

Invertebrates conservation: present situation and future challenges

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- *LIBRe – Laboratory for Integrative Biodiversity Research, University of Helsinki

Seminário Biogeográfico da Macaronésia
8 a 10 de novembro, Angra do Heroísmo, Terceira

Map of the talk

1. Invertebrates state of art:

- Diversity
- Habitats
- Legal protection
- And others

2. Conservation efforts in Madeira Archipelago

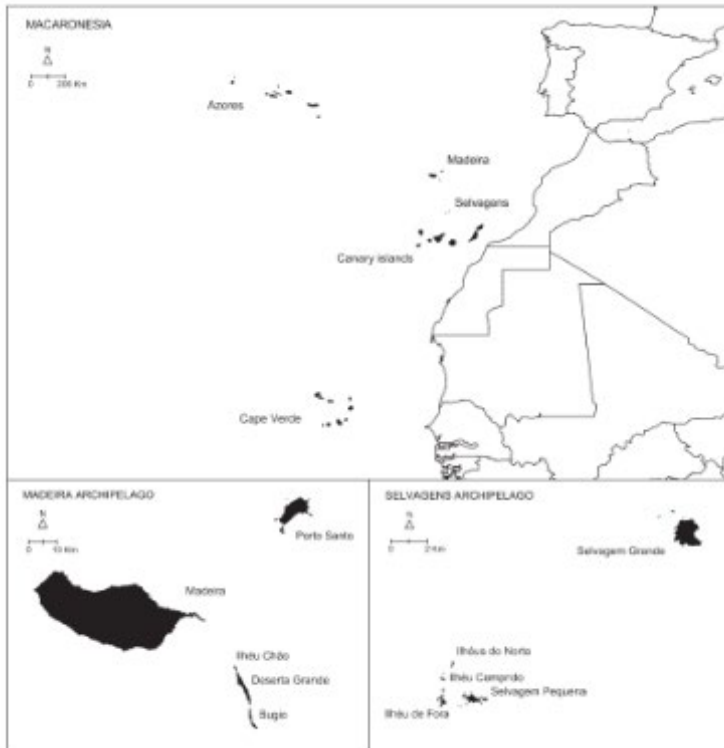
- Porto Santo Islets land snails (LIFE Ilhéus de Porto Santo)
- Desertas Land Snails (Help project)

3. Future challenges:

- Joint strategies and conservation programs
- Improve communication skills
- Legal constraints
- Alternative sources of funding

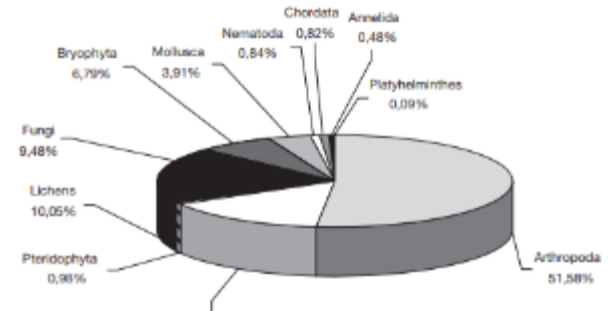


1.1 Diversity



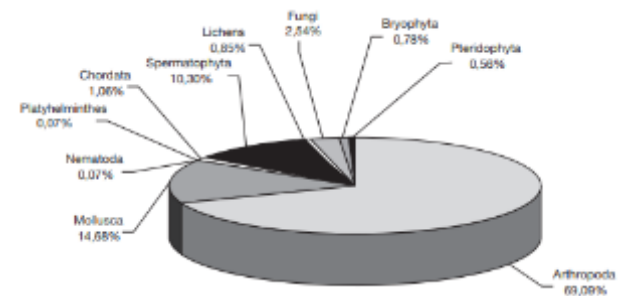
Madeira Archipelago (801 Km²)

