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Red List of the endemic beetles of Selvagens archipelago: a biodiversity and ecological study to set conservation priorities

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Mestrado em Ecologia e Gestão Ambiental

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2025

Acknowledgements

I would like to express my sincere and heartfelt gratitude to my parents and brother for their unwavering support from the very beginning and for always being the foundation of my passion for biology. I am also grateful to my grandparents for developing from an early age the interest in small, often overlooked wildlife and for making my entire academic journey possible. I also extend the acknowledgement to all my family and teachers who have encouraged and contributed to my aspirations.

A special note of appreciation to all my friends, with whom I have shared memorable moments throughout the course of this work and look forward to more shared experiences in the future.

I am grateful to IFCN and Mossy Earth for making our expedition possible and providing the opportunity to stay at the Selvagens Natural Reserve. To the nature rangers, Carlos Santos and João Paulo, for their experience and knowledge about the archipelago. My thanks go to the Portuguese Navy and the crew for the transport and for welcoming us. I would also like to acknowledge the officers Alexandre Graça Silva, António Pinto, and Romeu Sousa for their companionship and crucial assistance in reaching Selvagem Pequena and Ilhéu de Fora.

I wish to express my profound gratitude to my supervisor, Dr. Mário Boieiro, for his availability, expertise, as well as for his invaluable support during fieldwork in the Selvagens and throughout the development of this work. I am also deeply grateful to my co-supervisor Prof. Dr. Rui Rebelo for his helpful insights and guidance during this process.

I am thankful to Francisco Fernandes, Carlos Lobo, and Pedro Jardim for their contributions to the identification of the taxa on the islands, particularly the flora, and for their aid during fieldwork.

My gratitude extends to Prof. José Alberto Quartau and Prof. Pedro Oromí for granting access to essential literature about the Selvagens archipelago.

Finaly, I also thank the Museu Municipal do Funchal and Dr. Ysabel Gonçalves for providing materials for the expedition, along with samples and information on collection specimens from the Selvagens Islands. A huge thanks to Tiago Carrapiço for his companionship and insights provided during the several days of sorting specimens in the laboratory.

Resumo

As ilhas oceânicas representam uma pequena fração da superfície terrestre, mas destacam-se como uma das regiões mais relevantes do planeta em termos de biodiversidade. Estas áreas albergam uma elevada proporção de espécies endémicas e, simultaneamente, um elevado número de espécies ameaçadas e taxas alarmantes de extinções recentes. Esta conjugação de riqueza biológica e fragilidade ecológica torna as ilhas oceânicas um foco prioritário para a investigação e realização de ações de conservação da natureza à escala global.

Nos ecossistemas insulares, os artrópodes terrestres figuram entre os grupos mais diversos, com os coleópteros a assumirem particular destaque em termos de riqueza específica. No arquipélago das Selvagens, os coleópteros correspondem à maior parcela de espécies endémicas conhecidas. Muitos destes animais estabelecem relações interespecíficas com a flora nativa e desempenham funções ecológicas essenciais, como a decomposição da matéria orgânica, herbivoria, predação e polinização. Alguns destes coleópteros, como o escaravelho longicórnio *Deucalion oceanicum*, desenvolveram ciclos de vida dependentes de plantas hospedeiras ameaçadas e de distribuição restrita, o que o torna particularmente suscetível a fenómenos de extinção. Além disso, estando sujeitos a condições ambientais singulares, houve uma diversificação das formas endémicas que partilham características comuns. Por exemplo, devido a fatores ambientais como a elevada exposição ao vento, forte radiação solar, escassa cobertura vegetal e a quase ausência de predadores de grande porte, favoreceu-se a perda parcial ou total da capacidade de voo (apterismo) em muitas destas espécies. Esta característica morfológica limitativa da sua dispersão e distribuição, torna-as vulneráveis a ameaças como a introdução de espécies exóticas invasoras, a exposição à poluição marinha nos seus habitats e as alterações climáticas. Nas Selvagens, ameaças como a presença de animais e plantas invasoras têm vindo a ser controladas através de programas de erradicação, bem-sucedidos, de que é exemplo a erradicação do coelho e do ratinho-das-casas e o controlo e quase erradicação da tabaqueira na Selvagem Grande. No entanto, os impactos da poluição marinha e das alterações climáticas permanecem ainda pouco monitorizados nas ilhas, apesar dos indícios do seu agravamento.

Na Macaronésia, os artrópodes continuam a ser um dos grupos taxonómicos com menos avaliações de risco de extinção para a Lista Vermelha da União Internacional para a Conservação da Natureza (UICN). Embora tenham sido feitos avanços recentes na avaliação de coleópteros endémicos nos Açores, nas Selvagens esses esforços limitaram-se até agora às aranhas, tendo sido identificadas duas espécies como ameaçadas: *Dysdera aneris* (Vulnerável) e *Oecobius selvagensis* (Criticamente em Perigo). No que respeita aos coleópteros endémicos, apenas o escaravelho *Deucalion oceanicum* consta listado como uma das 100 espécies prioritárias da Madeira como alvo de conservação. À semelhança do que ocorre noutras ilhas, a profusa biodiversidade e o desconhecimento do público-geral, aliados aos reduzidos incentivos para a implementação de estudos direcionados aos invertebrados, tiveram como resultado que estes permaneçam amplamente negligenciados nos programas de conservação. Neste contexto, a avaliação do risco de extinção dos coleópteros endémicos das Selvagens é necessária para o diagnóstico dos riscos de extinção que enfrentam. Este trabalho visa colmatar essa lacuna, fornecendo os conhecimentos necessários para apoiar tomadas de decisão em matérias de conservação da natureza nas Ilhas Selvagens.

Nesse sentido, o presente estudo avalia o risco de extinção das 21 espécies endémicas de escaravelhos conhecidas nas três ilhas do arquipélago das Selvagens. Para tal, foi reunida informação histórica disponível na literatura e na coleção do Museu Municipal do Funchal. Paralelamente, foram também analisados dados preliminares resultantes do programa de monitorização de longo prazo iniciado com a

expedição comemorativa dos 50 anos da Reserva Natural, em 2023. Através deste protocolo de monitorização procurou-se também analisar a presença e a abundância das espécies endémicas de escaravelhos em quatro espécies de plantas. Foi também aumentado o esforço amostral sob os coleópteros durante a mais recente campanha de monitorização (em 2024). Delimitaram-se os principais habitats existentes no arquipélago com base na sua cobertura vegetal, características do solo e posteriormente identificou-se a sua riqueza específica em endemismos de coleópteros. Estes dados contribuíram finalmente, para a definição de prioridades e medidas de conservação, consciencializando futuras decisões e ações em matéria de proteção da biodiversidade.

Os resultados das avaliações do risco de extinção traduzem-se na classificação de 16 espécies como não ameaçadas (14 com a classificação de Pouco Preocupante e 2 como Quase Ameaçadas), 3 ameaçadas (1 Vulnerável, 1 Criticamente em Perigo e 1 Criticamente em Perigo - Possivelmente extinta) e 2 com Dados Insuficientes. As três espécies ameaçadas são *Leipommata oromiana*, *Deucalion oceanicum* e *Ifnidius atlanticus*, encontram-se especialmente em risco de extinção pelas suas atuais distribuições restritas e pelas ameaças de perda de habitat a que estão sujeitas. Através da monitorização direcionada a plantas cujas populações se encontram em recuperação na Selvagem Grande, mostrou-se que entre as espécies endémicas de escaravelhos, apenas *Attalus oceanicus* e *Sphaericus bicolor* foram encontrados nas plantas monitorizadas, destacando-se a sua ausência em *Schizogyne sericea*. Para além disso, constatou-se que o habitat costeiro apresenta um grande número de espécies endémicas, incluindo as ameaçadas. Este habitat revela-se como prioritário, estando em risco principalmente devido às crescentes ameaças da poluição marinha e das alterações climáticas, cujos efeitos são visíveis no arquipélago. Com a intensificação das alterações climáticas, prevê-se que os regimes de precipitação possam vir a ser alterados, para além da temperatura, com a promoção de fenómenos meteorológicos extremos e a elevação do nível médio do mar, um risco especialmente preocupante em ilhas de baixa altitude como a Selvagem Pequena e o Ilhéu de Fora. Ainda assim, os endemismos exclusivos da Selvagem Grande *Aplocnemus zinoi* e *Nesotes monodi*, permanecem sem um risco de extinção atribuído, uma vez que ainda não existem informações suficientes para apoiar a suas avaliações.

De acordo com os resultados, a maior parte das espécies de escaravelhos endémicos não se encontra em risco de extinção iminente, um cenário que eventualmente poderia ser mais gravoso caso não houvesse ações sobre as ameaças anteriormente verificadas no arquipélago. Por outro lado, demonstra-se a existência de espécies ameaçadas mesmo em áreas de Reserva Natural Integral, onde a presença humana e os seus impactos são mínimos. É por isso necessário sensibilizar o público em geral para a existência destas espécies endémicas e o seu reconhecimento em legislação que vise a sua conservação, explicitando no mínimo as espécies ameaçadas. Será também necessário agir no controlo das ameaças que promovem a redução da qualidade do habitat costeiro e implementar medidas de criação de refúgios para a entomofauna. Através da colocação de pedras e tábuas de madeira nas zonas centrais das ilhas e afastadas das ameaças, poderão ser criados abrigos para as espécies ameaçadas e não ameaçadas, permitindo o aumento das suas populações. Deve-se também garantir a continuidade da monitorização de longo prazo com métodos mais abrangentes, para melhor inclusão dos escaravelhos Curculionidae, bem como a realização de campanhas de amostragem durante o outono/inverno para recolha de dados sobre as espécies com informação insuficiente. Será essencial estender a amostragem às ilhas Selvagem Pequena e Ilhéu de Fora, albergando e acompanhando as suas populações, não só de escaravelhos endémicos como a restante fauna de artrópodes terrestes, que se encontra parcialmente estudada. Perante a perda de biodiversidade global, torna-se importante impedir a extinção da riqueza faunística deste arquipélago, criando uma visão mais clara e estabelecendo medidas de conservação mais rigorosas, capazes de responder eficazmente às ameaças silenciosas, mas crescentes, que afetam as ilhas oceânicas.

Palavras-chave: Coleoptera; Ecologia insular; Reserva Natural; Risco de extinção; UICN

Abstract

Oceanic islands are key areas for biodiversity conservation due to their uniqueness, but also because they host high numbers of species classified as threatened of extinction. However, the vast diversity of terrestrial arthropod species on most islands, jointly with the lack of human (e.g. taxonomists) and financial resources, has hindered the extinction risk assessment of most species of this group. The Selvagens archipelago exemplifies this challenge, as its terrestrial arthropod fauna remains largely understudied and is predominantly represented by endemic Coleoptera. This study assesses the extinction risk of 21 endemic beetle species across the three islands of the Selvagens archipelago, with the goal of defining conservation priorities. To this end, we compiled historical data and analyzed preliminary findings from the first long-term monitoring campaigns conducted in the Natural Reserve during 2023 and 2024. Additionally, we investigated potential relationships between species abundance and four plant species to aid in conservation planning. We also identified the key habitats of the islands and their endemic beetle species richness. The assessments present 16 species as non-threatened (14 LC and 2 NT), 3 as threatened (1 VU, 1 CR and 1 CR Possibly extinct) and 2 as DD. Only two endemic beetle species were found on the selected plants, with none occurring on *Schizogyne sericea*. Among the habitats, the coastline shows a large number of endemic species, being also one of the most menaced due to increasing threats from climate change and marine pollution. Overall, the findings of this study suggest that most species are not facing imminent extinction, but still underscore the presence of threatened species, even in protected sites with little human disturbance. Thus, if we aim to stop biodiversity loss, it is critical to set conservation priorities amongst the native taxa (particularly endemics) to enable the effective allocation of resources for island species conservation.

Keywords: Coleoptera; Extinction risk; Island ecology; IUCN; Natural Reserve

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List of Abbreviations, Acronyms, and Symbols

AOO – Area of Occupancy
ARM – Autonomous Region of Madeira
CR – Critically Endangered
DD – Data Deficient
EN – Endangered
EOO – Extent of Occurrence
EX – Extinct
EW – Extinct in the Wild
GBIF – Global Biodiversity Information Facility
IF – Ilhéu de Fora
IFCN – Instituto das Florestas e Conservação da Natureza
IPCC – Intergovernmental Panel on Climate Change
IUCN – International Union for Conservation of Nature
IAS – Invasive Alien Species
NT – Near Threatened
SG – Selvagem Grande
SP – Selvagem Pequena
SSP – Shared Socioeconomic Pathway scenario
SAC – Special Area of Conservation
SPA – Special Protection Area
VU – Vulnerable

1. Introduction

Oceanic islands represent 6.7% of the Earth's land surface, but are home to 20% of all biodiversity on our planet (Fernández-Palacios et al., 2021). These ecosystems are renowned sites for their fascinating biotas, characterized by a high degree of endemism (Kier et al., 2009). Furthermore, oceanic islands have become critical areas of conservation concern, as they host half of the species classified as threatened by the IUCN Red List and hold nearly 75% of all recorded extinctions (Fernández-Palacios et al., 2021). The higher vulnerability of island endemics to extinction results from the range-restricted distributions and small fragmented populations of many species, jointly with their lower ability to cope with disturbances (Vitousek, 1988; Fernández-Palacios et al., 2021).

Within the Autonomous Region of Madeira (ARM), the Selvagens archipelago is located approximately 300 km from Madeira Island and 165 km from the Canary archipelago (Mata et al., 2013). The archipelago is part of Macaronesia, which integrates one of the most relevant biogeographical regions in terms of biodiversity, the Mediterranean basin hotspot (Médail and Quézel, 1999; Myers et al., 2000). Here, the Macaronesian islands stand out as fruitful scenarios for studying island biology and conservation (Florencio et al., 2021), owing to their high species richness and endemism of both flora and fauna, particularly among terrestrial arthropods (Serrano et al., 2010). Despite the small land area (≈3 km^2), the Selvagens islands are home to an estimated 219 species and subspecies of terrestrial invertebrates, the majority of which are arthropods (92%) (Borges et al., 2008; IFCN, 2017). Currently, 44 terrestrial arthropod taxa are known to be endemic to these islands (IFCN, 2017), even though the discovery rate of new taxa is not decreasing. Between 1970 and 2000, an average of 90 new endemic species and subspecies of terrestrial arthropods were discovered per decade in the Madeira and Selvagens archipelagos (Borges et al., 2008). This figure highlights the substantial knowledge gap regarding the biodiversity of these two archipelagos. Additionally, arthropods suffer from lack of public awareness, insufficient research funding and often lack of basic scientific knowledge, being often neglected in biodiversity conservation policies (Cardoso et al., 2011b). These issues hinder effective conservation efforts, particularly for priority insular arthropod species (Martín et al., 2010).

Worldwide, insects are the most biodiverse group, with the Coleoptera being recognized as the largest contributor to the total number of insect species. On this scale, coleopterans account for 38% of the total species richness of insects (Borges et al., 2008). Following the last entomological expedition to the Selvagens Islands in 2015, 78 coleopteran species were recorded to the archipelago, including five new species records and a new species for science (Stüben, 2016). Overall, 21 beetle species (from nine families) are endemic to the Selvagens archipelago. Island beetles are subjected to unique environmental conditions, where evolutionary processes guided the development of many endemic forms. Factors such as strong wind exposure, intense solar radiation, low vegetation cover, coupled to the near absence of major predators, led to apterism or reduced flight capabilities in many species (Serrano, 1983). These coleopterans have also developed interspecific relationships with native plants and play key ecological roles as decomposers of organic matter, herbivores, predators and flower visitors (Arechavaleta and Oromí, 2015). Additionally, they are important in the diet of other living beings that cohabit the same space. For example, endemic beetles are a source of food for the lizard *Teira dugesii selvagensis* (Bischoff, Osenegg & Mayer, 1989) (Aguilar, 2016) and carabids are the most important source in terms of biomass for the endemic Selvagens gecko (*Tarentola bischoffi* Joger, 1984) (Gil, 2011). Here, beetles may also form part of the diet of *Anthus bertheloti bertheloti* Bolle, 1862, a resident and mainly insectivorous bird, that is unique to Selvagens and the Canary Islands (Oliveira et al., 2010; Ramos Melo, 2015).

Among the Selvagens beetle fauna, and despite the high number of endemics and their ecological importance, only the longhorn beetle *Deucalion oceanicum* Wollaston, 1854, exclusive to the tiny Ilhéu de Fora, was acknowledged as an important conservation target (Martín et al., 2008). This recognition is also due to its life-cycle dependence on the Critically Endangered endemic plant *Euphorbia anachoreta* Svent. exclusive to the same islet (Stüben, 2016; Carvalho et al., 2021). In fact, the Selvagens archipelago invertebrates, particularly coleopterans, have not been under direct conservation efforts. Even though some past threats have been controlled, such as human occupation and exploitation of natural resources (Menezes et al., 2004), others persist to this day. Several invasive alien species (IAS) were introduced in Selvagem Grande, but there is no evidence of IAS introductions in the other islands. For instance, goats and rabbits were most probably introduced in Selvagem Grande during XV century, the former persisting there until the XIX (Menezes et al., 2004) and the latter until 2003 (Oliveira et al., 2010). By the end of the XIX century a notable plant invader, the tree tobacco (*Nicotiana glauca* Graham), was introduced in Selvagem Grande. This species occupied a considerable area of the island, excluding endemic flora and saproxylic beetles from their favored habitats. Remarkably, the establishment of *N. glauca* likely led to the disruption of natural ecological interactions, with endemic coleopterans, like the weevil *Caulotrupis mauli* (Folwaczny, 1972), having already been found feeding inside its dry branches (Stüben, 2016). Since 2003, the Selvagens Islands have been almost free of IAS, with the near-complete removal of *N. glauca* and the eradication of rabbits (*Oryctolagus cuniculus* (Linnaeus, 1758)) and mice (*Mus musculus* Linnaeus, 1758) (Oliveira et al., 2010; Santos et al., 2015). However, the islands remain vulnerable to new accidental introductions and settlement of exotic taxa, through the regular transport of personnel (nature rangers, maritime authorities and researchers), goods and commodities to these islands. Climate change is another major threat, both present and future, to Selvagens' biodiversity and ecosystems. Many studies show that climate change has and will have a profound impact on oceanic islands due to rising sea levels, an increase in the frequency and magnitude of extreme weather events and changes in temperature and humidity reference values (Cropper and Hanna, 2014; Ferreira et al., 2016; IPCC, 2023). These changes will reshape coastal environments and pose a threat to the biodiversity of low-lying islands (Boieiro et al., 2015), including the Selvagens archipelago. Here, reductions in island area have been in place (Moreira, 1991) and changes in habitat area and quality are expected to continue.

The International Union for Conservation of Nature (IUCN) Red Lists stand as an important tool for assessing species vulnerability to extinction. This initiative enacts as a global inventory for species extinction risk assessments, allowing the identification of conservation priorities and resource allocation needs (Bennun et al., 2017). Despite efforts being underway, only 5.6% of the arthropod endemic species of Macaronesia have been assessed for the IUCN Red List, and the scenario is even worse in Madeira and Selvagens, where only 1.4% of the endemic species were listed (Casimiro, 2017). Moreover, there is still a limited number of studies on endemic insects that address aspects that are key for their extinction risk assessment, such as population size, current distribution, species ecology, threats, and future trends (Faria et al., 2008). In recent years, several efforts have been made to assess the extinction risk of beetle species on Macaronesian archipelagos, particularly in the Azores (e.g. Borges et al., 2017; Borges et al., 2019). At the Selvagens archipelago, these efforts involved only the endemic spiders (Cardoso et al., 2017), leading to the identification of two threatened species - *Dysdera aneris* Macías-Hernández & Arnedo, 2010 assessed as Vulnerable (Cardoso et al., 2018a) and *Oecobius selvagensis* Wunderlich, 1995 classified as Critically Endangered (Cardoso et al., 2018b). Concerning the coleopterans of Selvagens archipelago, only the longhorn beetle *D. oceanicum* is listed on Madeira's Top 100 Priority List (Martín et al., 2008). Red List evaluations for these taxa are therefore imperative, aiming to diagnose their current extinction risks. This dissertation intends to address this gap, by providing insights to support informed decision-making for future conservation efforts on the Selvagens archipelago.

1.1 Objectives

The main objective of this dissertation is to elaborate the Red List of the endemic beetles of Selvagens. To this end, the following specific objectives were defined:

1. Systematize historical data and gather novel information on the distribution, abundance and ecology of the endemic coleopteran species of the Selvagens archipelago;
2. Evaluate spatial differences in the richness of the endemisms;
3. Assess the extinction risk of endemic beetles using the IUCN methodology;
4. Identify the most threatened species and priority sites in the archipelago, enabling the proposal of conservation measures.

2. Materials and methods

2.1 Study area

This study focuses on all three main islands of the Selvagens archipelago. This group of islands of volcanic origin located in the North Atlantic emerged around 29 Ma ago (Geldmacher et al., 2005). The archipelago is composed of the three major islands: Selvagem Grande, the largest island, and the cluster of Selvagem Pequena and Ilhéu de Fora (surrounded by adjacent islets), which delimit Portugal's southernmost territory, (Figure 2.1.1). The entire land area of the Selvagens archipelago, along with its marine area, constitutes the oldest Nature Reserve in Portugal, established since 1971 in response to the need to set a legal framework to safeguard the diverse range of marine and terrestrial species, particularly the rare and endemic. In 2021, it became the largest marine area with full protection in Europe and the North Atlantic. Moreover, these islands are part of the Natura 2000 Network, and are classified as Special Area of Conservation (SAC) and Special Protection Area (SPA). The archipelago also supports five habitats of Community interest under the Habitats Directive (92/43/CEE Annex I), which are home to unique taxa on a global scale (Menezes et al., 2004; IFCN, 2017).

