

The Desertas Wolf Spider

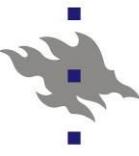
Conservation Strategy 2016-2022

Edited by Pedro Cardoso, Mark Bushell and Mark Stanley-Price



 **SSC**
Species Survival Commission

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 **IFCN**
Instituto das Florestas e
Conservação
da Natureza IPRAM


UNIVERSIDADE da MADEIRA

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DESERTAS WOLF SPIDER CONSERVATION PLAN

The Strategy for the Conservation of the Desertas Wolf Spider is edited in English and Portuguese.



DESERTAS WOLF SPIDER CONSERVATION PLAN

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STATUS REVIEW

Species description

The Desertas wolf spider (*Tarântula das Desertas*) *Hogna ingens* from Vale da Castanheira, Desertas Islands, Madeira, Portugal was described in 1857 by John Blackwall (1857). Despite having an impressive 40mm body size, very little is known about this species (Crespo et al. 2014). Even though some taxonomists have provided redescriptions (Blackwall 1867; Kulczynski 1899; Roewer 1960; Denis 1962; Wunderlich 1992), every other aspect of this remarkable species has remained unknown until recently (Crespo et al. 2014).

It was assessed as Critically Endangered according to the International Union for the Conservation of Nature (IUCN) criteria (Cardoso 2014) but is not protected by any international, national or regional legislation or agreements.

In the absence of any native terrestrial mammals, this spider is a top predator in its habitat. Although its major prey consists of other invertebrates, such as the staphylinid beetle *Ocyphus olens* (Müller, 1764) and the invasive millipede *Ommatoiulus moreleti* (Lucas, 1860), adults have also been seen predating on juvenile *Tiera dugesii mauli* lizards (Mertens, 1938). The latter, along with birds and mice, are the major predators of *H. ingens*, mostly during its juvenile stage. This is when the spider is most vulnerable to predators, because in addition to its smaller size, it tends to disperse in order to find new shelters, thus maximizing the likelihood of encounters with potential predators, including conspecific adults. As spiders grow and find proper shelters, mostly below rocks but also in soil crevices, their inclination to disperse gradually decreases. It takes about two years for spiders to reach maturity.

Species functions and values

The Desertas Islands have never been permanently occupied by humans, causing the spider to be relatively unknown to the local population of Madeira. It is, however, a top predator, with a perceived regulatory role over the invertebrate populations of the single valley it occupies.

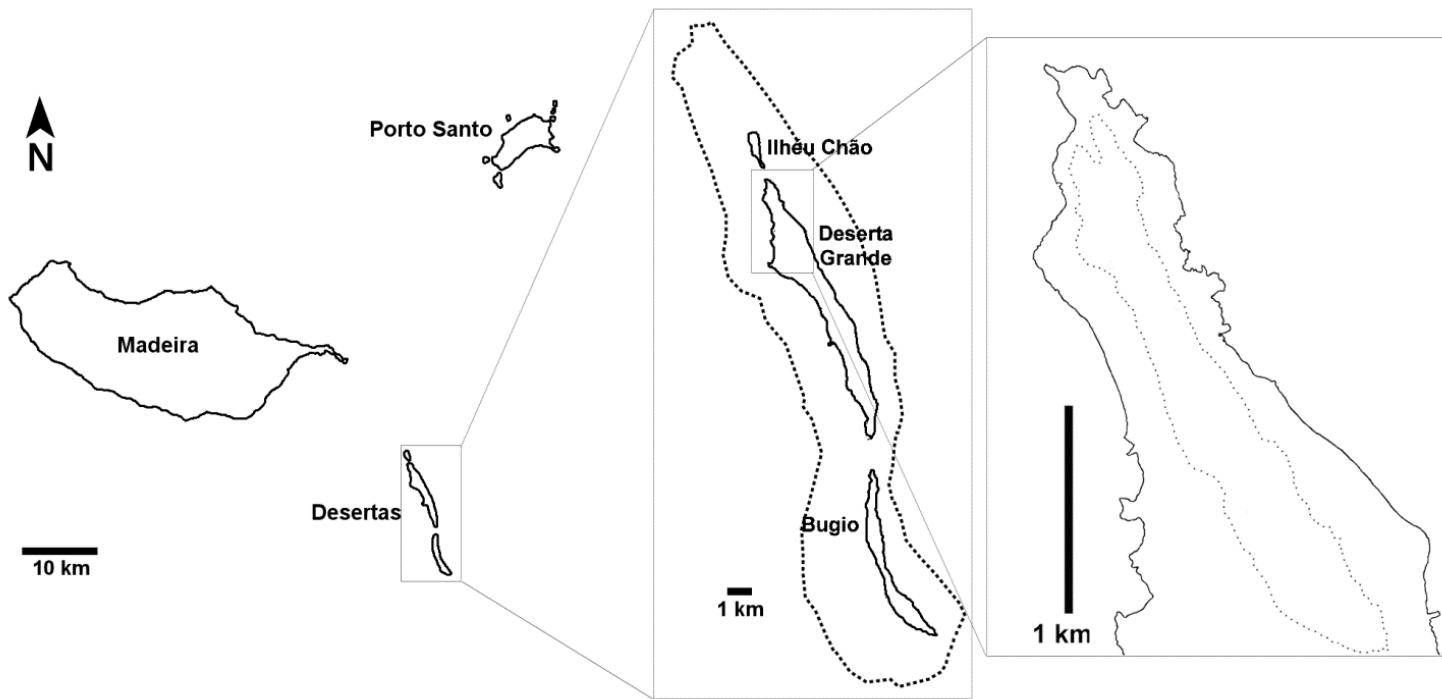
Historical account

The Madeira Archipelago is situated in the Atlantic Ocean, about 1000 km from the Iberian Peninsula and 600 km from Africa. Together with the archipelagoes of the Azores, Selvagens, Canary Islands and Cape Verde, they constitute Macaronesia; a region where native ecosystems pre-date the last Ice Age, mostly due to the buffering capacity of the oceanic climate. The Madeira Archipelago is formed by Madeira Island (742 km², 4.6 My), Porto Santo Island (43 km², 14 My) and the Desertas Islands (13.5 km², 5 My).

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The Desertas sub-archipelago, 20 km southeast of Madeira, is composed of three islands, the Deserta Grande (10 km^2), Ilhéu Chão (0.5 km^2) and Bugio (3 km^2). Due to the harsh environment and lack of water sources, the Desertas remained uninhabited, despite historical attempts to colonize the island of Deserta Grande. The geomorphology is rugged with very steep slopes, rising from sea level to about 400 m.

H. ingens is known to historically occur only in one valley, the Castanheira Valley, at the northern end of Deserta Grande Island). This valley is approximately 2.8 km long and between 180 – 400 m wide, and has an estimated area of 83 ha. The geomorphology separates the valley into two distinct areas. For most of its length, two opposing slopes are divided by a small riverbed, which is dry most of the year. However, at the north end of the valley, near the site where the riverbed meets the ocean, a small plateau rises which extends to the end of the island. The elevation of the valley ranges from 150 - 350 m a.s.l.

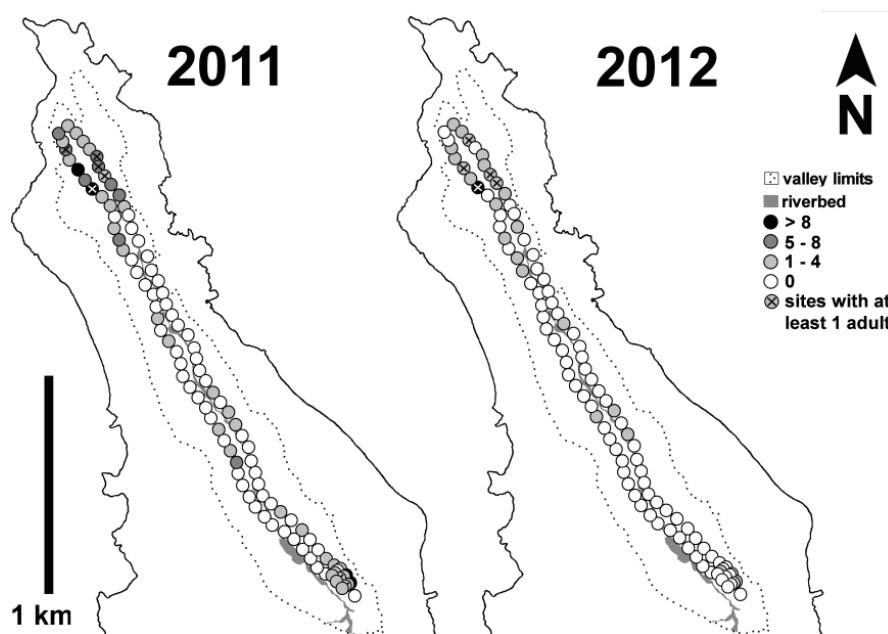


This site was possibly originally occupied by patches of microforest/scrub and a mix of native grasses. Most of it is now occupied by one or more species of *Phalaris* spp. (of status currently undetermined), grasses that recently expanded dramatically in the valley (expansion detected in 2005). These plants cover the entire surface of the soil and crevices, preventing access to shelters that are usually occupied by both the spider and other endemic fauna. Before *Phalaris* became dominant, *H. ingens* inhabited the entire valley. Since 2005, the spider's range has declined abruptly, as has the range for a number of other endemic taxa such as land snails.