7571 total taxa



56,9% invertebrates

1419 endemic taxa



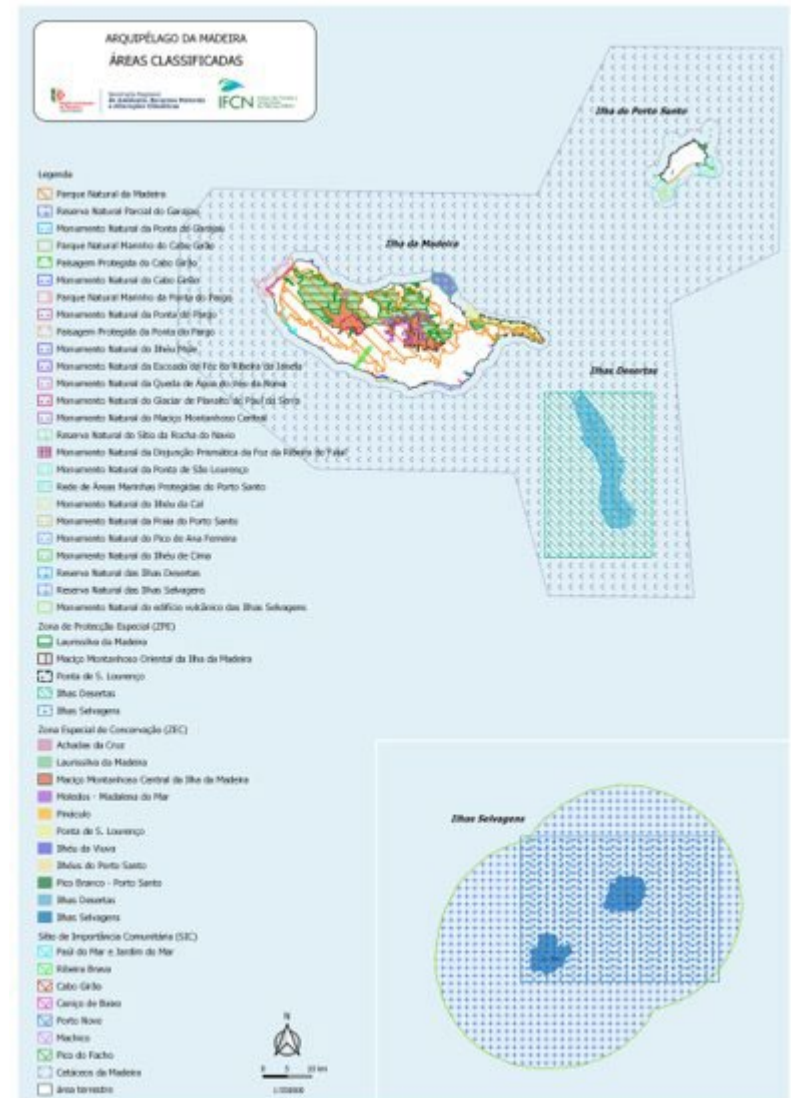
83,91% invertebrates

1.2 Species distribution

- Occour on every habitat available
- From coastal to subalpine areas

Protected areas and Natura 2000 sites

- **25** Protected areas
- **19** Natura 2000 Sites
- **58%** of the territory
- **89%** of the territorial sea



1.3 Legal protection for invertebrates

- Bern Convention
- Habitats Directive (17 sp. appendix II, all snails)

1.4 Threats and pressures

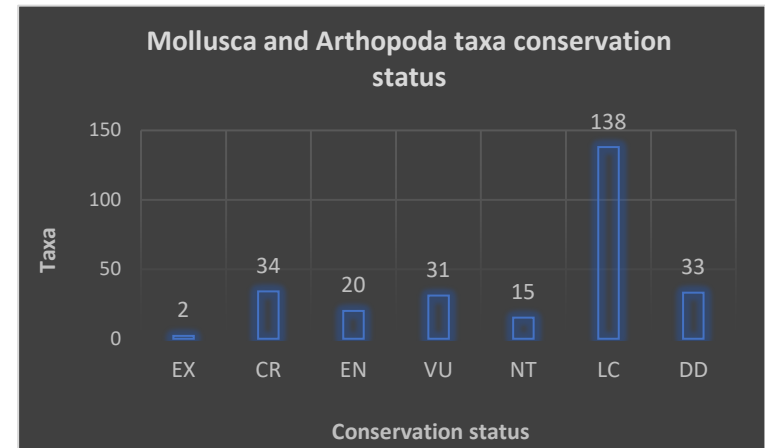
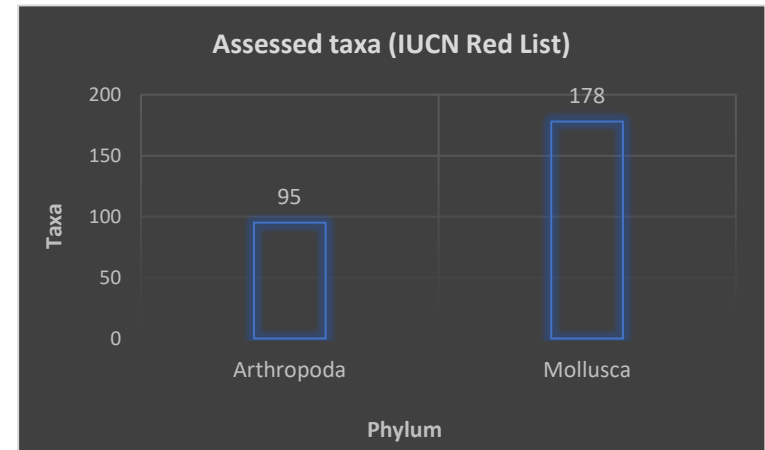
- Lack of knowledge *sensu lato*
- Habitat loss and degradation
- IAS (e.g feral goats)
- Climate change
- Narrow distribution and low dispersal rate
- Inbreeding

1.5 Conservation status

- Only 7% of the taxa assessed
- 31% assessed as threatened (CR, EN or VU)

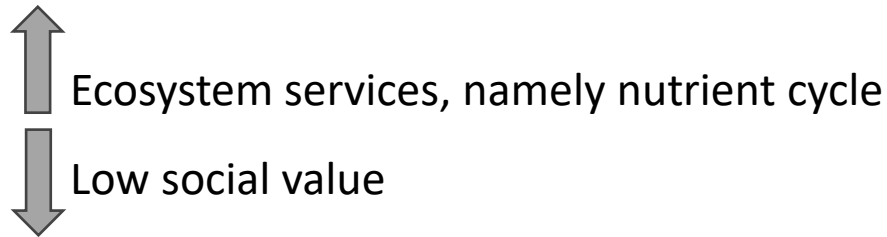


Vast majority land snails (79%) and spiders (21%)