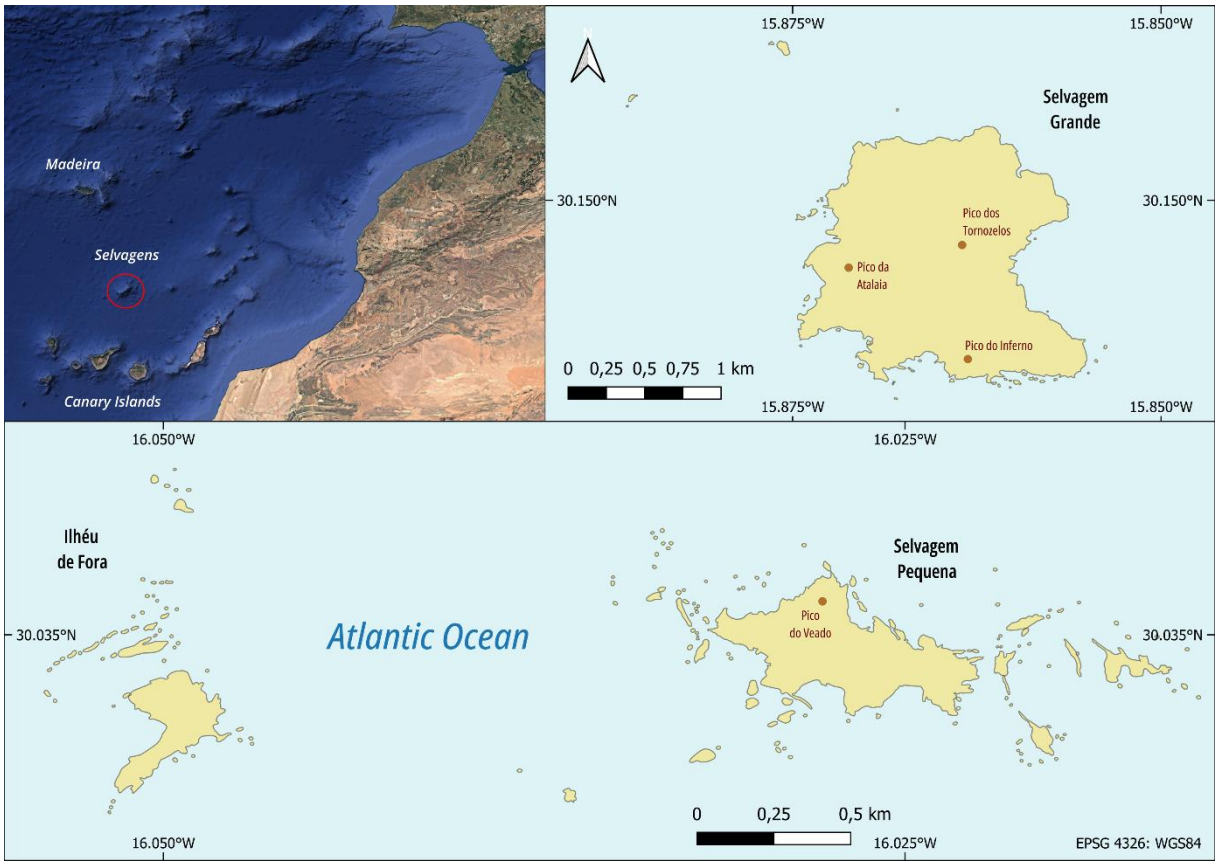

Figure 2.1.1. Location of the Selvagens archipelago. The main island, Selvagem Grande is the largest (2.45 km²) and has the highest elevation (163m), located at Pico da Atalaia. Approximately 20 km southwest Selvagem Grande lies Selvagem Pequena (0.2 km²), reaching 49m at Pico do Veado. Ilhéu de Fora is the smallest island (0.08 km²) and has a maximum altitude of only 18 meters (IFCN, 2017). The map was created using satellite image data (© Google Earth), adapted from the Official Administrative Map of Portugal (CAOP - version 2023) and was generated with QGIS v.3.36.0.

Despite their shared volcanic foundation, the islands exhibit distinct geomorphological features and plant communities (Figure 2.1.2). Selvagem Grande stands out from the others for its high-altitude plateau flanked by steep cliffs. The soil is predominantly rocky, apart from the northeast region where a calcareous sand deposit, rich in sub-fossil snail shells, forms the singular "Chão dos Caramujos" habitat (IFCN, 2017). In contrast, the smaller islands are extensively covered by sand, are flatter and

more subject to maritime influence. The sandy areas serve as the preferred habitat for colonies of the White-faced Storm Petrel (*Pelagodroma marina* (Latham, 1790)), a seabird that digs its nests underground, and these sites are protected from human presence to avoid nest destruction and bird mortality (IFCN, 2017). The most remarkable differences between the two smaller islands are found in their elevated areas, which support plant endemisms singular to each island. For instance, Selvagem Pequena is home to a small population of *Argyranthemum thalassophilum* (Svent.) Humphries, that co-occurs with *Asparagus nesiotes nesiotes* Svent., while Ilhéu de Fora harbors the spurge *Euphorbia anachoreta*.

The climate across the Selvagens islands is arid and subtropical maritime. This is primarily due to their high exposure to prevailing northeast winds and limited water availability, which is mostly supplied by occasional rainfall. The archipelago is affected by trade winds carrying humidity, but unlike the neighboring Madeira Island, its low altitude is insufficient to cause precipitation, leading to annual rainfall typically less than 200 mm. Temperatures are usually higher than those of Madeira, not only due to their lower latitude but also because of the influence of warm winds blowing from east (IFCN, 2017).

The vegetation is dominated by xerophilous plants adapted to the dry climate conditions. In these environments, shrub-like species are more prevalent, with *Suaeda vera* Forssk. ex J.F.Gmel being widespread and thriving across all islands. In Selvagem Grande, the vegetation is still undergoing a recovery process that began in 2003 following an eradication program targeting invasive species (Oliveira et al., 2010). Since then, signs of regeneration have emerged, with past damage from grazing animals giving way to an increase in herbaceous plants and an expansion of shrub cover (Santos et al., 2015; Oliveira et al., 2023).

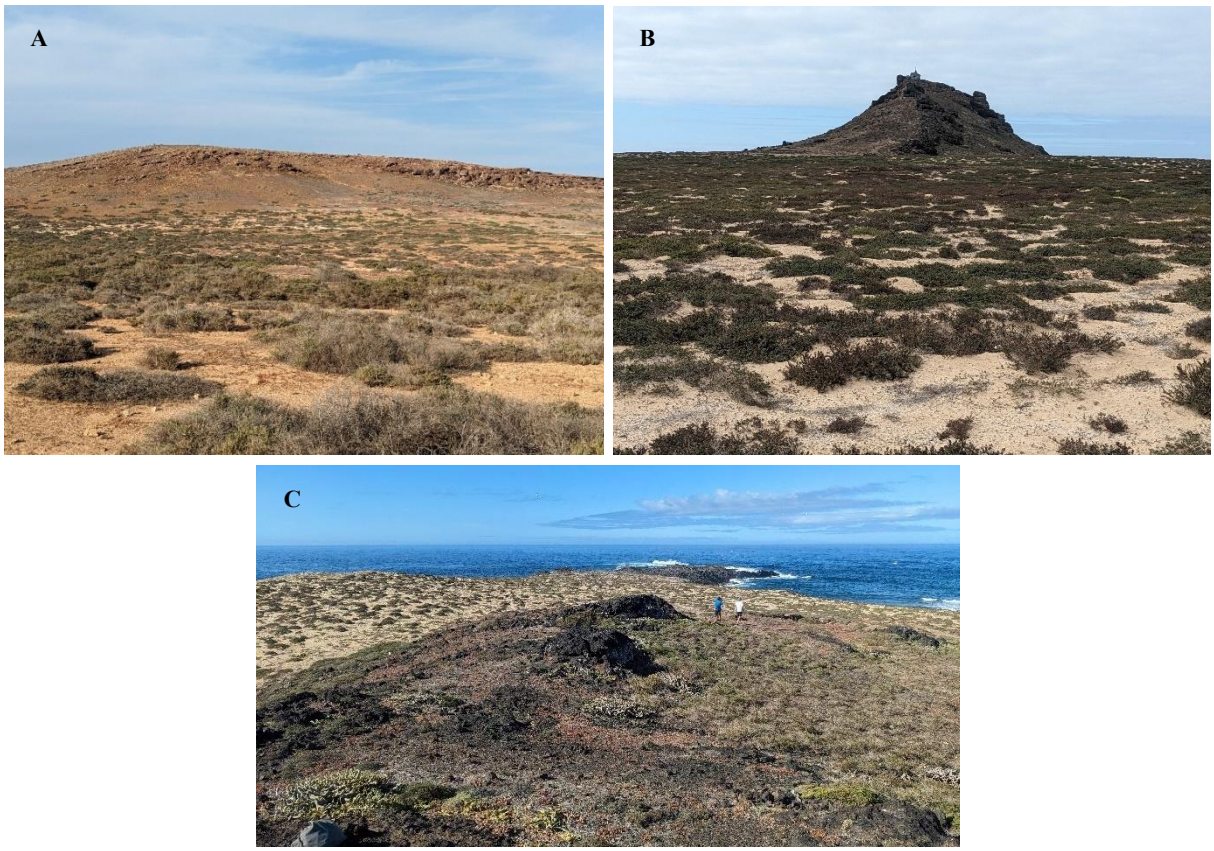

Figure 2.1.2. The landscape of the different islands of Selvagens archipelago: Selvagem Grande (A), Selvagem Pequena (B) and Ilhéu de Fora (C).

2.2 Data collection

2.2.1 Historical data

Through a comprehensive review of literature, supported by an extensive listing of publications on the Selvagens (Ulbrich, 2014), key literature on the endemic Coleoptera was identified. The historical data was compiled from various sources, including scientific literature, catalogues and unpublished data on species taxonomy, distribution, abundance and ecology (Annex 2.2.1.1). The information includes collection specimens dating as far back as 1851. The most relevant records were obtained from major scientific expeditions (Oromí et al., 1978; Erber and Wheater 1987; 1988; Arechavaleta et al., 2001), with the most recent historical data stemming from entomological expeditions conducted in 2014-2015, the first to provide precise geographical coordinates of specimens' records (Stüben, 2016). The latter records contributed most in this category to measuring distribution areas and assessing the risk of extinction.

2.2.2 Biodiversity monitoring data

2.2.2.1 Monitoring data (2023)

The most recent data was obtained from the long-term monitoring program initiated in 2023 on Selvagem Grande to assess the outcomes of conservation efforts. This initiative marked the 50th anniversary of the Natural Reserve and resulted in a monitoring plan that spans from overall habitat quality to specific marine and terrestrial taxonomic groups (Oliveira et al., 2023). The monitoring plan of terrestrial arthropods follows a standardized methodology, to evaluate species richness, composition and relative abundance, by using different sampling techniques: pitfall traps; direct sampling in quadrats and vegetation sweeping along transects (Menezes et al., 2023). This protocol was applied between April 24-29, 2023 by a team of entomologists and led to the collection of endemic beetles.

2.2.2.2 Monitoring data (2024)

Following the recommendations of the long-term monitoring program, the sampling protocol was repeated earlier in 2024, aiming for the favorable season for coleopteran activity. The sampling took place from March 19 to April 11, although it was affected by atypical weather conditions for the season. During our stay, Selvagem Grande experienced heavy rain and strong winds, which hindered sampling efforts. Once the weather conditions changed, a brief visit to Selvagem Pequena and Ilhéu de Fora was allowed between April 2-3 for further sampling.

During the 2024 monitoring expedition, in addition to implementing the sampling protocol from the previous year, additional actions were taken to enhance data collection on endemic beetles:

1) Additional sampling points were established, including pitfall traps, vegetation sweeping along transects and direct sampling in quadrats**,** to address unsampled habitats (Figure 2.2.2.2.1). New sampling sites were also selected for active search, to fill distribution gaps not covered by historical data and monitoring protocol.

2) Despite its conclusion after the sampling, efforts were made to update the habitat map of the islands, as the previous maps no longer reflected the changes in vegetation following the invasive species eradication program. Using vegetation maps (Sánchez-Pinto et al., 2015), geological charts (Zbyszewski et al., 1979) and an early habitat map from for Selvagem Grande

(Rui Rebelo, unpublished), it was possible to develop an updated version of the distribution of the main habitats (Annex 2.2.2.2.1, 2.2.2.2.2 and 2.2.2.2.3).

3) Precautionary measures were implemented, due to the vulnerability of some endemic species and the ease to identify several other ones by direct observation in these species' poor areas. As a result, specimen collection was minimized whenever possible. On the two smaller islands (Selvagem Pequena and Ilhéu de Fora), where populations of endemic beetles are more fragile, the use of pitfall traps was excluded. For unique species like *Deucalion oceanicum*, to preserve both the developing larva and the fragile stalks of its host plant *Euphorbia anachoreta*, the individuals were not captured but instead recorded as observations.

The sorted samples of Coleoptera from the 2023 monitoring program were provided by the Museu Municipal do Funchal, while the samples from 2024 were brought to the laboratory of entomology (Faculty of Sciences, University of Lisbon) for sorting and specimen identification. The array of collected specimens was counted and identified to the lowest taxonomical level possible, using a stereomicroscope Olympus SZX7. Subsequently, they were preserved in ethanol (80%), labeled accordingly and assigned to a georeferenced point, obtained previously in the field using a Garmin GPSmap 67i. The collection is deposited at the entomology lab of the Faculty of Sciences of the University of Lisbon (Lisboa, Portugal), and will be forwarded to the entomological collection of the Museu Municipal do Funchal (Funchal, Madeira, Portugal).

All fieldwork was conducted under the license Nº02/IFCN/2024 – FAU MAD, emitted by Instituto das Florestas e Conservação da Natureza, IP-RAM (IFCN).

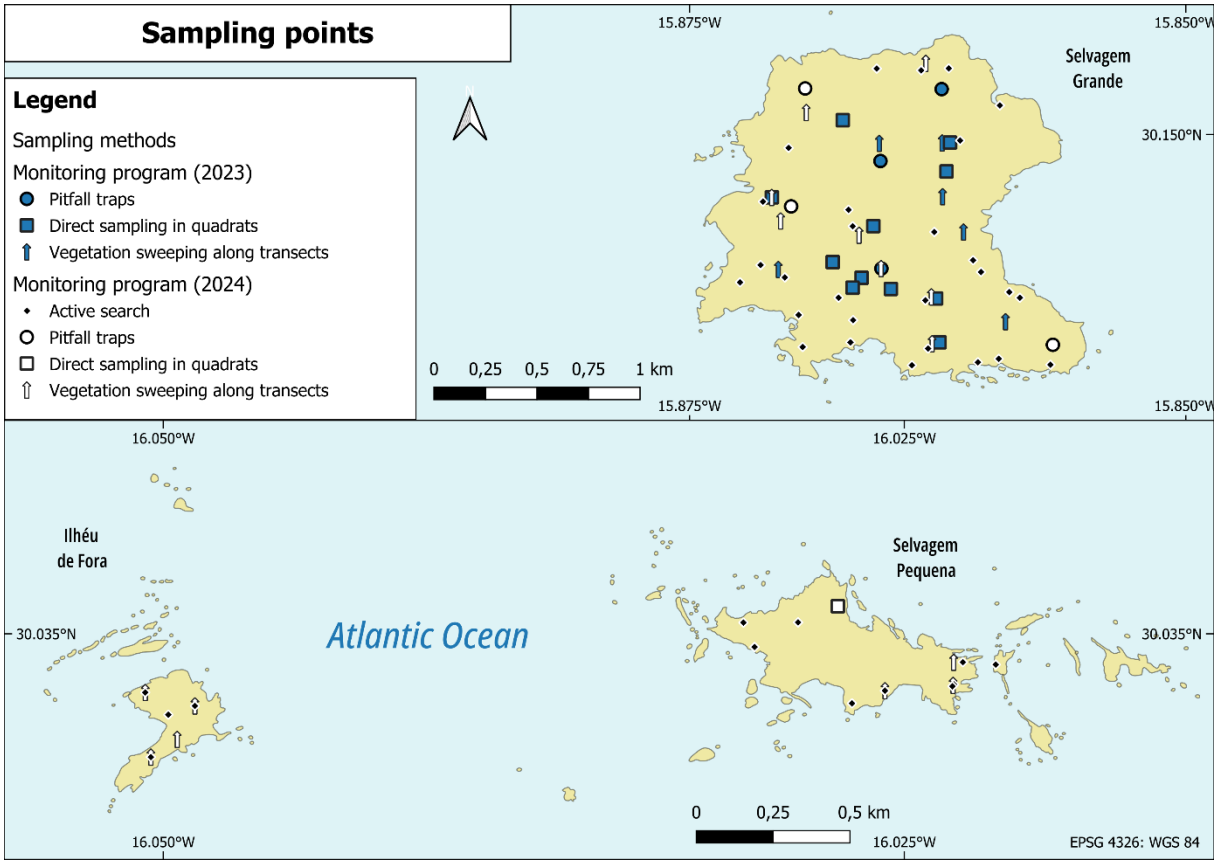

Figure 2.2.2.2.1. Sampling design implemented in each island of the Selvagens archipelago in 2023 and 2024. The map was adapted from the Official Administrative Map of Portugal (CAOP - version 2023) and was generated with QGIS v.3.36.0.

2.3 Sampling methods

2.3.1 Pitfall

The pitfall traps were placed in 3 sampling points during 5 consecutive nights. On each sampling point we used 6 traps, placed 2m apart in 2 lines of 3 traps each. Every cup had a diameter of 12cm and was equipped with a protective cover on top, supported by a metal frame to prevent accidental catches (Figure 2.3.1.1). The liquid content was an attractive solution of water and 20% dark beer with a drop of detergent (Menezes et al., 2023). This method targets epigean beetles, including species with nocturnal habits. In addition to the 3 points established during the 2023 monitoring, 3 additional points were added in 2024. Pitfall traps were placed only on Selvagem Grande, as their use on the other islands is prohibited due to their ecological sensitivity (Figure 2.2.2.2.1).

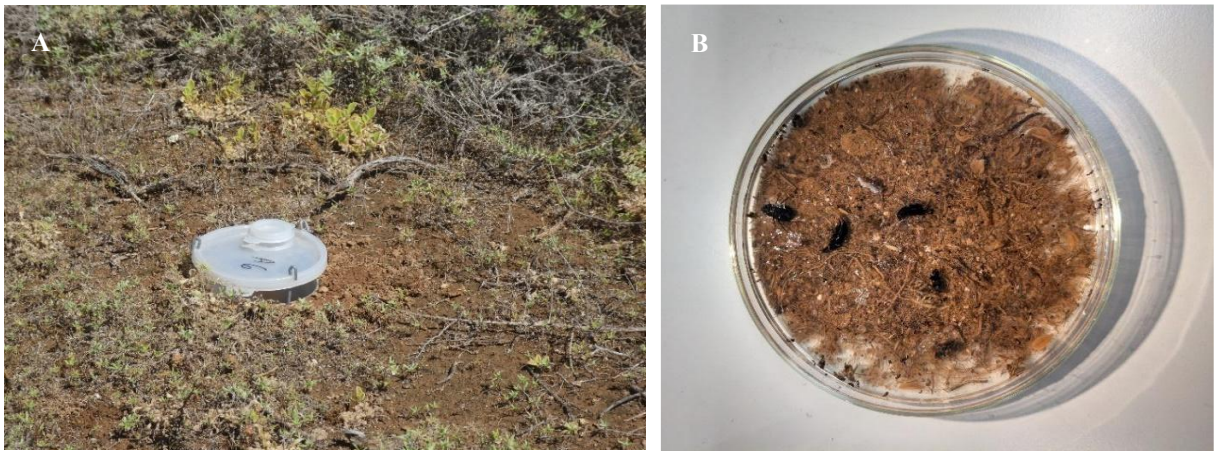

Figure 2.3.1.1. Pitfall trap (A) and its contents in a Petri dish (B).

2.3.2 Direct sampling in quadrats

The direct sampling in quadrats was conducted by delimitating 10m x 10m squares at 11 sampling points. Each quadrat was subdivided into 3 parallel lines, spaced 2.5m from each other as well from the margins. All arthropods found on the soil, on plants, and under stones were captured within a 0.5m band on either side of the line (Figure 2.3.2.1). During the 2024 monitoring, all the previous squares in Selvagem Grande were sampled and an additional quadrat was sampled at Selvagem Pequena.

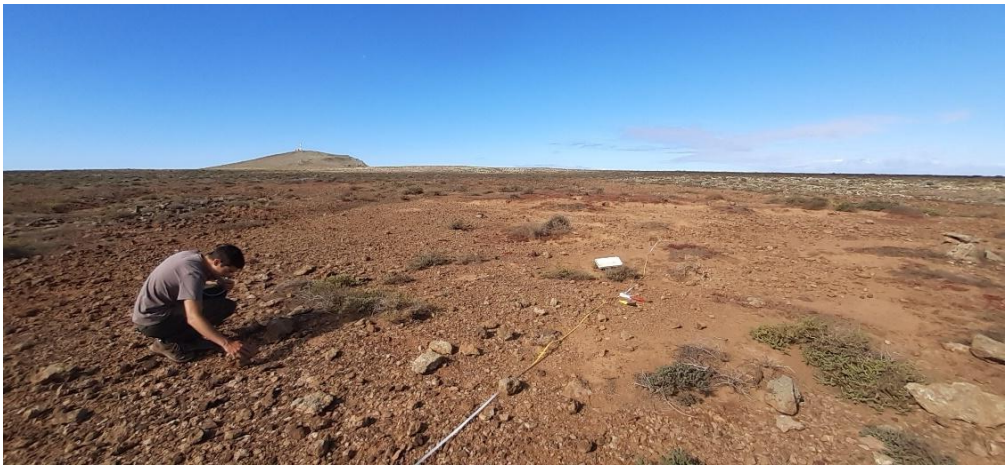

Figure 2.3.2.1. Direct sampling in a quadrat on the plateau of Selvagem Grande. Photo courtesy: Mário Boieiro.

