

Digitizing the Azorean bryophyte, vascular plant and arthropod' collections: **The Azores Biportal Initiative**

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Island Biology 2016

II International Conference on Island Evolution, Ecology and Conservation
18-22 July, University of the Azores, Angra do Heroísmo, Terceira Island, Azores, Portugal

Humans are good problem solvers...

Our problem:

Biodiversity is threatened and rapidly disappearing



Humans are (also!) biological creatures

Human beings have the innate desire to catalogue, understand and spend time with other life forms.

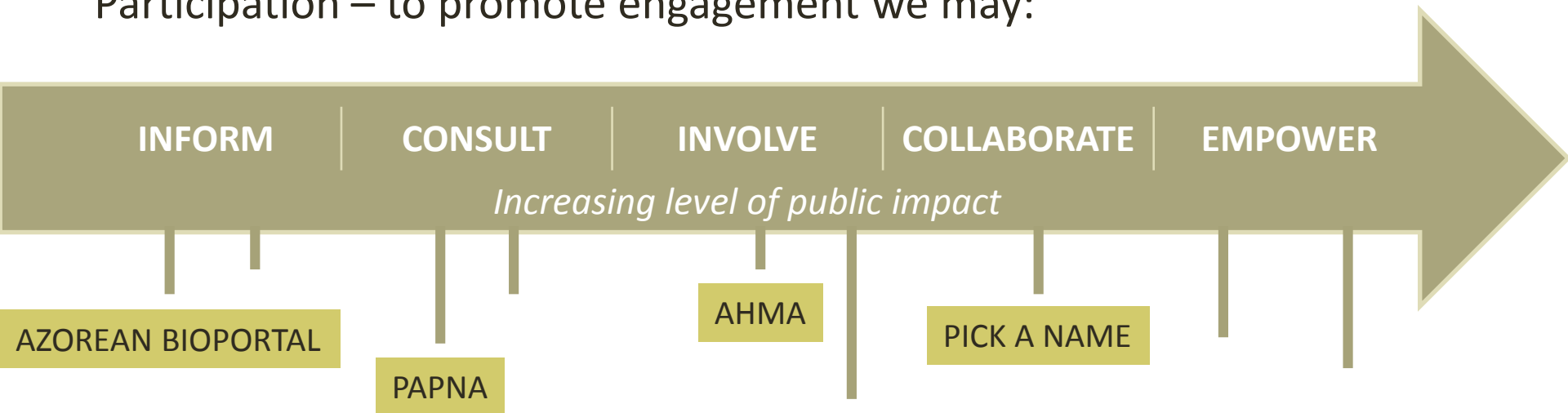
E. O. Wilson, 1984



How do we, at least, minimize biodiversity loss?

A good strategy seems to be the involvement of more people interested in biodiversity conservation.

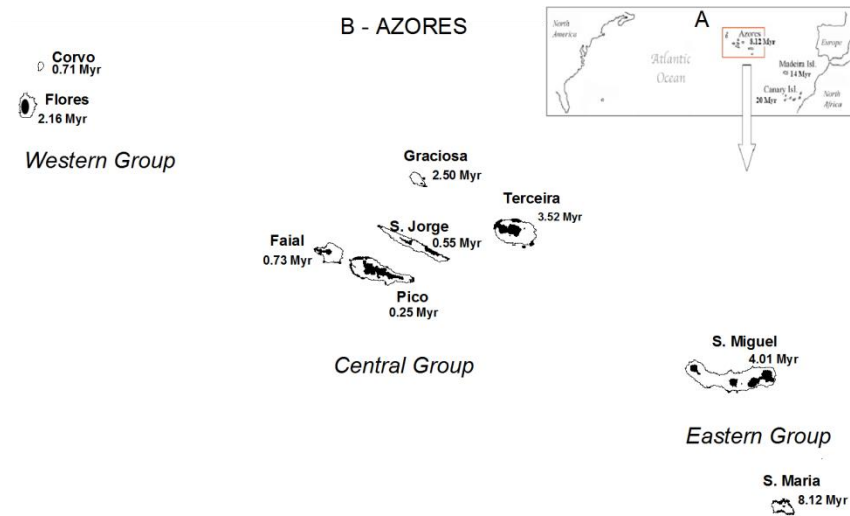
Using the framework of IAP² – International Association for Public Participation – to promote engagement we may:



and at the Azorean Biodiversity Group, we have used different kinds of communication devices, starting with the Azorean Bioportal.

The Azores

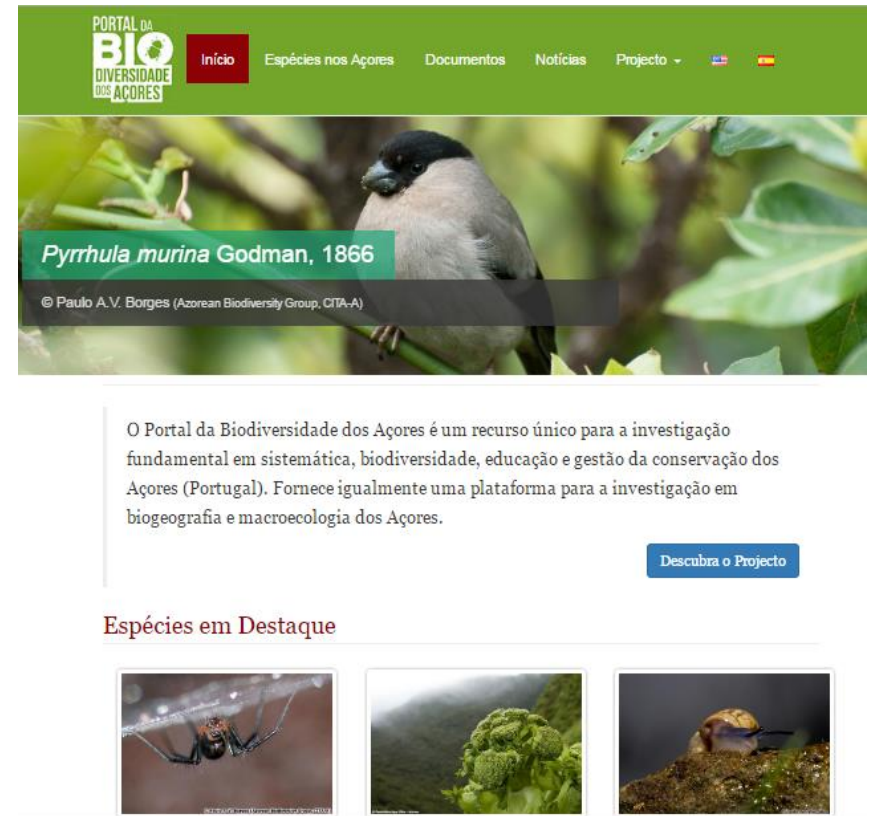
- Archipelago of 9 small, spread, young, oceanic islands
- Distant from sources of colonization
- **Fragmented**, but still with interesting native ecosystems



The Azores Bioportal

Aims

- to have a Web Page for each species.