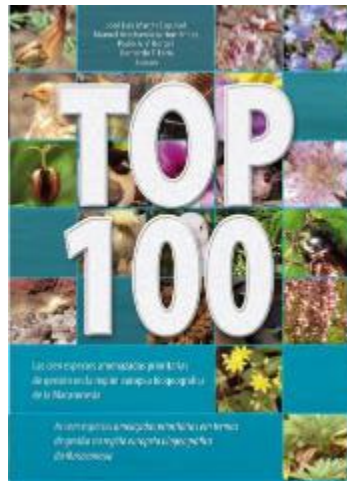


Source: IUCN Red List november 2023

1.6 Invertebrates impact in ecosystems and society



Scale issue



	4. Taxón de alto valor social para la comunidad en la Macaronesia o en una parte significativa de ella (archipiélago).		3. Taxón de alto valor social para la comunidad, al menos en una de las islas de Macaronesia.		2. Taxón de valor social, como mínimo para un grupo de interés relevante en la región o una parte significativa de ella (archipiélago).		1. Taxón generalmente desconocido para un amplio grupo de la comunidad.	
Azores	2	20,00%	4	57,1%	14	51,9%	3	5,4%
Madeira	4	40,00%	0	-	8	29,6%	14	25,0%
Canarias	4	40,00%	3	42,9%	5	18,5%	39	69,6%
Total	10	100%	7	100%	27	100%	56	100%

All invertebrates

Low social value

Low ecological literacy

Lack of information/knowledge

Source:

MARTÍN, J. L., M. ARECHAVALETA, P. A. V. BORGES & B. FARIA (eds.). 2008. Top 100. Las 100 especies amenazadas prioritarias de gestión en la región europea biogeográfica de la Macaronesia. Consejería de Medio Ambiente y Ordenación Territorial, Gobierno de Canarias 500

INVERTEBRATES STATE OF ART

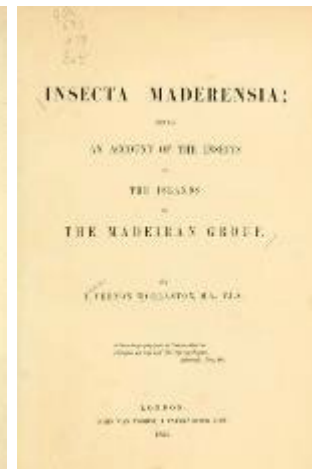
WHAT HAVE WE LEARNED???

Conservation projects:

- More than 150 years of knowledge (???)
- First projects started in 2010 (+ 16 years later than vertebrates and plant sp. conservation projects)



1878



1854

CONSERVATION EFFORTS IN MADEIRA ARCHIPELAGO

LIFE ILHÉUS DO PORTO SANTO



Porto Santan snails



CONSERVATION EFFORTS IN MADEIRA ARCHIPELAGO

LIFE ILHÉUS DO PORTO SANTO



Idiomela subplicata (Sowerby, 1824)

Shell size: 23–25 mm breadth, 24–26 mm height

- Monotypic genus
- Once common and widespread (Quaternary deposits), is now circumscribed to Ilhéu da Cal
- Two known populations until 2010

Threats:

- Predation by mice
- Habitat fragmentation/loss due to IAS plants and human activities

Estimated population size (2010):

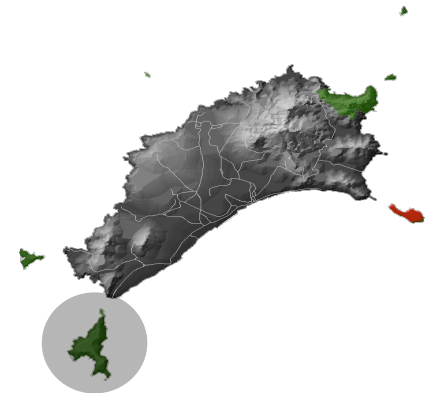
- Less than 500 specimens



Ilhéu de Baixo



Quarry activities
(until 70s of 20th century)



CONSERVATION EFFORTS IN MADEIRA ARCHIPELAGO

LIFE ILHÉUS DO PORTO SANTO



Wollastonaria turricula (Lowe 1838)

Shell size: 7mm breadth, 9 mm height

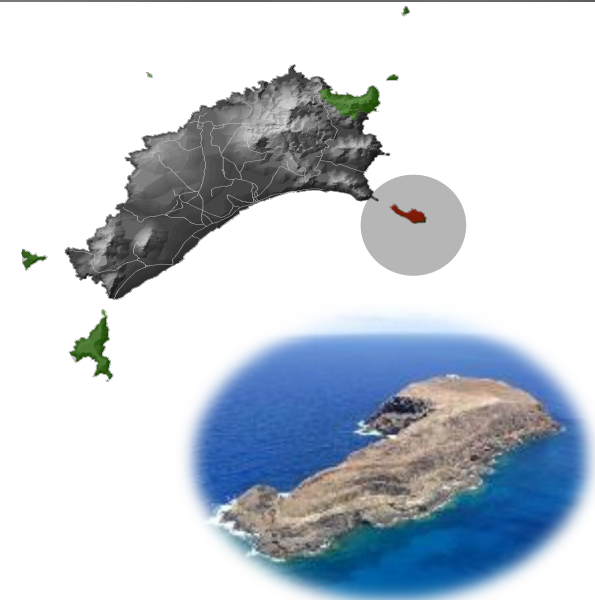
- Known only from Ilhéu de Cima
- Two known subpopulations until 2010

Threats:

- Potential predation by argentine ant and seagulls
- Habitat disturbance due to human activities
- Habitat fragmentation due to grazing by the European rabbit

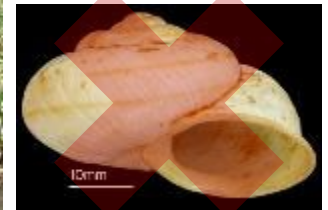
Estimated population size (2010):

- Less than 1000 specimens



Dragon tree (*Dracaena draco*)