2.3.3 Vegetation sweeping along transects

The vegetation sweeping along transects consisted in 10m x 1m lines at 6 sampling points. On each transect, plants were swept using an entomological net, and then the arthropods were subsequently collected with an entomological aspirator (Figure 2.3.3.1). Adding to the sampling effort defined in 2023, 8 additional transects were selected in Selvagem Grande to comprehensively cover all habitats. On Selvagem Pequena, three transects were prioritized in poorly sampled areas, avoiding seabird nesting areas. Four vegetation sweeping transects were also established on Ilhéu de Fora.

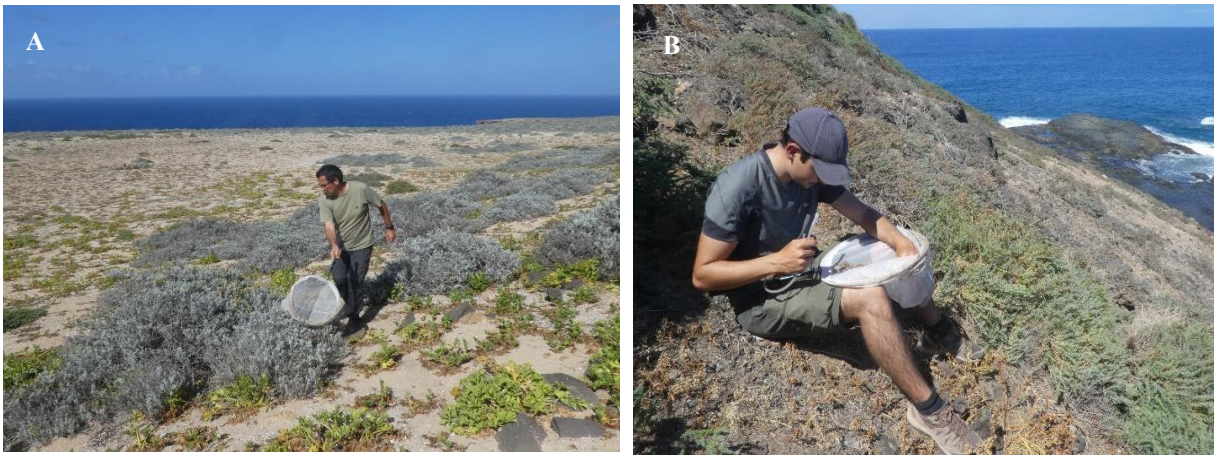

Figure 2.3.3.1. Vegetation sweeping transects in Selvagem Grande (A) and Selvagem Pequena (B). Photo courtesy: Mário Boieiro (B).

2.3.4 Specific plant sweeping

Sampling was also directed towards a single plant species to improve the knowledge on the associations of endemic beetles with the local plants. For each plant species, 5 sampling points distributed throughout the island were established. In each sampling point, we performed 7 swepts on plant individuals of the selected species with the aid of an entomological net. This method was applied on Selvagem Grande, where the selected plant species included *Astydamia latifolia* (L.fil.) Kuntze*, Chenopodium coronopus* Moq.*, Schizogyne sericea* (L.fil.) DC. *and Suaeda vera* (Figure 2.3.4.1).

Figure 2.3.4.1. Plant species targeted in specific plant sweeps: *Astydamia latifolia* (A), *Chenopodium coronopus* (B), *Schizogyne sericea* (C) and *Suaeda vera* (D). Photo courtesy: Mário Boieiro (B).

2.3.5 Active search

The active search was an effort to target areas with no previous records, aiming to improve spatial cover of the sampling protocol. Further, it was directed towards *Nicotiana glauca* deadwood*, Cistanche phelypaea* (L.) Cout. and *Patellifolia procumbens* (Chr.P.Sm. ex Hornem.) A.J. Scott, Ford-Lloyd &

J.T. Williams stalks, in search of specific endemic beetles that develop in these plants (Figure 2.3.5.1). The first two plant types were successfully examined, but the latter could not be sampled during the visit to the smaller islands. In both Selvagem Pequena and Ilhéu de Fora, the method was complementary to the vegetation transects, by targeting beetles with epigeal habits, since it was not possible to set pitfall traps on these islands.

Figure 2.3.5.1. Direct sampling of endemic Coleoptera: Active search on Selvagem Grande (A); The desert hyacinth (*Cistanche phelypaea)*, a parasitic plant that grows on *Suaeda vera* (B); Dry log of a tree tobacco plant (*Nicotiana glauca*) (C). Photo courtesy: Mário Boieiro (A).

2.4 Endemic beetle species list

From the total number of endemic coleopteran taxa, only the endemic species were selected, as the IUCN Red List requires a species-level assessment before any evaluation directed to the subspecies and subpopulations (IUCN, 2024). Hence, a single endemic subspecies, *Leipaspis caulicola oceanica* Wollaston, 1865, was excluded from the analysis. This subspecies is present on all three Selvagens islands, while its nominotypical taxon is found in the Canary Islands (Stüben, 2016). The list was compiled using previous collection records, recent checklists (Oromí et al., 2010; Arechavaleta and Oromí, 2015; Stüben, 2016) and updates the latest species checklist of the Selvagens archipelago (Borges et al., 2008). Overall, 21 endemic species, from nine beetle families, were selected for assessment of extinction risk using the IUCN methodology (Table 2.4.1).

Table 2.4.1. List of the endemic beetle species of Selvagens archipelago. Species are listed alphabetically by family and subfamily. The species *Laparocerus garretai* Uyttenboogaart, 1940 has two subspecies: the nominotypical subspecies *Laparocerus garretai garretai* Uyttenboogaart, 1940, occurring only in Selvagem Grande and *Laparocerus garretai albosquamosus* Machado, 2011, present in Selvagem Pequena and Ilhéu de Fora.

Family	Subfamily	Species
Anobiidae	Ptininae	*Sphaericus bicolor* Bellés, 1982
		Sphaericus selvagensis Bellés, 2001
Carabidae	Harpalinae	*Nesacinopus pelagicus* (Wollaston, 1860)
	Lebiinae	*Cymindis paivana* (Wollaston, 1860)
Cerambycidae	Lamiinae	*Deucalion oceanicum* Wollaston, 1854
Curculionidae	Cossoninae	*Caulotrupis mauli* (Folwaczny, 1972)
		Leipommata oromiana Osella, 1978
	Cryptorhynchinae	*Aeoniacalles neptunus* (Wollaston, 1854)
		Echinodera pallida Israelson, 1985
		Ficusacalles oceanicus (Stüben, 2002)
	Entiminae	*Laparocerus garretai* Uyttenboogaart, 1940
Dasytidae	Rhadalinae	*Aplocnemus zinoi* Stüben, 2016
Elateridae	Cardiophorinae	*Coptostethus oromii* (Cobos, 1978)
Malachiidae	Malachiinae	*Attalus oceanicus* Evers, 1971
		Ifnidius atlanticus Evers, 1981
Staphylinidae	Aleocharinae	*Oligota selvagensis* Assing, 2000
	Paederinae	*Leptobium paivae* (Wollaston, 1865)
Tenebrionidae	Pimeliinae	*Hegeter latebricola* Wollaston, 1854
	Tenebrioninae	*Gonocephalum dilatatum* (Wollaston, 1854)
		Nesotes leacoccianus (Wollaston, 1854)
		Nesotes monodi Alluaud, 1935

2.5 Data analysis

2.5.1 Information compilation

For the analysis of information collected, all the historical and recent monitoring data was compiled in a database following the Darwin Core standards. The Darwin Core format allows for standardization of biological data using predefined terms, facilitating the sharing of information among researchers. The compiled data will be made publicly available through the GBIF platform (Figure 2.5.1.1).

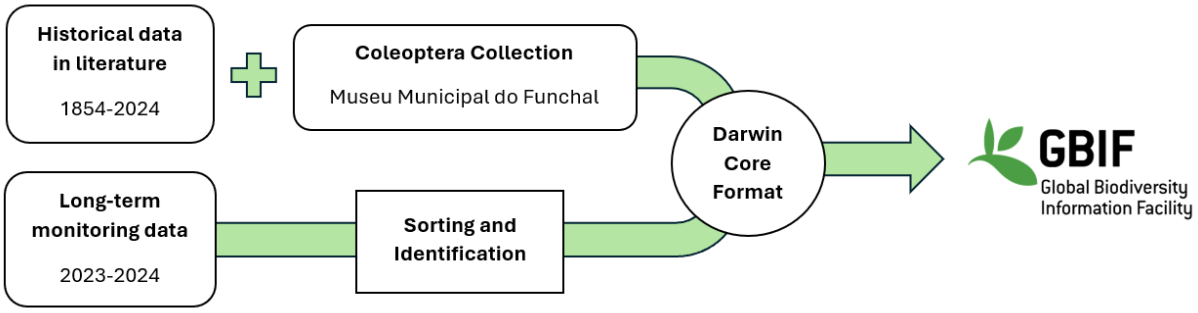

Figure 2.5.1.1. Diagram of the data collection and standardization process on the endemic Coleoptera species of Selvagens archipelago.

2.5.2 Statistical analysis

To analyze the associations between endemic beetles and selected plant species, assumptions on using parametric analysis were first assessed. Data normality was evaluated using the Shapiro-Wilk test, while homoscedasticity was tested using Levene's test, implemented via the "car" package (Fox and Weisberg, 2018). Given the non-parametric nature of the data, a Kruskal-Wallis's test was used to compare groups. When this test indicated statistical significance, a post-hoc Dunn's test was conducted for pairwise comparisons. The statistical analyses were conducted using RStudio program, with the R statistical environment (version 4.4.2) (R Core Team, 2024). The "ggplot2" package (Wickham, 2016) was used for data visualization. The significance level of 0.05 was adopted in all subsequent tests.

2.5.3 IUCN species extinction risk assessments

The extinction risk assessments followed the IUCN Red List criteria and guidelines (IUCN, 2024). For the species under evaluation, the application of these criteria results in the attribution of one out of eight well-defined categories (Figure 2.5.3.1). The Data Deficient (DD) category enlists species with insufficient data for a comprehensive evaluation, encouraging the collection of the necessary information for a future assessment. Following an upward trend in extinction risk, the Least Concern (LC) and Near Threatened (NT) statuses are the most basal ranks indicating no immediate threat but still warranting conservation attention. The categories Vulnerable (VU), Endangered (EN) and Critically Endangered (CR) are collectively referred to as threatened, revealing that the survival of the species is menaced and conservation measures are needed to ensure its survival. Once a species ceases to exist in its natural habitat, but remains *ex-situ*, the status Extinct in the Wild (EW) applies. If the previous statement is not met the species is declared Extinct (EX). The CR category may also include a tag (Possibly Extinct) to designate species, which based on available evidence are likely extinct, but still have remote chances of being extant.

Whenever possible, the five IUCN Red List criteria (from A to E) should be considered to set a category for a species under evaluation. However, the lack of quantitative information on species population sizes and trends, as often occurs for most terrestrial arthropods, prevents the application of specific criteria, namely A, C and E. For this reason, most assessments of terrestrial arthropods rely on the application of criteria B and/or D – both related with species geographic ranges (Cardoso et al., 2011a).

These two criteria are supported by the estimation of geographic distribution metrics, namely the Area of Occupancy **(**AOO) and the Extent of Occurrence **(**EOO), usually measured in square kilometers. The AOO is a scaled metric that reflects the area of suitable habitat currently occupied by the species, typically in cells of a grid 2x2km (4km^2). The EOO refers to the total area in which a species is found, including all known and potential habitats, providing a broader view of its distribution. If the EOO is smaller than the AOO, it was matched to the same value of the AOO to maintain consistency with the definition of AOO, as an area within the EOO (IUCN, 2024). Furthermore, the application of these IUCN criteria involves the understanding of several other concepts related to populations dynamics, fragmentation, threats and number of locations (IUCN, 2024). Those were applied and complemented with information on species' ecology and other attributes. Also, each assessment includes detailed information on the threats that influence species survival as well as conservation actions in place and recommendations (IUCN, 2024; https://www.iucnredlist.org/).

Since the IUCN assessments require estimation of distribution ranges, the AOO and EOO metrics were calculated for each species using the online GeoCat platform (Bachman, 2011; https://geocat.iucnredlist.org/). The collection specimens with no coordinates, but with information on the collection site were georeferenced, with a minimum of 30m and maximum of 150m radius of uncertainty. For those species whose distribution on one of the islands could not be determined from the collection specimens, but whose presence was confirmed in the literature, a virtual point was assigned on the island. If previous collected specimens revealed their presence on a specific habitat/plant, it was attributed a point on that site. In case of not being possible to infer the specific habitat/plant, a central point with the uncertainty radius was placed on the same island.

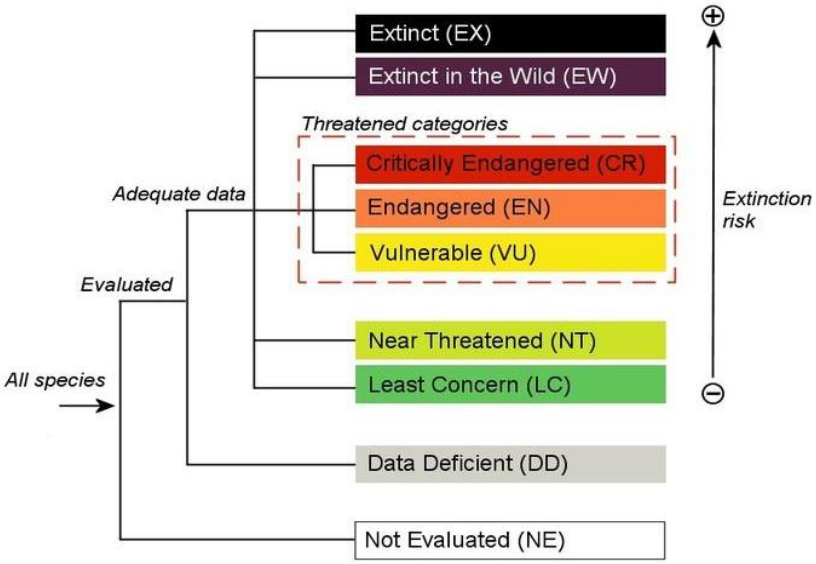

Figure 2.5.3.1. Structure of the IUCN Red List Categories. Adapted from IUCN (2024).

3. Results

3.1 Biodiversity monitoring data

During the 2023 monitoring campaign, 10 endemic beetle species were detected on Selvagem Grande. Following the long-term monitoring protocol in 2024, all previously identified endemic species were recorded again, with the addition of *Oligota selvagensis* Assing, 2000. The additional sampling efforts implemented on Selvagem Grande also led to the detection of *Caulotrupis mauli, Echinodera pallida* Israelson, 1985, and *Gonocephalum dilatatum* (Wollaston, 1854).

In total, during the 2024 expedition, 14 endemic beetle species were collected out of the 18 known to occur on Selvagem Grande. During the brief visit to the smaller islands, 6 of the 17 endemic species were detected on Selvagem Pequena. Furthermore, *Attalus oceanicus* Evers, 1971 and *Leptobium paivae* (Wollaston, 1865) were for the first time recorded on Ilhéu de Fora. As a result, 11 species were collected on Ilhéu de Fora out of the 14 extant.

Overall, the 2 sampling campaigns of the long-term monitoring program led to novel geographic records, although the following endemic species were not found: *Aplocnemus zinoi* Stüben, 2016, *Ficusacalles oceanicus* (Stüben, 2002), *Ifnidius atlanticus* Evers, 1981, *Nesotes monodi* Alluaud, 1935 and *Leipommata oromiana* Osella, 1978.

Therefore, Selvagem Grande currently hosts the majority of the endemic beetle species, with 15 species also distributed across the other islands, and 3 single-island endemics: *Aplocnemus zinoi, Nesotes monodi and Oligota selvagensis.* Selvagem Pequena is home to 17 endemic species, of which, *Ifnidius atlanticus* is island-exclusive. Ilhéu de Fora contains 14 endemic species, with only 1 exclusive species, the longhorn beetle *Deucalion oceanicum* (Table 3.1.1).

Table 3.1.1. Endemic beetle species richness in each island of the Selvagens archipelago.

	Selvagem Grande	**Selvagem Pequena**	**Ilhéu de Fora**
Endemic species richness	18	17	14
Single-island endemics	3	1	1

In both sampling seasons, new records of beetle taxa were found for the Selvagens archipelago. In 2023, we recorded *Phloeonomus pusillus* (Gravenhorst, 1806) cf. on Selvagem Grande, a species also found in the Canary Islands and Madeira (Borges et al., 2008), as well as 1 species from the family Coccinellidae. In 2024, this coccinellid was again recorded, along with 1 species from the family Oedemeridae and another from the family Anthicidae, which was only detected on Selvagem Pequena. These specimens are currently under study before being officially reported as new records for the Selvagens archipelago.

The specific plant sweeping yielded various arthropod taxa, including 5 beetle species. However, only 2 endemic beetles were found using this method. Those species were *Attalus oceanicus* Evers, 1971 and *Sphaericus bicolor* Bellés, 1982.

Throughout both monitoring periods, no clear association was observed between *Attalus oceanicus* and the selected plant species (Kruskal-Wallis chi-squared = 4.2195, *P*-value = 0.2387). However, the relative abundance of the endemic beetle *Sphaericus bicolor* showed statistical differences between plant species (Kruskal-Wallis chi-squared = 8.9748, *P*-value = 0.0296). This species was significantly more abundant in *Chenopodium coronopus* over *Schizogyne sericea* (Dunn's test Z = 2.8931, *P*-value = 0.0038) and *Suaeda vera* (Dunn's test Z = 2.0142, *P*-value = 0.0440). No specimens of either endemic species were found on *Schizogyne sericea* (Figure 3.1.1).

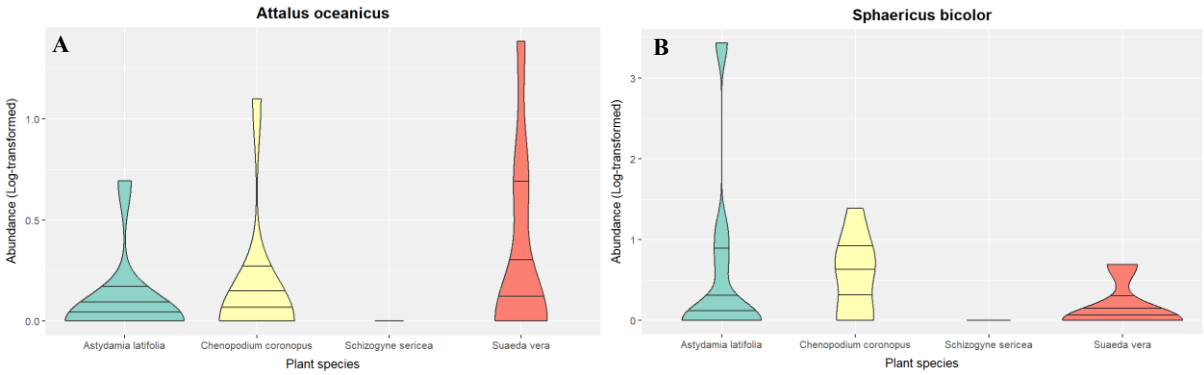

Figure 3.1.1. Boxplots of the abundance (Log-transformed) of the endemic beetle species in each selected plant species: *Attalus oceanicus* (A) and *Sphaericus bicolor* (B).

3.2 Habitat species richness

In Selvagem Grande, the highest number of species occurs in the rocky ground habitat dominated by *Suaeda vera* and *Schizogyne sericea,* inside the caldera (Annex 2.2.2.2.1), as well as along the cliffs and coastline, with a total of 15 species (Figure 3.2.1). The three species exclusive to this island (*Aplocnemus zinoi, Nesotes monodi* and *Oligota selvagensis*) can be found in the first habitat. Additionally, *Aplocnemus zinoi* and *Oligota selvagensis* are also present in the sandy ground habitat dominated by *Schizogyne sericea*, known as "Chão dos caramujos", which supports at least 13 endemic species.

On Selvagem Pequena, 15 species are localized around Pico do Veado, particularly on the northwest slope. Additionally, many endemic species are found along the coastline in the supratidal zone, where the single record of *Ifnidius atlanticus* was made. The rocky habitat dominated by *Autonoe madeirensis* (Menezes) Speta was not sampled and there is no historical data on the presence of endemic beetles in this area. Nevertheless, we suspect that this habitat can maintain at least 6-9 endemic species due to its favorable features such as presence of rocks, and for being contiguous with the species rich coastal habitats.

On Ilhéu de Fora, the area covered by *Euphorbia anachoreta* shelters 10 endemic species, including the longhorn beetle *Deucalion oceanicum*. Similarly, the rocky outcrop in the northwest sector of the island also harbors the same number of endemic beetle species. Overall, sandy areas with poor plant species richness and less complex vegetation structure had lower numbers of endemic beetle species (Figure 3.2.1).