Current distribution and demography

Recent survey locations

The entire Castanheira Valley has been recently and systematically surveyed for the presence of *H. ingens* (Crespo et al. 2014). Although juveniles were found in different parts of the valley, including a few in sub-optimal areas dominated by *Phalaris*, adults were restricted to areas with native vegetation.



Current distribution (including Extent of Occurrence and Area of Occupancy)

The Area of Occupancy (AOO) was estimated to be 23 ha in 2011, and 15 ha in 2012. The Extent of Occurrence (EOO) can be considered to be the entire valley in both years (83 ha). Given that originally (pre-2005) the AOO corresponded to the EOO, we estimate a decrease in less than a decade of nearly 72% of AOO by 2011, reaching 81% by 2012.

Identifying populations

A single population of *H. ingens* is known. The estimated population size was 4,447 adult specimens in 2011 and 4,086 in 2012. The same estimate computed for both adults and juveniles points to 71,832 specimens for 2011 and 24,635 specimens for 2012.

Demographic analysis

No demographic analysis has been conducted on the species. However, two sub-populations seem to co-exist sympatrically. A summer sub-population reaches maturity in June and a winter sub-population in September/October. They can be distinguished in morphology and behaviour when adults, with the winter spiders being darker and more aggressive than summer individuals. It is unknown to what extent these two sub-populations interbreed in nature. However, this was never observed and females apparently refuse males from different sub-populations as they copulate only once (Silva pers. obs.). We also do not know if morphological and behavioural differences are driven by genetics or environment, or a mix of both.

Habitat and resource assessment

The Castanheira Valley was possibly originally occupied by patches of microforest/scrub and a mix of native grasses. In this habitat spiders search for the underside of rocks and crevices to provide daytime shelter. Being a generalist predator they feed on large arthropods, mostly the staphylinid beetle *Ocypus olens* (Müller, 1764) or the invasive millipede *Ommatoiulus moreleti* (Lucas, 1860).

Threat analysis

Diagnosing ongoing threats

The small valley where the spider lives is currently mostly covered by *Phalaris* spp.. The colonization of this grass in the Vale da Castanheira was hidden for some years due to the presence of rabbits (*Oryctolagus cuniculus* L.), that grazed and controlled the spread of the plant. With the eradication of rabbits from the Valley in 1996, *Phalaris* lost its main predator and now proliferates. This grass appears to not only displace many native plants, but also many of the native animals. It covers the surface of the soil and rocks, making the microhabitats below the rocks harder to access for the spiders. One of the most common arthropods is the invader diplopod *Ommatoiulus moreleti* (Lucas, 1860), which seems able to survive in the harsher environment that *Phalaris* creates. The microclimate might also have been altered as the vegetation structure is now different. This is especially critical as the valley provides the only home for, or is an important part of the global distribution for many species, such as land snails e.g. *Boettgeria jensi*, (Neubert & Groh, 1998), and *Leiostyla macilenta* (Lowe, 1852)).

Anticipating threats

The spread of *Phalaris* to the remaining valley is still a strong possibility; this would be catastrophic for the spider population. In addition, the population is possibly going through a genetic bottleneck which will reduce genetic diversity and may hamper the successful recovery of the species in the long term. The effects of climate change have never been studied. Even if currently there is no reason to believe it will be a threat, many island-

restricted species are endangered by global warming (e.g. Ferreira et al. 2016), so we do not exclude the possibility.

Conservation and management

The Desertas Islands are protected under the Natura 2000 network and the Natural Reserve of Desertas. The latter was created to ensure the sustainable use of the abundant marine resources, and to protect the Mediterranean monk seal (*Monachus monachus* (Hermann, 1779)). The management of human activities and of most native species conservation projects in the Desertas, is the responsibility of the Natural Park of Madeira. No specific spider-related actions are currently running in any of the projects.

An EU LIFE+ project will be partly conducted in the Castanheira Valley. It will target some snail species endemic to the island, including one, *Atlantica gueriniana*, listed in Annex II of the Habitats Directive. One of the goals is to reduce the density of *Phalaris* in the valley and allow the original vegetation to recover. No monitoring or recovery of *H. ingens* is planned.

The rangers and technicians of the Natural Park of Madeira have tried to control *Phalaris* in delimited areas using different methods, namely fire and chemicals. These experiments were conducted in 2010 and 2011 respectively, with mixed results (Crespo et al. 2014). The use of fire promoted the spread of *Phalaris*; the chemicals have apparently resulted in the recovery of both native vegetation and the associated fauna, including *H. ingens*.

The protection of *H. ingens* under national legislation was recently proposed through the National Institute for Nature Conservation and Forests (ICNF), but the process is ongoing and legal protection is not yet guaranteed.

CONSERVATION STRATEGY PLANNING

Workshop

A workshop was held in Funchal, Madeira, on May 9 - 10 2016 (see schedule in Appendix I and meeting notes in Appendix II). Participants from the Regional Directorate of Environment, Madeira Natural Park Services (two bodies that have now merged under the Institute of Forests and Conservation of Nature - IFCN), University of Madeira, IUCN Species Survival Commission and Bristol Zoological Society were involved (see section 4.5 below). During this workshop the following vision, objectives and actions were proposed, discussed and agreed.

Vision

"The Island of Desertas Grande supports a viable population of the Desertas wolf spider, living in suitable habitat of native plants across the entire Castanheira Valley, with conservation measures based on good research and with strong public awareness and support, making it one of the symbols of nature conservation in Madeira."

Goals

Four goals are foreseen:

1. **In-situ conservation.** To restore the ecological balance in the Castanheira Valley through reduction of *Phalaris* density on the assumption that a viable population of spiders will persist across the entire valley.
2. **Ex-situ conservation.** To maintain and breed a second spider population.
3. **Research.** To analyze the genetic structure of the population, its habitat preferences and the potential consequences of climate change.
4. **Public outreach.** To raise awareness of the importance and uniqueness of the spider.

Objectives

1) In-situ conservation

- a) To reduce the density of *Phalaris*
- b) To monitor the vegetation structure
- c) To monitor the *H. ingens* population

2) Ex-situ conservation

- a) To establish a founder captive population of *H. ingens*
- b) To develop and execute a captive population management plan for *H. ingens*

3) Research

- a) To raise funds for a PhD student to study the major questions concerning *H. ingens* conservation
- b) To analyze the genetic structure of *H. ingens* sub-populations
- c) To study the habitat preferences of *H. ingens*
- d) To study the potential consequences of climate change on *H. ingens*
- e) To conduct in-situ experiments on the effects of habitat management on *H. ingens*

4) Public outreach

- a) To increase the awareness about *H. ingens*, its habitat and conservation problems

Actions

1) In-situ conservation

- a) **Control of *Phalaris* (chemical, subject to government approval, otherwise manual) over the entire area (20 % or around 5 ha/year).**
 - i. Responsible: *Institute of Forests and Conservation of Nature (IFCN)* Directive Council
 - ii. Actors: IFCN, volunteers
 - iii. Schedule: 2016 - 2020 (November to March every year)

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- iv. Resources: 65 person days/year, water availability
 - v. Deliverables: Reduction of 5 ha/year (20 %/year) of area dominated by *Phalaris*. Local density of the plant should be reduced to <10 % across the entire valley
- b) Annual monitoring of plants and spiders using existing transects (8 since 2005 plus 8 out of 19 established in 2014).**
- i. Responsible: IFCN Directive Council
 - ii. Actors: IFCN
 - iii. Schedule: 2016 - 2022 (First half of May every year)
 - iv. Resources: 15 person days/year
 - v. Deliverables: Monitor the effectiveness of intervention measures on the reduction of *Phalaris* and the consequences on the range and density of *H. ingens*
- c) Reproduction of endemic plant species on Deserta Grande Island, through a greenhouse built on Doca, for reintroduction/reinforcement of new populations in the Castanheira Valley.**
- i. Responsible: *Institute of Forests and Conservation of Nature* (IFCN) Directive Council
 - ii. Actors: IFCN
 - iii. Schedule: 2017 - 2020
 - iv. Resources: Relevant personnel
 - v. Deliverables: Reproduction of a wide variety of endemic plants according to available resources