Pseudocampylaea lowii



CONSERVATION EFFORTS IN MADEIRA ARCHIPELAGO

LIFE ILHÉUS DO PORTO SANTO

Threats eradication



Cima islet



Wollastonaria turricula (Lowe 1838)



Baixo islet

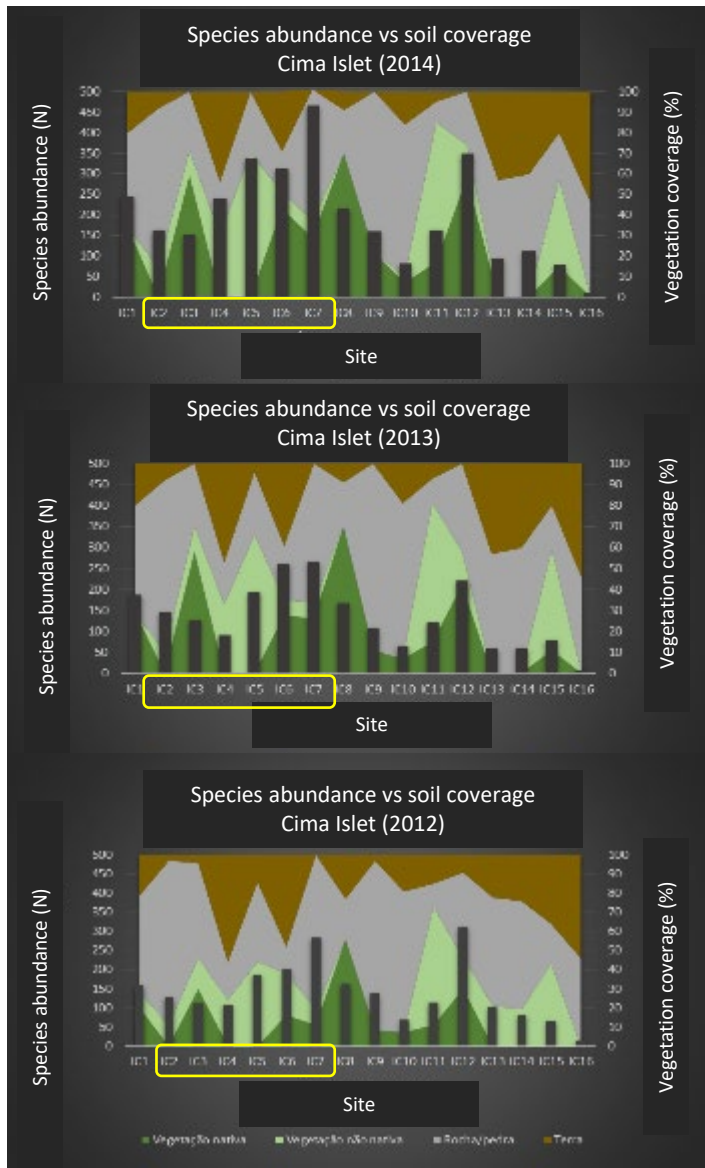


Idiomela subplicata (Sowerby, 1824)

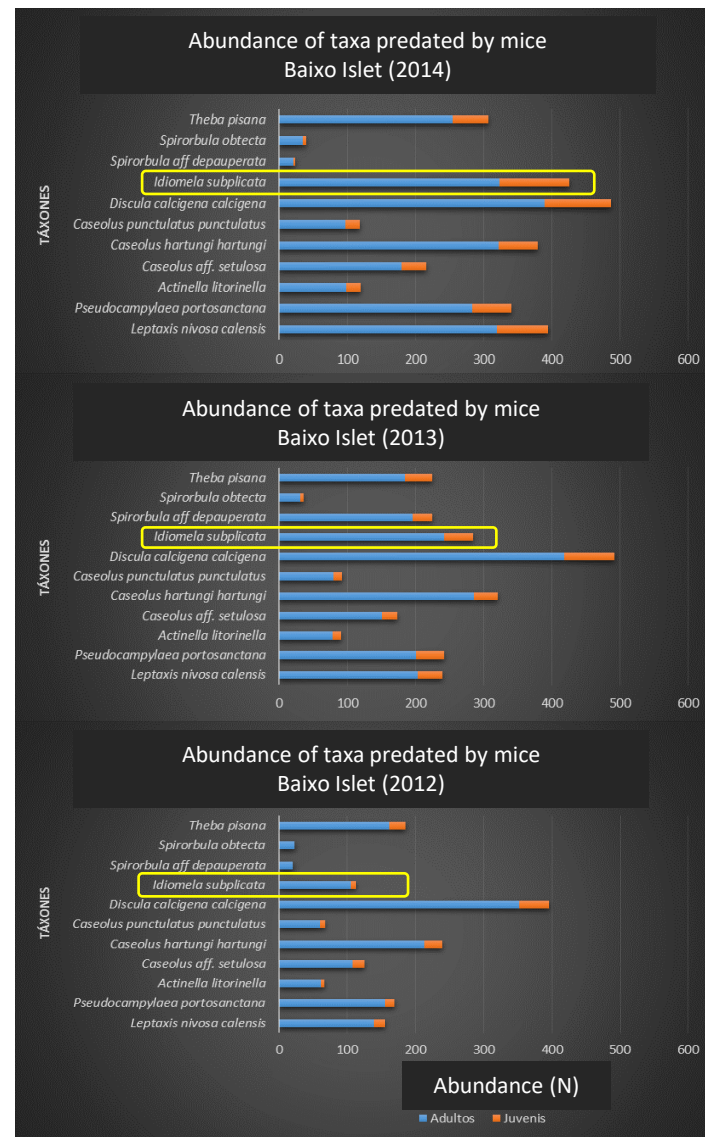
CONSERVATION EFFORTS IN MADEIRA ARCHIPELAGO

