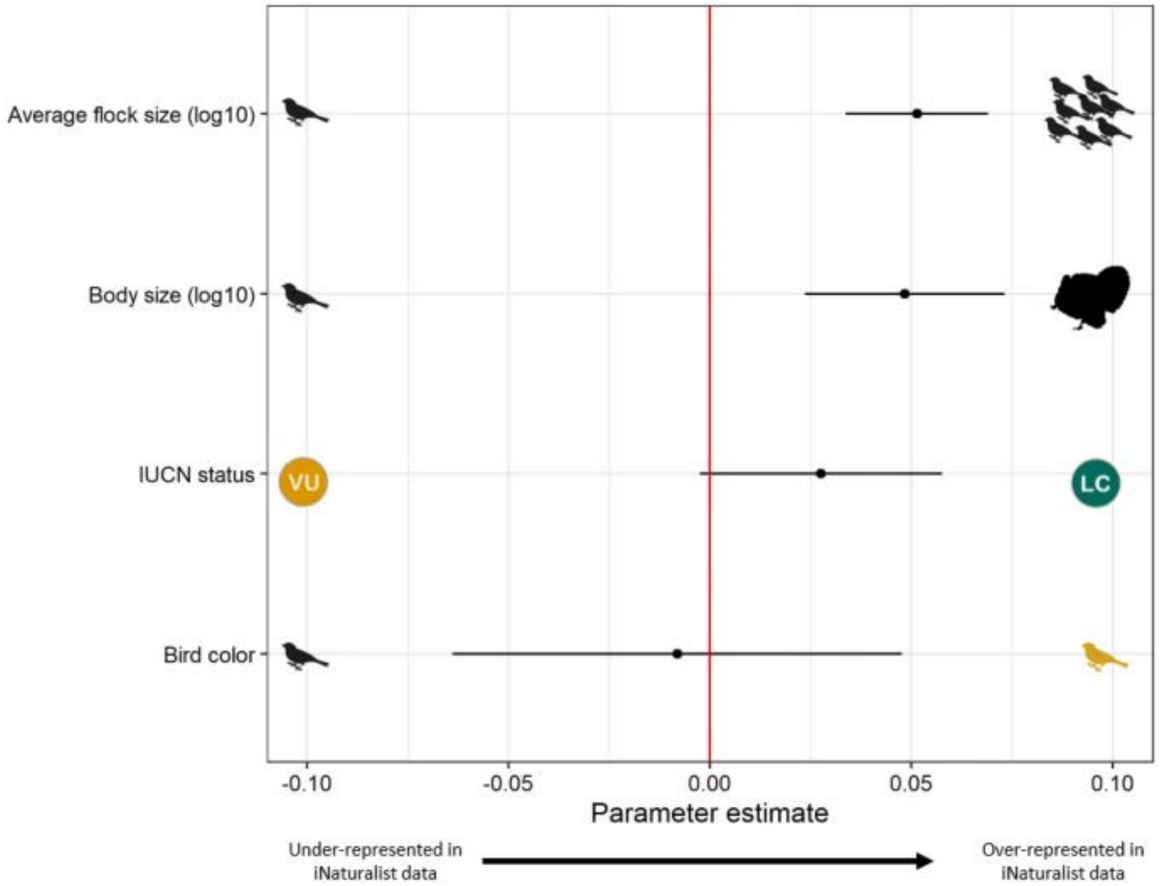
scientific reports

Check for updates

OPEN

Large-bodied birds are over-represented in unstructured citizen science data

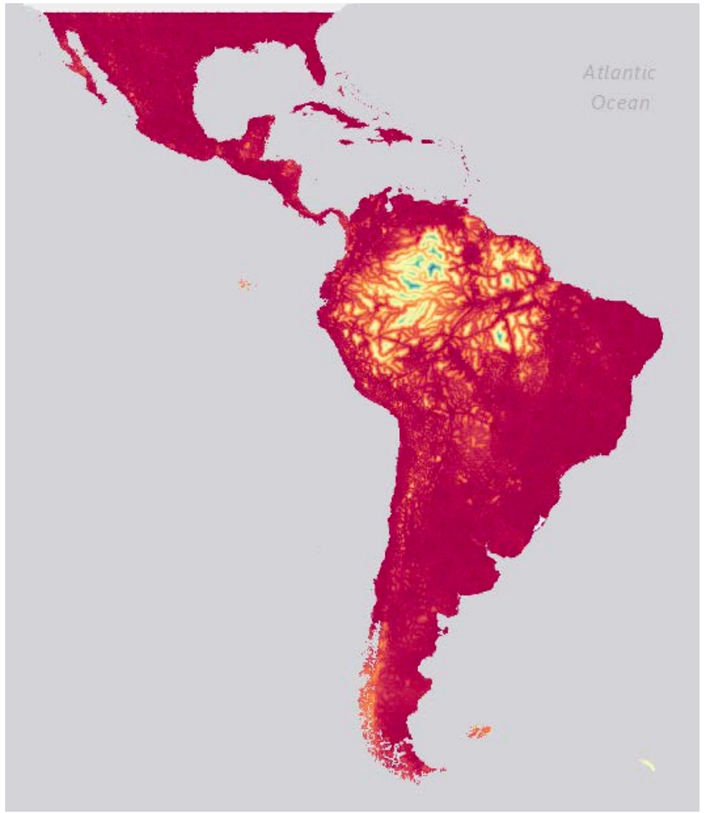
Corey T. Callaghan[1,2,3]✉, Alistair G. B. Poore[2], Max Hofmann[1,3], Christopher J. Roberts[2] & Henrique M. Pereira[1,3]