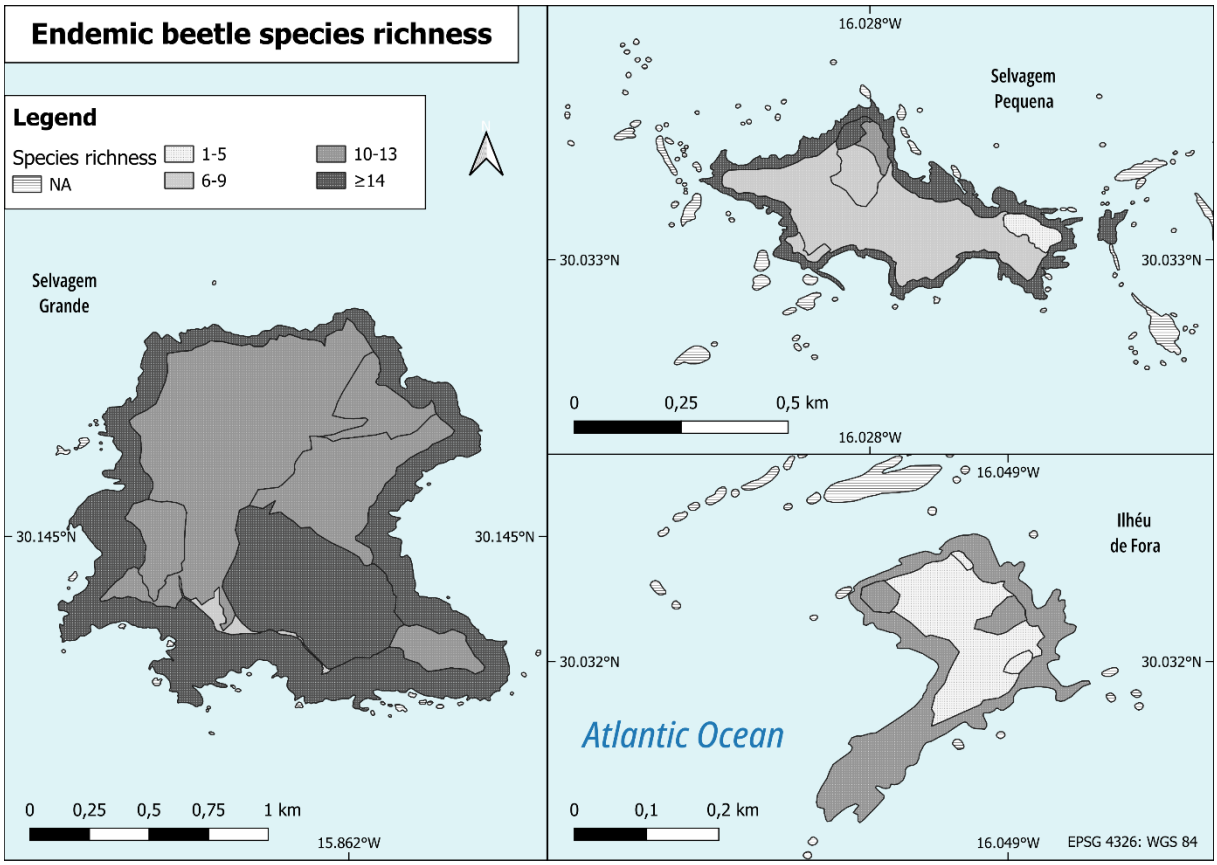

Figure 3.2.1. Species richness distribution of endemic beetles on each island of the Selvagens archipelago. The map was adapted from the Official Administrative Map of Portugal (CAOP - version 2023) and was generated with QGIS v.3.36.0.

3.3 IUCN assessments

The 21 endemic beetle species were successfully assessed for the IUCN Red List and the assessments are presented in more detail in Annex 3.3.1. Two endemic beetle species were classified as Data Deficient (DD), while 19 showed varying levels of extinction risk. The majority of species were classified as not threatened, with 14 categorized as Least Concern (LC) and two as Near Threatened (NT). The remaining three endemic beetle species are currently threatened: *Leipommata oromiana* is listed as Vulnerable (VU), *Deucalion oceanicum* is classified as Critically Endangered (CR) and *Ifnidius atlanticus* is assessed as Critically Endangered (CR Possibly extinct) (Table 3.3.1).

Selvagem Pequena hosts the highest number of threatened and NT species, followed by Ilhéu de Fora. In contrast, there are fewer species classified as threatened or NT on Selvagem Grande, but this island harbors the single-island endemics *Aplocnemus zinoi and Nesotes monodi,* both classified as DD, since there is still insufficient information to support their assessmen

Table 3.3.1. Summary table of the IUCN species extinction risk assessments of the endemic beetle species of the Selvagens archipelago. Selvagem Grande (SG), Selvagem Pequena (SP), Ilhéu de Fora (IF), Uncertain presence (?), New records for the island (*), Area of Occupancy (AOO) and Extent of Occurrence (EOO). The criteria applied and category assigned are also indicated.

Family	Species	Island			AOO (km^2)	EOO (km^2)	Habitat restricted	Criteria	Category
Anobiidae	*Sphaericus bicolor*	SG	SP	IF	20	36.7	No		LC
	Sphaericus selvagensis	SG	SP	IF	20	28.9	No		LC
Carabidae	*Nesacinopus pelagicus*	SG	SP	IF	16	28.9	No		LC
	Cymindis paivana	SG	SP	IF	16	30.7	No		LC
Cerambycidae	*Deucalion oceanicum*			IF	4	4	Yes	CR B1ab(iii,v)+2ab(iii,v)	CR
Curculionidae	*Caulotrupis mauli*	SG	SP		8	11.0	No		LC
	Leipommata oromiana	SG	SP		8	8	Yes	VU D2	VU
	Aeoniacalles neptunus	SG?	SP	IF	16	16	No		LC
	Echinodera pallida	SG	SP	IF	20	29.9	No		LC
	Ficusacalles oceanicus		SP	IF	12	12	Yes		NT
	Laparocerus garretai	SG	SP	IF	16	31.5	No		LC
Dasytidae	*Aplocnemus zinoi*	SG			4	4	Unknown		DD
Elateridae	*Coptostethus oromii*	SG	SP?		12	12	No		LC
Malachiidae	*Attalus oceanicus*	SG	SP	IF*	16	28.3	No		LC
	Ifnidius atlanticus		SP		4	4	Yes	CR B1ab(iii)+2ab(iii)	CR (Possibly extinct)
Staphylinidae	*Oligota selvagensis*	SG			8	8	No		LC
	Leptobium paivae	SG	SP	IF*	16	26.2	No		LC
Tenebrionidae	*Hegeter latebricola*	SG	SP	IF	20	36.7	No		LC
	Gonocephalum dilatatum	SG	SP	IF	20	36.2	Yes		NT
	Nesotes leacoccianus	SG	SP	IF	16	29.2	No		LC
	Nesotes monodi	SG			8	8	Unknown		DD

4. Discussion

Following IUCN guidelines, the assessments here presented categorized the 21 endemic beetles of Selvagens as follows: 14 LC, 2 NT, 1 VU, 2 CR and 2 DD. By combining historical and monitoring data, we showed that endemic beetle species richness is highest in the coastline habitat. This zone is one of the highest priority habitats for conservation in the entire archipelago due to its limited area, exposure to threats and also harbors higher numbers of near-threatened and threatened species. The use of specific plant sweeping led to further ecological insights concerning the future of the central plateau of Selvagem Grande, where the native vegetation continues to expand since the eradication of the non-native mammals.

Conservation and ecology remarks

In Macaronesian archipelagos, several efforts have been addressed to foster the conservation of island endemic arthropod species, with different outcomes in the different archipelagos. For example, in the Canary Islands, two catalogues of threatened species were elaborated and presently several arthropod species are protected by law (Ley 4/2010; Real Decreto 139/2011) and benefit from conservation efforts by the regional authorities. In the Azores, following the assessment of priority conservation species in several taxonomic groups (Martín et al., 2008), some arthropods were identified as in conservation need and later these same species were included in specific legislation (DLR n.º15/2012/A). This important step, together with additional efforts to Red List the Azorean arthropod endemic species (Borges et al., 2017), were key to obtain funding to support conservation efforts targeting Endangered and Critically Endangered beetle species (Life Beetles, 2020). In Madeira, despite the identification of a few arthropod species in need for conservation (e.g. Martín et al., 2008; Van Swaay et al., 2010; Hochkirch et al., 2016; Cardoso et al., 2017; Cálix et al., 2018; Vujić et al., 2022) none has been included in specific legislation and only a few projects are being carried out targeting two threatened endemic species, the Desertas wolf spider *Hogna ingens* (Blackwall, 1857) and the longhorn beetle *Deucalion oceanicum* (Cardoso et al., 2016; Mossy Earth, 2024).

The historical data complemented by the recent data from the 2023-2024 monitoring expeditions here presented provide a clearer picture of the current population status, distribution, and ecology of the endemic beetle species of Selvagens. Conversely, the combined use of different methods allowed for the detection of most species across the islands and in less-sampled habitats.

The new records of *Attalus oceanicus* and *Leptobium paivae* from Ilhéu de Fora were expected, given their presence on the neighboring island of Selvagem Pequena and the similar habitat conditions in which they were found. Some species, such as *Oligota selvagensis*, were only detected during the 2024 monitoring expedition. In this case, the species was absent in 2023, but in the following year it was present on all sites sampled by pitfall traps. We suspect that the weather conditions (with rainfall) during this expedition were favorable for the species' activity and, consequently, its detectability. Other species were only found due to the additional sampling efforts undertaken in 2024. Through new sampling points on Selvagem Grande, a more peripheral distribution of *Gonocephalum dilatatum* was recorded, suggesting its association to cliffs and coastlines.

Plant sweeping targeted at specific species suggest that the endemic beetle *Attalus oceanicus* utilizes different plant species as hosts, including *Astydamia latifolia*, *Chenopodium coronopus* and *Suaeda vera* (Figure 3.1.1). On the other hand, *Sphaericus bicolor* seems to show a preference for *Chenopodium coronopus* over *Suaeda vera* and *Schizogyne sericea*. Furthermore, these two beetle species are likely

to be absent or less abundant on *Schizogyne sericea*. This observation is consistent with previous research highlighting the insecticidal properties of essential oil extracted from *Schizogyne sericea* (Benelli et al., 2019).

It is still possible that these species utilize other plant species not sampled with this protocol, as polyphagy is a known characteristic of many insect herbivores in island ecosystems with low plant diversity (Ribeiro et al., 2005; Rego et al., 2019). For instance, the endemic weevils *Aeoniacalles neptunus* (Wollaston, 1854) and *Ficusacalles oceanicus*, beyond depending on their host plants *Patellifolia procumbens* and *Cistanche phelypaea*, respectively, have also been observed to develop on *Euphorbia anachoreta* on Ilhéu de Fora (Arechavaleta et al., 2001). Unexpectedly, other endemic beetle species, such as those from the Curculionidae family, were not collected during sweeping, despite being commonly reported on vegetation. This suggests that these species may be more closely associated with the dead leaf litter.

The following five species were not detected during the monitoring: *Aplocnemus zinoi*, *Ficusacalles oceanicus*, *Ifnidius atlanticus*, *Nesotes monodi* and *Leipommata oromiana*. The endemic beetles *Ficusacalles oceanicus* and *Leipommata oromiana* were not found, likely due to the need for specific search techniques. For *Aplocnemus zinoi* and *Nesotes monodi*, the lack of detection may be attributed to the sampling season, while *Ifnidius atlanticus* was searched during a favorable season based on collection date comparisons with its congeners (López et al., 2014). Additionally, during the active search for endemic species, was noted the absence of the weevil *Aeoniacalles neptunus* on Selvagem Grande, despite the presence of adults and pupae on Selvagem Pequena and Ilhéu de Fora. The search for this species on Selvagem Grande was also unsuccessful during previous expeditions (Stüben, 2016). Nevertheless, the existence of specimens in collections confirms the species' historical presence on this island, being crucial to evaluate if the species is still present on this island and assess its population size.

IUCN assessments

Overall, the extinction risk assessments indicate that most of endemic beetle species are currently not threatened, with 14 species classified as LC (Table 3.3.1). The populations of most species of the archipelago are apparently stable, with no significant threats. However, conservation needs should not be overlooked, given the existence of two species NT and three in threatened categories.

This outcome for endemic beetles of Selvagens can, in part, be attributed to the successful eradication of IAS on Selvagem Grande, which contributed to substantial improvements in habitat quality (Santos et al., 2015; Oliveira et al., 2023). For example, these efforts resulted in significant increases in abundance of Carabidae and Tenebrionidae (Oliveira et al., 2010). Additionally, the level of protection provided by the islands' designation as a Natural Reserve has reduced human-related threats such as habitat loss and pollution.

As a result, Selvagem Grande maintains the lowest number of species classified as threatened or NT, although the exclusive endemics *Aplocnemus zinoi* and *Nesotes monodi* remain assessed as DD (Table 3.3.1) and should be included in future conservation efforts until a definitive extinction risk status can be assigned. Selvagem Pequena harbors the highest number of threatened and NT species, with Ilhéu de Fora following closely. This can be attributed to their smaller land areas and to the threats currently affecting these taxa. Both Selvagem Pequena and Ilhéu de Fora are particularly vulnerable to rising sea levels, as they are low-lying islands where reductions in land area have already been observed (Moreira, 1991). Additionally, the coastlines of these islands are frequently affected by marine pollution, including

plastic debris, clothing fabrics, and fishing gear such as oil drums. Selvagem Pequena was also impacted by oil contamination from the wreck of the "Cerno" ship, which ran ashore in 1971 and that was not contained (Friedlander et al., 2016). Some studies following oil spills documented the persistence of contamination in sandy beaches with loss of invertebrate communities in subtidal and uppertidal zones. It is possible that there were detrimental impacts on coastal fauna, but today they should be minimal, as in other cases there were significant recoveries within a decade at most (Bejarano and Michel, 2016).

Previous studies emphasize the need for caution when conducting extinction risk assessments for invertebrates, since they may not always be robust (Cardoso et al., 2011a). In the context of oceanic islands, the application of the IUCN criteria can lead to clustering species in high threat categories and unrealistic conservation priorities, especially when it comes to endemic species (Romeiras et al., 2016). In this regard, the assessments of *Leipommata oromiana* (VU), *Deucalion oceanicum* (CR) and *Ifnidius atlanticus* (CR Possibly extinct) were primarily conducted with the knowledge of the restricted space they inhabit and significant threats they face (Annex 3.3.1). For comparison, two out of the four Selvagens endemic spider species are currently threatened, due to their restricted occurrence and presence of competing invasive congeners (Cardoso et al., 2017). The assessments of the 68 endemic beetle species in the Azores archipelago led to classification of 63 in threatened categories (IUCN, 2025). In this matter, the Azores faces greater threats than Selvagens, with more than 95% of its native forests already destroyed, leading to an “extinction debt”. This phenomenon occurs when the substantial reduction in habitat area/quality promotes an ongoing process of extinction, unless conservation measures are carried out (Triantis et al., 2010). Although on a smaller scale, this phenomenon may also be occurring or become worse in the future in the Selvagens archipelago, particularly on Selvagem Pequena and Ilhéu de Fora, which are islands nearing the end of their life cycle. Similarly, *Ifnidius atlanticus* may be an example of a "silent extinction", as the species has not been recorded since 1976. This phenomenon refers to the gradual decline of species that goes unnoticed until they are functionally extinct. This trend has been observed in various species worldwide, particularly among neglected groups such as arthropods. For example, the butterfly *Pieris wollastoni* (Butler, 1886), an endemic species of Madeira Island, was not initially suspected of being threatened, only to later be confirmed as extinct, just before any conservation measure could be implemented (Gardiner, 2003).

Priority sites and future perspective

To identify priority locations for conservation efforts, these were defined based on species richness and the presence of species with critical conservation statuses.

On Selvagem Grande, the caldera provides a habitat for 15 endemic beetle species (Annex 2.2.2.2.1, Figure 3.2.1), including the three exclusive endemics. Despite its lower species richness, the "Chão dos Caramujos" is also a priority habitat, as it supports at least 13 species (two single-island endemics) and is currently the only known site on the island where the weevil *Leipommata oromiana* (VU), has been recorded.

On Selvagem Pequena, the northeastern slope of Pico do Veado appears to be a hotspot for biodiversity (Annex 2.2.2.2.2, Figure 3.2.1). This slope likely accumulates more rainwater, creating favorable edaphoclimatic conditions for plant development and the establishment of soil invertebrates. For instance, this habitat is home to the remaining population of the endemic and highly threatened plant *Argyranthemum thalassophilum* (EN) and it is also where *Leipommata oromiana* was collected.

In comparison, on Ilhéu de Fora, the rocky outcrops with vegetation exhibit similar edaphoclimatic conditions to the previous habitat. This habitat supports 10 endemic beetle species (Annex 2.2.2.2.3, Figure 3.2.1), including the sole records of *Attalus oceanicus* and *Leptobium paivae* on the islet, as well as plants and other invertebrate species not found elsewhere on the islet. Likewise, the rocky outcrops with the endemic spurge *Euphorbia anachoreta* are considered a priority habitat due to the high number of endemic beetle species and its role in harboring *Deucalion oceanicum* (CR) and other species assessed as NT (Table 3.3.1).

In general, the species richness of endemic beetles is high along the coastline, making it a top conservation priority, particularly in Selvagem Pequena, where two threatened species and two NT species can be found. However, it is important to mention that some habitats on Selvagem Grande, such as the caldera, are better sampled due to the monitoring protocol's sampling design. On the other hand, other habitats can be underestimated due to difficult/restricted accesses and the brief stay on the smaller islands, which restricted sampling across all habitats. To address these gaps, presence data and ecological notes from both historical records and recent monitoring campaigns were thoroughly combined.

The habitat area and quality along the coastline are expected to continue decreasing due to the ongoing threats of climate change and marine pollution. Assuming the worst-case scenario drawn by the Intergovernmental Panel on Climate Change (IPCC), the coastline could be affected by the projected rise in mean sea level of 0.63 to 1.01 m over the next 100 years (SSP5-8.5) (IPCC, 2023). Even under a low-emission scenario for the same period, with a projected rise of 0.28 to 0.55 m (SSP1-1.9), simulations indicate substantial reductions in habitat area (Climate Central, 2025). This can result in nearly all the coastline habitat of Selvagem Pequena and Ilhéu de Fora becoming submerged. Additionally, those habitats at higher altitudes may also be impacted by climate change, with increased periods of drought, extreme temperatures, and storms at sea (IPCC, 2023). Furthermore, these islands may experience an increased accumulation of marine pollution along their shores. Although monitoring programs are currently underway on Selvagem Pequena, efforts to continuously remove the pollution are not yet in place (Oliveira et al., 2023). Thus, if no mitigation measures are implemented in the coming years, these changes could lead to a decline in habitat quality or even species extinction.

On the islet Ilhéu de Fora the single population of *Euphorbia anachoreta*, the host plant of *Deucalion oceanicum*, is also threatened with extinction. This plant species was assessed as CR with a very small population of mature individuals and very low recruitment (Martín et al., 2008; Rivers, 2017; Carvalho et al., 2021). The population is expected to decrease since the present threats are particularly worrisome. Sea level rise and the increase in extreme events will cause direct plant mortality and change habitat characteristics compromising its survival. Consequently, it is expected that these changes will also contribute to the decline of *Deucalion oceanicum* and lead to co-extinction. Although this topic often goes unnoticed in insects, some studies suggest that climate change is likely to foster co-extinctions by triggering phenological mismatches and resource overexploitation (Moir et al., 2014; Kehoe et al., 2021).

The presence of IAS remains a significant threat, although nearly eradicated in the archipelago. The accidental introduction of new taxa is probable, particularly on Selvagem Grande, due to ongoing human activity. Historical records reveal regular detections of invertebrate neotaxa that have arrived on the islands but failed to establish permanently (Stüben, 2016). Nevertheless, some of these species may persist and could pose a risk as potential invasives, as reported for the endemic spiders. Two invasive spiders (*Dysdera crocata* C.L. Koch, 1838 and *Oecobius navus* Blackwall, 1859) are major threats to

the threatened endemics *Dysdera aneris* (VU) and *Oecobius selvagensis* (CR) (Cardoso et al., 2017; Cardoso et al., 2018b).

Conservation measures

Due to significant threats pending, there is the need to implement conservation measures to safeguard the habitats and endemic biodiversity of the archipelago.

The longhorn beetle *Deucalion oceanicum* is a priority species for conservation. It is currently the focus of conservation efforts under the RESCUE project, which aims to promote the repopulation of *Euphorbia anachoreta* on other islands in the archipelago and simultaneously create new habitats for this endemic beetle (Mossy Earth, 2024). In the short-term, efforts are being addressed to improve the knowledge on species population size and ecology, but ex-situ conservation is also being considered.

The need to create additional refuge sites is a measure transversal to all islands, with a particular focus on Selvagem Pequena and Ilhéu de Fora due to the limited availability of favorable habitat with high endemic species richness. The use of stones and wooden planks could facilitate the establishment of beetles such as Carabidae, Curculionidae, Elateridae, Staphylinidae, and Tenebrionidae. This approach was previously suggested to be implemented in the archipelago by other researchers (Stüben, 2016).