LIFE ILHÉUS DO PORTO SANTO

Wollastonaria turricula (Lowe 1838)



Idiomela subplicata (Sowerby, 1824)



CONSERVATION EFFORTS IN MADEIRA ARCHIPELAGO

LIFE ILHÉUS DO PORTO SANTO

Wollastonaria turricula (Lowe 1838)

2019

- AOO **6x** larger compared to 2012



Idiomela subplicata (Sowerby, 1824)

2019

- AOO **2x** larger compared to 2012



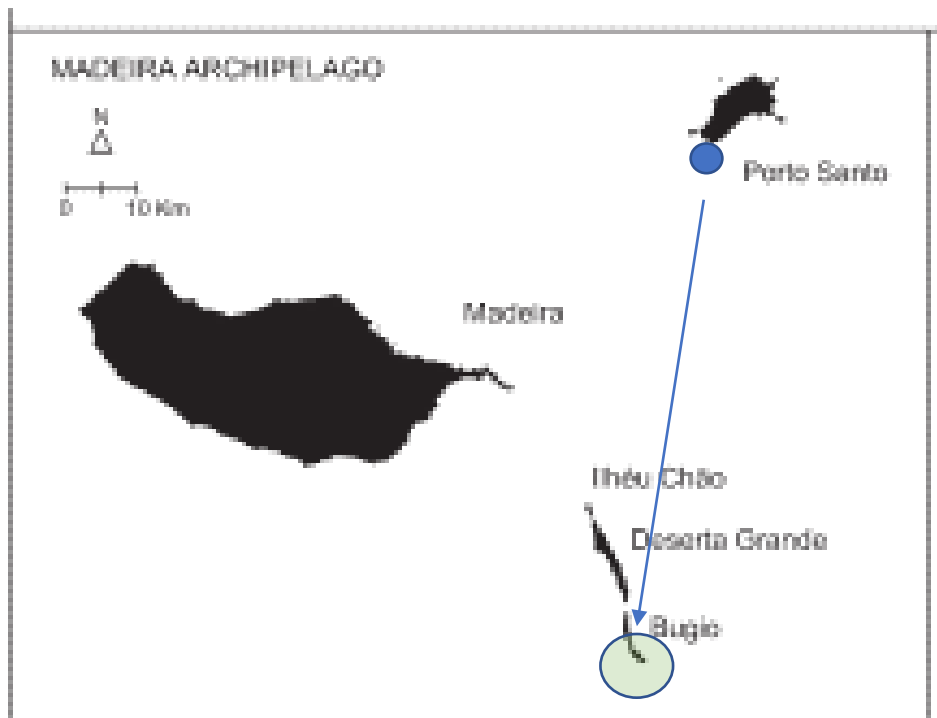
Both species to be downlisted

CONSERVATION EFFORTS IN MADEIRA ARCHIPELAGO

LIFE ILHÉUS DO PORTO SANTO

When nature does the work for us...

Idiomela subplicata (Sowerby, 1824)



2019



- Specimens transported by seagulls
- Emerge alive from the pellets



CONSERVATION EFFORTS IN MADEIRA ARCHIPELAGO

LIFE ILHÉUS DO PORTO SANTO

Idiomela subplicata (Sowerby, 1824)

- **Biological controller of the IAS tree tobacco (*Nicotiana glauca*)**



Tree tobacco (*Nicotiana glauca*)