2) Ex-situ conservation

- a) Letter of agreement between IFCN and Bristol Zoological Society (BZS)**
- i. Responsible: IFCN Directive Council, BZS
 - ii. Actors: IFCN, BZS
 - iii. Schedule: June 2016
 - iv. Resources: Relevant personnel
 - v. Deliverables: Signing letter of agreement
- b) Capture 25 juvenile individuals of *H. ingens* as a founder population for ex-situ breeding**
- i. Responsible: IFCN Directive Council
 - ii. Actors: IFCN, BZS, IUCN Spider and Scorpion Specialist Group (SSSG)
 - iii. Schedule: May 2016
 - iv. Resources: 12 person-days
 - v. Deliverables: Successful capture of 25 juvenile spiders and respective transport to Bristol Zoological Gardens. Property of captured individuals will be kept by IFCN
- c) Possibility of increasing captures if the sex ratio or “summer/winter population” representation is biased**

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- i. Responsible: IFCN Directive Council
- ii. Actors: IFCN, BZS
- iii. Schedule: June 2017
- iv. Resources: 8 person days
- v. Deliverables: Successful capture of juvenile spiders and respective transport to Bristol Zoo. Property of captured individuals will be kept by IFCN

d) Develop captive population management plan

- i. Responsible: BZS
- ii. Actors: BZS
- iii. Schedule: October 2016
- iv. Resources: Relevant personnel
- v. Deliverables: Management plan approved by European Association of Zoos and Aquaria (EAZA)

e) Run captive population management plan

- i. Responsible: BZS
- ii. Actors: BZS and other zoological institutions to be decided
- iii. Schedule: 2016 - 2022
- iv. Resources: Suitable facilities and staff to be decided
- v. Deliverables: Ex situ population(s) kept until at least 2022

3) Research

a) Find a PhD student and apply for funding to work on the project

- i. Responsible: University of Helsinki (UH)
- ii. Actors: UH, University of Madeira, University of Barcelona, IUCN
- iii. Schedule: 2016 - 2017
- iv. Resources: Funding to be applied for
- v. Deliverables: PhD student funded for 4 years. The student will work on *Hogna* phylogenetics, winter/summer population dynamics, assess genetic structure of the winter/summer populations, etc.

b) Clarification of sub-population status through barcoding – mtDNA

- i. Responsible: University of Trier (UT)
- ii. Actors: UT, University of Madeira (UMa), IFCN, UH
- iii. Schedule: 2016 to 2017
- iv. Resources: Covered by UT, UMa
- v. Deliverables: Sequences obtained

c) Study of habitat preferences

- i. Responsible: IFCN (*in-situ*), BZS (*ex-situ*)
- ii. Actors: IFCN, BZS
- iii. Schedule: 2017 or 2018 during one year (depending on availability of data loggers), *in-situ* bimonthly

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- iv. Resources: *In-situ* 25 data loggers, 12 person-days; *ex-situ* requires no further resources
- v. Deliverables: Habitat preference known based on 100 sampling points and captive population, scientific publication

d) Study climate change consequences on the viability of *Hogna* populations

- i. Responsible: UH
- ii. Actors: UH, University of Coimbra
- iii. Schedule: 2017 -adapt existing climate models to Desertas and infer on vegetation change across the islands; 2018 or 2019 - depending on data from data loggers, assess viability of *H. ingens*)
- iv. Resources: Researcher time
- v. Results: Consequences projected, scientific publication

e) Assess vegetation and spider density change through in situ experiments

- i. Responsible: IFCN
- ii. Actors: IFCN, UH (if PhD student is available)
- iii. Schedule: 2018
- iv. Resources: Staff time (to be calculated), fences
- v. Results: Effect of *Phalaris* removal and goat exclusion on other plants and spiders

4) Public outreach

a) Website

- i. Responsible: IFCN
- ii. Actors: IFCN, UH
- iii. Schedule: 2016 onwards
- iv. Resources: Staff time
- v. Results: specific section inside IFCN's website

b) Video.

- i. Responsible: BZS
- ii. Actors: BZS, IFCN, UH
- iii. Schedule: 2017 (production) onwards (exhibition)
- iv. Resources: Professional filmmaker, expenses for 7 days
- v. Results: Video to be exhibited on website and at the ranger station in Doca for visitors to Desertas

c) Zoo exhibitions

- i. Responsible: BZS
- ii. Actors: BZS and other zoological institutions to be decided
- iii. Schedule: 2016 onwards
- iv. Resources: Staff time, same as ex-situ breeding
- v. Results: Exhibitions running with graphical interpretation, livecam and brochures produced

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d) Media

- i. Responsible: IFCN
- ii. Actors: IFCN, BZS, IUCN
- iii. Schedule: 2016 onwards
- iv. Resources: Media partners
- v. Results: News, press releases

Monitoring of effectiveness

Actions will be monitored and objectives reviewed every year from 2016 to 2022. Annual reports will be produced. Compilation and dissemination of information will be made by IUCN - SSSG.

Sites for action

In-situ conservation will be done in the Castanheira Valley. *Ex-situ* conservation will be done at Bristol Zoological Gardens and possibly other European zoos.

Timeline

Action	2016	2017	2018	2019	2020	2021	2022
1a. Intervention							
1b. Monitoring	■						■
1c. Plant reproduction			■	■	■	■	
2a. Letter agreement	■						
2b. Founder population	■						
2c. Increased captures			■				
2d. Develop management plan		■					
2e. Run management plan			■	■	■	■	■
3a. PhD student	■						
3b. Sub-population status	■						
3c. Habitat preference			■	■			
3d. Climate change			■		■		
3e. In-situ experiments				■			
4a. Website		■	■	■	■	■	■
4b. Video			■	■	■	■	■
4c. Zoo exhibitions		■	■	■	■	■	■
4d. Media	■						

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Actors

The organisations and people involved in different actions and stages of the project will be:

Institute of Forests and Conservation of Nature (IFCN).

- Eng. Manuel Filipe (President of the Directive Council)
- Dr. Paulo Oliveira (Vice-president of the Directive Council)
- Eng. Duarte Barreto (Head of Biodiversity and Conservation Division)
- Dr. Dinarte Teixeira (Technician)
- Eng. Cristina Medeiros (Responsible for plant control actions)
- Dr. Carolina Santos (Coordinator of Natural Reserve of Desertas Islands)
- Dr. Pedro Sepúlveda (Project manager of LIFE 'Recover Natura')
- Mr. Isamberto Silva (Natural Park Ranger)

University of Madeira (UMa)

- Prof. Miguel Sequeira (Researcher and collaborator as habitat protection specialist)
- Prof. José Jesus (Researcher and collaborator as a molecular analysis specialist)

International Union for the Conservation of Nature (IUCN)

- Dr. Mark Stanley Price (Chair of the Species Conservation Planning Sub-Committee - SCPSC)
- Dr. Axel Hochkirch (Chair of the Invertebrate Conservation Sub-Committee - ICSC, also UT)
- Dr. Pedro Cardoso (Chair of the Spider and Scorpion Specialist Group - SSSG, also UH)

Bristol Zoological Society (BZS) and European Association of Zoos and Aquaria (EAZA)

- Mr. Mark Bushell (Chair of the EAZA Terrestrial Invertebrate Taxon Advisory Group (TITAG), responsible for the *ex-situ* breeding programme)
- Dr. Richard Saunders BSc (Hons) BVSc FRSB CBIOL DZooMed (Mammalian) MRCVS RCVS (Specialist in Zoo and Wildlife Medicine -veterinary)

REVISÃO DO ESTATUTO

Descrição da espécie

A tarântula-das-Desertas (*Hogna ingens*) foi descrita em 1857 por John Blackwall do Vale da Castanheira, Ilhas Desertas, Madeira, Portugal. Apesar do impressionante tamanho de corpo de 40mm, sabe-se muito pouco acerca desta espécie (Crespo et al. 2014). Alguns taxonomistas redescreveram-na (Blackwall 1867; Kulczynski 1899; Roewer 1960; Denis 1962; Wunderlich 1992), mas quase todos os outros aspectos da distribuição, abundância e ecologia da espécie eram desconhecidos até recentemente (Crespo et al. 2014).

A espécie foi avaliada recentemente como Criticamente em Perigo de Extinção de acordo com os critérios da União Internacional para a Conservação da Natureza (IUCN, Cardoso 2014), mas não está protegida por qualquer legislação ou acordos internacionais, nacionais ou regionais.

Na ausência de mamíferos terrestres nativos, esta aranha é um predador de topo no seu pequeno habitat, e apesar de a maioria das presas serem constituídas por outros invertebrados, tal como o escaravelho *Ocypus olens* (Müller, 1764) ou o miríapode *Ommatoiulus moreleti* (Lucas, 1860), alguns adultos foram avistados a alimentar-se de juvenis da lagartixa-das-Desertas *Tiera dugesii mauli* (Mertens, 1938). Este réptil, juntamente com aves e ratos, devem no entanto ser os maiores predadores da tarântula, principalmente durante os estágios juvenis. É nesta altura que a aranha está mais vulnerável, dado que em adição ao pequeno tamanho ela tende a dispersar em busca de novos abrigos, maximizando as hipóteses de encontros com potenciais predadores (incluindo adultos conspecíficos). À medida que as aranhas crescem e encontram abrigos apropriados (maioritariamente debaixo de rochas mas também em fendas no solo), a sua tendência para dispersar diminui gradualmente. Leva cerca de dois anos para uma aranha atingir a maturidade.