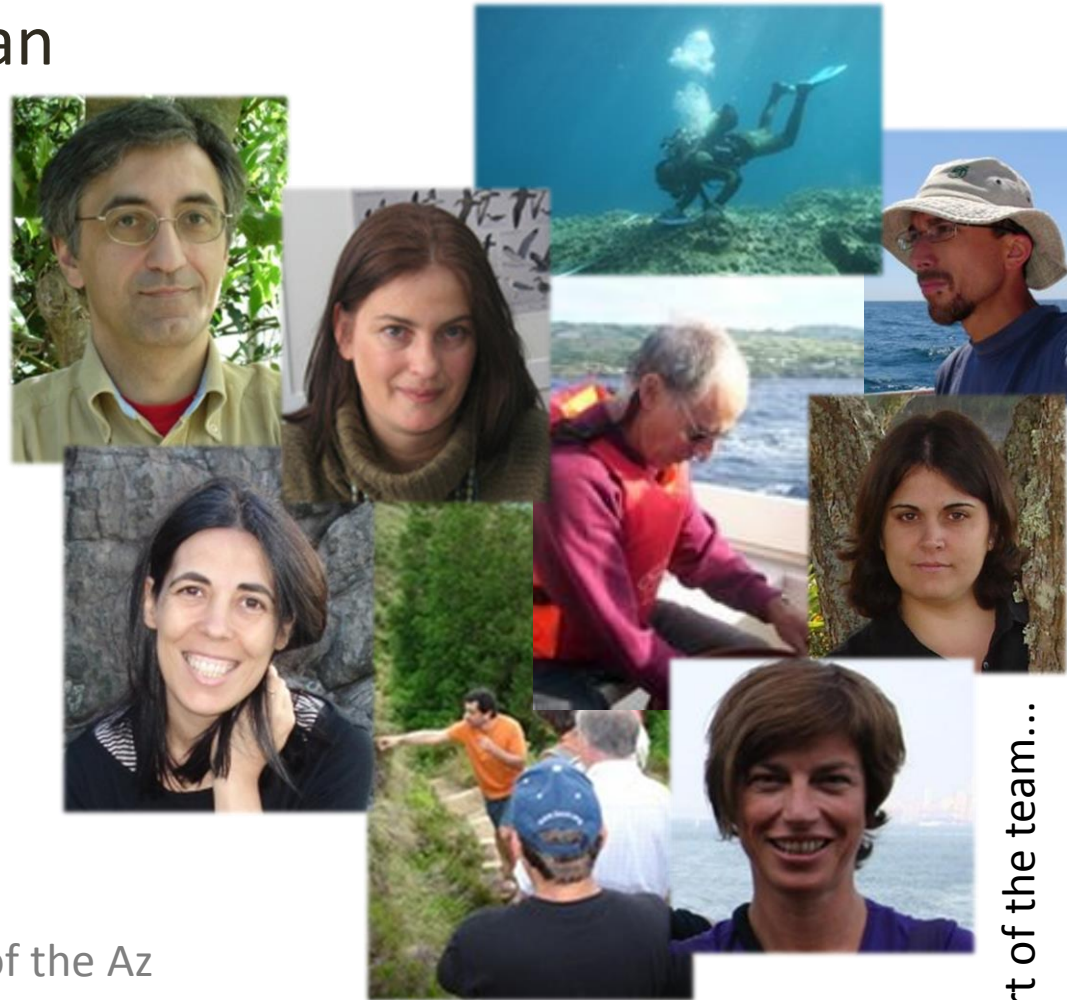


The screenshot displays the Azores Bioportal website. At the top, there is a green navigation bar with the logo "PORTAL DA BIODIVERSIDADE DOS AÇORES" and a menu with items: "Início", "Espécies nos Açores", "Documentos", "Notícias", and "Projecto" with a dropdown arrow. Below the navigation bar is a large image of a bird, *Pyrrhula murina*, perched on a branch. A green banner over the image contains the text "Pyrrhula murina Godman, 1866" and a copyright notice "© Paulo A.V. Borges (Azorean Biodiversity Group, CITA-A)". Below the image is a white box containing a paragraph of text in Portuguese: "O Portal da Biodiversidade dos Açores é um recurso único para a investigação fundamental em sistemática, biodiversidade, educação e gestão da conservação dos Açores (Portugal). Fornece igualmente uma plataforma para a investigação em biogeografia e macroecologia dos Açores." To the right of this text is a blue button labeled "Descubra o Projecto". Below this section is a heading "Espécies em Destaque" followed by three small image thumbnails: a spider, a green plant, and a bird on a rock.

How ~~with~~ ~~the~~ ~~team~~ ~~at~~ the Azores Bioportal

Our vision: to put Azorean Biodiversity on the map!

- How many species?
- Which species?
- Where are they located? Over time?
- How can we get more people to know about them?

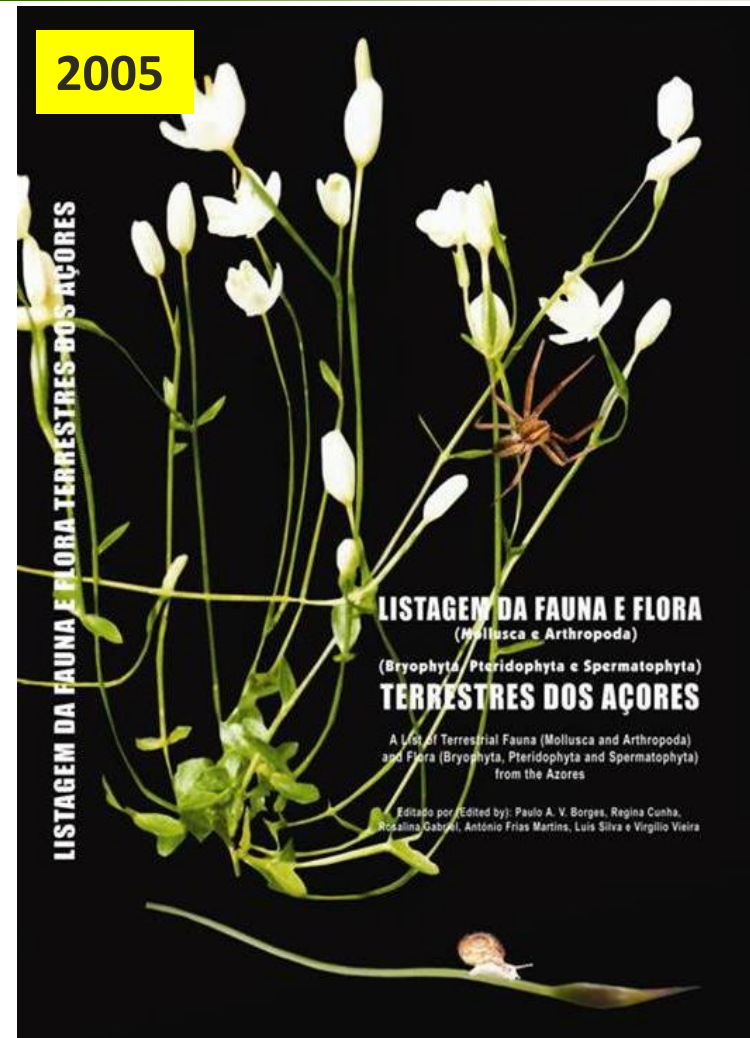


2005 – 1st comprehensive check-list of the Az
2008 – 1st “Azorean Biodiversity Portal”

How many species are there in the Azores?

4489 terrestrial *taxa*

- Annelids: 21
- Arthropods: 2209
- Bryophyte: 439
- Chordate: 49
- Ferns and Allies: 71
- Lichens: 632
- Molluscs: 111
- Nematodes: 80
- Seed plants: 877

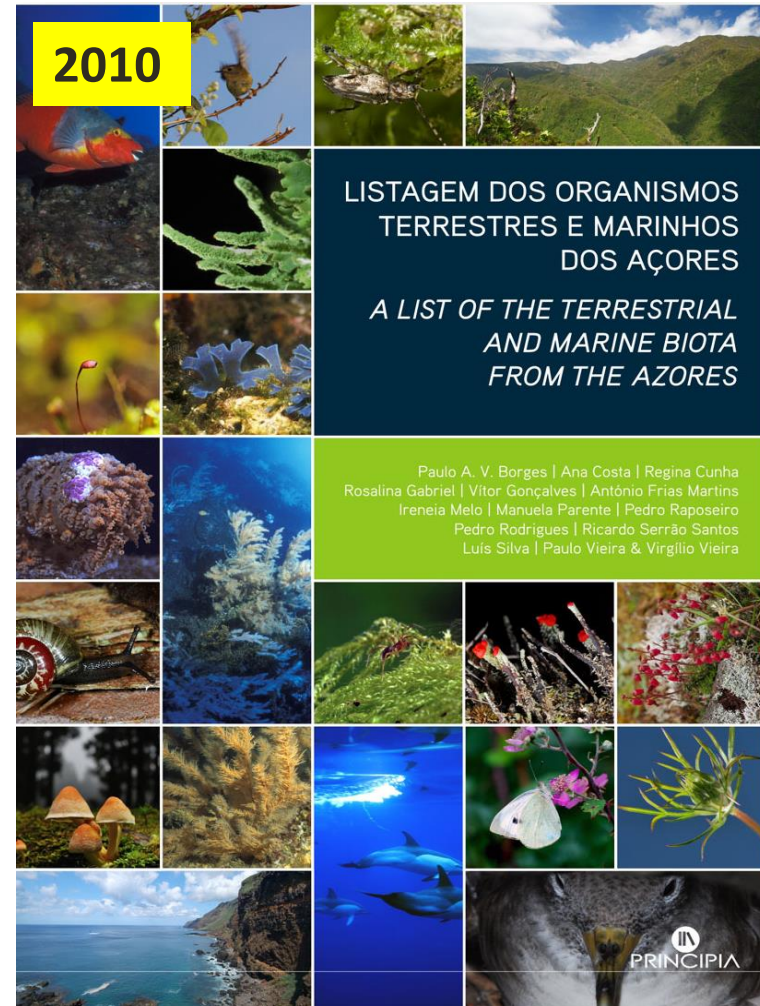


How many species are there in the Azores?