CONSERVATION EFFORTS IN MADEIRA ARCHIPELAGO

HELP DESERTAS SNAILS



Desertas Snails



4 CR species rediscovered between 2008 - 2012



Geomitra grabhami



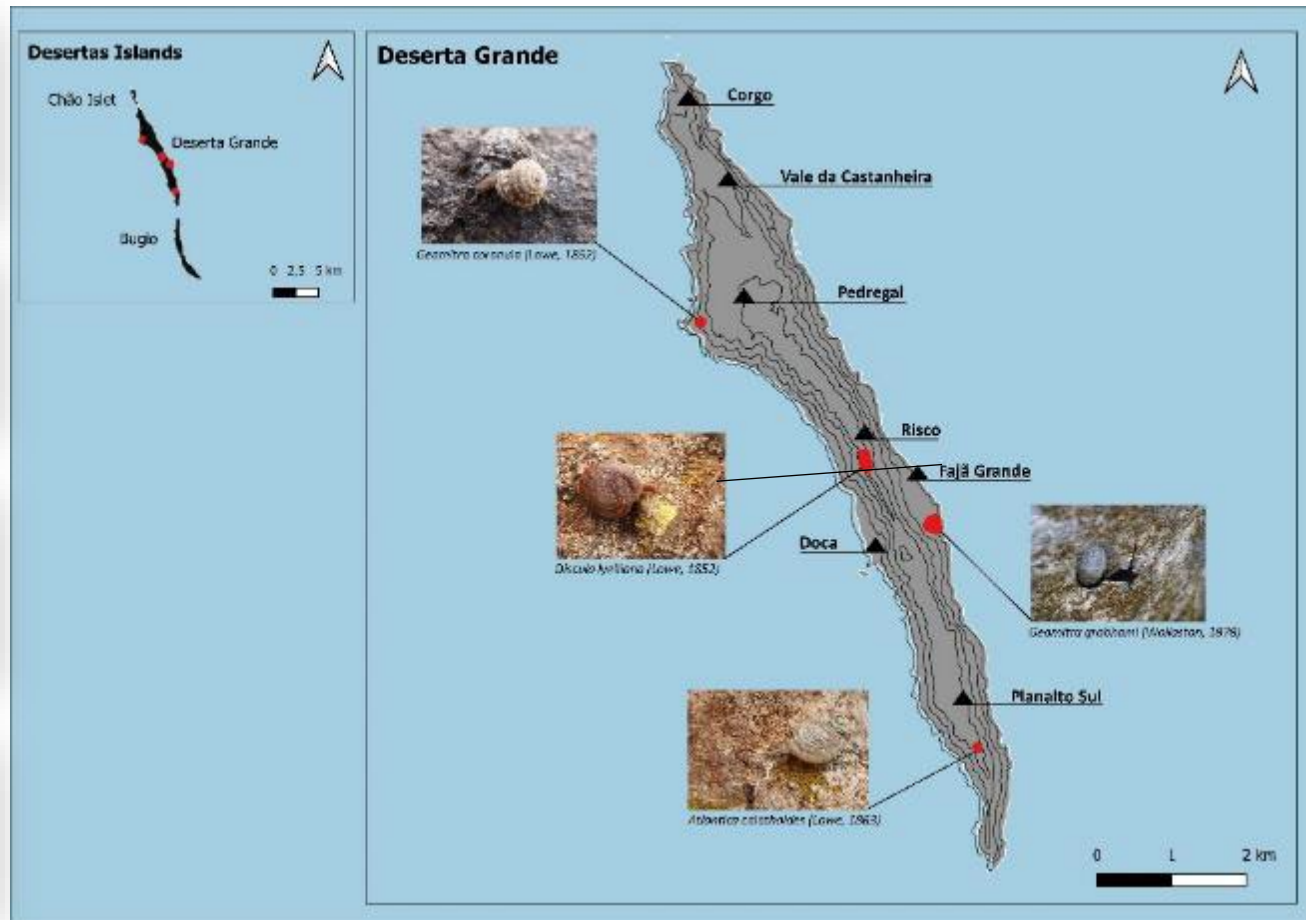
Discula lyelliana



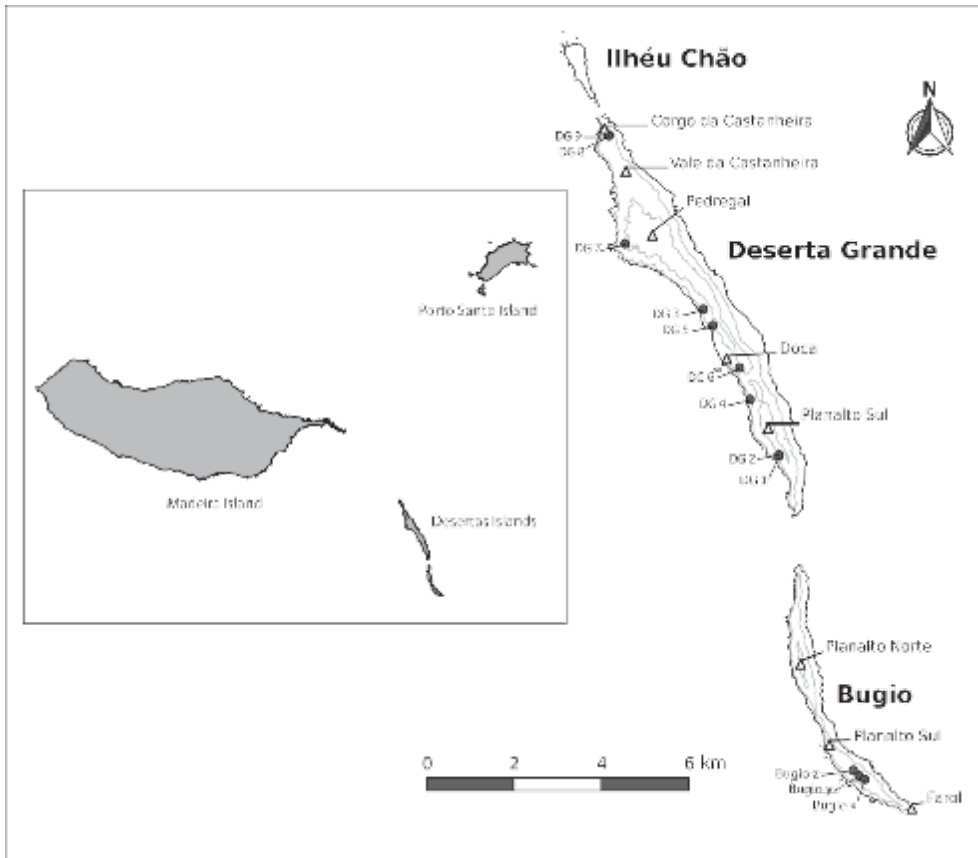
Atlantica calathoides



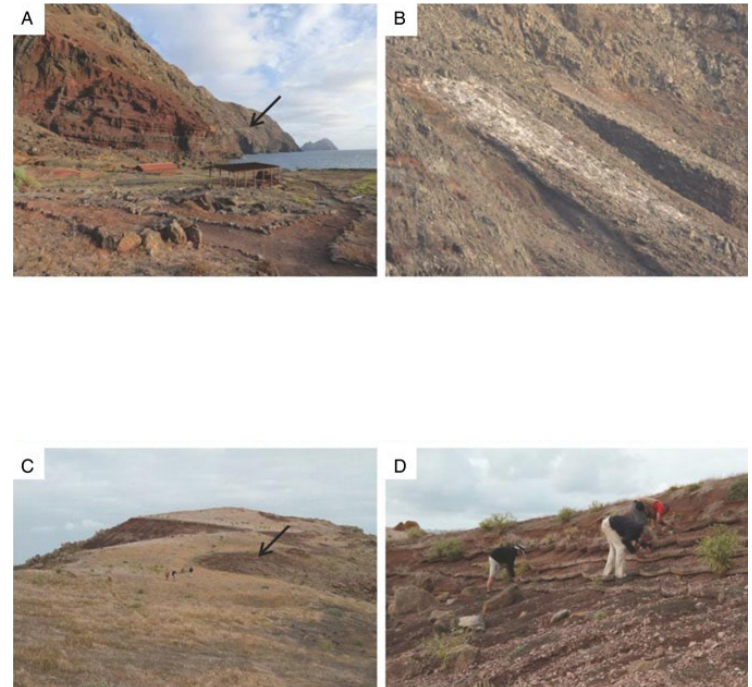
Geomitra coronula



Historical distribution of the target species based of the 8 new fossil deposits found



92 ma – 6 ma



Source:

Teixeira, D., Pokryszko, B., Cameron, R.A.D., Silva, I. & Groh, K. (2019). Taxonomic revision of the late-Pleistocene/Holocene land-mollusc fauna (Gastropoda: Eupulmonata) of the Desertas Islands, Madeiran Archipelago, with the description of 6 new species and 2 new subspecies. *Archiv für Molluskenkunde*. 148(2): 137-159., available online at <https://doi.org/10.1127/arch.moll/148/137-159>.

CONSERVATION EFFORTS IN MADEIRA ARCHIPELAGO