Funcões e valores da espécie

As Ilhas Desertas nunca foram permanentemente ocupadas pelo Homem, o que levou ao relativo desconhecimento da espécie entre a população local da Madeira. No entanto, sendo um predador de topo, terá um papel regulador hipotético nas populações de invertebrados no único vale por si ocupado.

História

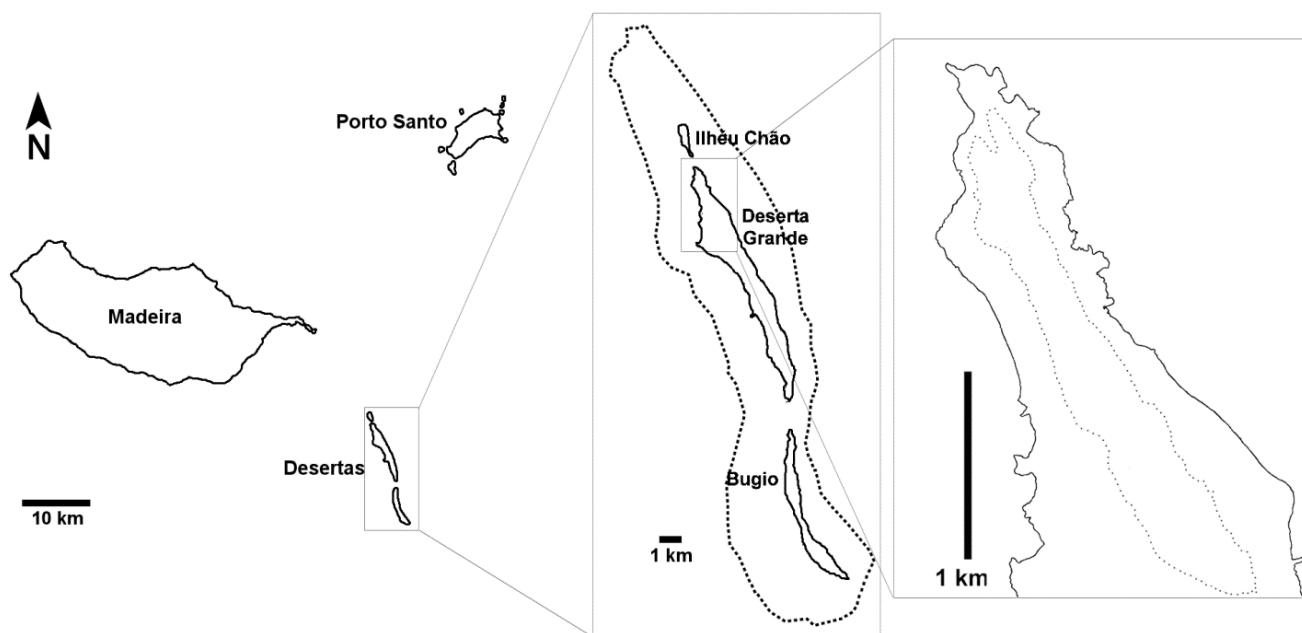
O arquipélago da Madeira está situado no Oceano Atlântico, a cerca de 1000km da Península Ibérica e 600km de África. Juntamente com os arquipélagos dos Açores, Selvagens, Canárias e Cabo Verde constituem a região da Macaronésia; uma região onde os ecossistemas nativos são anteriores à última era glacial, em grande parte devido à capacidade amenizadora do clima oceânico. O arquipélago da Madeira é constituído pela ilha

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da Madeira (742.0km^2 , 4.6 m.a.), Porto Santo (43.0km^2 , 14.0 m.a.) e Desertas (13.5km^2 , 5.0 m.a.).

O sub-arquipélago das Desertas, 20km a sueste da Madeira, é composto por três ilhas, a Deserta Grande (10.0km^2), Ilhéu Chão (0.5km^2) e Bugio (3.0km^2). Devido às difíceis condições ambientais e falta de água doce, as Desertas permaneceram desabitadas apesar de várias tentativas históricas para colonizar a Deserta Grande. A geomorfologia dominante é escarpada, com falésias abruptas desde o nível do mar até os 400m de altitude.

Historicamente sabe-se que a tarântula apenas ocorre em um vale na ponta Norte da Deserta Grande. O Vale da Castanheira tem aproximadamente 2.8km de comprimento e a sua largura varia entre 180 e 400m. A área estimada é de cerca de 83ha. A geomorfologia separa o vale em duas áreas distintas: na maioria do seu comprimento duas vertentes opostas são separadas por uma pequena linha de água de regime torrencial; na ponta Norte do vale, perto do local onde a linha de água se encontra com o oceano, um pequeno planalto eleva-se e estende-se até o extremo da ilha. A altitude do vale varia entre os 150 e 350m.

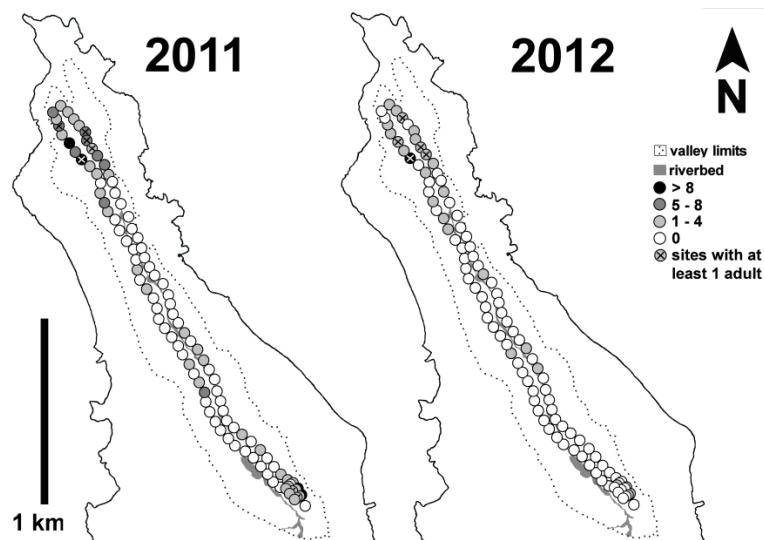


O vale era possivelmente ocupado originalmente por floresta dominada por espécies de pequena estatura e uma mistura de gramíneas nativas. A maioria está agora ocupada por uma ou mais espécies de *Phalaris* spp. (de status indeterminado), gramíneas que recentemente expandiram dramaticamente no vale (a expansão foi detectada em 2005). Estas plantas cobrem toda a superfície do solo e fendas, impedindo a acesso a abrigos procurados pelas aranhas e outra fauna endémica. Antes do domínio do Vale da Castanheira pela *Phalaris*, a *Hogna ingens* habitava todo o vale. Desde a invasão que a área de ocupacão da espécie decresceu abruptamente, tal como o de outras espécies endémicas do vale, incluindo alguns caracóis terrestres.

Distribuição e demografia actuais

Amostragens recentes

Todo o Vale da Castanheira foi recentemente e sistematicamente amostrado para a presença de *Hogna ingens* (Crespo et al. 2014). Apesar de se encontrarem juvenis em diferentes partes do Vale, incluindo em áreas sub-óptimas dominadas por *Phalaris*, os adultos estão restritos a áreas com vegetação nativa.



Distribuição actual (incluindo extensão de ocorrência e área de ocupacão)

A área de ocupacão (AOO) foi estimada em 23ha em 2011 e 15ha em 2012. A extensão de ocorrência (EOO) em ambos os anos é similar à original, 83ha, equivalente à área de todo o vale. Dado que originalmente (pré-2005) a AOO era similar à EOO, estimou-se um declínio de 72% do AOO em 2011 e 81% em 2012.

Tamanho populacional

Conhece-se uma única população de *H. ingens*. O tamanho populacional estimado era de 4447 adultos em 2011 e 4086 em 2012. A mesma estimativa feita para adultos e juvenis era de 71 832 indivíduos em 2011 e 24 635 indivíduos em 2012.

Análise demográfica

Nenhuma análise demográfica foi feita à espécie. No entanto, parecem co-existir duas populações simpátricas. Uma sub-população de Verão alcança a maturidade em Junho e uma sub-população de Inverno em Setembro/Outubro. Estas podem ser distinguidas na morfologia e comportamento enquanto adultas, sendo os indivíduos de Inverno mais escuros e agressivos que os de Verão. Não se sabe se estas sub-populações se cruzam em termos

reprodutivos na natureza. No entanto, isto nunca foi observado e as femeas aparentemente recusam machos de sub-populações diferentes, dado que copulam uma única vez (Silva pers.obs.). Também não se sabe se as diferenças morfológicas e comportamentais são devidas a causas genéticas ou ambientais, ou uma mistura de ambas.