Statistical methods

Probability of retaining (observing) a point as a function

Occurrences



Accesibility

Country of origin

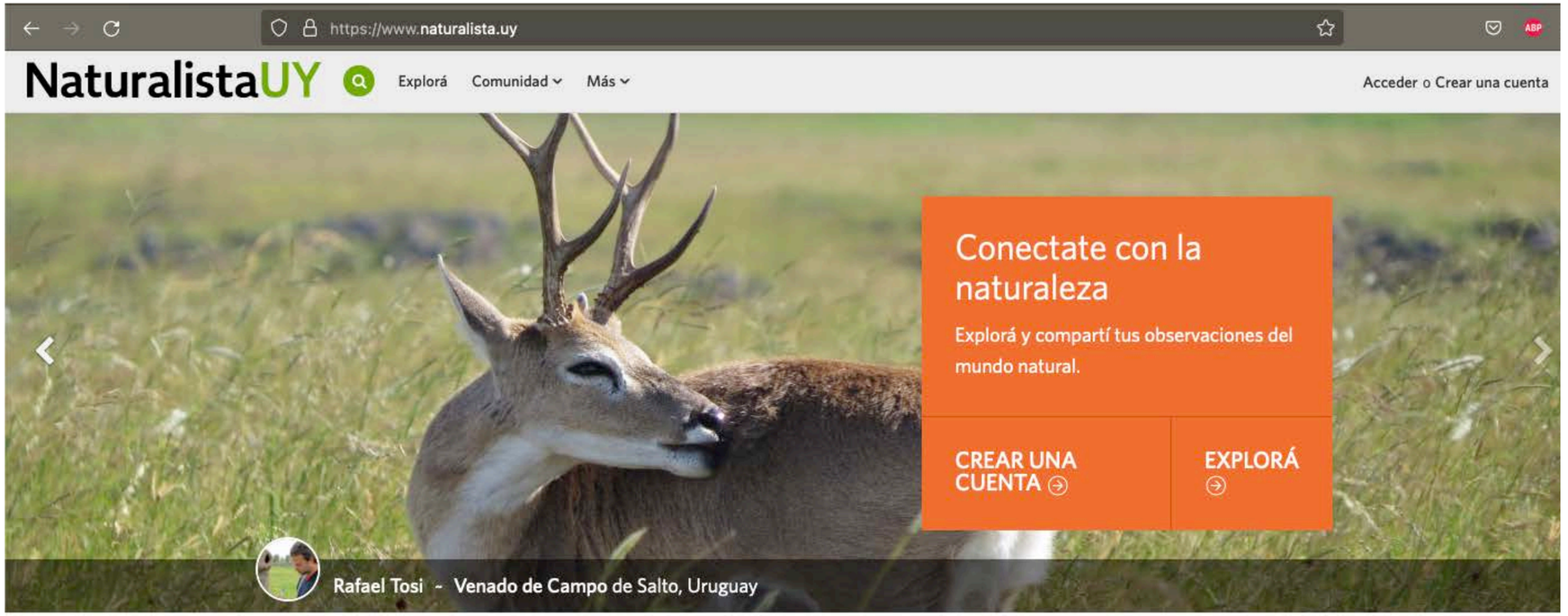
Temporal dynamics of geographic ranges of carnivores in Latin America
(Grattarola, Bowler & Keil)

I hope you are now convinced about using community-science derived data

NaturalistaUY

JULANA
Jugando en la Naturaleza

BIODIVERSIDATA
CONSORCIO DE DATOS DE BIODIVERSIDAD DEL URUGUAY


https://www.naturalista.uy
NaturalistaUY
Explorá
Comunidad
Más
Acceder o Crear una cuenta
Conectate con la naturaleza
Explorá y compartí tus observaciones del mundo natural.
CREAR UNA CUENTA
EXPLORÁ
Rafael Tosi - Venado de Campo de Salto, Uruguay