HELP DESERTAS SNAILS

Habitat change/fragmentation



19th century



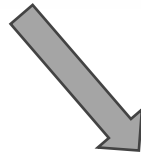
Invasive species



Goat (*Capra hircus*)



Mice (*Mus musculus*)



Brinck of extinction

CONSERVATION EFFORTS IN MADEIRA ARCHIPELAGO

HELP DESERTAS SNAILS

Atlantica calathoides - Loss of population 1



2013



2018

Pteridium aquilinum (native)



Sideritis candicans subsp. *crassifolia* (endemic)



Vegetation succession



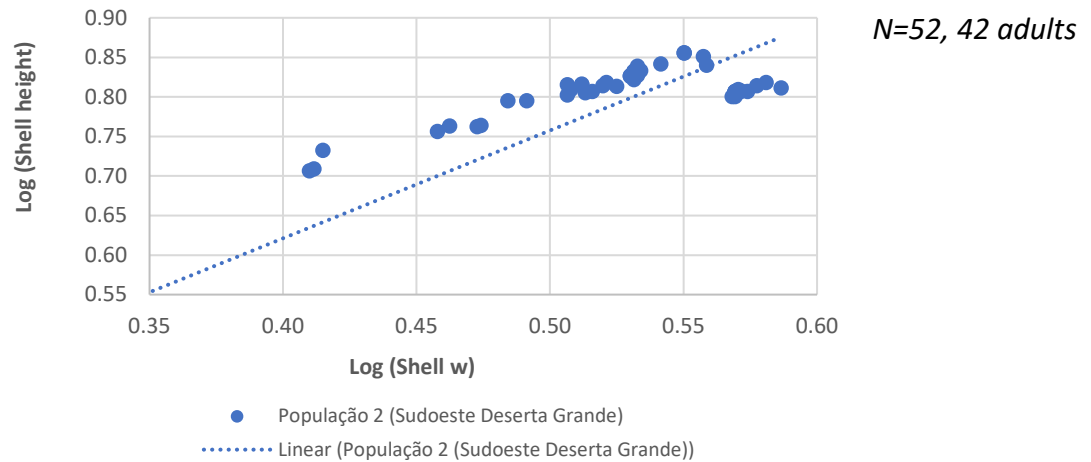
CONSERVATION EFFORTS IN MADEIRA ARCHIPELAGO

HELP DESERTAS SNAILS

Mark-recapture to monitoring movements, habitat use, survivorship, and abundance

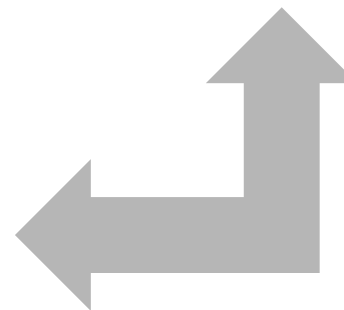


Atlantica calathoides specimens marked with bee tags



Similar results for the other target species:

- *Discula lyelliana* (N=49, 41 adults)
- *Geomitra coronula* (N=32, all adults)
- *Geomitra grabhami* (N=124, 101 adults)



ACT NOW!!!