In summary, this solution should involve placing rocks and wooden planks in more central areas of the islands, where rocky habitats transition into sandy, shrub-covered areas. On Selvagem Pequena, this measure could be implemented around Pico do Veado, while on Ilhéu de Fora, the rocky outcrop with *Euphorbia anachoreta* should be prioritized, since it can benefit *Deucalion oceanicum* by creating refuge for adults when they emerge. This initiative could create more favorable conditions for other endemic taxa, including *Ficusacalles oceanicus* and *Gonocephalum dilatatum*, which are currently assessed as NT.

On Selvagem Grande, the areas encompassing the protected nesting sites of the White-faced Storm Petrel are shared with most of the endemic beetle species (Annex 2.2.2.2.1, Figure 3.2.1), including the exclusive endemics. For instance, in the caldera and "Chão dos Caramujos" habitats, new refuges could be established to further support these beetle populations. In contrast, on Selvagem Pequena and Ilhéu de Fora, the seabirds nesting grounds cover nearly the entire island, but they host fewer beetle species (Annex 2.2.2.2.2, Annex 2.2.2.2.3, Figure 3.2.1). The presence of sandier soils may reduce endemic species richness, as these areas lack refuge sites such as loose rocks that would shelter them from harsh weather conditions. Adding refuges to these areas should not significantly impact the bird populations, considering the low abundance of coleopterans in the nests of Cory's shearwater (*Calonectris borealis*) (Wheater, 1986; Esteves, 2017). However, it should be confirmed whether a similar trend is observed in White-faced Storm Petrel nests and if this intervention may promote the establishment of other invertebrates that could potentially interfere with nesting.

The next monitoring campaigns should continue to track the population fluctuations of native beetles, particularly the endemics. The sampling effort in Selvagem Grande has been increased to better cover all the habitats, so this new sampling design on this island should be followed in future monitoring. It is recommended to expand the existing sampling protocol by incorporating methods that more effectively detect species living on or below the ground. Techniques like sifting and Berlese traps could help overcome challenges in detection of some endemic beetle species, namely the Curculionidae. Furthermore, it is advised sampling during autumn (October–December) to assess the population

dynamics across different seasons and to detect other species, such as the Selvagem Grande exclusives *Aplocnemus zinoi* and *Nesotes monodi*, which are currently listed as DD. The monitoring efforts can be expanded with new sampling points on Selvagem Pequena and Ilhéu de Fora to better monitor all habitats and their species, but avoiding methods that result in species mortality. Those on Selvagem Pequena should prioritize the search for *Ifnidius atlanticus*, ideally in early spring, as this single-island endemism is particularly threatened. Moreover, marine pollution must be contained and reduced with the necessary logistics to enhance the quality of the coastline habitat, which is shared by many endemic beetle species on the island.

Despite the above, precautionary measures should also be considered to ensure the early detection of IAS introduced through goods brought to Selvagem Grande. Additionally, efforts to raise awareness and promote these species to the public are encouraged. The formal inclusion of threatened species in specific conservation legislation is also recommended, as they are an integral part of the biodiversity of the Selvagens Islands Natural Reserve and the insular Portuguese endemic fauna.

5. Final considerations

Considering the limited number of studies on the rich endemic terrestrial fauna of the islands, this work sought to cover the largest portion of endemics of the Selvagens archipelago. It highlights the need for more research focused on insular arthropods and on their extinction risk assessments, as way to bring inconspicuous species to the public eye and attract crucial resources for their conservation.

The high number of endemic beetle species assessed at non-threat categories unveils the importance of the islands being classified as a Natural Reserve. It is necessary to perpetuate the level of protection, in order to promote and establish conservation policies and actions that protect the pristine ecosystem. However, the presence of three threatened species and two near-threatened species cannot be overlooked, especially in light of increasing threats from climate change and marine pollution. Conservation efforts improving habitat quality should be emphasized on the coastline habitat, standing out for its high species richness, but minding priority on species already at risk of extinction, as well as those on the verge of becoming threatened. Additionally, with two species classified as data deficient, it is necessary to follow the monitoring recommendations to ensure an informed protection of these single-island endemics.

Moreover, further ecological studies are necessary to better understand the role of these species within this intricate ecosystem. Here, we conclude that the abundance of at least one endemic species significantly differs between plant species during this season, being crucial for defining habitat-based conservation strategies for threatened species. Additionally, long-term monitoring on Selvagem Grande must continue and eventually be extended to the other islands to gain a comprehensive understanding of the entire set of species. Similarly, it is necessary to expand this approach and research to the remaining groups of endemic arthropods to encompass the rich biodiversity of the island, that is still waiting to be uncovered.

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Annexes

Annex 2.2.1.1. List of historical data consulted and used for the database on the endemic beetle species of Selvagens archipelago. References are listed chronologically.

Contents	Reference
Species description	Wollaston, T.V. (1854). Insecta Maderensia; being an account of the insects of the islands of the Madeiran group. J. van Voorst, London.
Species description	Wollaston, T.V. (1862). On the Coleoptera of the Salvages. *The Journal of Entomology*, 1(2), 84-93.
Species description	Wollaston, T.V. (1865). Coleoptera atlantidum. being an enumeration of the coleopterous insects of the Madeiras, Salvages, and Canaries. J. van Voorst, London.
Expedition catalogue	Fea, L. (1883). Le crociere dell'yacht Corsaro del Capitano armatore Enrico D'Albertis; V. Coleotteri. *Annali del Museo Civico di Storia Naturale di Genova,* 18, 759–774.
Expedition catalogue	Garreta, L. (1911). Les insects de l'île Grande Salvage. *Bulletin de la Société Entomologique de France*, 16(20), 392–397.
Expedition catalogue	Alluaud, C. (1935). Les coléoptères des Iles Salvages. *Revue française d'Entomologie*, 2(1), 35–44.
Expedition catalogue	Uyttenboogaart, D. L. (1940). Voyage de M. Ch. Alluaud aux îles Canaries (1889–1890) et à l'archipel de Madère (1938). Coléoptères curculionides (Contributions to the knowledge of the fauna of the Canary Islands, XXIV.). *Revue Française d'Entomologie*, 7, 49–69.
Species description	Evers, A.M. (1971). *Attalus oceanicus* nov. spec. (Col., Malach.). *Entomologische Blätter*, 66(3), 175–177.
Species description	Folwaczny, B. (1972). Neue palaearktische Cossoninen (12. Beitrag zur Kenntnis der palaearktischen Cossoninen). *Entomologische Blätter*, 68(2), 91–96.
Species description	Cobos, A. (1978). Sobre «*Cardiophorus*» atlanticos extracanarios del subgenero «*Coptostethus*» (Coleoptera, Elateridae). In: Contribución al estudio de la Historia Natural de las Islas Salvajes. Aula de Cultura de Tenerife, Santa Cruz de Tenerife, 145-150.
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Species description	Evers, A.M. (1981). *Ifnidius altlanticus* n. sp. (Col., Malachidae) von den Selvagens-Inseln. *Entomologische Blätter*, 77, 155–157.
Species description	Bellés, X. (1982). El primer representante de la familia Ptinidae (Col.) de las Islas Salvajes: *Sphaericus bicolor* n. sp. *Vieraea*, 11, 103–108.
Expedition catalogue	Serrano, A.R.M. (1983). Os Coleópteros do Arquipélago das Selvagens. *Actas del I Congresso Ibérico de Entomologia*, Léon, 2, 159-776.
Species description	Israelson, G. (1985). An *Echinodera* Wollaston from the Salvage Islands (Coleoptera, Curculionidae). *Bocagiana*, Funchal, 82.
Expedition catalogue	Erber, D. & Wheater, C.P. (1987). The coleoptera of the Selvagens Islands including a catalogue of the specimens in the Museu Municipal do Funchal. *Boletim do Museu Municipal do Funchal*, 39(193), 156-187.
Expedition catalogue	Serrano, A.R.M. (1987). Contribution à la connaissance des Coléoptères (Insecta, Coleoptera) de l´archipel des Îles Selvagens. *Bocagiana*, Funchal, 111.
Taxa revison	Bellés, X. (1994). El género *Sphaericus* Wollaston, 1854 (Coleoptera: Ptinidae). *Boletín de la Asociación Española de Entomología*, 18, 61-79.
Species description	Assing, V. (2000). A new species of *Oligota* Mannerheim from the Ilhas Selvagens (Coleoptera, Staphylindae). *Reichenbachia*, 33(37), 317–319.
Expedition catalogue	Arechavaleta, M., Zurita, N. & Oromí, P. (2001). Nuevos datos sobre la fauna de artrópodos de las Islas Salvajes. *Revista de la Academia Canaria de Ciencias*. 12(3-4), 83-99.
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Taxa revison	Stüben, P.E., Behne, L. & Bahr, F. (2001). Analytischer Katalog der westpaläarktischen Cryptorhynchinae / Analytical Catalogue of Westpalearctic Cryptorhynchinae. Teil/Part 1: *Kyklioacalles*, *Onyxacalles*, *Dichromacalles*, *Calacalles*, *Echinodera* (Col.: Curculionidae: Cryptorhynchinae). *SNUDEBILLER, Studies on taxonomy, biology and ecology of Curculionoidea*, 2(20), 59-119.
Species description	Stüben, P.E. (2002). Die Cryptorhynchinae von den Inseln Madeiras und Selvagens. Taxonomie, Ökologie, Biogeographie und Evolution

	(Coleoptera: Curculionidae). *SNUDEBILLER, Studies on taxonomy, biology and ecology of Curculionoidea*. 3(29), 88-195.
Taxa revison	Stüben, P.E., Behne, L. & Bahr, F. (2003). Analytischer Katalog der westpaläarktischen Cryptorhynchinae / Analytical Catalogue of Westpalearctic Cryptorhynchinae. Teil2/Part 2: *Acalles*, *Acallocrates* (Col.: Curculionidae: Cryptorhynchinae). *SNUDEBILLER, Studies on taxonomy, biology and ecology of Curculionoidea*, 4(36), 11-100.
Taxa revison	Assing, V., (2005). A revision of the genus *Leptobium* Casey (Coleoptera: Staphylinidae: Paederinae). *Stuttgarter Beiträge zur Naturkunde Serie A (Biologie)*, 673.
Museum catalogue	Ortega, G. (2005). Type-specimens of terrestrial arthropods in the entomological collection of the Museo de Ciencias Naturales de Tenerife (Canary Islands). *Vieraea*, 33, 201–240.
Museum catalogue	Machado, A. (2006). The type material of the species of *Laparocerus* Schönherr, 1834 (Coleoptera, Curculionidae, Entiminae). *Journal of Natural History*, 40(35-37), 2001–2055.
Taxa revison	Schimmel, R. (2008). The genus *Coptostethus* Wollaston from the Selvage Islands, with descriptions of two new species (Coleoptera: Elateridae). *Stuttgarter Beitraege zur Naturkunde Serie A (Biologie)*, 1, 351–355.
Taxa revison	Assing, V. (2009). A revision of *Leptobium* Casey. IV. Three new species and additional records (Coleoptera: Staphylinidae: Paederinae). *Stuttgarter Beiträge zur Naturkunde Serie A*, Neue Serie 2, 227–236.
Taxa revison	Stüben, P.E. & Astrin, J.J. (2009). Neue Erkenntnisse zur Taxonomie, Biologie und Ökologie der Cryptorhynchinae von den Makronesischen Inseln. 5. Beitrag: Madeira / Porto Santo / Desertas / Selvagens (Coleoptera: Curculionidae: Cryptorhynchinae). *SNUDEBILLER, Studies on taxonomy, biology and ecology of Curculionoidea*, 10(122), 48-86.
Taxa revison	Stüben, P. & Astrin, J. (2010). Molecular phylogeny in endemic weevils: revision of the genera of Macaronesian Cryptorhynchinae (Coleoptera: Curculionidae). *Zoological Journal of the Linnean Society*, 160, 40-87.
Taxa revison	Machado, A. (2011). Los *Laparocerus* Schoenherr, 1834 de las Canarias orientales, islas Salvajes y Marruecos (Coleoptera, Curculionidae, Entiminae). *Graellsia*, 67(2), 205-241.
Museum catalogue	Viñolas, A. & Masó, G. (2013). The collection of type specimens of the family Ptinidae (Coleoptera) deposited in the Natural History Museum of Barcelona, Spain. *Arxius de Miscellània Zoològica*, 11, 1–79.
Taxa revison	López, H., García, R. & Oromí, P. (2014). New Species of Soft-Winged Flower Beetles of the Genus *Ifnidius* Escalera, 1940 (Coleoptera:

	Malachiidae) from the Canary Islands. *African Entomology*, 22(2), 307-314.
Museum catalogue	Aguiar, A.M.F., & Carvalho, J.A. (2016). A catalogue of the surviving insect collection of the old Funchal Seminary Museum of Natural History. *Boletim Do Museu De História Natural Do Funchal*, 66(346), 41–95.
Expedition catalogue	Stüben, P.E. (2016). The Coleoptera of the Salvage Islands. Curculio Institute, Moenchengladbach.
Taxa revison	Stüben, P.E. (2016). The Macaronesian Islands an Encyclopedia of Curculionoidea (Coleoptera). Le Charançon (Internet journal). Available at:https://www.curci.de/institute/lecharancon/catalogue_4/catalogue_4.php
Taxa revison	Stüben, P.E. (2017). Die Curculionoidea (Coleoptera) von den Inseln Madeiras und den Selvagens. *SNUDEBILLER: Studies on taxonomy, biology and ecology of Curculionoidea*, 18(261).
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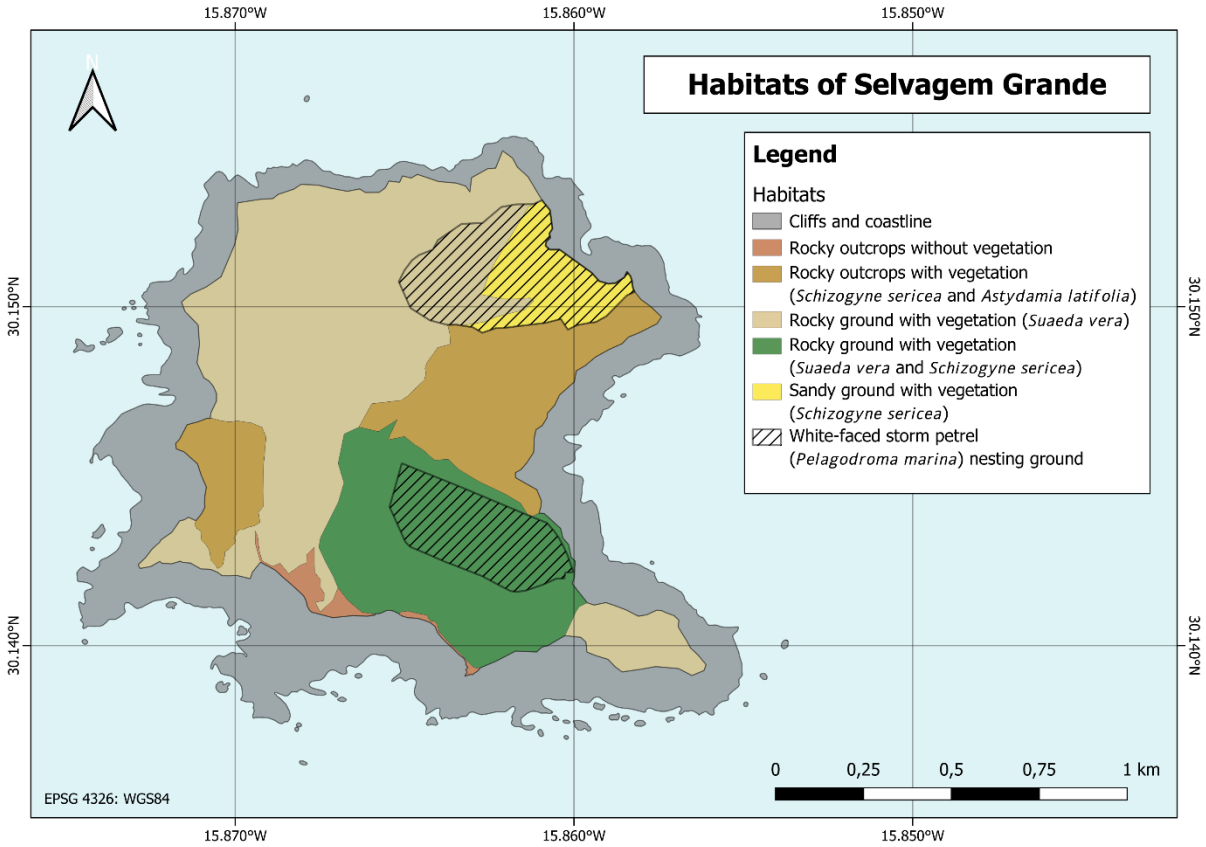
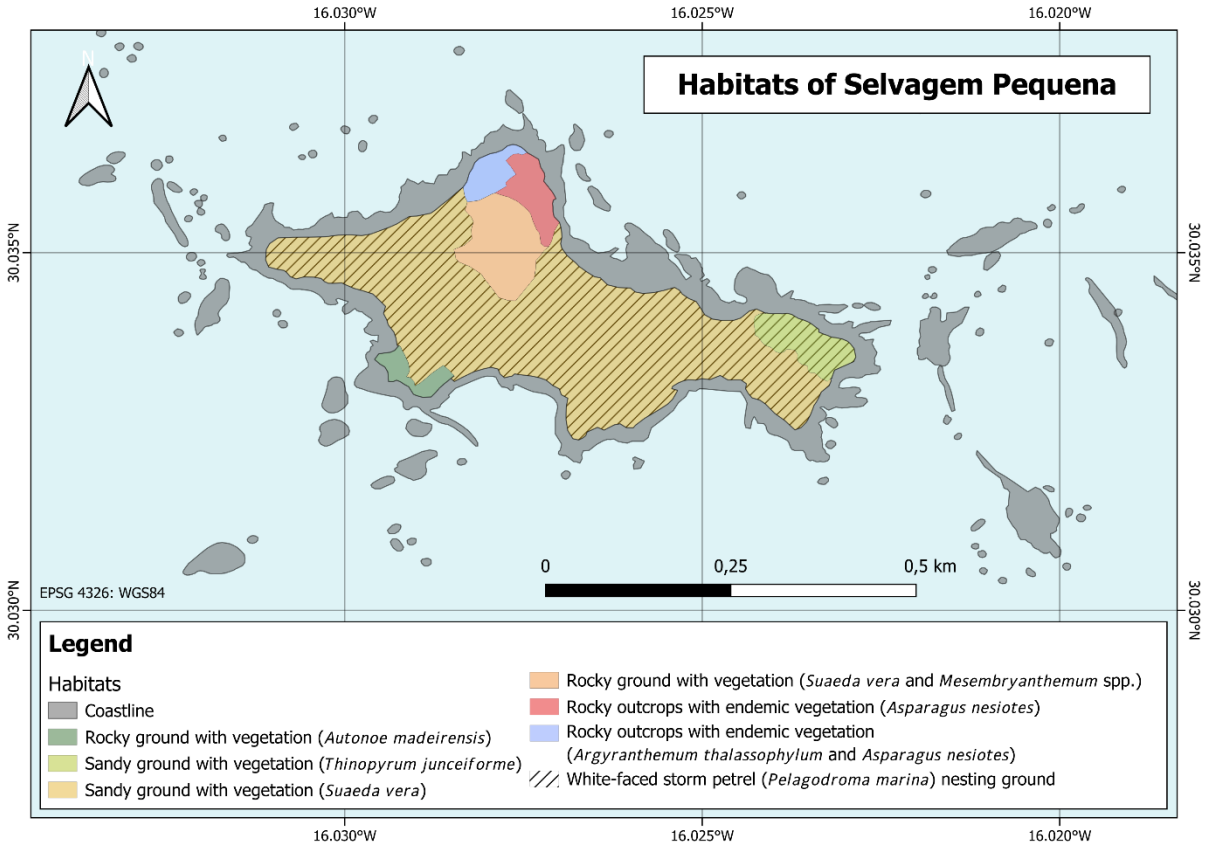
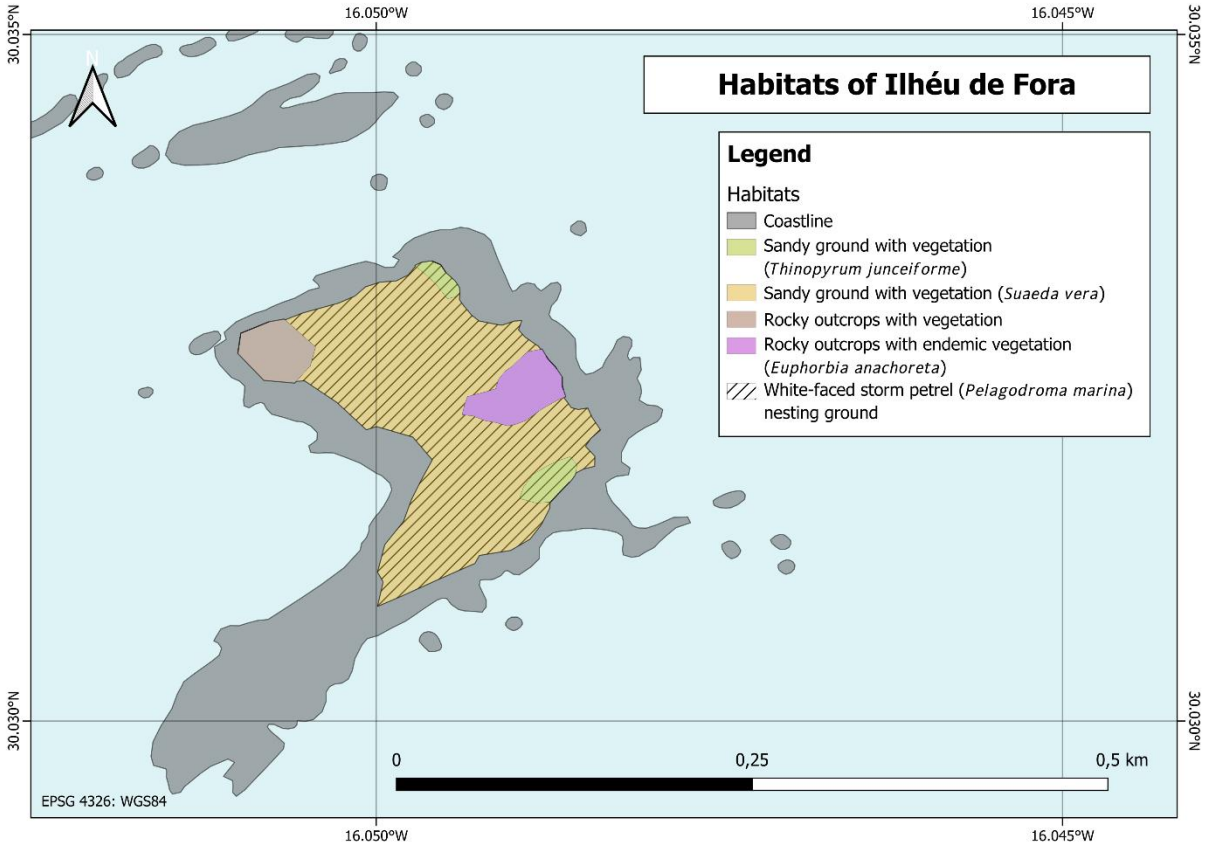
Taxa revison	Vives, E. & Trócoli, S. (2021). Cerambycidae de la Macaronesia (Coleoptera, Cerambycidae). *Faunitaxys*, 9(44).
Taxa revison	Stüben, P.E. (2022). Weevils of Macaronesia. Canary Islands, Madeira, Azores (Coleoptera: Curculionoidea). Curculio Institute, Mönchengladbach.