Habitat e recursos naturais

O Vale da Castanheira era possivelmente ocupado originalmente por floresta dominada por espécies de pequena estatura e uma mistura de gramíneas nativas. Neste habitat, a espécie procura abrigo na zona inferior de rochas e interior de fendas naturalmente abertas no solo que servem como abrigo (de predadores e dessecacão) durante o dia. Sendo um predador generalista alimenta-se de artrópodes com porte considerável, principalmente o escaravelho *Ocypus olens* ou o miríápode *Ommatoiulus moreleti*.

Análise de ameacas

Diagnóstico de ameacas correntes

O pequeno vale ocupado pela espécie está maioritariamente coberto por *Phalaris* spp.. A colonização destas gramíneas permaneceu invisível durante anos devido à presença de coelhos (*Oryctolagus cuniculus* L.), que se alimentavam e evitavam a proliferação da planta. Quando os coelhos foram erradicados do Vale da Castanheira em 1996, as *Phalaris* perderam o seu principal predador e proliferaram. Estas gramíneas parecem não apenas impedir o crescimento de muitas espécies nativas, mas também o de muitos animais. Actualmente um dos artrópodes mais comuns é o miríápode invasor *Ommatoiulus moreleti*, possivelmente por ser uma das poucas espécies capazes de sobreviver neste ambiente agora inóspito. Além disso, as *Phalaris* cobrem a superfície do solo e rochas, tornando os microhabitats debaixo das rochas mais difíceis de aceder por parte das aranhas, que aí procuram abrigo durante o dia. O microclima também se pode alterar devido à estrutura da vegetação ser diferente da existente antes da proliferação das *Phalaris*. Isto é especialmente crítico quando muitas espécies apenas sobrevivem neste vale ou cujas populações locais são uma parte importante da sua distribuição global, tal como os caracóis terrestres *Boettgeria jensi* Neubert & Groh, 1998 e *Leiostyla macilenta* (Lowe, 1852).

Antecipando ameacas futuras

A expansão das *Phalaris* ao restante vale é ainda uma forte possibilidade, podendo ser catastrófica para a população da tarântula. Adicionalmente, uma baixa diversidade genética da população restante possivelmente devida a um *bottleneck* genético pode impedir a recuperação bem sucedida da espécie no longo prazo. Finalmente, os efeitos das mudanças climáticas nunca foram estudados. Mesmo que actualmente não exista nenhuma razão para pensar que será uma ameaca, muitas espécies restritas a ilhas estão globalmente ameaçadas pelo aquecimento global (e.g. Ferreira et al. 2016), de forma que esta hipótese não pode ser excluída.

Conservacão e gestão

As Ilhas Desertas estão protegidas sob a rede Natura 2000 e Reserva Natural das Desertas, a última criada devido à urgência de garantir o uso sustentável dos abundantes recursos marinhos e proteger o lobo-marinho (*Monachus monachus* (Hermann, 1779)). A gestão das actividades humanas e da maioria dos projectos de conservacão das espécies e ecossistemas nativos nas Desertas pertence ao Servico do Parque Natural da Madeira. Nenhuma accão específica referente à tarântula está consagrada dentro de nenhum projecto. Um projecto EU LIFE+ está a ser parcialmente conduzido no Vale da Castanheira. Não se destina a esta espécie mas sim a alguns caracóis endémicos da ilha, incluindo um, *Atlantica gueriniana* (Lowe, 1852), listado no anexo II da Directiva Habitats. O decréscimo da densidade de *Phalaris* no vale e recuperacão da vegetacão original é um dos objectivos, apesar de a monitorizacão ou recuperacão da *H. ingens* não estar prevista. Os vigilantes e técnicos do Parque Natural da Madeira tentaram controlar a planta em áreas delimitadas recorrendo a fogo e químicos. Estas experiências foram conduzidas em 2010 e 2011 respectivamente, com resultados contrastantes (Crespo et al. 2014). O uso de fogo promoveu o alastrar das *Phalaris* mas os químicos aparentemente permitiram a recuperacão de vegetacão nativa e fauna associada, incluindo a populacao de tarântula. A proteccão da *Hogna ingens* na legislacão nacional foi recentemente proposta através do Instituto para a Conservacão da Natureza e Florestas (ICNF) nacional, mas o processo ainda decorre e a proteccão não está garantida.

PLANO ESTRATÉGICO DE CONSERVACÃO

Workshop

Um workshop foi realizado no Funchal, Madeira, dias 9 e 10 de Maio de 2016 (ver programa no Appendix I e notas da reunião no Appendix II, ambos apenas em inglês). Estiveram presentes participantes da Direccão regional do Ambiente, Servico do Parque Natural da Madeira (estes dois entretanto fundidos no Instituto de Florestas e Conservacão da Natureza – IFCN), Universidade da Madeira, Species Survival Commision da IUCN e Bristol Zoological Society (ver seccao 4.5). Durante este workshop foram propostos, discutidos e acordados uma visão, metas, objectivos e accões.

Visão

“A Ilha da Deserta Grande suporta uma populacão viável de tarântula-das-Desertas, vivendo em um habitat adequado constituído por plantas nativas em todo o Vale da Castanheira, com medidas de conservacão baseadas em boa investigacão e com uma forte consciencializacão e apoio do público, tornando-a um dos símbolos da conservacão da Natureza na Madeira.”

Metas

Estão previstas quatro metas:

1. **Conservacão in-situ.** Restaurar o equilíbrio ecológico no Vale da Castanheira através da redução da densidade de *Phalaris* com a expectativa que uma população viável da aranha subsista em todo o vale.
2. **Conservacão ex-situ.** Manter e reproduzir uma segunda população da espécie.
3. **Investigacão.** Analizar a estrutura genética da população, preferências de habitat e potenciais consequências das mudanças climáticas.
4. **Divulgacão.** Promover a consciencialização da importância e singularidade da aranha.

Objectivos

1) Conservacão in-situ.

- a. Reduzir a densidade de *Phalaris*.
- b. Monitorizar a estrutura da vegetação.
- c. Monitorizar a população das aranhas.

2) Conservacão ex-situ.

- a. Estabelecer uma população fundadora em cativeiro.
- b. Desenvolver e executar um plano de gestão da população em cativeiro.

3) Investigacão.

- a. Angariar fundos para um estudante de doutoramento abordar as principais questões de conservacão.
- b. Analizar a estrutura genética das sub-populações.
- c. Obter conhecimento das preferências de habitat da aranha.
- d. Estudar as potenciais consequências das mudanças climáticas.
- e. Conduzir experiências *in-situ* acerca dos efeitos da gestão de habitat.

4) Divulgacão.

- a. Aumentar a consciencialização das populações locais acerca da espécie, o seu habitat e problemas de conservacão.

Accões

1) Conservacão in-situ.

- a. **Controlo da *Phalaris* (em toda a área ocupada, a ser executado no âmbito do projecto LIFE+).**
 - i. Responsável: Conselho Directivo do Instituto das Florestas e Conservacão da Natureza (IFCN).

- ii. Actores: IFCN, voluntários.
 - iii. Datas: 2016 a 2020 (Novembro a Marco todos os anos).
 - iv. Recursos: 65 pessoas-dia/ano, disponibilidade de água.
 - v. Resultados: Redução de 5ha/ano (20%/ano) de área dominada por *Phalaris*. A densidade local da planta deve ser reduzida para menos que 10% em todo o vale.
- b. **Monitorização anual das plantas e aranhas usando os transectos existentes (8 desde 2005 mais 8 dos 19 estabelecidos em 2014).**
- i. Responsável: Conselho Directivo do IFCN.
 - ii. Actores: IFCN.
 - iii. Datas: 2016 a 2022 (primeira metade de Maio todos os anos).
 - iv. Recursos: 15 pessoas-dia/ano.
 - v. Resultados: Monitorização das medidas de intervenção na redução da densidade de *Phalaris* e consequências na área e densidade de *H. ingens*.
- c. **Reprodução de plantas endémicas na Deserta Grande, com recurso a uma estufa construída na Doca, para reintrodução e reforço de novas populações no Vale da Castanheira.**
- i. Responsável: Conselho Directivo do IFCN.
 - ii. Actores: IFCN.
 - iii. Datas: 2017 a 2020.
 - iv. Recursos: Pessoal relevante.
 - v. Resultados: Reprodução de uma grande variedade de plantas endémicas de acordo com os recursos disponíveis.

2) Conservação ex-situ.