CONSERVATION EFFORTS IN MADEIRA ARCHIPELAGO

HELP DESERTAS SNAILS

2021. Rescue + captive breeding program



Geomitra grabhami N=80



Discula lyelliana N=32



Atlantica calathoides N=36



Geomitra coronula N=23

173 specimens

Successful breeding program in Chester Zoo, Bristol Zoo Gardens & Beauval Zoo



+6000 specimens in total



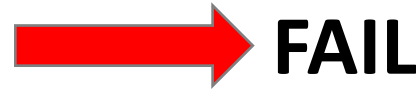
Discula lyelliana

General objectives (Desertas islands)

- Baseline survey to update species richness on Desertas

Specific objectives (Deserta Grande and Bugio)

- Identify new populations and the distribution area of the target species (*D. lyelliana*, *A. calathoides*, *G. coronula* & *G. grabhami*)
- Collect climatic data on target species sites
- Field studies to increase our understanding of biology & ecology
- Mark-recapture to monitoring movements, habitat use, survivorship, and abundance
- **Monitoring species response to conservation measures**
 - Mice population control / eradication
 - Feral goats population control/erradication
- Elaborate species action plans for the target species



CONSERVATION EFFORTS IN MADEIRA ARCHIPELAGO

HELP DESERTAS SNAILS

Species reintroduction - April 2024

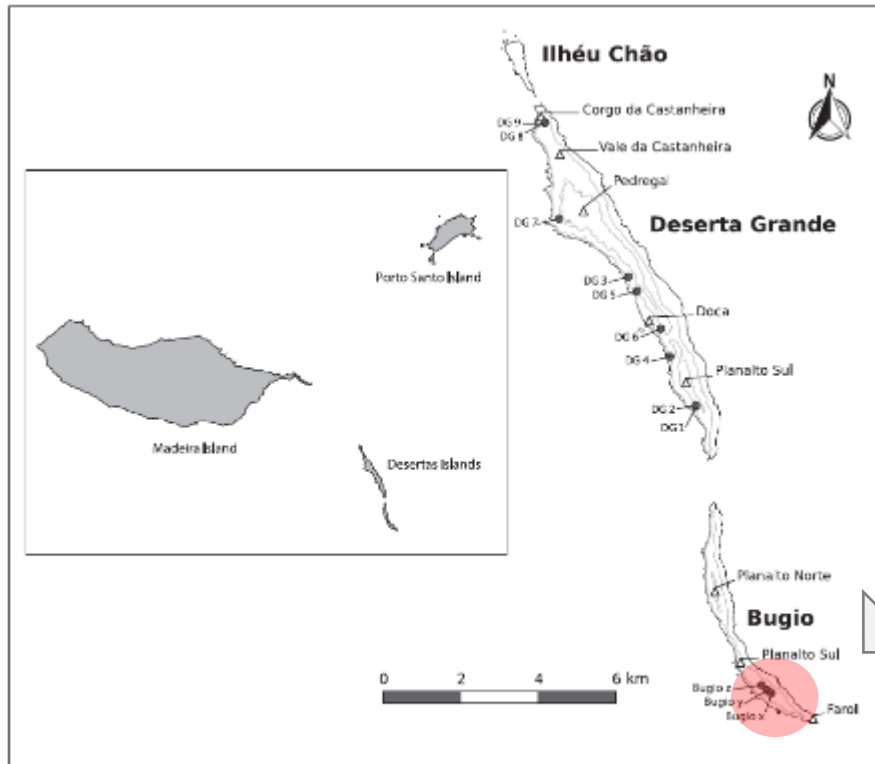


Figure 1. A map of the Desertas, showing the location of fossiliferous sites sampled, together with other locations mentioned in the text.



Discula lyelliana



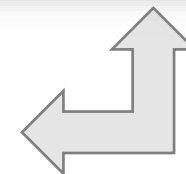
Atlantica calathoides



Geomitra coronula



Goats + mice + rabbits



Next steps

- Ecosystem restoration strategy (2024)
- Workshop to updated conservation strategy (2024)
- Threats control/eradication
- Reinforcement and creation of new populations in the wild (Deserta Grande)

Santa Maria island

HABITAT LOSS

Endemic species dwindling over the past three decades
Not being found alive in the last 20 years
Become rarer



Pico Alto



Plan to Act (2020)



Santa Maria (Azores) Invertebrate Planning Workshop Report



28th and 29th February 2020
Santa Maria Island
The Azores



LIFE SNAILS (2022-2026)

OBJECTIVES

Increase habitat suitability + Reduce fragmentation

Control invasive plants + Restricting cattle access

Public awareness campaign

Enhance species conservation



Ecological corridors



Leptaxis minor



Oxychilus agostinhoi



Azorivitrina angulosa

Status: ongoing

More information about *LIFE SNAILS*: De Frias Martins, A (INS-03): *LIFE SNAILS – Azores: Mending the pieces to give them a chance.*

Endemic species

6 CR land snails species

Small area of occupancy

Rarer or not being found alive since their description

Pilot study



Klaus Groh



Marco T. Neiber



Tenerife island



Hemicycla plicaria



Hemicycla mascaensis



Hemicycla modesta



Insulivitrina reticulata



Keraea garachicoensis

N. teobaldoi



Endemic species

Objectives

Collect information on species occurrence, habitat type and characterization and define the area of occupancy.

Definition of criteria for the species rescue

Help regional and local administration to develop plans for the protection of these animals, especially by the protection of their habitats

Status: ongoing

Training + Capacity Building

November/22

More information about *Hemicycla*: Neiber *et al.* (INS-08): How many goodly creatures are there here! Origin, radiation and diversification of *Hemicycla* land snails in the Canary Islands (Gastropoda: Stylommatophora: Helicidae)

1. Macaronesian Conservation Strategy for Invertebrates

- Set priorities !!!!
- Our goal should be to restore habitats/ecosystems and improve species conservation status (Green list)
- Conservation efforts must be measurable, tangible and comparable
- Plan to act (conservation plans, inventories, conservation actions)

2. Increase social value and invertebrates' appreciation

- Increase citizens' literacy based on scientific facts, not opinions !!!!
- Implement broad environmental awareness programs, campaigns and activities
- Improve project and experts networking and implement volunteers' program

3. Funding

- Find alternative funding sources (Zoos and Rewilding NGOS)

Thank you for your attention