Annex 2.2.2.2.1. The habitats of Selvagem Grande. The map was adapted from the Official Administrative Map of Portugal (CAOP - version 2023) and was generated with QGIS v.3.36.0.



Annex 2.2.2.2.2. The habitats of Selvagem Pequena. The map was adapted from the Official Administrative Map of Portugal (CAOP - version 2023) and was generated with QGIS v.3.36.0.



Annex 2.2.2.2.3. The habitats of Ilhéu de Fora. The map was adapted from the Official Administrative Map of Portugal (CAOP - version 2023) and was generated with QGIS v.3.36.0.

Annex 3.3.1. Species Conservation Profiles

Here we present the detailed information on species taxonomy, geographic range, extent of occurrence (EOO), area of occupancy (AOO), locations, populations, subpopulations, habitats, ecology, threats, conservation actions and research needs. It supported the extinction risk assessments of all endemic beetle species of Selvagens archipelago following the IUCN Red List guidelines. This information includes a manuscript entitled "Species conservation profiles of the endemic beetles (Coleoptera) of the Selvagens archipelago, Portugal" under construction in the Pensoft online platform to be submitted to the Biodiversity Data Journal.

Sphaericus bicolor Bellés, 1982

Species information

Taxonomy

Kingdom	Phylum	Class	Order	Family
Animalia	Arthropoda	Insecta	Coleoptera	Anobiidae

Region for assessment:

- Global

Geographic range

Biogeographic realm:

- Palearctic

Countries:

- Portugal

Map of records (Google Earth):

Annex 3.3.1.1

Basis of EOO and AOO: Observed

Basis (narrative)

The EOO and AOO were calculated using all information available on species distribution, both published and unpublished data.

Min Elevation/Depth (m): 0

Max Elevation/Depth (m): 163

Range description

This species is found in Selvagem Grande, Selvagem Pequena and Ilhéu de Fora (Stüben, 2016).

Extent of occurrence

EOO (km2): 37

Trend: Unknown

Justification for trend

The species has an EOO of 37 km2, but it is expected to reduce as a consequence of sea level rise (IPCC, 2023; Climate Central, 2025).

Causes ceased?: No

Causes understood?: Yes

Causes reversible?: No

Extreme fluctuations?: Unknown

Area of occupancy

AOO (km2): 20

Trend: Stable

Causes ceased?: Yes

Causes understood?: Yes

Causes reversible?: Yes

Extreme fluctuations?: Unknown

Locations

Number of locations: Unknown

Justification for number of locations

There are no known current threats to this species.

Trend: Unknown

Extreme fluctuations?: Unknown

Population

Trend: Unknown

Causes ceased?: Unknown

Causes understood?: Unknown

Causes reversible?: Unknown

Extreme fluctuations?: Unknown

Subpopulations

Number of subpopulations: At least 3

Trend: Unknown

Extreme fluctuations?: Unknown

Habitat

System: Terrestrial

Habitat specialist: No

Habitat (narrative)

The species is widely distributed and is present in more sandy or rocky habitats of the Selvagens archipelago.

Trend in extent, area or quality?: Stable

Habitat importance: Major Importance

Habitats:

- 3.5. Shrubland - Subtropical/Tropical Dry
- 6. Rocky areas (e.g. inland cliffs, mountain peaks)
- 13.1. Marine Coastal/Supratidal - Sea Cliffs and Rocky Offshore Islands
- 13.3. Marine Coastal/Supratidal - Coastal Sand Dunes

Ecology

Size: 1.4 - 1.9 mm

Generation length (yr): Unknown

Dependency of single sp?: No

Ecology and traits (narrative)

The *Sphaericus* genus is mainly represented by species endemic to the islands of Macaronesia (Bellés, 2001). The endemic spider beetle *Sphaericus bicolor* is present in the three islands of the archipelago (Stüben, 2016). This small Anobiidae has around 1.4-1.9mm in body length and has a light sexual dysmorphism, in which females tend to be slightly larger and with shorter antennae (Bellés,1982). *S. bicolor* can be distinguished from its congeneric endemic species *S. selvagensis* by its longer and slender antennae and more ellipsoidal elytra (Bellés, 2001). It can be found by sieving mulch various plant species, particularly under the bushes of *Suaeda vera*, where feeds on the detritus (Oromí et al., 1978; Arechavaleta and Oromí, 2015; Stüben, 2016). During the March/April 2023 and 2024 monitoring campaigns, the species was found in abundance by sweeping of plants along transects and was widespread in Selvagem Grande. It was recorded with specific sweeping on *Astydamia latifolia*, *Centaurea melitensis*, *Chenopodium coronopus*, *Lobularia canariensis*, *Malva parviflora* and *Suaeda vera*, but was absent when searching on *Schizogyne sericea*. A substantial number of specimens were recorded on the

Poaceae *Thinopyrum junceum*, a plant limited to Ilhéu de Fora and the eastern part of Selvagem Pequena (Serrano, 1983; Bellés, 1994; Bellés, 2001). It can also be found in the parasitic plant *Cistanche phelypaea*.

Threats

Threat type: Future

Threats:

- 9. Pollution
- 10.2. Geological events - Earthquakes/tsunamis
- 11. Climate change & severe weather

Justification for threats

The subpopulations of Selvagem Pequena and Ilhéu de Fora may be impacted by the cumulative effect of marine pollution on the shore and climate change leading to the rise of sea level. The individuals on Selvagem Grande and at higher elevations could be affected by extended periods of drought, extreme temperatures and storms.

Conservation

Conservation action type: In Place

Conservation actions:

- 1.1. Land/water protection - Site/area protection
- 2.1. Land/water management - Site/area management
- 2.2. Land/water management - Invasive/problematic species control

Conservation action type: Needed

Conservation actions:

- 4. Education & awareness

Justification for conservation actions

The entire range of the species is within the Selvagens Nature Reserve.

Other

Use type: International

Ecosystem service type: Very important

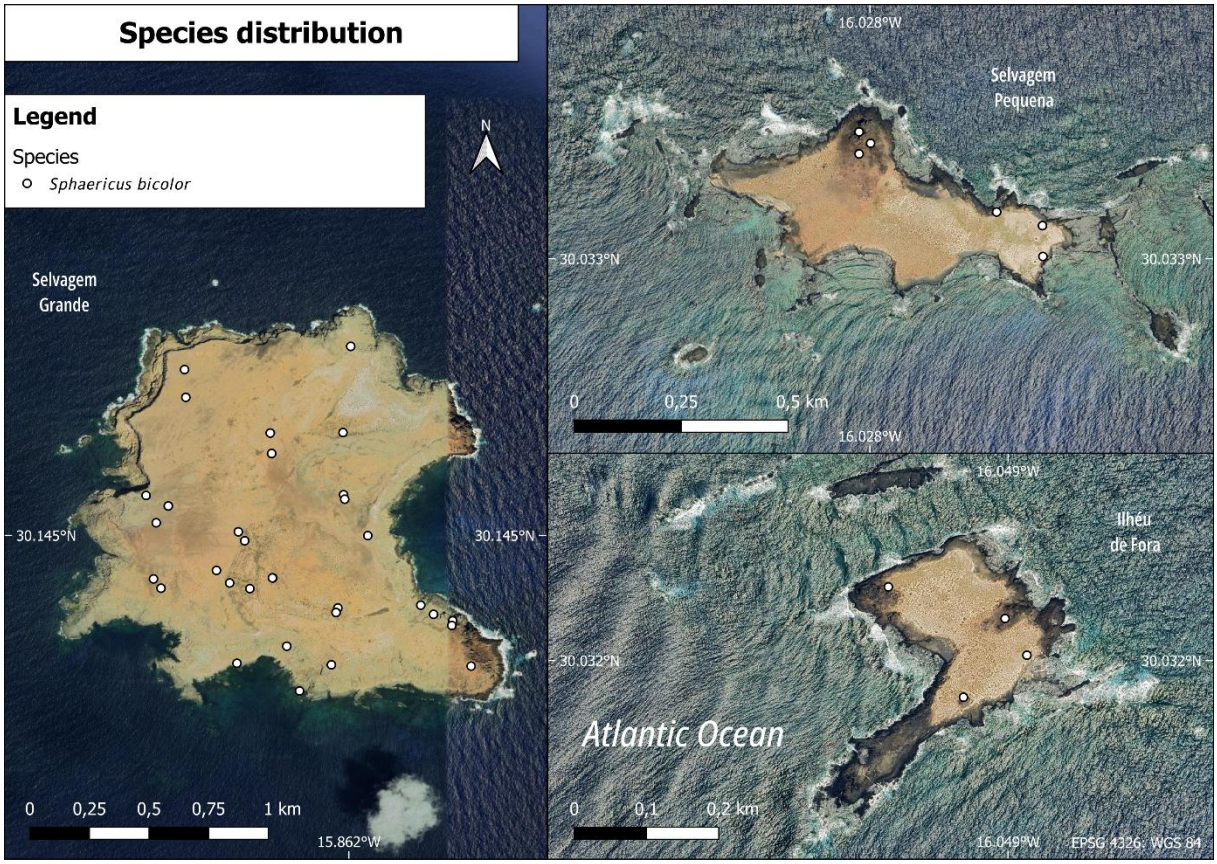
Research needed:

- 1.2. Research - Population size, distribution & trends
- 1.3. Research - Life history & ecology
- 1.5. Research - Threats

- 3.1. Monitoring - Population trends
- 3.4. Monitoring - Habitat trends

Justification for research needed

There is a lack of information about this species' population size, full distribution and aspects about its life history and ecology. The impact of all threats is not fully understood. The study of population and habitat trends should also be maintained moving forward.



Annex 3.3.1.1. Distribution of *Sphaericus bicolor*. The map was created using satellite image data (© Google Earth) and was generated with QGIS v.3.36.0.

Sphaericus selvagensis Bellés, 2001

Species information

Taxonomy

Kingdom	Phylum	Class	Order	Family
Animalia	Arthropoda	Insecta	Coleoptera	Anobiidae

Region for assessment:

- Global

Geographic range

Biogeographic realm:

- Palearctic

Countries:

- Portugal

Map of records (Google Earth):

Annex 3.3.1.2

Basis of EOO and AOO: Observed

Basis (narrative)

The EOO and AOO were calculated using all information available on species distribution, both published and unpublished data.

Min Elevation/Depth (m): 0

Max Elevation/Depth (m): 163

Range description

This species was recorded in Selvagem Grande, Selvagem Pequena and Ilhéu de Fora (Stüben, 2016).

Extent of occurrence

EOO (km2): 29

Trend: Unknown

Justification for trend

The species has an EOO of 29 km2, but it is expected to reduce as a consequence of sea level rise (IPCC, 2023; Climate Central, 2025).

Causes ceased?: No

Causes understood?: Yes

Causes reversible?: No

Extreme fluctuations?: Unknown

Area of occupancy

AOO (km2): 20

Trend: Stable

Causes ceased?: Yes

Causes understood?: Yes

Causes reversible?: Yes

Extreme fluctuations?: Unknown

Locations

Number of locations: Unknown

Justification for number of locations

There are no known current threats to this species.

Trend: Unknown

Extreme fluctuations?: Unknown

Population

Trend: Unknown

Causes ceased?: Unknown

Causes understood?: Unknown

Causes reversible?: Unknown

Extreme fluctuations?: Unknown

Subpopulations

Number of subpopulations: At least 3

Trend: Unknown

Extreme fluctuations?: Unknown

Habitat

System: Terrestrial

Habitat specialist: No

Habitat (narrative)

This species is widely distributed and is present in more sandy or rocky habitats of the Selvagens archipelago.

Trend in extent, area or quality?: Stable

Habitat importance: Major Importance

Habitats:

- 3.5. Shrubland - Subtropical/Tropical Dry
- 6. Rocky areas (e.g. inland cliffs, mountain peaks)
- 13.1. Marine Coastal/Supratidal - Sea Cliffs and Rocky Offshore Islands
- 13.3. Marine Coastal/Supratidal - Coastal Sand Dunes

Ecology

Size: 1.2 – 1.8mm

Generation length (yr): Unknown

Dependency of single sp?: No

Ecology and traits (narrative)

The Anobiidae *Sphaericus selvagensis* is endemic to the three islands of the archipelago of Selvagens. This spider beetle is a little smaller than *S. bicolor* being around 1.2–1.8mm in body length and does not present prominent external sexual dysmorphism (Bellés, 2001). The species deposited in collection were found by sifting mulch of different plant species, particularly under the bushes of *Bassia tomentosa* and *Lotus glaucus* (Arechavaleta et al., 2001; Bellés, 2001; Stüben, 2016). During the March/April 2023 and 2024 monitorization the species had less records than *S. bicolor*. It was only found in pitfall traps, direct sampling in quadrats and active search in detritus under *Suaeda vera*. Compared to its congener *S. bicolor*, this species appears to be epigean and prefer the mulch zone.

Threats

Threat type: Future

Threats:

- 9. Pollution
- 10.2. Geological events - Earthquakes/tsunamis
- 11. Climate change & severe weather

Justification for threats

The subpopulations of Selvagem Pequena and Ilhéu de Fora can be impacted by the cumulative effect of marine pollution on the shore and climate change leading to the rise of sea level. The individuals on

Selvagem Grande and at higher elevations could be affected by extended periods of drought, extreme temperatures and storms.

Conservation

Conservation action type: In Place

Conservation actions:

- 1.1. Land/water protection - Site/area protection
- 2.1. Land/water management - Site/area management
- 2.2. Land/water management - Invasive/problematic species control

Conservation action type: In Place

Conservation actions:

- 4. Education & awareness

Justification for conservation actions

The entire range of the species is within the Selvagens Nature Reserve.

Other

Use type: International

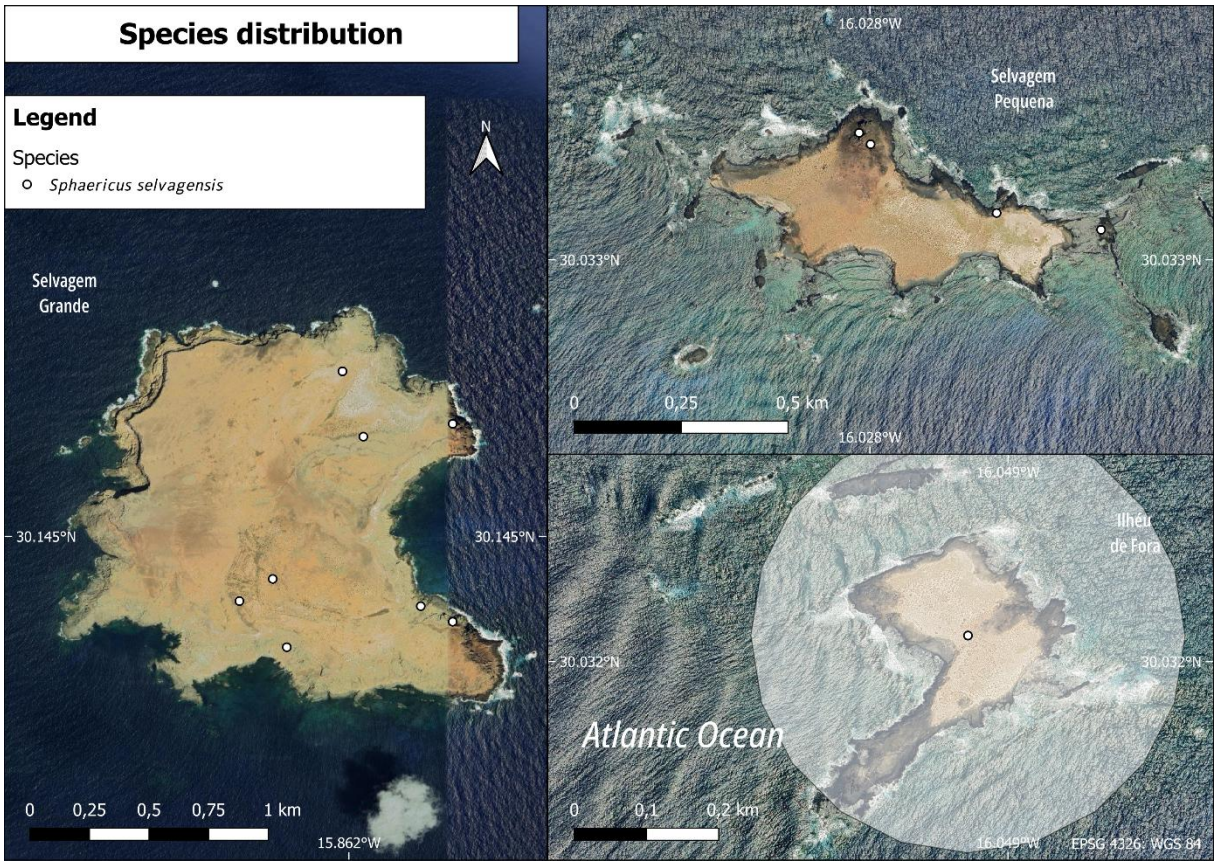
Ecosystem service type: Very important

Research needed:

- 1.2. Research - Population size, distribution & trends
- 1.3. Research - Life history & ecology
- 1.5. Research - Threats
- 3.1. Monitoring - Population trends
- 3.4. Monitoring - Habitat trends

Justification for research needed

There is a lack of information about this species' population size, full distribution and aspects about its life history and ecology. The impact of all threats is not fully understood. The study of population and habitat trends should also be maintained moving forward.



Annex 3.3.1.2. Distribution of *Sphaericus selvagensis*. The map was created using satellite image data (© Google Earth) and was generated with QGIS v.3.36.0.

Nesacinopus pelagicus (Wollaston, 1860)

Species information

Synonyms

Harpalus pelagicus Wollaston, 1860; *Nesarpalus pelagicus* Wollaston, 1862; *Cratognathus pelagicus* Wollaston, 1860; *Selenophorus pelagicus* Woll.

Taxonomy

Kingdom	Phylum	Class	Order	Family
Animalia	Arthropoda	Insecta	Coleoptera	Carabidae

Taxonomic notes

The species was described as *Harpalus pelagicus* Wollaston, 1860 and was cited later as *Selenophorus pelagicus* Woll. (Fauvel, 1897), *Cratognathus pelagicus* Wollaston, 1860 (Wollaston, 1865) and *Nesarpalus pelagicus* Wollaston, 1862 (Erber and Wheater, 1987).

Region for assessment:

- Global

Geographic range

Biogeographic realm:

- Palearctic

Countries:

- Portugal

Map of records:

Annex 3.3.1.3

Basis of EOO and AOO: Observed

Basis (narrative)

The EOO and AOO were calculated using all information available on species distribution, both published and unpublished data.

Min Elevation/Depth (m): 0

Max Elevation/Depth (m): 163

Range description

This species is endemic to the Selvagens archipelago, occurring in Selvagem Grande, Selvagem Pequena and Ilhéu de Fora (Stüben, 2016).

Extent of occurrence

EOO (km2): 29

Trend: Unknown

Justification for trend

The species has an EOO of 29 km2, but it is expected to reduce as a consequence of sea level rise (IPCC, 2023; Climate Central, 2025).

Causes ceased?: No

Causes understood?: Yes

Causes reversible?: No

Extreme fluctuations?: Unknown

Area of occupancy

AOO (km2): 16

Trend: Stable

Causes ceased?: Yes

Causes understood?: Yes

Causes reversible?: Yes

Extreme fluctuations?: Unknown

Locations

Number of locations: Unknown

Justification for number of locations

There are no known current threats to this species.