- a. **Protocolo entre o IFCN e a Bristol Zoological Society (BZS).**
- i. Responsável: Conselho Directivo do IFCN, BZS.
 - ii. Actores: IFCN, BZS.
 - iii. Datas: Junho 2016.
 - iv. Recursos: Pessoal relevante.
 - v. Resultados: Assinatura do protocolo.
- b. **Capturar 25 juvenis de *H. ingens* como população fundadora para reprodução ex-situ.**
- i. Responsável: Conselho Directivo do IFCN.
 - ii. Actores: IFCN, BZS, IUCN Spider and Scorpion Specialist Group (SSSG).
 - iii. Datas: Maio 2016.
 - iv. Recursos: 12 pessoas-dia.
 - v. Resultados: Captura de 25 aranhas juvenis e respectivo transporte para os Bristol Zoological Gardens. A propriedade dos indivíduos capturados permanece com o IFCN.
- c. **Possibilidade de aumentar as capturas se o sex-ratio ou representação das populações de Verão/Inverno estiver enviesado.**
- i. Responsável: Conselho Directivo do IFCN.

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- ii. Actores: IFCN, BZS.
 - iii. Datas: Junho 2017.
 - iv. Recursos: 8 pessoas-dia.
 - v. Resultados: Captura de aranhas juvenis e respectivo transporte para os Bristol Zoological Gardens. A propriedade dos indivíduos capturados permanece com o IFCN.
- d. **Desenvolvimento de plano de gestão de população cativa.**
- i. Responsável: BZS.
 - ii. Actores: BZS.
 - iii. Datas: Outubro 2016.
 - iv. Recursos: Pessoal relevante.
 - v. Resultados: Plano de gestão aprovado pela European Association of Zoos and Aquaria (EAZA).
- e. **Execução de plano de gestão de população cativa.**
- i. Responsável: BZS.
 - ii. Actores: BZS e outras instituições zoológicas a decidir.
 - iii. Datas: 2016 a 2022.
 - iv. Recursos: Instalações e pessoal adequados, a decidir.
 - v. Resultados: Populações ex-situ mantidas até 2022 (pelo menos).

3) *Investigacão.*

- a. **Encontrar estudante de doutoramento e procurar financiamento para trabalhar no projeto.**
- i. Responsável: Universidade de Helsínquia (UH).
 - ii. Actores: UH, Universidade da Madeira (UMa), Universidade de Barcelona, IUCN.
 - iii. Datas: 2016 a 2017.
 - iv. Recursos: Projecto a ser submetido.
 - v. Resultados: Estudante de doutoramento financiado por quatro anos. O estudante trabalhará em filogenética, dinâmica populacional das populações de Verão/Inverno, estrutura genética destas populações, etc.
- b. **Clarificacão do estatuto destas sub-populações através de barcoding – mtDNA.**
- i. Responsável: Universidade de Trier (UT).
 - ii. Actores: UT, UMa, IFCN, UH.
 - iii. Datas: 2016 a 2017.
 - iv. Recursos: garantidos por UT, UMa.
 - v. Resultados: Sequências obtidas.
- c. **Estudo das preferências de habitat.**
- i. Responsável: IFCN (*in-situ*), BZS (*ex-situ*).
 - ii. Actores: IFCN, BZS.
 - iii. Datas: 2017 ou 2018 (dependendo da disponibilidade de *data loggers*), durante um ano, *in-situ* a cada dois meses.

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- iv. Recursos: *in situ* 25 *data loggers*, 12 pessoas-dia; *ex-situ* não requer recursos adicionais.
 - v. Resultados: Preferências de habitat conhecidas baseado em 100 pontos de amostragem e população cativa, publicação científica.
- d. **Estudo das consequências das alterações climáticas na viabilidade das populações de *Hogna*.**
- i. Responsável: UH.
 - ii. Actores: UH, Universidade de Coimbra.
 - iii. Datas: 2017 (adaptacão de modelos climáticos existentes às Desertas e inferição de mudanças na vegetação em todas as ilhas); 2018 ou 2019 (dependendo da disponibilidade de dados de *data loggers*: aferir viabilidade de *H. ingens*).
 - iv. Recursos: Tempo de investigadores.
 - v. Resultados: Projecção das consequências, publicação científica.
- e. **Avaliar as diferenças de densidade de vegetação e das aranhas através de experiências *in situ*.**
- i. Responsável: IFCN.
 - ii. Actores: IFCN, UH (se estudante de doutoramento estiver disponível).
 - iii. Datas: 2018.
 - iv. Recursos: Tempo de staff (a ser calculado), cercas.
 - v. Resultados: Efeito da remoção de *Phalaris* e exclusão de cabras na vegetação e aranhas.

4) Divulgação.

a. **Website.**

- i. Responsável: IFCN.
- ii. Actores: IFCN, UH.
- iii. Datas: 2016 e futuro.
- iv. Recursos: Tempo do staff.
- v. Resultados: seção específica dentro do website do IFCN.

b. **Video.**

- i. Responsável: BZS.
- ii. Actores: BZS, IFCN, UH.
- iii. Datas: 2017 (produção) e futuro (exibição).
- iv. Recursos: Videógrafo profissional, despesas por sete dias.
- v. Resultados: Video a ser exibido no website e para visitantes da estação dos vigilantes na Doca.

c. **Exposições no Zoo.**

- i. Responsável: BZS.
- ii. Actores: BZS e outras instituições zoológicas a ser decididas.
- iii. Datas: 2016 e futuro.
- iv. Recursos: Tempo de staff time, mesmo que reprodução *ex situ*.
- v. Resultados: Exposições a decorrer com interpretação gráfica, *livecam* e brochuras.

d. Media.

- i. Responsável: IFCN.
- ii. Actores: IFCN, BZS, IUCN.
- iii. Datas: 2016 e futuro.
- iv. Recursos: parceiros nos media.
- v. Resultados: Notícias, press releases.

Monitorizacão das actividades

A monitorizacão de todas as accões e cumprimento dos objectivos vai ser conduzido todos os anos de 2016 a 2022. Relatórios serão produzidos anualmente, no fim de cada ano, baseado nas informacões prestadas pelas entidades responsáveis por cada accão. A compilacão e disseminacão da informacão será feita pelo IUCN SSSG.

Locais de accão

A conservacão *in-situ* vai ser feita no único local onde a espécie ocorre naturalmente, o Vale da Castanheira. A conservacão *ex-situ* vai ser feita nos Bristol Zoological Gardens e possivelmente outros zoos europeus a ser decididos.

Calendário

Accão	2016	2017	2018	2019	2020	2021	2022
1a. Controlo de <i>Phalaris</i>							
1b. Monitorizacão	■					■	■
1c. Reproducção de plantas			■	■	■	■	
2a. Protocolo	■						
2b. Captura	■						
2c. Captura extra			■				
2d. Desenvolvimento do plano de gestão		■					
2e. Execucão do plano de gestão			■	■	■	■	■
3a. Estudante de doutoramento	■	■					
3b. Estatuto populacional	■	■	■				
3c. Preferências de habitat			■	■			
3d. Alteracões climáticas			■		■		
3e. Experiências <i>in situ</i>				■			
4a. Website		■	■	■	■	■	■
4b. Video			■	■	■	■	■
4c. Zoo		■	■	■	■	■	■
4d. Media	■	■	■	■	■	■	■

Actores

As diferentes organizações e pessoas envolvidas em diferentes accões são:

Instituto das Florestas e Conservação da Natureza (IFCN).

- Eng. Manuel Filipe (Presidente do Conselho Directivo)
- Doutor Paulo Oliveira (Vice-presidente do Conselho Directivo)
- Eng. Duarte Barreto (Chefe da Divisão de Biodiversidade e Conservação)
- Dr. Dinarte Teixeira (Técnico)
- Eng. Cristina Medeiros (Responsável pelas accões de control de densidade das plantas)
- Dra. Carolina Santos (Coordenadora da Reserva Natural das Desertas)
- Dr. Pedro Sepúlveda (Gestor do projecto LIFE+ “Recover Natura”)
- Sr. Isamberto Silva (Vigilante do Parque Natural)

Universidade da Madeira (UMa).

- Professor Miguel Sequeira (Investigador e colaborador como especialista em protecção de habitats)
- Professor José Jesus (Investigador e colaborador como especialista em análise molecular)

International Union for the Conservation of Nature (IUCN).

- Dr. Mark Stanley Price (Chair do Species Conservation Planning Sub-Committee - SCPSC)
- Dr. Axel Hochkirch (Chair do Invertebrate Conservation Sub-Committee - ICSC, também UT)
- Dr. Pedro Cardoso (Chair do Spider and Scorpion Specialist Group - SSSG, também UH)

Bristol Zoological Society (BZS) e European Association of Zoos and Aquaria (EAZA).