6164 *taxa terrestres*

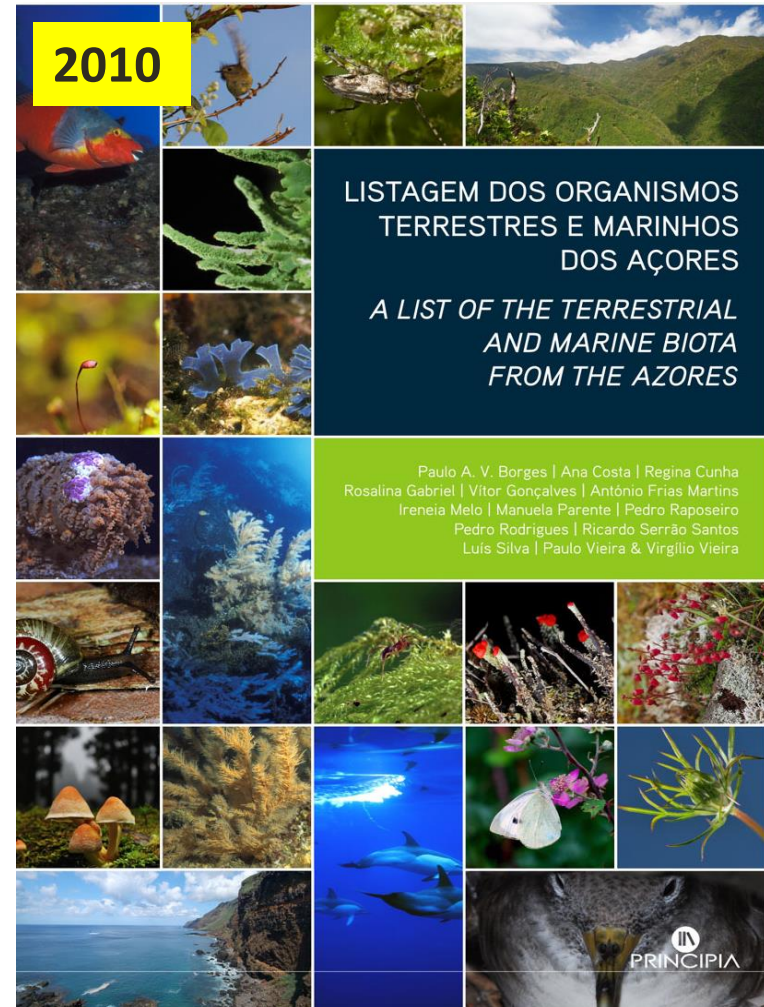
- Annelids: 22 (+ 1)
- Arthropods: 2278 (+ 69)
- Bryophytes: 475 (+ 36)
- Chordate: 69 (+ 20)
- *Diatoms: 536*
- Ferns and Allies: 69 (- 2)
- *Fungi: 552*
- Lichens: 775 (+ 132)
- Molluscs: 114 (+ 3)
- Nematodes: 131 (+ 51)
- Seed plants: 1017 (+ 149)
- *Plathelminte: 31*

& 1883 *marine taxa*



How many species are there in the Azores?

8057
natural or naturalized
taxa
+
350
migratory birds



How did we create the “Azores Bioportal”?

1. Build a multidisciplinary team

- Building on the network that had made the checklists

2. Compile all types of sources of data

- Also gathered for the checklists

3. Use of a specific database: ATLANTIS

- Already tested in the Canary Islands

4. Devised a web Portal

5. Look for sustainable financial support

- **2003-2005** - Projecto ATLÁNTICO (INTERREG III B)
- **2006 - 2007**- Projecto Base de Dados da Biodiversidade dos Açores (DRAM)
- **2009 - 2011**- Bolsa CITA-A para E. Mendonça
- **2012-2015** - Projecto ATLANTIS-MAR: mapeamento da biodiversidade costeira e marinha dos Açores
- **2015-2020** - AZORES-BIOPORTAL – PORBIOTA (*e-infrastructure*) – awaits financing...

GATHERING DATA

goal

- to obtain all the records available for each species

source

- published
 - papers
 - books
- unpublished
 - Field reports
 - Project reports
 - Specialist documents
 - Herbaria and animal collections

location

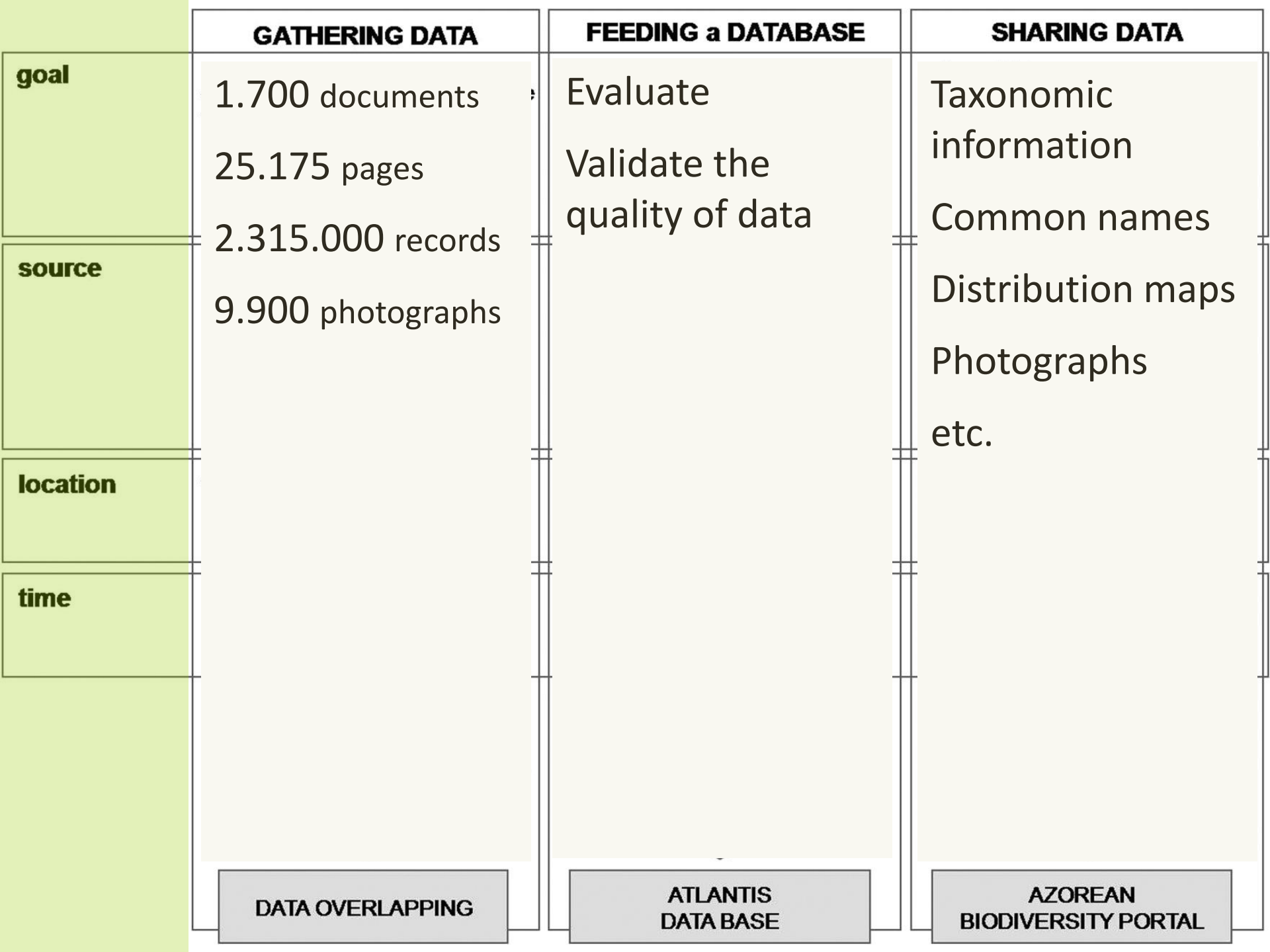
- Azorean islands

time

- through historical time

compile and
strengthens
data

DATA OVERLAPPING



The Azores Bioportal

So... the Azorean Biodiversity Portal appeared in 2008

The screenshot shows the homepage of the Azores Biodiversity Portal. The header features the text "BASE DE DADOS DA Biodiversidade DOS AÇORES" and the "bio Natura" logo. Below the header is a navigation bar with logos for "PROCONVERGENCIA AÇORES", various institutional logos, and "AZORES.GOV.PT Governo dos Açores". A sidebar on the left contains a language selector with flags for Portugal, Spain, and the UK, and a list of menu items: Start, Team and contacts, Publications, Activities, FAQs, News, Partners, and Links. The main content area displays a "PHOTO GALLERY Biodiversidade inAzores" with a large image of a dragonfly and a button that says "EXPLORE GALLERIES >>". The word "Home" is visible at the bottom of the page.

The Azores Bioportal

... and reformulated in 2015



O Portal da Biodiversidade dos Açores é um recurso único para a investigação fundamental em sistemática, biodiversidade, educação e gestão da conservação dos Açores (Portugal). Fornece igualmente uma plataforma para a investigação em biogeografia e macroecologia dos Açores.

[Descubra o Projecto](#)

The Azores Bioportal

Each page includes information on:

- Taxonomy
 - Synonyms
 - Common name
 - Photos
 - 10.000 for 60% of species
 - Colonization status
 - Protection status
 - Habitats (in progress)
- ... in 3 languages
- pt, sp, en

BIO
PORTAL
AZORES

Home **Azores Species** Documents News Project

Vanessa virginiensis (Drury, 1773)
Painted beauty, American painted lady

Description Synonyms 1 Gallery 10 Citations 4 Records 122

Taxonomy	
Reino:	Animalia
Filó:	Arthropoda
Classe:	Insecta
Ordem:	Lepidoptera
Família:	Nymphalidae
Gênero:	Vanessa
Especie:	Vanessa virginiensis

Icon validated by the document.
Lata actualizada e revista das Lepidoptera (Insecta) das Açores

Additional Information	
Source Category	Document
Migrante regular	Lata actualizada e revista das Lepidoptera (In...