Trend: Unknown

Extreme fluctuations?: Unknown

Population

Trend: Unknown

Causes ceased?: Unknown

Causes understood?: Unknown

Causes reversible?: Unknown

Extreme fluctuations?: Unknown

Subpopulations

Number of subpopulations: At least 3

Trend: Unknown

Extreme fluctuations?: Unknown

Habitat

System: Terrestrial

Habitat specialist: No

Habitat (narrative)

This species is widely distributed and is present in more rocky habitats of the Selvagens archipelago.

Trend in extent, area or quality?: Stable

Habitat importance: Major Importance

Habitats:

- 3.5. Shrubland - Subtropical/Tropical Dry

- 6. Rocky areas (e.g. inland cliffs, mountain peaks)
- 13.1. Marine Coastal/Supratidal - Sea Cliffs and Rocky Offshore Islands

Ecology

Generation length (yr): Unknown

Dependency of single sp?: No

Ecology and traits (narrative)

The Carabidae *Nesacinopus pelagicus* is an endemic species of the Selvagens archipelago and it is found across the three islands (Selvagem Grande; Selvagem Pequena and Ilhéu de Fora) (Stüben, 2016). This species is probably detritvorous, possibly feeding on different vegetative material (Arechavaleta and Oromí, 2015). It was usually recorded under rocks during various expeditions (Oromí et al., 1978; Erber and Wheater, 1987; Arechavaleta et al., 2001), but was also found in mulch, when sieving *Suaeda vera* and *Zygophyllum fontanesii* (Stüben, 2016). The most recent data from the long-term monitoring also point to the historical observations of being widespread, abundant and found it in the typical microhabitat used by the species.

Threats

Threat type: Future

Threats:

- 9. Pollution
- 10.2. Geological events - Earthquakes/tsunamis
- 11. Climate change & severe weather

Justification for threats

The subpopulations of Selvagem Pequena and Ilhéu de Fora can be impacted by the cumulative effect of marine pollution on the shore and climate change leading to the rise of sea level. The individuals on Selvagem Grande and at higher elevations could be affected by extended periods of drought, extreme temperatures and storms.

Conservation

Conservation action type: In Place

Conservation actions:

- 1.1. Land/water protection - Site/area protection
- 2.1. Land/water management - Site/area management
- 2.2. Land/water management - Invasive/problematic species control

Conservation action type: Needed

Conservation actions:

- 4. Education & awareness

Justification for conservation actions

The entire range of the species is within the Selvagens Nature Reserve.

Other

Use type: International

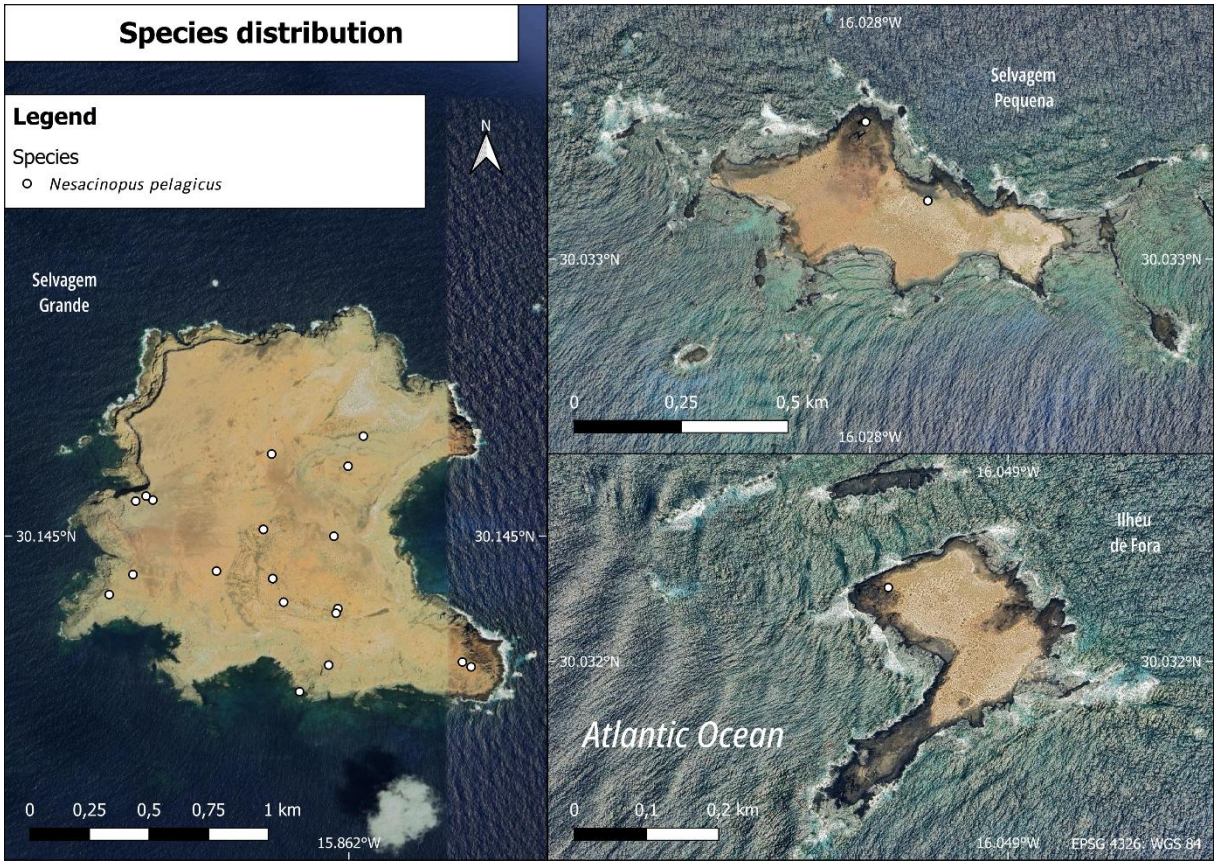
Ecosystem service type: Very important

Research needed:

- 1.2. Research - Population size, distribution & trends
- 1.3. Research - Life history & ecology
- 1.5. Research - Threats
- 3.1. Monitoring - Population trends
- 3.4. Monitoring - Habitat trends

Justification for research needed

There is potential for improvement in the understanding of population size, full distribution and aspects about its life history and ecology. The impact of all threats is not fully understood. The study of population and habitat trends should also be maintained moving forward.



Annex 3.3.1.3. Distribution of *Nesacinopus pelagicus*. The map was created using satellite image data (© Google Earth) and was generated with QGIS v.3.36.0.

Cymindis paivana (Wollaston, 1860)

Species information

Synonyms

Tarus paivana Wollaston, 1862; *Tarus paivanus* Wollaston, 1860.

Taxonomy

Kingdom	Phylum	Class	Order	Family
Animalia	Arthropoda	Insecta	Coleoptera	Carabidae

Taxonomic notes

The species was described as *Tarus paivana* Wollaston, 1860 and erroneously cited as *Tarus paivanus* Wollaston, 1860 (Wollaston, 1865).

Region for assessment:

- Global

Geographic range

Biogeographic realm:

- Palearctic

Countries:

- Portugal

Map of records:

Annex 3.3.1.4

Basis of EOO and AOO: Observed

Basis (narrative)

The EOO and AOO were calculated using all information available on species distribution, both published and unpublished data.

Min Elevation/Depth (m): 0

Max Elevation/Depth (m): 163

Range description

The species was found in Selvagem Grande, Selvagem Pequena and Ilhéu de Fora (Stüben, 2016).

Extent of occurrence

EOO (km2): 31

Trend: Unknown

Justification for trend

The species has an EOO of 31 km2, but it is expected to reduce as a consequence of sea level rise (IPCC, 2023; Climate Central, 2025).

Causes ceased?: No

Causes understood?: Yes

Causes reversible?: No

Extreme fluctuations?: Unknown

Area of occupancy

AOO (km2): 16

Trend: Stable

Causes ceased?: Yes

Causes understood?: Yes

Causes reversible?: Yes

Extreme fluctuations?: Unknown

Locations

Number of locations: Unknown

Justification for number of locations

There are no known current threats to this species.

Trend: Unknown

Extreme fluctuations?: Unknown

Population

Trend: Unknown

Causes ceased?: Unknown

Causes understood?: Unknown

Causes reversible?: Unknown

Extreme fluctuations?: Unknown

Subpopulations

Number of subpopulations: At least 3

Trend: Unknown

Extreme fluctuations?: Unknown

Habitat

System: Terrestrial

Habitat specialist: No

Habitat (narrative)

This species is widely distributed and is present in more rocky habitats of the Selvagens archipelago.

Trend in extent, area or quality?: Stable

Habitat importance: Major Importance

Habitats:

- 3.5. Shrubland - Subtropical/Tropical Dry
- 6. Rocky areas (e.g. inland cliffs, mountain peaks)
- 13.1. Marine Coastal/Supratidal - Sea Cliffs and Rocky Offshore Islands

Ecology

Size: 7.5 - 8 mm

Generation length (yr): Unknown

Dependency of single sp?: No

Ecology and traits (narrative)

The ground beetle *Cymindis paivana* is endemic to all three islands of three islands of the Selvagens archipelago (Selvagem Grande, Selvagem Pequena and Ilhéu de Fora) (Stüben, 2016). This Carabidae measures around 7,5 to 8mm and its elytra coloration can be different between individuals (Kraatz, 1873; Garreta, 1911). This species is a predator and can feed on some small invertebrates of the soil (Arechavaleta and Oromí, 2015). It has been frequently found under rocks since past expeditions (Oromí et al., 1978; Erber and Wheater, 1987; Arechavaleta et al., 2001) and was also reported when sieving mulch from different plant species, like *Suaeda vera*, *Astydamia latifolia* and *Lotus glaucus* (Stüben, 2016). The most specimens in collection found in mulch in the same instance were over 50 specimens from Selvagem Pequena, sieved under *Patellifolia procumbens*. Another specimen was collected by pitfall under nest of a seagull (Stüben, 2016). The most recent data from the long term monitorization also points to the historical observations of being widespread, abundant and and found it in the typical microhabitat used by the species.

Threats

Threat type: Future

Threats:

- 9. Pollution
- 10.2. Geological events - Earthquakes/tsunamis
- 11. Climate change & severe weather

Justification for threats

The subpopulations of Selvagem Pequena and Ilhéu de Fora can be impacted by the cumulative effect of marine pollution on the shore and climate change leading to the rise of sea level. The individuals on Selvagem Grande and at higher elevations could be affected by extended periods of drought, extreme temperatures and storms.

Conservation

Conservation action type: In Place

Conservation actions:

- 1.1. Land/water protection - Site/area protection
- 2.1. Land/water management - Site/area management
- 2.2. Land/water management - Invasive/problematic species control

Conservation action type: Needed

Conservation actions:

- 4.3. Education & awareness - Awareness & communications

Justification for conservation actions

The entire range of the species is within the Selvagens Nature Reserve.

Other

Use type: International

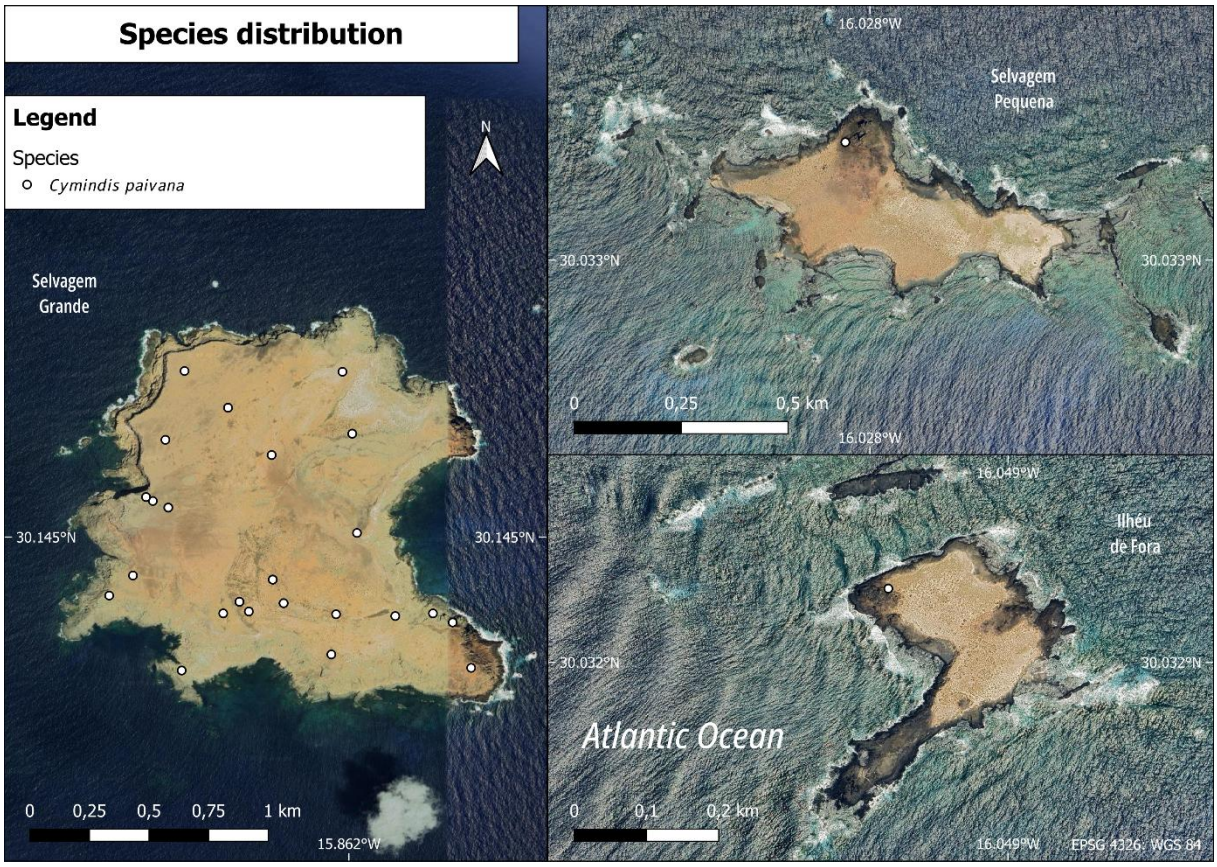
Ecosystem service type: Very important

Research needed:

- 1.2. Research - Population size, distribution & trends
- 1.3. Research - Life history & ecology
- 1.5. Research - Threats
- 3.1. Monitoring - Population trends
- 3.4. Monitoring - Habitat trends

Justification for research needed

There is potential for improvement in the understanding of population size, full distribution and aspects about its life history and ecology. The impact of all threats is not fully understood. The study of population and habitat trends should also be maintained moving forward.



Annex 3.3.1.4. Distribution of *Cymindis paivana*. The map was created using satellite image data (© Google Earth) and was generated with QGIS v.3.36.0.

Deucalion oceanicum Wollaston, 1854

Species information

Synonyms

Deucalion oceanicus Wollaston, 1854

Taxonomy

Kingdom	Phylum	Class	Order	Family
Animalia	Arthropoda	Insecta	Coleoptera	Cerambycidae

Taxonomic notes

The species was described as *Deucalion oceanicus* Wollaston, 1854, being referred by this name in many references.

Region for assessment:

- Global

Geographic range

Biogeographic realm:

- Palearctic

Countries:

- Portugal

Map of records:

Annex 3.3.1.5

Basis of EOO and AOO: Observed

Basis (narrative)

The EOO and AOO were calculated using all information available on species distribution, both published and unpublished data.

Min Elevation/Depth (m): 0

Max Elevation/Depth (m): 18

Range description

The species is endemic to Ilhéu de Fora, an islet close to Selvagem Pequena in the Selvagens archipelago (Stüben, 2016, Vives and Trócoli 2021).

Extent of occurrence

EOO (km2): 4

Trend: Unknown

Justification for trend

There are two known sites. The species EOO is rounded to 4km2 following IUCN standards, but it is expected to reduce as a consequence of sea level rise (IPCC, 2023; Climate Central, 2025) and habitat loss.

Causes ceased?: No

Causes understood?: Yes

Causes reversible?: No

Extreme fluctuations?: Unknown

Area of occupancy

AOO (km2): 4

Trend: Stable

Causes ceased?: Yes

Causes understood?: Yes

Causes reversible?: Yes

Extreme fluctuations?: Unknown

Locations

Number of locations: 1

Justification for number of locations

The species has a single subpopulation and occurs in a specific habitat in a small islet (0.08 km²). This endemic beetle is highly dependent on a single host plant species for larval development, the endemic *Euphorbia anachoreta*, which is classified as Critically Endangered (Rivers, 2017), being restricted to a very small area in the same islet and counting only 65 individuals in the wild (Francisco Fernandes, pers. comm.). Both the beetle and its host plant are severely threatened by the consequences of climate change which include sea level rise and increasing drier conditions, leading to habitat quality degradation and loss. According to recent models (IPCC, 2023; Climate Central, 2025), the sea level could rise up to 1m over the next 100 years, significantly reducing the islet area. Considering the historical information and the new data, it suggests a decline in the population of the host plant and visible environmental changes due to climate changes (Rivers, 2017; Carvalho et al., 2021).

Trend: Decline (projected)

Extreme fluctuations?: Unknown

Population

Trend: Unknown

Causes ceased?: Unknown

Causes understood?: Unknown

Causes reversible?: Unknown

Extreme fluctuations?: Unknown

Subpopulations

Number of subpopulations: 1

Trend: Unknown

Extreme fluctuations?: Unknown

Habitat

System: Terrestrial

Habitat specialist: Yes

Habitat (narrative)

The Ilhéu de Fora is a small island, where the species is found mainly at a spurge-dominated (*Euphorbia anachoreta)* rocky ground. During the active search in 2024, an individual was observed under a stone at the Euphorbia's ground, where the host plant resides, but also another one specimen relatively far from that place. The furthest individual was located under a stone relatively near shore at the island's south point, where there are no *Euphorbias*.

Trend in extent, area or quality?: Decline (inferred)

Habitat importance: Major Importance

Habitats:

- 13.1. Marine Coastal/Supratidal - Sea Cliffs and Rocky Offshore Islands

Ecology

Size: 9 -19 mm

Generation length (yr): Unknown

Dependency of single sp?: Yes

Dependent on species: *Euphorbia anachoreta*

Dependent on IUCN Status: Critically Endangered (CR)

Ecology and traits (narrative)

The genus *Deucalion* is a monotypic taxon endemic to the Selvagens archipelago (Boieiro et al., 2015). The longhorn beetle *Deucalion oceanicum* is a single-island endemism of Ilhéu de Fora and is considered to be one of the most threatened endemic species of the archipelago due to the limited area it inhabits and its specialized ecology. This cerambycid is cycle-dependent on a likewise threatened endemic host plant, relieying on *Euphorbia anachoreta* for the larval development (Stüben, 2016, Vives and Trócoli, 2021). The host plant at the time is assessed as Critically Endangered (Rivers, 2017) and has been just recently under the focus of a conservation program. The adults can be found under rocks

(Wollaston, 1854), during the active search in the monitoring campaign of 2024, one individual was observed at the Euphorbia's ground, where resides the host plant, and another was relatively near shore at the island's south point. It is known for producing an audible stridulating sound, something also previously described for the related species *Paradeucalion desertarum* (Wollaston, 1854) and more recently in *Paradeucalion maderense* (Krátký and Aguiar, 2019). The species has significant different body sizes, the length can vary from 9-19mm, it has shorter antennae than the body, with more details in literature (KrátKý and Aguiar, 2019; Vives and Trócoli, 2021). The evident differences of adults in terms of body length could be attributable to factors like inbreeding or genetic drift (since Ilhéu de Fora has only 0.08km2), however that may not be the case. Some researchers suggest that this could be explained by the low food availability, in which larvae access more or less food from the host plant depending on the branch size (Stüben, 2016). It also thought the endemic beetle and its host plant could be formely common on other islands of the Selvagens archipelago (Stüben, 2016, Vives and Trócoli, 2021).

Threats

Threat type: Past

Threats:

- 11. Climate change & severe weather

Threat type: Ongoing

Threats:

- 11. Climate change & severe weather

Threat type: Future

Threats:

- 9. Pollution
- 10.2. Geological events - Earthquakes/tsunamis
- 11. Climate change & severe weather

Justification for threats

The habitat of *Deucalion oceanicum* is threatened by the ongoing effects of climate change which are expected to worsen in the near future. These threats include sea level rise, which may lead to an islet area and the deterioration of the habitat of this endemic beetle. Also, the periods of drier conditions are expected to be more prolonged and intense, directly affecting the survival of the beetle, its host plant and the habitat quality. Extreme weather conditions and events (such as sea storms) are likely to increase and cause direct mortality of beetles and plants since this islet has a low altitude, being highly vulnerable to these events. Marine pollution is currently a threat due to the accumulation of many pollutants on the coastline, which are carried inland by strong winds and sea storms. This threat is expected to continue in the future.

Conservation

Conservation action type: In Place

Conservation actions:

- 1.1. Land/water protection - Site/area protection
- 2.1. Land/water management - Site/area management
- 3. Species management

Conservation action type: Needed

Conservation actions:

- 4. Education & awareness
- 5.1. Law & policy - Legislation

Justification for conservation actions

The entire range of the species is within the Selvagens Nature Reserve. The species and its host plant are under a conservation program.