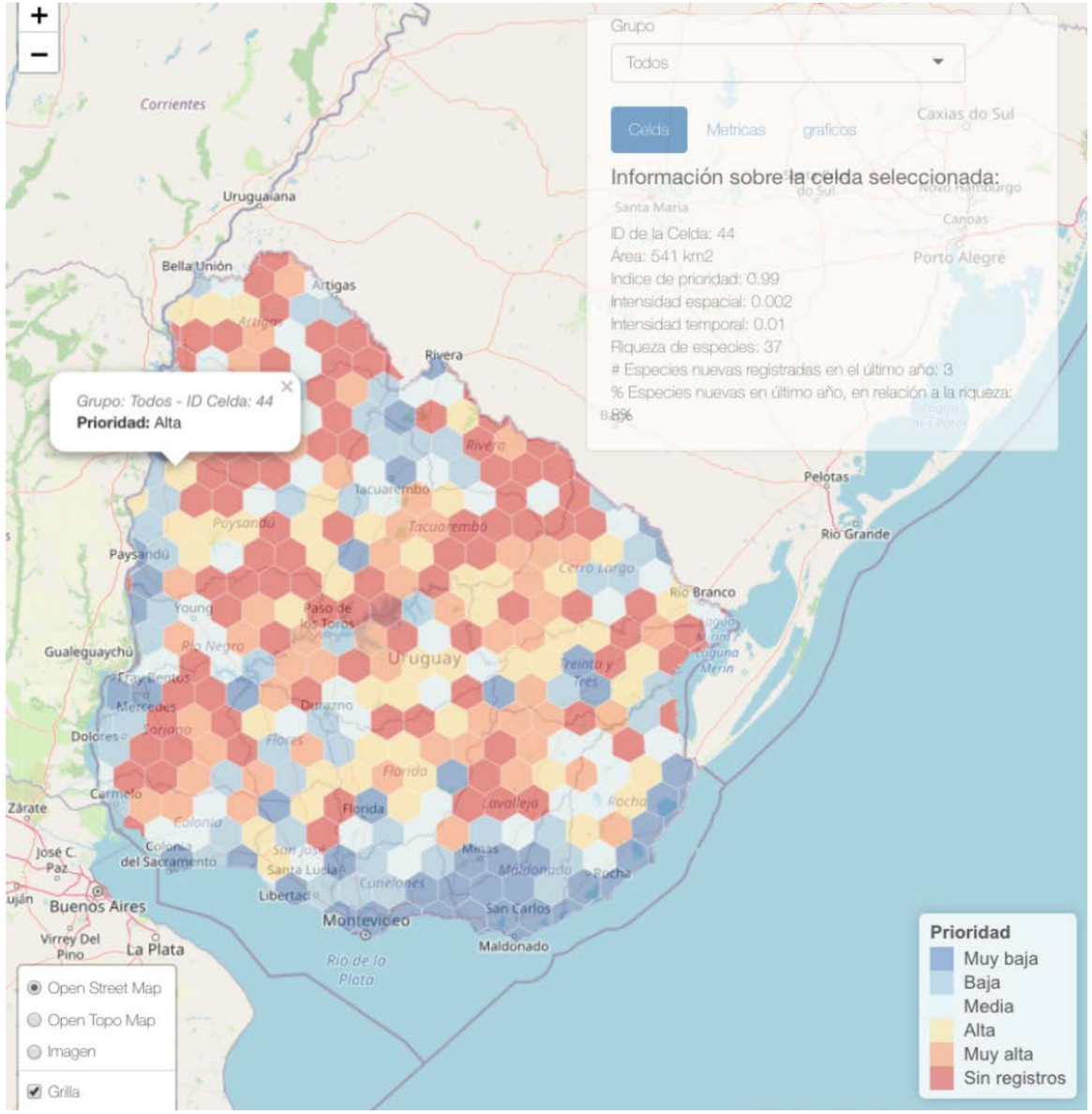
OBSERVACIÓN
DEL MES EN
NATURALISTA UY
@ DIEGO_CABALLERO
SAN JOSÉ
VERANO
FEBRERO 2022

OBSERVACIÓN DEL MES EN
NATURALISTA UY
UNA INICIATIVA
iNaturalist

Citizen science is the process of community-based research through the collection, analysis and interpretation of data, and the integration of diverse knowledge, for the generation of new knowledge and the creation of learning opportunities