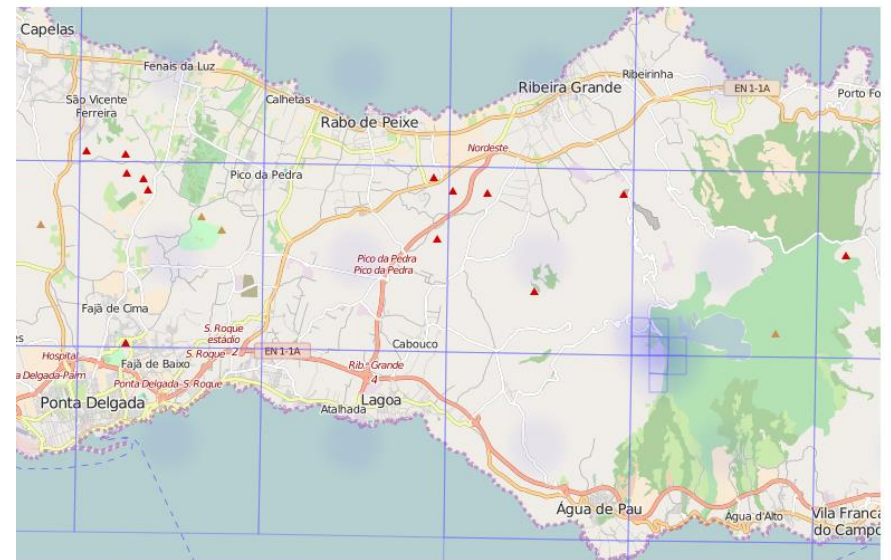
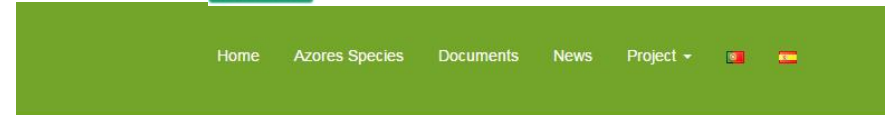
Distribution Summary for *Vanessa virginiensis*

The Azores Bioportal

Each page includes information on:

Distribution

- Archipelago
- Island
- Within-island –
 - 500 m x 500 m cells



The Azores Bioportal

Physeter macrocephalus Linnaeus, 1758

Scientific Name

Sperm whale

Description

Synonymies

Gallery 6

Citations 3

Records 1349

Taxonomy

Reino	Animalia
Filo	Chordata
Classe	Mammalia
Ordem	Cetacea
Família	Physeteridae
Género	Physeter
Espécie	<i>Physeter macrocephalus</i>

Taxon validated by the document

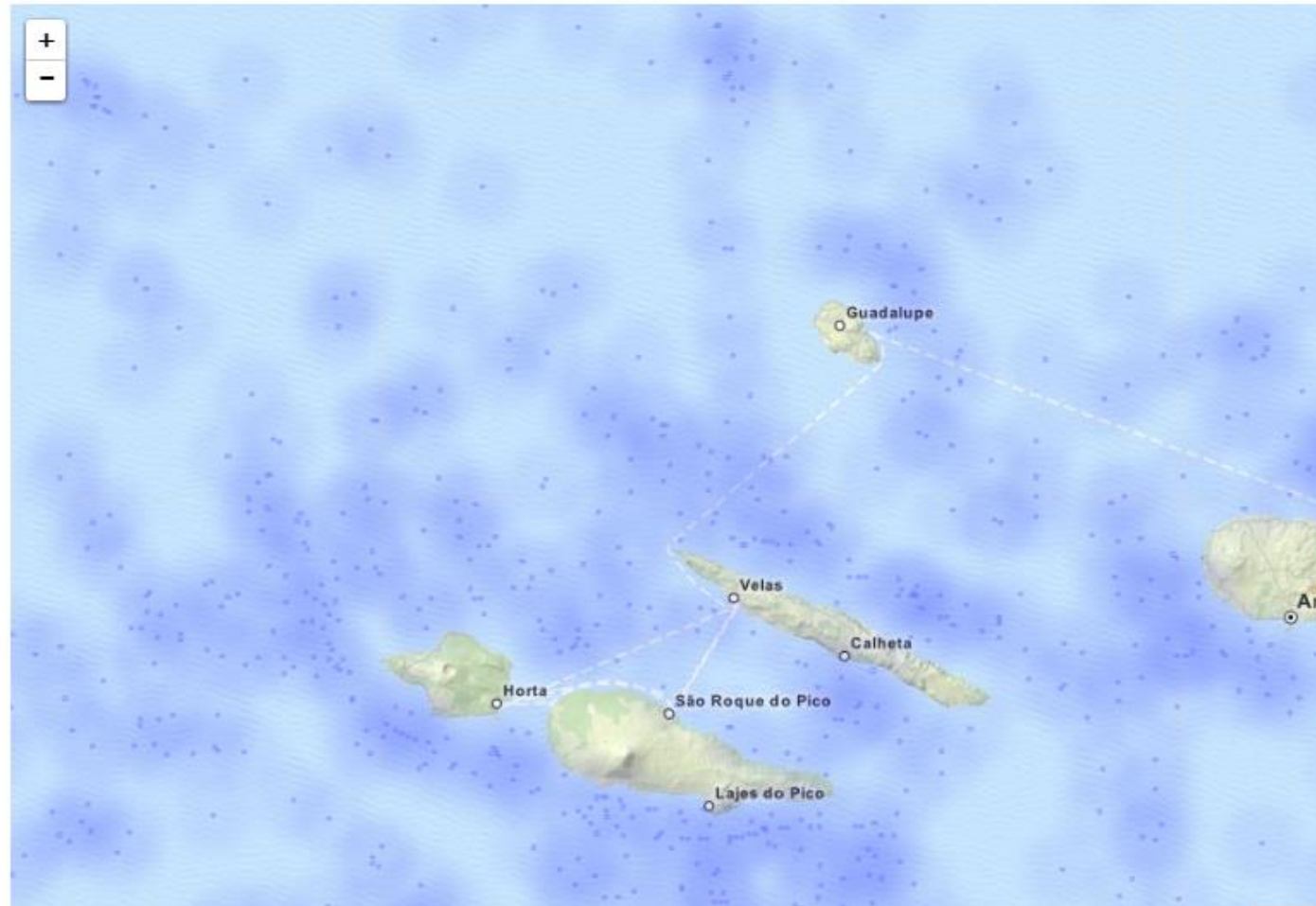
Lista dos mamíferos marinhos dos Açores 2010



The Azores Bioportal

Layers

Σ 1349 *Physeter macrocephalus*



A large cloud of distribution points for sperm whales

The Azores Bioportal

Potential Users

- Citizens
- Managers
- Researchers

The screenshot shows the Azores Bioportal interface for the species *Turinyphia cavernicola*. The page includes a navigation bar with 'Home', 'Azores Species', 'Documents', 'News', and 'Project'. The main content area features a taxonomic table, a gallery of images, and several information sections: 'Endemism', 'Additional Information', and 'Protection Level'.

Taxonomy

Reino:	Animalia
Filo:	Arthropoda
Classe:	Arachnida
Ordem:	Araneae
Família:	Turinyphiidae
Género:	Turinyphia
Espécie:	<i>Turinyphia cavernicola</i>

Endemism

Ilha(s)	Turinyphia	<i>Turinyphia cavernicola</i>
Azores	Não Endemico	Endemico

Additional Information

Source Category	Document	
Endemism das Açores	Lista actualizada e revista das Araneae (Arachn...	
Habitat Categories	Document	Assign Document
Criadores Múltiplos	Understanding Underground Biodiversity, Studie...	Projeto SALA - Listagem das espécies de Colé...
Criadores Múltiplos	Espécies realçadas de Grutas da ilha Terceira ...	Projeto SALA - Listagem das espécies de Colé...

Protection Level

Ilha(s)	Protection Level	Document	Assign Document
Terceira	Top 100 Açores	Capítulo Regional Açores (Artrópodes). In: Top ...	Capítulo Regional Açores (Artrópodes). In: Top ...
Terceira	Top 100 Macaronésias	Top 100 - As 100 espécies ameaçadas prioritárias...	Top 100 - As 100 espécies ameaçadas prioritárias...