- Sr. Mark Bushell (Chair do EAZA Terrestrial Invertebrate Taxon Advisory Group (TITAG), Responsável pelo programa de reprodução ex-situ)
- Dr. Richard Saunders BSc (Hons) BVSc FRSB CBiol DZooMed MRCVS RCVS (Veterinário especialista em medicina zoológica e de vida selvagem)

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AGREEMENT

The vision, goals and objectives of the Desertas Wolf Spider conservation strategy are shared by:

Institute of Forests and Conservation of Nature

Date:

Signature:

IUCN Species Survival Commission - Species Conservation Planning Sub-Committee

Date:

Signature:

Bristol Zoological Society (BZS)

Date:

Signature:

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Appendix I - Workshop schedule

Monday 9 May 2016	
09h30	Welcome and opening remarks
09h45	Presentations of participants
10h00	What is the IUCN, the SCP and the SSSG
10h45	Outlining the workshop
11h00	Coffee break
11h30	Biology and conservation of CR species
12h00	Vision
12h30	Lunch
14h00	Goals
14h30	Objectives
15h00	Conservation management <i>in situ</i> I
16h00	Coffee break
16h30	Conservation management <i>in situ</i> II
17h30	End of day 1
Tuesday 10 May 2016	
09h30	Conservation management <i>ex-situ</i>
11h00	Coffee break
11h30	Legal protection
12h30	Lunch
14h00	Outreach
15h00	Funding options
16h30	Preparation and advice for field trip
17h30	End of workshop

Appendix II - Workshop notes

Day 1 - May 9th 2016

10h00 - Opening remarks and personal presentations

Miguel Sequeira (MS), director of the Forestry and Nature Conservation Department of Madeira Autonomous Region Government made the welcome speech, underlining the main objectives of the workshop and welcoming all the participants of the event. He took the opportunity to make an environmental retrospective of Desertas Islands, mainly as vegetation is concerned, challenging the present to embrace a new paradigm for Deserta Grande conservation, supported by the development of a true forest as pre-colonization attempts, using the historical knowledge of vegetation coverage. In his opinion, this will contribute for a favourable change of the landscape, enhancing the soil coverage, preventing erosion and resulting in more shade.

Paulo Oliveira (PO), is a biologist, Director of the Madeira Natural Park Service, with a background as an ornithologist. He has participated in several LIFE projects developed in the Madeira Archipelago, being also a recognized expert on invasive species eradication programmes. On Desertas, he has recently coordinated the eradication programs directed to mice (Bugio), rabbits and goats (Deserta Grande).

Pedro Cardoso (PC), chair of the IUCN Spider & Scorpion Specialist Group, addressed all the participants making an historic review of the monitoring scheme implemented within the SOST-MAC project in 2011 and 2012, highlighting the contribution of Isamberto Silva, warden of Madeira Natural Park and a major expert of *Hogna ingens*, who contributed since the first surveys. He stresses that the workshop will be informal and urges everyone to bring a valid contribution to the conservation plan of the wolf spider.

Mark Stanley Price (MSP), chair of the Species Conservation Planning Sub-Committee of IUCN SSC stressed the importance of the sub-committee, highlighting a number of examples of very successful projects implemented in different regions worldwide. He also took the opportunity to accentuate the IUCN effort and commitment towards invertebrate conservation. Axel Hochkirch (AH), chair of the Invertebrate Conservation Sub-Committee of IUCN SSC mentioned that this workshop is a very good opportunity to not only discuss the conservation status of *Hogna ingens*, but also to delineate a plan that could be gladly signed by every stakeholder present. He revealed that he was eager to contribute to the protection of the species.

Manuel Filipe (MF), director of Forestry and Nature Resources department of the Forestry and Nature Conservation Directorate, praised the importance of conducting a workshop of this nature in Madeira and stressed the importance of protecting a species as iconic as the wolf spider.

José Jesus (JJ), researcher from University of Madeira, is a molecular phylogeny expert.

Carolina Santos (CS), manager of the Nature Reserve of Desertas islands, stressed the emphasis of the Madeira Natural Park on species conservation, revealing that the Desertas Islands have a high number of endemic species, mainly plants, spiders and terrestrial molluscs.

Cristina Medeiros (CM), coordinator of the control programmes of invasive plant species implemented by the Madeira Natural Park Service since 2008, stressed that since 2013 she is

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responsible for the density control programme of *Phalaris* spp. in the Castanheira Valley, one of the conservation tasks of the LIFE Recover Natura project.

The Natural Park Ranger Isamberto Silva (IS) has 30 years of experience working on many taxonomic groups, including invertebrates (mainly spiders and land snails) and has been participating in several conservation projects in the Madeira Archipelago. He is a recognized spider specialist who has contributed directly to the discovery of new species for science. Isamberto Silva was also responsible for the first monitoring programmes targeting *Hogna ingens*, and has conducted life history studies of the species during 5 years.

Pedro Sepulveda (PS) is a technician of the Madeira Natural Park Service with a background as ornithologist. Since 2013 he is the manager of the LIFE Recover Natura project.

Dinarte Teixeira (DT) is a technician in the Directorate of Forestry and Nature Conservation, with a background on malacology. Since 2010 has been the coordinator of the conservation actions addressing the land snail communities in the LIFE projects "Porto Santo Islets", "Madeira High Peaks" and "Recover Natura". He will secretary for this meeting.

Duarte Barreto (DB) is responsible for the biodiversity and conservation department of the Directorate of Forestry and Nature Conservation.

Mark Bushell (MB) is currently employed by Bristol Zoo Gardens as Curator of Invertebrates and is also the Chair of the terrestrial Invertebrate Taxon Advisory Group (TITAG) within the European Association of Zoos and Aquaria (EAZA). He has coordinated the ex-situ breeding program of the gooty sapphire ornamental spider (*Poecilotheria metallica*) developed in BZS among other similar projects.

Richard Saunders (RS) is a zoologist and a veterinarian. Having previously worked in small mammals and birds, Richard is currently the RWAF Senior Clinical Training Scholar in Zoo and Rabbit Medicine at Bristol Zoo and Langford, University of Bristol. Richard has lectured and written articles on rabbits and exotics, co-authored "Notes on Rabbit Internal Medicine" and has a particular interest in chinchillas, rabbits and birds of prey. He is one of only 18 people in the world registered as a recognised RCVS specialist in Zoo and Wildlife Medicine.

10h40 – Outlining the Workshop and presentations of the goals of the IUCN Species Survival Commission and the Specialist Groups

MSP made a presentation emphasizing the role of IUCN, its structure, vision and goals, mainly focusing on the role of the Species Survival Commission, whose main goal is to promote conservation planning for biodiversity (information compiled in a handbook). He presented a number of examples of conservation problems/issues and solutions implemented worldwide related with the case of the Desertas Wolf Spider (*Hogna ingens*).

11h00

AH gave a presentation focusing on the IUCN SSC Invertebrate Conservation Sub-Committee and its commitment as a facilitator in the development of Red Lists. He stressed the example of the Crau grasshopper conservation plan developed in 2015 as a case study and a good example to follow in this particular workshop.

11h15

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PC gave a presentation on the role of the IUCN SSC Spider and Scorpion Specialist Group, stressing their goals and purposes. As the person responsible for the draft of the conservation plan for *Hogna ingens*, he presented the questions that will be discussed during the following two days of workshop.

11h30 - Coffee break

11h45 - Wolf spider conservation plan discussion

PC made a presentation regarding the *Hogna ingens* current conservation status, sharing the conclusions of the monitoring scheme implemented by Crespo *et al.* (2014), whose results served as the basis for the IUCN assessment of the species made by himself during the same year. He briefly presented the results of the IUCN assessment and opened the discussion of the species conservation strategy for the Desertas wolf spider.

1. Status review

PC made an introduction on species distribution and range according to the 2011/2012 data. Isamberto Silva stressed the damage made by *Phalaris* spp. in the core habitat of the wolf spider, covering rocks that serve as shelters for this species on a large area in the valley. Nonetheless, he mentioned that there is a population in the middle of the Castanheira Valley that has been growing in numbers. This is an area that was not managed, a positive outcome in his opinion.

According to CS, until 2016 the control actions covered a total of 11ha. Cristina Medeiros mentioned that there is a number of "new" plant species that are developing after the eradication programme implementation. Miguel Sequeira pointed out that the replacement of *Phalaris* (perennial) by annual plants probably is not the best in terms of species conservation. In his opinion, the vegetation mosaic foreseen for the valley is of crucial importance. He stresses that goats could have a positive impact on the *Phalaris* abundance in dry years. Isamberto Silva confirms that during drought years he has witnessed goats eating this plant. According to him, on rainy years goats neglect *Phalaris* as a food source, giving preference to other species. Miguel Sequeira raised the question about the goat's role on the *Phalaris* distribution/dispersion.

PC gave a brief explanation of the proposed conservation plan and how it should be interpreted by all participants. According to him, the main goal is to restore the species distribution and population.

MS raised the question about the historic species distribution. According to him, it could be wider/larger in the past compared with the actual situation. Second, in his opinion it is advisable to implement the same vegetation mosaic throughout the entire Island, in order to guarantee the survival of *Hogna ingens*.