Participative monitoring to improve biodiversity knowledge

https://bienflorencia.shinyapps.io/iNatUy_priority_map/

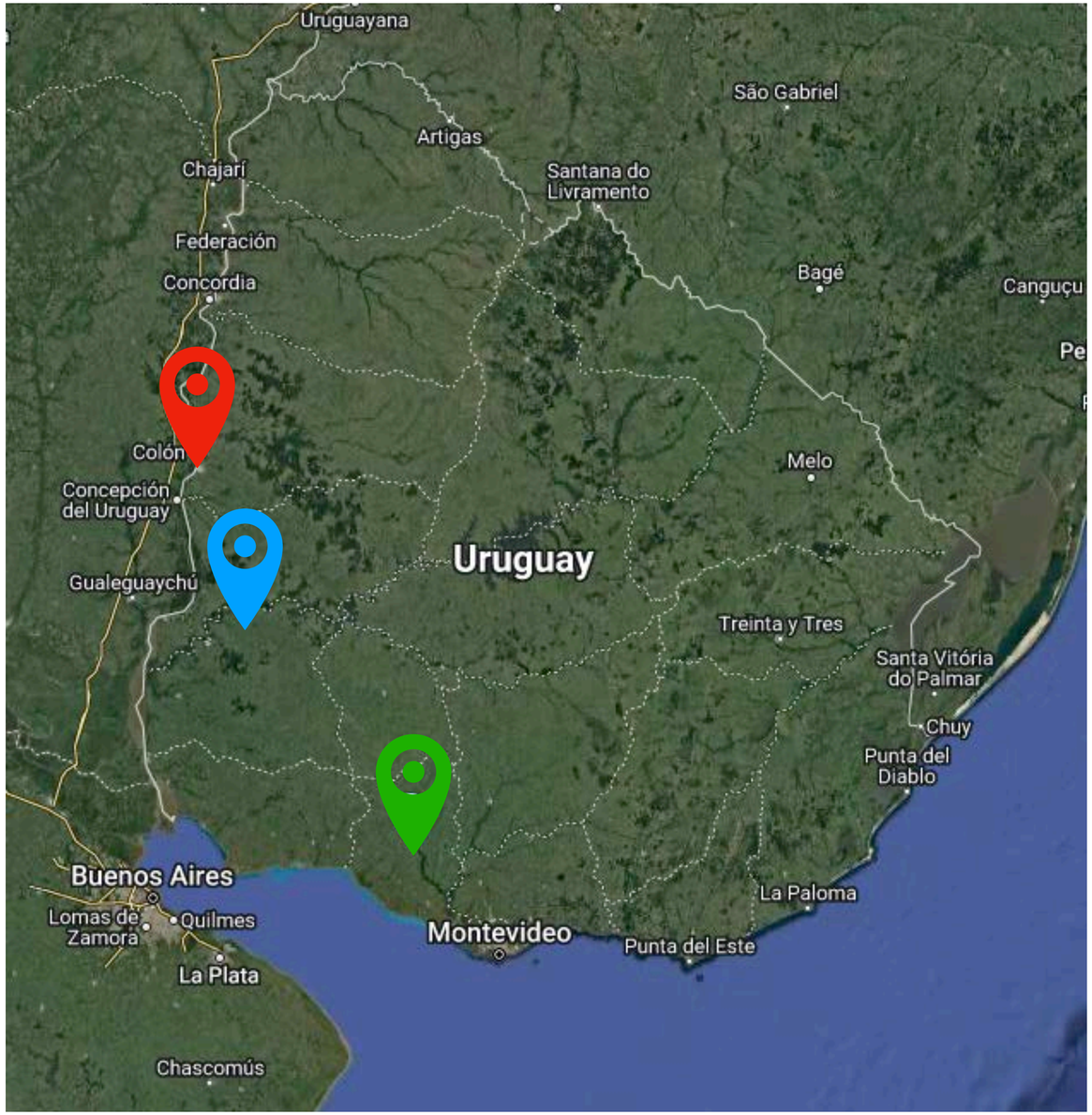


Three sampling events in areas of the country with lack of data and active local communities

1. **Islands from the Uruguay river and wetland from La Curtiembre stream**: an area with potential to be included in the national system of PA.

2. **Cololó**: a tourism initiative within an agricultural cooperative.

3. **Ubajay**: an initiative to build an urban park in the city of San José.



JULANA
Jugando en la Naturaleza

Goals

1. Generate case examples of **community-based** biodiversity knowledge generation in Uruguay.

2. Explore the **behaviour of people at mass monitoring events** and assess the potential of the tool for diverse research questions (e.g., invasive species).

Contribute and use iNaturalist

It’s fun!

The value of opportunistic records is increasing

You have the opportunity to engage the broader public