The Azores Bioportal

Users statistics



34.348 - average number of monthly visits (Jul 2014 – Jun 2015)
Different parts of the world – mainly from Europe and also from Portuguese speaking countries

The Azores Bioportal

UTILITY

- Invasive species in the Azores
- Urban insects
- Auxiliary fauna

Thematic pages

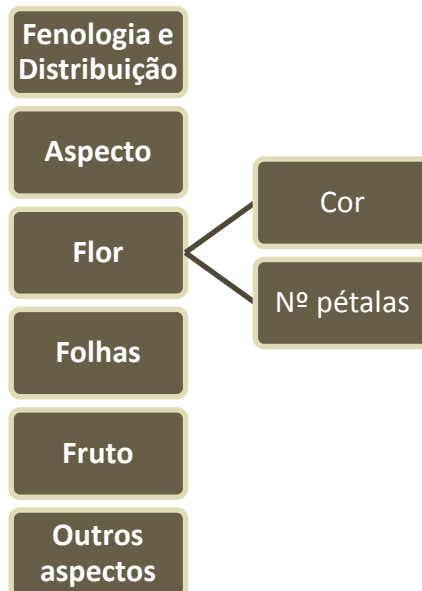


The Azores Biportal

UTILITY

- Multicriterion identification keys for
 - endemic vascular plants
 - (bryophytes: mosses & liverworts)

Identification keys



The Azores Bioportal

UTILITY

- Observing photographs from similar species (same genus)



Online comparison of species



Lotus creticus

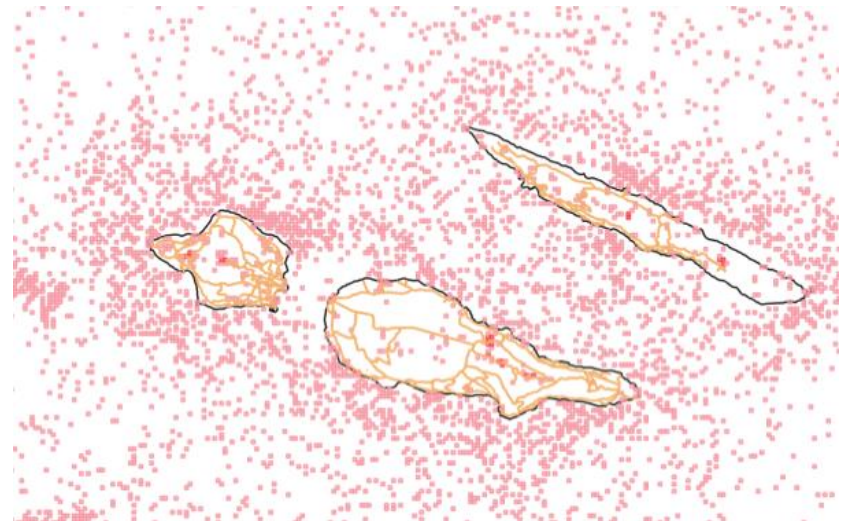
Lotus corniculatus

The Azores Biportal

Specialized information

Distribution maps for almost all terrestrial and marine species

- Different taxonomic groups
- Different taxonomic levels
- Different colonization status
- Different protection status
- Different scales



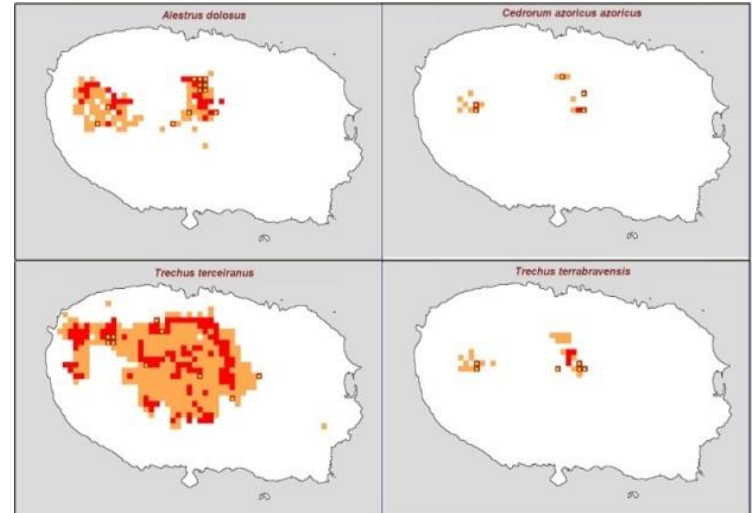
Richness of Species

The Azores Bioportal

Specialized information

Distribution maps for almost all terrestrial and marine species

- Different taxonomic groups
- Different taxonomic levels
- Different colonization status
- Different protection status
- Different scales



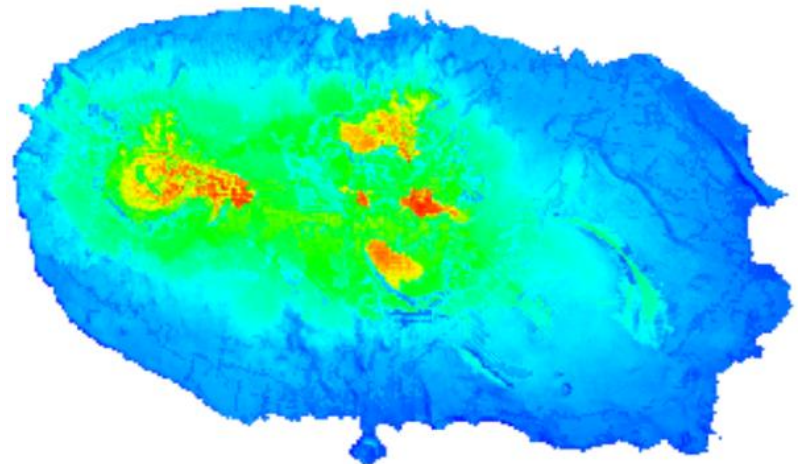
Predicting Habitat Adequacy

The Azores Biportal

Specialized information

Distribution maps for almost all terrestrial and marine species

- Different taxonomic groups
- Different taxonomic levels
- Different colonization status
- Different protection status
- Different scales



Complementary selection of
Protected Areas

The Azores Bioportal

Support Citizen Science projects

Pick a name!

- 12 endemic insect with no common names
- “identity card” for each one
- People proposed common names
- The most creative and representative names were selected by Azores Bioportal to represent those 12 species

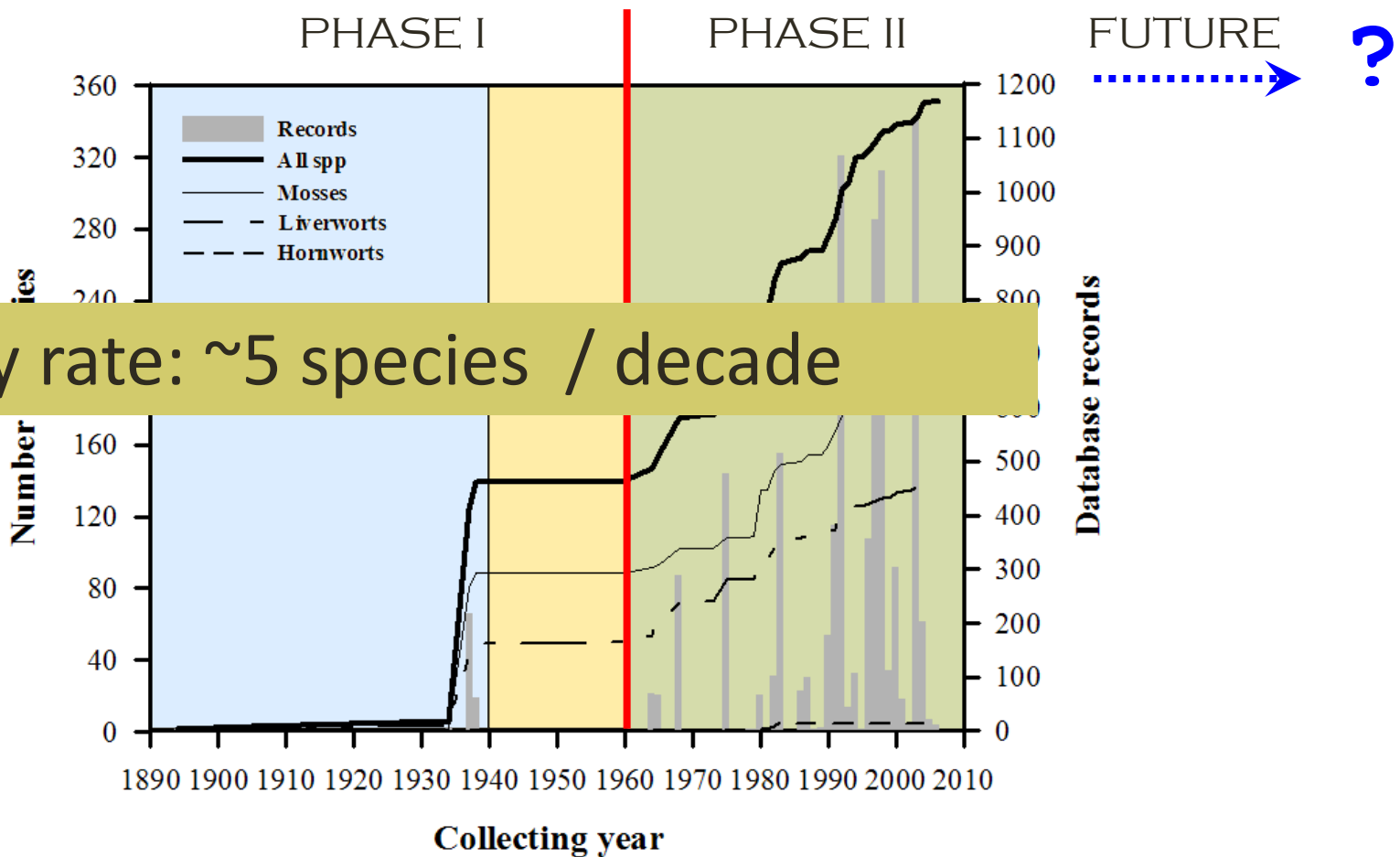


Challenges

- Due to the nature of information, a constant update is needed
- Since we want to use data for different predictions, we should be aware of bias of information