2. Vision

In the discussion of this point, MSP and AH both stressed the importance of including the comments "viable population" and "suitable habitat of native plants" in the text. They proposed the following text:

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"The Island of Deserta Grande supports a viable population of the Desertas Wolf Spider, living in a suitable habitat of native plants, with conservation measures based on good research and with strong public awareness and support, making it one of the symbols of nature conservation in Madeira".

12h52 - Lunch break

14h16 - Session restart

2. Vision - Resumption of the discussion

MSP stresses the importance of stating clearly what the size of a viable population is. According to PC, based on the current knowledge, it is not possible to advance a specific number for a viable population. He suggests that molecular analysis could be helpful to estimate it. According to AH, the molecular approach will not be very helpful, suggesting using population viability analysis instead. MSP suggests that the question in hand should be addressed using only the viable population of Castanheira Valley, rather than the habitat approach. He also suggested adding a goal addressing the implementation of a second population on Deserta Grande, as an *in situ* conservation measure. On this matter, IS shared his experience indicating that he tried a similar approach, where he attempted to establish a new population on the southern part of Deserta Grande, at the south plateau, which has relatively similar environmental conditions to Castanheira Valley. For this purpose, he took 50 specimens from Castanheira to Planalto Sul, but had no success. In his opinion, the climatic conditions, mainly wind and relative humidity, are different enough from Castanheira Valley, along with the orography (slope) of the area, as the wolf spider feeds mainly on millipedes and other small arthropods and these are abundant across the island. He also made some observations about the species' life cycle, reproduction and feeding. He stated that there is a possibility that we are dealing with two different populations with very distinct reproductive seasons. Taking into account IS's opinion, PC indicates that it is best to assume that the Castanheira Valley is the total distribution area available (with optimal conditions).

PS indicated that vegetation cover in Castanheira Valley is changing.. The control of *Phalaris* is successful and on areas where this species has not been controlled there has been substitution by other species (due to competition). There is a mix of species, where *Phalaris* is no longer the dominant species. According to him, this is all very preliminary and the results are not conclusive. Furthermore, there may be more than one species of *Phalaris* in Castanheira Valley. This question is being currently evaluated by the botanical garden researchers through the Recover Natura project. He reminded all those present that the goat population is still a problem. It was reduced to 50 specimens through an extensive programme over several years in the 1990's. The project stopped for a few years and the goat population has increased again. AH saw the opportunity to urge the local authorities to advance a new project with the aim of controlling *Phalaris* and eradicate goats from Deserta Grande.

According to PC, it would be important to have more workforce helping on the control work and MB reinforces the idea that there are several people from a number of institutions in UK that are willing to collaborate in habitat restoration on Castanheira Valley. PC suggested that Madeira Natural Park Services could use volunteers from BZS and other zoological collections in Europe to help with direct actions regarding the habitat restoration in Deserta Grande. CS and PS stated that the Madeira Natural Park Service is willing to consider this

offer. According to CS, the total area of distribution of *Phalaris* is 34 ha, of which 11 ha have been already subject to density control measures.

Regarding the ex-situ breeding programme, CS and PS raised the question of specimens resulting from it possibly being not compatible for reintroduction in Castanheira Valley. MB answered that they have a lot of experience with other species of invertebrates, using well established and tested protocols.

PC asked those present for known threats to *Hogna*. According to IS, no other threats besides the spread of *Phalaris* are known, *Hogna* being the top predator in the ecosystem. There is however the possibility of predation by owls or seagulls, although never to threatening levels.

3. Objectives

3.1 In-situ conservation

During this discussion, RS asked about the possibility of building a dam in the Castanheira Valley with the purpose of retaining water that could be later used on the chemical fight against *Phalaris*. PS answered that this solution was not studied in-depth. MSP questioned PS about the feasibility of this proposal. According to PS, this could be done on a 5-year plan. MSP suggested that, with this control programme, we could reach a balance between the *Phalaris* and other plant species in the area subject to density control measures.

Day 2 - May 10th 2016

09h30

3.2 Ex-situ conservation

PC opened the session with a brief summary of the advances made on the first day and called MB to make a quick presentation of the ex-situ breeding programme. According to MB, 25 individuals will be collected to form a founder population, breed in captivity with the possibility to be released back in the wild if needed, when the habitat restoration is completed or reaches a state of balance. RS took the opportunity to remind that 25 individuals are a good balance between non-harm to current populations and future success of the ex-situ breeding programme. MB stressed that BZS have gathered financial support and volunteers within other UK zoological institutions which have also expressed their interest in participating in the breeding programme. The individuals collected during the Desertas field trip (juveniles only) will be moved to Bristol Zoo Gardens into a quarantine room. He also pointed out that this institution has the capacity to implement a long-term breeding programme.

MSP emphasized the importance of this breeding programme and that he is confident in its success. According to PS, there are two important arguments in favour of the programme: 1) start another population and 2) ensure the maintenance of a viable population *ex-situ* in case of a catastrophic event *in-situ*.

According to AH, it is vital to have a second population on an ex-situ location and MSP challenged the participants to discuss the 2 different populations (morphs) raised by IS on the first day. IS indicated that it is very difficult to distinguish the two populations in May,

indicating late June or early July as the best time of the year to do so. Also according to IS, the variability in the morphs is mainly evident in adult females.

On the other hand, PS expressed his concern regarding the prey collection for feeding purposes of the juveniles collected for the ex-situ programme. MB reassured all present that they are prepared to collect millipedes or other species that are part of the spider's diet. He also stressed that BZS is keen to respond to the genetic questions regarding the 2 different populations.

PS questioned MB regarding the need to collect more individuals in the near future, to which MB answered that the situation should be evaluated upon the first results of the breeding programme.

10h45 - Coffee-break

11h15 – Session restart

3.3 Research

MSP asked the participants if they feel the need for including the species food web in plan, without any direct answer being given. AH suggested a division between research and monitoring in the conservation plan, indicating that it would be a good idea to use mark/recapture to establish the size of the two (sub-)populations. According to PC, it is vital to have a student to implement/address the scientific questions that arise in the current plan. PS suggested the installation of a network of data loggers on Castanheira Valley in order to monitor the climate variation within the valley and to assess the habitat preferences of the species. Furthermore, MSP stressed the importance of clarifying the taxonomic status of the 2 populations. AH suggested to use mtDNA for a cheap and rapid check whether both populations represent different species. The use of micro-satellites might be helpful to assess the degree of genetic connectivity within a population, but will make the study more expensive. AH also stressed the importance of gathering external financial support to perform the genetic analyses. On this matter, DT suggested the University of Madeira (UMa) to be responsible for this task but JJ clarified that UMa is prepared to deal only with phylogenetics with selected markers, not micro-satellites. Nonetheless, if they choose to perform typical molecular analysis, UMa could co-advice a PhD student to perform the assessment of genetic structure with mtDNA, according to JJ.

IS indicated that it is not advisable to extract a leg from the specimens for DNA sampling as usual for spiders, being preferable instead to collect exuviae. On this matter, AH indicated that exuviae might be adequate and PC suggested collecting them during the trip following the workshop in order to start the molecular analysis program, RS suggested implementing a coordination group involving the IUCN, local government authorities and UMa, in order to actively search for a PhD student to study this issue.

13h00 - Lunch-break

14h30 – Session restart

3.3 Research

In the afternoon session, the discussion continued around research and MS indicated that there is a vegetation model for Madeira Island made by Albano Figueiredo (University of Coimbra), which encompasses more than 13,000 points collected in the field during 3 years, which could be very helpful if we intend to model potential vegetation and species distributions. Furthermore, in his opinion, climate will not change the pioneer plant communities on which *Hogna* relies. PC agreed that a vegetation model will be useful for future knowledge and this information could be important as a resource for the decision-making process.

PS expressed his concerns about *Phalaris* not leaving open areas for species reintroductions or enough space for pioneer plant settlement. MS, PC and IS discussed briefly the methodology that should be used for the assessment of vegetation and spider density.

3.4 Public outreach

PC suggested a sub-page, within the Madeira Natural Park Service (MNPS) web-page, dedicated to *Hogna ingens*. Furthermore, IS stressed the importance of having an exhibition on the wardens' station on Desertas, with live specimens. According to him, this has been tried before but there were a number of problems with the maintenance that needed to be solved. Still on this matter, DT suggested the installation of a webcam in Bristol Zoo Gardens, with a link to the MNPS SPNM webpage.

MSP suggested that the IUCN could make a publication on this project, which could further lead to scientific papers. MB indicated that BZS intended to publish the results of the *ex-situ* breeding programme and MS encouraged all participants to release information about the ongoing conservation actions regarding *Hogna* on March 14th 2017, the international spider day.

MB indicated that they are prepared to produce a video depicting the wolf spider and the efforts to save it through the services of a professional filmmaker, and that BZS could be responsible for this task.

Workshop conclusions

MSP informed all the present that he would be responsible for writing the conclusions of the meeting for press release purposes and PC was assigned responsibility for preparing the draft by the end of May 2016.

Back Cover: Isamberto Silva holding an adult female *H. ingens*