Need for constant UPDATING

The temporal pattern of species discovery



Bryophytes in Terceira Island

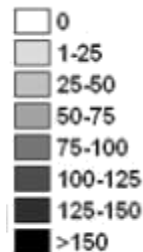
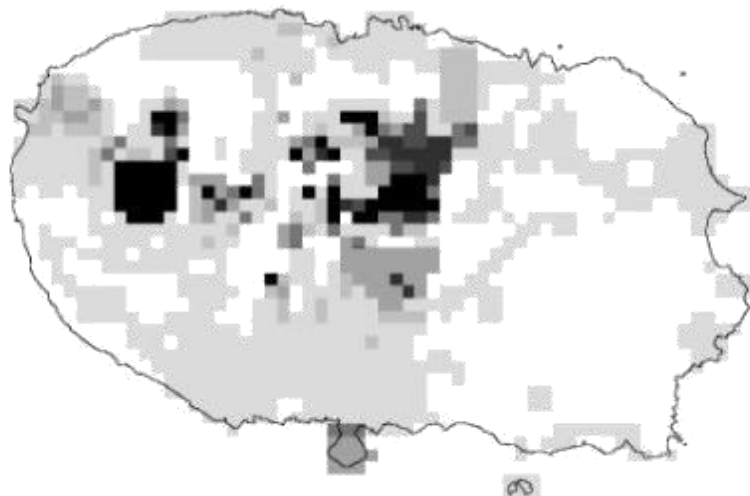
Bias in the information

The spatial pattern of species



COLLECTING SITES
(500 m UTM-squares)

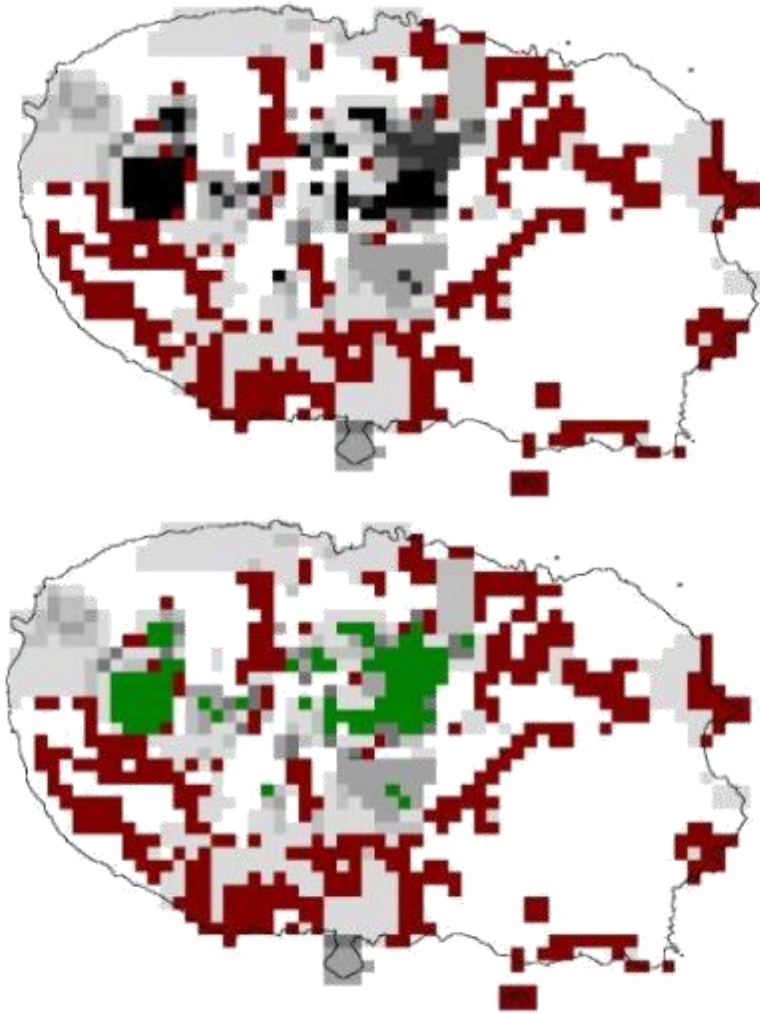
***Circa 50%* of island area was visited – at least once**



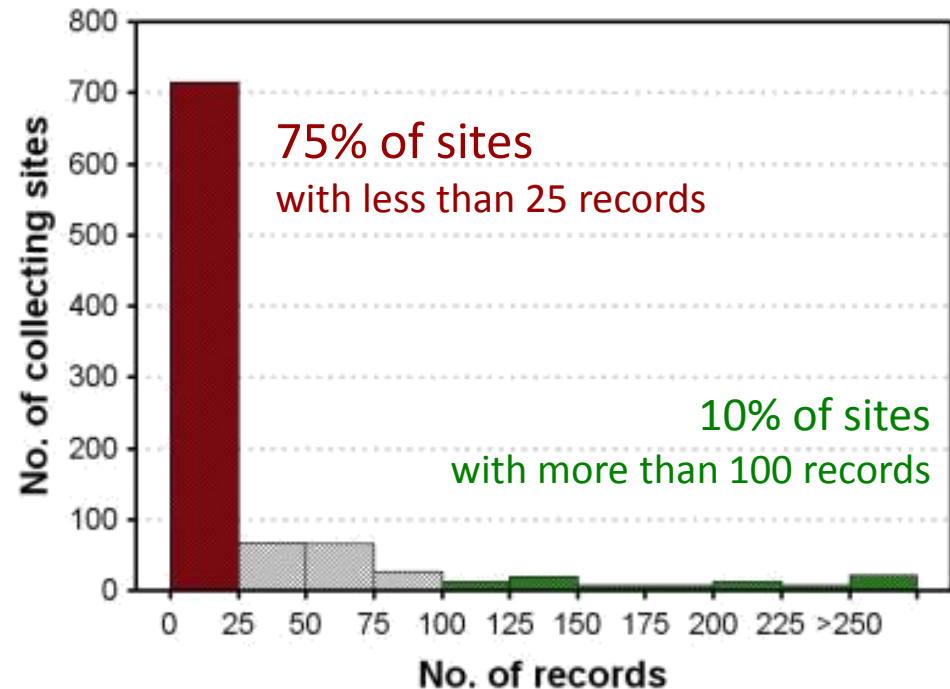
But the N°. of records per site is unbalanced
There is different sampling effort!

Bias in the information

The spatial pattern of species



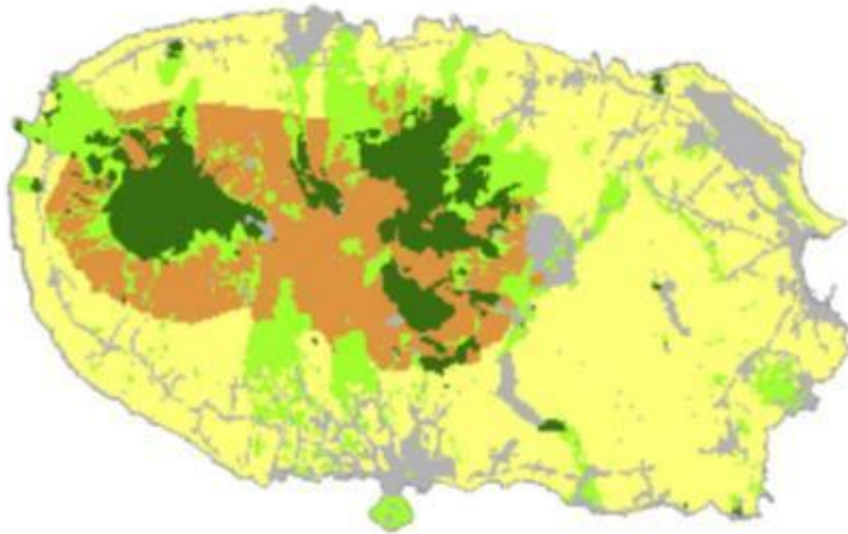
Highly skewed distribution



COLLECTING SITES
(500 m UTM-squares)

Bias in the information

The habitat gaps of information



- Native forests
- Exotic forests
- Semi-natural pastures
- Intensive pastures
- Social areas

There are only 17 UTM-squares with completeness higher than 80%

- Most of them in native forests!
- Social areas and intensive pastures are insufficiently sampled

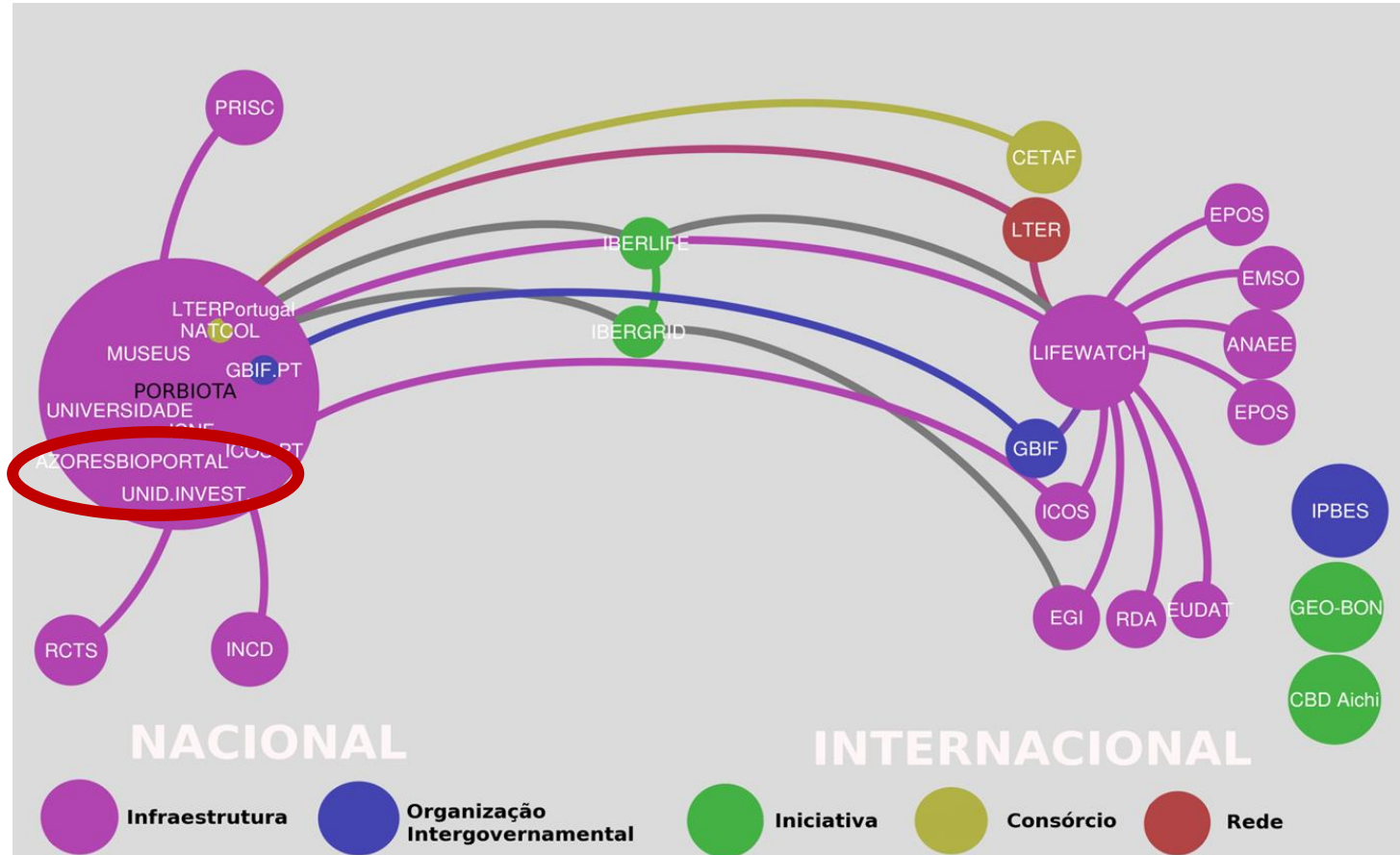
Land use changes with time!

Challenges

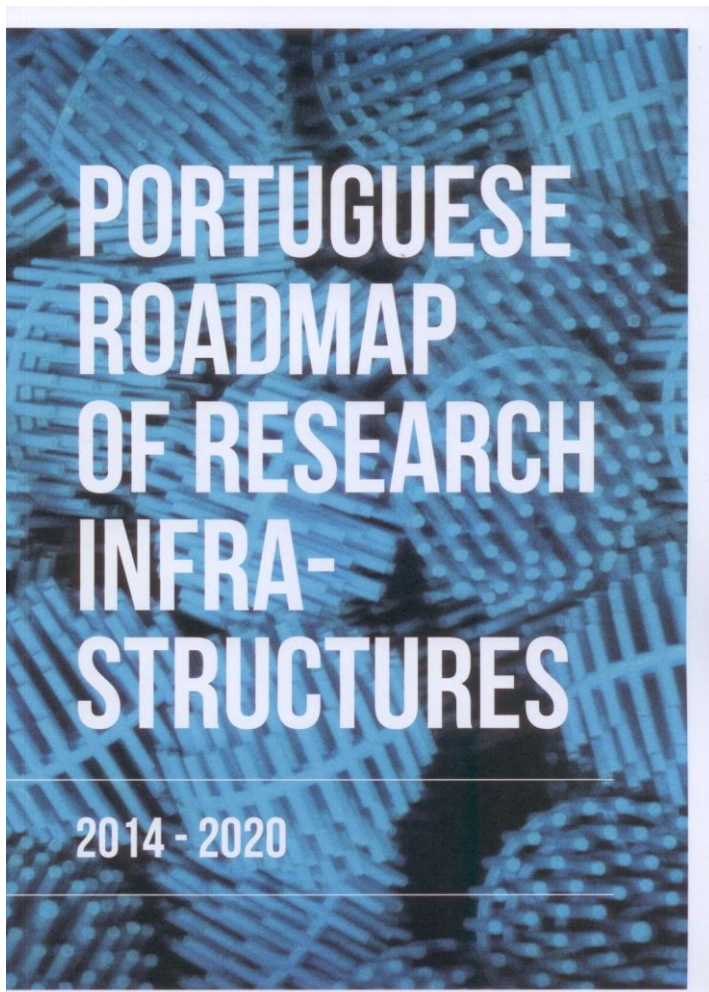
- Many data are still missing from our DataBase, and these are mostly data present in different Collections / Herbaria away from the Azores
 - Paris
 - London
 - Stockholm
 - etc.

Connect with different organizations

Improve our networking, both national and international level



PORBIOTA



Azores Bioportal is now incorporated in PORBIOTA, one of the 40 Research Infrastructures included in the national roadmap, presented in December 2014.

We thus hope to continue improving our DataBase, including information which is available outside the Azores.

FCT

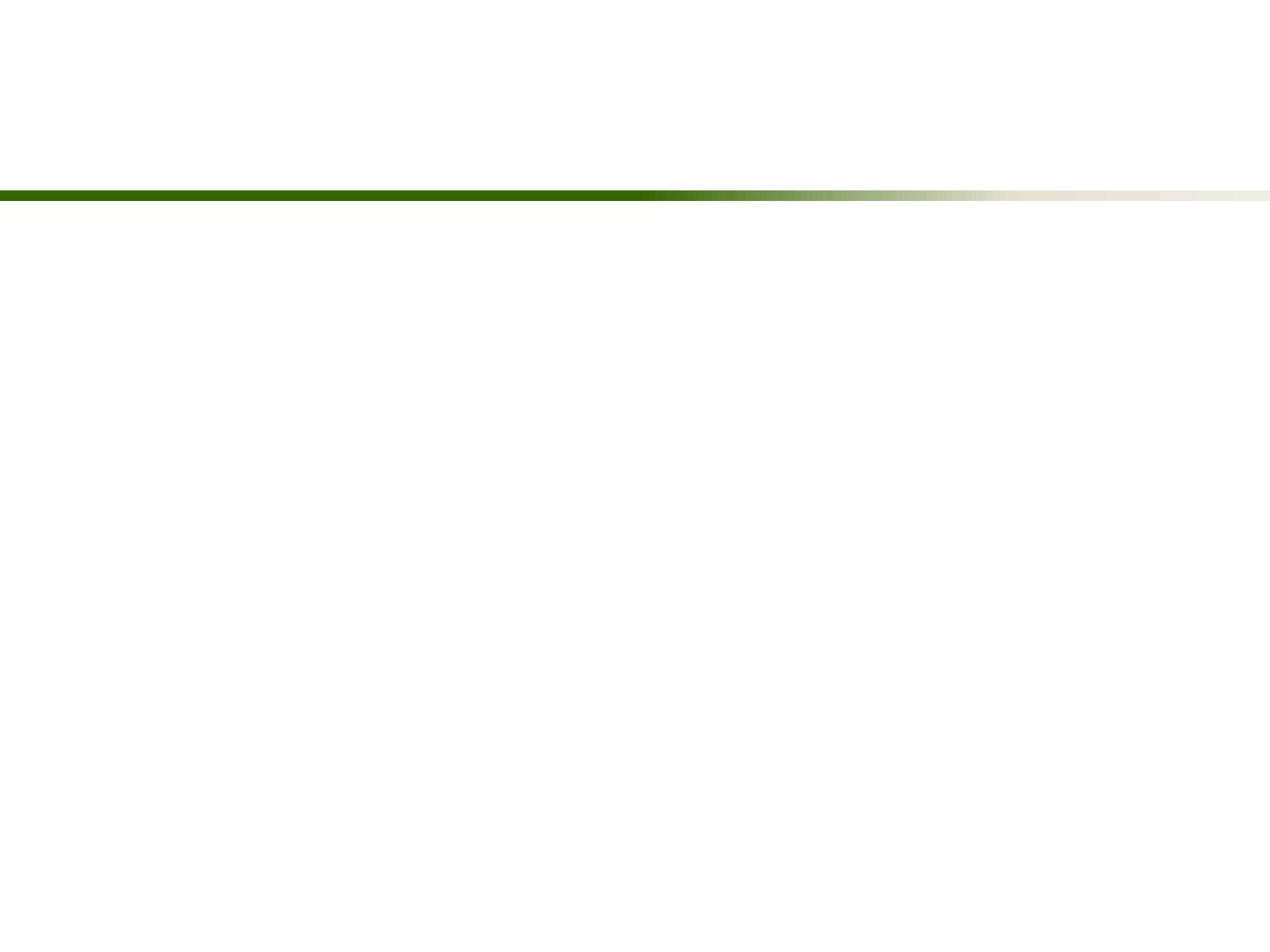
Fundação para a Ciência e a Tecnologia
MINISTÉRIO DA CIÊNCIA, TECNOLOGIA E ENSINO SUPERIOR

The Azores Bioportal



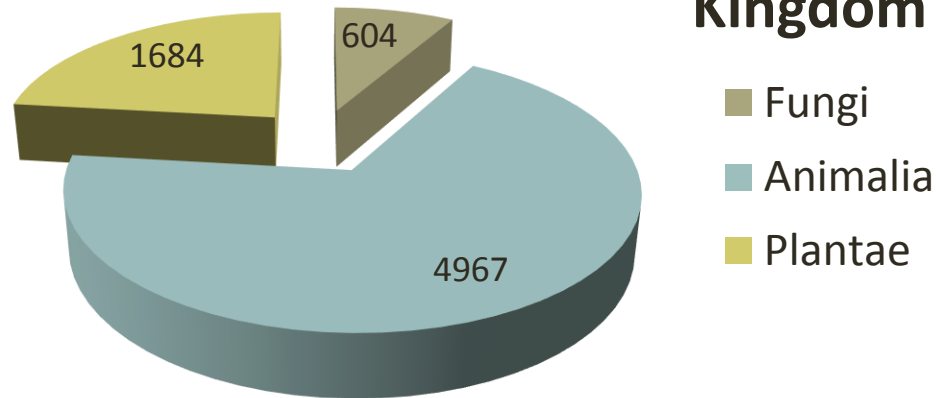
Thank you!



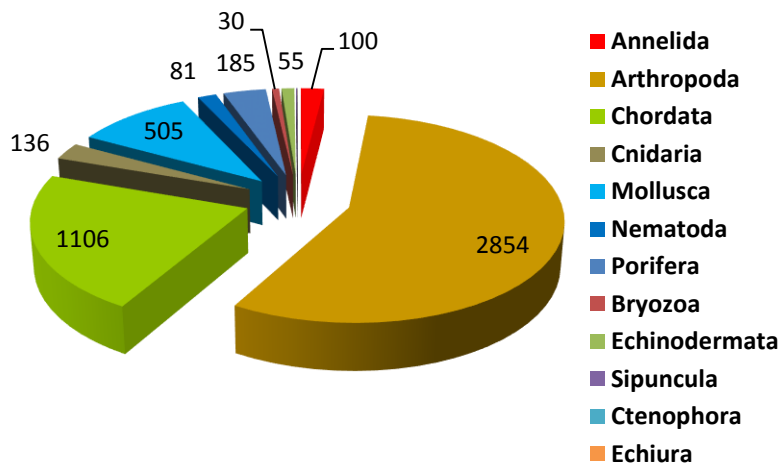


7.255 known species/subspecies terrestrial & marine in the Azores

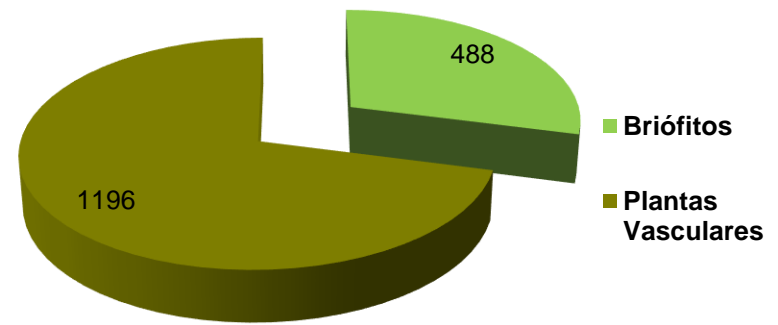
Kingdom



Animalia



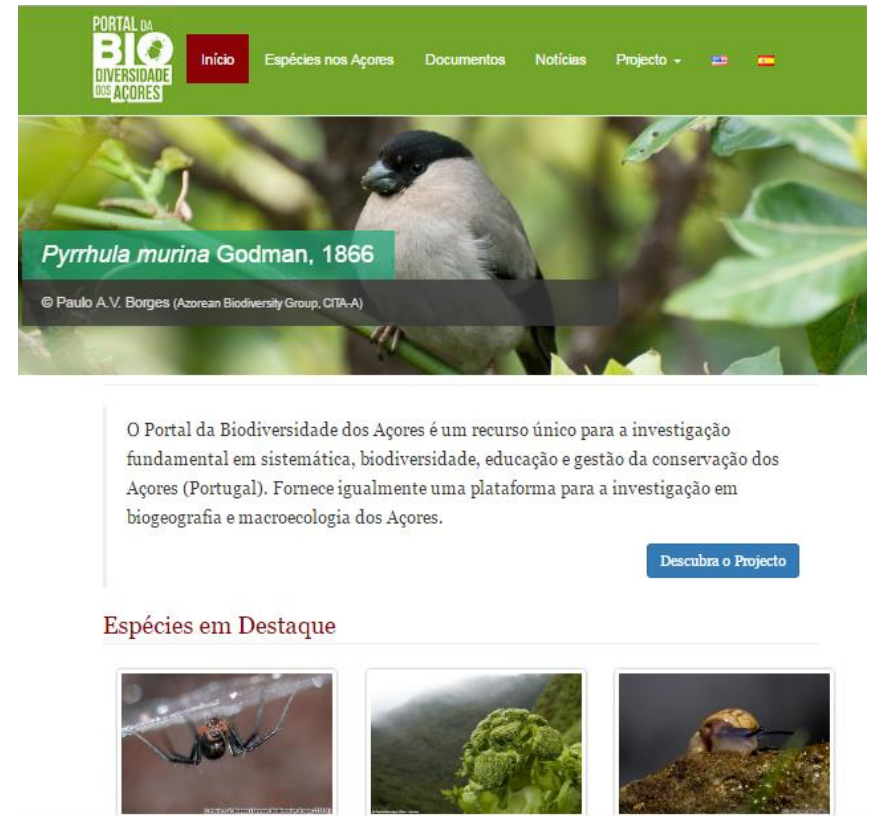
Plantae



The Azores Bioportal

Besides plants, animals and lichens,

we have check-listed Diatoms, Marine Algae and also Fungi, but so far these species do not have a distribution page.



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The temporal pattern of species discovery

Terceira Island

Biological database:

351 spp

8,140 records,

~400 visited localities

(500 m x 500 m UTM-squares)

	A	B	C	D	E	F
1	ID	Specie	Locality	X-UTM	Y-UTM	Altitude
2	1	Acanthocoleus aberrans (Lindenb. et Gottsche) Krujft	Juncal, 500-600 m	478500	4289500	500
3	2	Acrobolbus wilsonii Nees	Caldeira da S. S. Bárbara, 600 m, T	473500	4289250	600
4	3	Acrobolbus wilsonii Nees	Caldeira da S. S. Bárbara, 600 m, T	473500	4289250	600
5	4	Acrobolbus wilsonii Nees	Lagoa Negra e Lagoa Funda, entre	471875	4288125	830
6	5	Acrobolbus wilsonii Nees	Serra de Santa Bárbara, TG1	472250	4287500	950
7	6	Acrobolbus wilsonii Nees	Serra de Santa Bárbara (Cume do	472250	4286750	950
8	7	Acrobolbus wilsonii Nees	Caldeira da Serra de Santa Bárbar	472750	4288750	918
9	8	Acrobolbus wilsonii Nees	BALAT11	472250	4288750	918
10	9	Acrobolbus wilsonii Nees	BALAT22	479750	4287750	589
11	10	Adelanthus decipiens (Hook.) Mitt.	Serra de Santa Bárbara (Cume do	472250	4286750	950
12	11	Adelanthus decipiens (Hook.) Mitt.	Terra Brava	482517	4287117	650
13	12	Adelanthus decipiens (Hook.) Mitt.	Lagoa do Pinheiro	472750	4288750	860
14	13	Adelanthus decipiens (Hook.) Mitt.	Mistérios Negros	475125	4287813	630
15	14	Adelanthus decipiens (Hook.) Mitt.	Ribeira das Lapas, 650 m	471250	4289750	650
16	15	Adelanthus decipiens (Hook.) Mitt.	Terra Brava, 2 km N of Algar do Cai	481500	4288750	600
17	16	Adelanthus decipiens (Hook.) Mitt.	BALAT18	482750	4287250	660
18	17	Adelanthus decipiens (Hook.) Mitt.	BALAT18	482750	4287250	700
19	18	Adelanthus decipiens (Hook.) Mitt.	BALAT11	472250	4288750	918
20	19	Adelanthus decipiens (Hook.) Mitt.	BALAT20	478750	4287750	530
21	20	Adelanthus decipiens (Hook.) Mitt.	BALAT20	478750	4287750	530
22	21	Alophosia azorica (Renauld et Cardot) Cardot	Agualva, 600 m	482875	4288475	600
23	22	Alophosia azorica (Renauld et Cardot) Cardot	Pico Gordo e Biscoitos, Caminho e	477232	4291232	600
24	23	Alophosia azorica (Renauld et Cardot) Cardot	Criação do Mato	478500	4288500	Gap

We assumed that:

Species discovery occurs randomly in both time and space, and it is independent of sampling effort