Other

Use type: International

Ecosystem service type: Very important

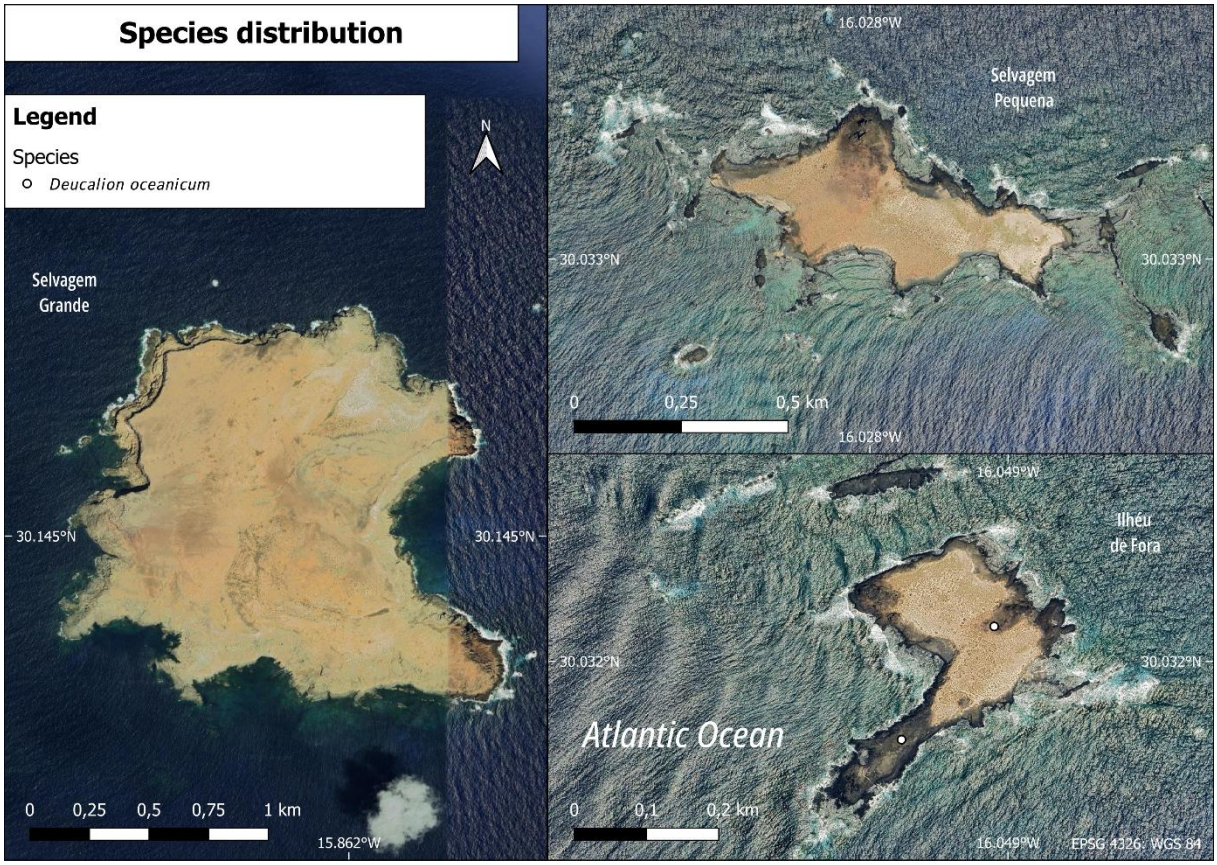
Research needed:

- 1.2. Research - Population size, distribution & trends
- 1.3. Research - Life history & ecology
- 1.5. Research - Threats
- 1.6. Research - Actions
- 2.1. Conservation Planning - Species Action/Recovery Plan
- 2.2. Conservation Planning - Area-based Management Plan
- 3.1. Monitoring - Population trends
- 3.4. Monitoring - Habitat trends

Justification for research needed

There is a lack of information about this species' population size, full distribution and aspects about its life history and ecology. The impact of all threats is not fully understood, excluding habitat loss. The

population and habitat trends should also be studied to further support the conservation efforts. Those efforts are being implemented and should be maintained moving forward.



Annex 3.3.1.5. Distribution of *Deucalion oceanicum*. The map was created using satellite image data (© Google Earth) and was generated with QGIS v.3.36.0.

Caulotrupis mauli (Folwaczny, 1972)

Species information

Synonyms

Salvagopselactus mauli Folwaczny, 1972

Taxonomy

Kingdom	Phylum	Class	Order	Family
Animalia	Arthropoda	Insecta	Coleoptera	Curculionidae

Taxonomic notes

The species was described as *Salvagopselactus mauli* Folwaczny, 1972.

Region for assessment:

- Global

Geographic range

Biogeographic realm:

- Palearctic

Countries:

- Portugal

Map of records:

Annex 3.3.1.6

Basis of EOO and AOO: Observed

Basis (narrative)

The EOO and AOO were calculated using all information available on species distribution, both published and unpublished data.

Min Elevation/Depth (m): 0

Max Elevation/Depth (m): 163

Range description

The species is known from Selvagem Grande and Selvagem Pequena (Stüben, 2016).

Extent of occurrence

EOO (km2): 11

Trend: Unknown

Justification for trend

The species has an EOO of 11 km2, but it is expected to reduce as a consequence of sea level rise (IPCC, 2023; Climate Central, 2025).

Causes ceased?: No

Causes understood?: Yes

Causes reversible?: No

Extreme fluctuations?: Unknown

Area of occupancy

AOO (km2): 8

Trend: Stable

Causes ceased?: Yes

Causes understood?: Yes

Causes reversible?: Yes

Extreme fluctuations?: Unknown

Locations

Number of locations: Unknown

Justification for number of locations

There are no significant current threats to this species.

Trend: Unknown

Extreme fluctuations?: Unknown

Population

Trend: Unknown

Causes ceased?: Unknown

Causes understood?: Unknown

Causes reversible?: Unknown

Extreme fluctuations?: Unknown

Subpopulations

Number of subpopulations: At least 2

Trend: Unknown

Extreme fluctuations?: Unknown

Severe fragmentation?: Unknown

Habitat

System: Terrestrial

Habitat specialist: No

Habitat (narrative)

This species is relatively distributed and is present in more sandy or rocky habitats of the Selvagens archipelago.

Trend in extent, area or quality?: Stable

Habitat importance: Major Importance

Habitats:

- 3.5. Shrubland - Subtropical/Tropical Dry
- 6. Rocky areas (e.g. inland cliffs, mountain peaks)
- 13.1. Marine Coastal/Supratidal - Sea Cliffs and Rocky Offshore Islands
- 13.3. Marine Coastal/Supratidal - Coastal Sand Dunes

Ecology

Generation length (yr): Unknown

Dependency of single sp?: No

Dependent on species: The adults of this species have been found associated with *Suaeda vera* and *Nicotiana glauca* plants.

Ecology and traits (narrative)

The beetle *Caulotrupis mauli* of the subfamily Cossoninae is endemic to Selvagem Grande and Selvagem Pequena. It was previously thought to be also an endemic monotypic genus of the Selvagens archipelago under the name *Salvagopselactus* syn. (Stüben and Schutte, 2018). This endemic xilophagous beetle lives on the native Suaeda vera (Arechavaleta and Oromí, 2015). There are also specimens from Selvagem Grande collected by sieving under *Schizogyne sericea* and others from Selvagem Pequena under *Patellifolia procumbens* (Stüben, 2016). More than 100 specimens were previously collected inside dry branches of the invasive tobacco plant (*Nicotiana glauca*) (Erber and Wheater, 1987) and a lower amount in another instance (Arechavaleta et al., 2001), when the species was not erradicated from the island. During the March/April 2024 monitoring, the species was only found during active search in Selvagem Grande, under mulch of *Suaeda vera* and continues to be found inside leftovers of dry branches of *Nicotiana glauca*.

Threats

Threat type: Ongoing

Threats:

- 8. Invasive and other problematic species, genes & diseases

Threat type: Future

Threats:

- 9. Pollution
- 8. Invasive and other problematic species, genes & diseases
- 10.2. Geological events - Earthquakes/tsunamis
- 11. Climate change & severe weather

Justification for threats

Nicotiana glauca is currently present on Selvagem Grande, however it is nearly eradicated and the impacts do not appear to be necessarily negative, since the species develops on the plant. In the future, the subpopulations of Selvagem Pequena and Ilhéu de Fora can be impacted by the cumulative effect of marine pollution on the shore and climate change leading to the rise of sea level. The individuals on Selvagem Grande and at higher elevations could be affected by extended periods of drought, extreme temperatures and storms.

Conservation

Conservation action type: In Place

Conservation actions:

- 1.1. Land/water protection - Site/area protection
- 2.1. Land/water management - Site/area management
- 2.2. Land/water management - Invasive/problematic species control

Conservation action type: Needed

Conservation actions:

- 4. Education & awareness

Justification for conservation actions

The entire range of the species is within the Selvagens Nature Reserve.

Other

Use type: International

Ecosystem service type: Very important

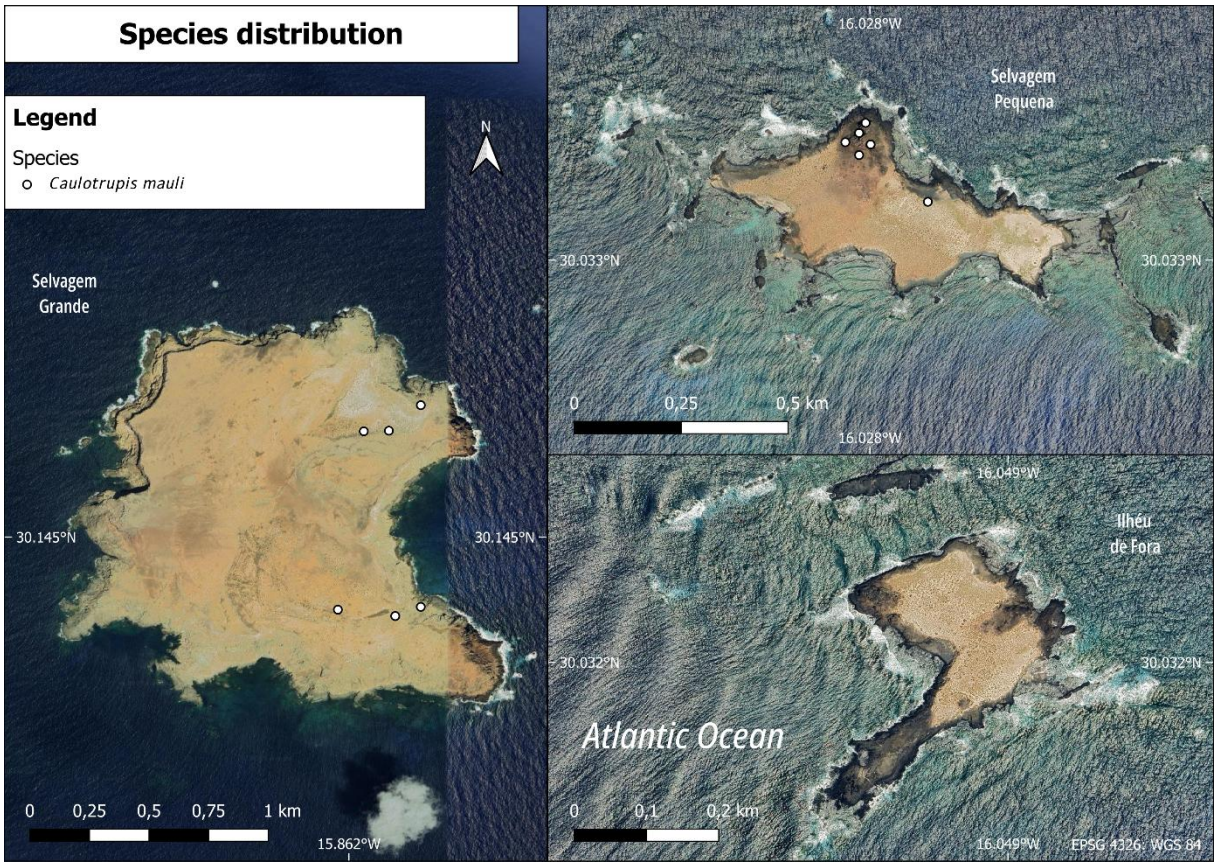
Research needed:

- 1.2. Research - Population size, distribution & trends
- 1.3. Research - Life history & ecology
- 1.5. Research - Threats
- 3.1. Monitoring - Population trends

- 3.4. Monitoring - Habitat trends

Justification for research needed

There is potential for improvement in the understanding of population size, full distribution and aspects about its life history and ecology. The impact of all threats is not fully understood. The study of population and habitat trends should also be maintained moving forward.



Annex 3.3.1.6. Distribution of *Caulotrupis mauli*. The map was created using satellite image data (© Google Earth) and was generated with QGIS v.3.36.0.

Leipommata oromiana Osella, 1978

Species information

Synonyms

Leipommata oromianum Osella, 1978

Taxonomy

Kingdom	Phylum	Class	Order	Family
Animalia	Arthropoda	Insecta	Coleoptera	Curculionidae

Taxonomic notes

The species was described as *Leipommata oromianum* Osella, 1978, being referred by this name in many references.

Region for assessment:

- Global

Geographic range

Biogeographic realm:

- Palearctic

Countries:

- Portugal

Map of records:

Annex 3.3.1.7

Basis of EOO and AOO: Observed

Basis (narrative)

The EOO and AOO were calculated using all information available on species distribution, both published and unpublished data.

Min Elevation/Depth (m): 0

Max Elevation/Depth (m): 163

Range description

This species is restricted to Selvagem Grande and Selvagem Pequena (Stüben, 2016).

Extent of occurrence

EOO (km2): 8

Trend: Unknown

Justification for trend

There are two known sites. The species EOO is rounded to 8km2 following IUCN standards, but it is expected to reduce as a consequence of sea level rise (IPCC, 2023; Climate Central, 2025).

Causes ceased?: No

Causes understood?: Yes

Causes reversible?: No

Extreme fluctuations?: Unknown

Area of occupancy

AOO (km2): 8

Trend: Stable

Causes ceased?: Yes

Causes understood?: Yes

Causes reversible?: Yes

Extreme fluctuations?: Unknown

Locations

Number of locations: 1

Justification for number of locations

The species has two subpopulations and occurs in a specific habitat. One of those subpopulations, present in Selvagem Pequena, can be compromised in the future due to sea level rise (IPCC, 2023; Climate Central, 2025).

Trend: Unknown

Extreme fluctuations?: Unknown

Population

Trend: Unknown

Causes ceased?: Unknown

Causes understood?: Unknown

Causes reversible?: Unknown

Extreme fluctuations?: Unknown

Subpopulations

Number of subpopulations: At least 2

Trend: Unknown

Extreme fluctuations?: Unknown

Severe fragmentation?: Unknown

Habitat

System: Terrestrial

Habitat specialist: Yes

Habitat (narrative)

The species is currently restricted to Selvagem Grande and Selvagem Pequena. The endemic beetle seems to be confined to "Chão dos caramujos" in Selvagem Grande and is currently known from one site close to the shore in the northwest slope of Pico do Veado (Selvagem Pequena).

Trend in extent, area or quality?: Stable

Habitat importance: Major Importance

Habitats:

- 13.1. Marine Coastal/Supratidal - Sea Cliffs and Rocky Offshore Islands
- 13.3. Marine Coastal/Supratidal - Coastal Sand Dunes

Ecology

Generation length (yr): 1

Dependency of single sp?: No

Dependent on species: The adults of this species have often been found associated with *Suaeda vera* and *Nicotiana glauca* plants.

Ecology and traits (narrative)

The species belongs to the genus *Leipommata*, which includes another species from Porto Santo (Madeira) sharing a close resemblance (*Leipommata calcaratum*). The *Leipommata oromiana* is also similar to other *Pselactus* species from the Canarias archipelago and the endemic *Caulotrupis* from Madeira (Osella, 1978; Stüben, 2016; Stüben, 2022). It is eyeless and has only been found on two islands of the Selvagens archipelago. The first time it was collected in the sand, between the roots of *Suaeda vera* in Selvagem Pequena (Oromí et al., 1978). The second was found also in the sand but between the roots of *Nicotiana glauca* (Arechavaleta et al., 2001). Based on historical data and crossing information from the new monitoring campaigns, the species appears to be psammophile by preferring sandier areas like Selvagem Pequena and the "Chão dos caramujos" zone at Selvagem Grande (Arechavaleta et al., 2001).

Threats

Threat type: Ongoing

Threats:

- 8. Invasive and other problematic species, genes & diseases
- 11. Climate change & severe weather

Threat type: Future

Threats:

- 9. Pollution
- 10.2. Geological events - Earthquakes/tsunamis
- 11. Climate change & severe weather

Justification for threats

Nicotiana glauca is currently present on Selvagem Grande, however it is nearly eradicated and the impacts do not appear to be necessarily negative, since the species develops on the plant. Nevertheless, its distribution is restricted on the two islands, with the subpopulation on Selvagem Grande confined to "Chão dos caramujos" and on Selvagem Pequena situated close to sea level. In the future, the subpopulation of Selvagem Pequena can be impacted by the cumulative effect of marine pollution on the shore and climate change leading to the rise of sea level. The individuals on Selvagem Grande and at higher elevations could be affected by extended periods of drought, extreme temperatures and storms.

Conservation

Conservation action type: In Place

Conservation actions:

- 1.1. Land/water protection - Site/area protection
- 2.1. Land/water management - Site/area management
- 2.2. Land/water management - Invasive/problematic species control

Conservation action type: Needed

Conservation actions:

- 4.3. Education & awareness - Awareness & communications

Justification for conservation actions

The entire range of the species is within the Selvagens Nature Reserve.

Other

Use type: International

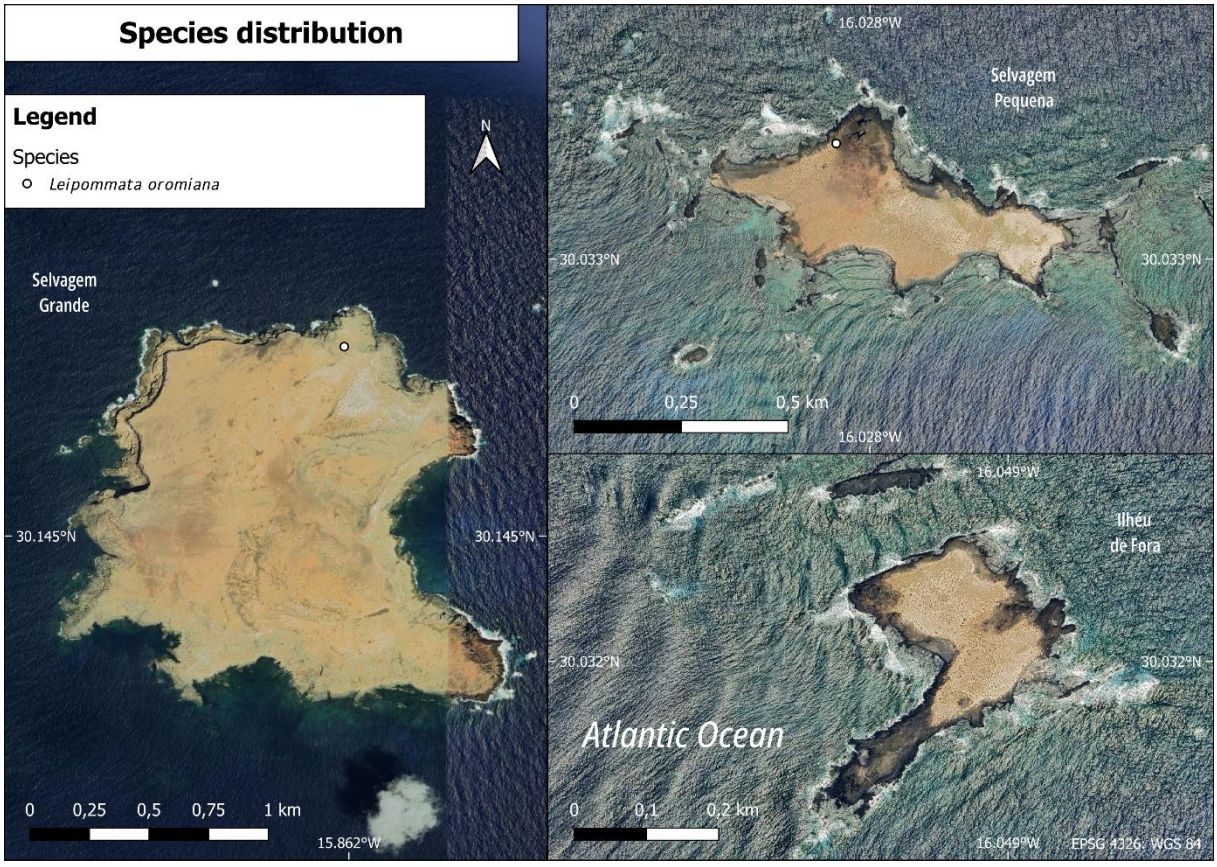
Ecosystem service type: Very important

Research needed:

- 1.1. Research - Taxonomy
- 1.2. Research - Population size, distribution & trends
- 1.3. Research - Life history & ecology
- 1.5. Research - Threats
- 1.6. Research - Actions
- 3.1. Monitoring - Population trends
- 3.4. Monitoring - Habitat trends

Justification for research needed

There is a lack of information about this species' population size, full distribution and aspects about its life history and ecology. The knowledge on taxonomy can be improved since there are taxonomic similarities with *Leipommata calcaratum*. The impact of all threats is not fully understood, excluding habitat loss. The population and habitat trends should also be studied to further support the conservation efforts.



Annex 3.3.1.7. Distribution of *Leipommata oromiana*. The map was created using satellite image data (© Google Earth) and was generated with QGIS v.3.36.0.

Aeoniacalles neptunus (Wollaston, 1854)

Species information

Synonyms

Acalles neptunus Wollaston, 1854

Taxonomy

Kingdom	Phylum	Class	Order	Family
Animalia	Arthropoda	Insecta	Coleoptera	Curculionidae

Taxonomic notes

The species was described as *Acalles neptunus* Wollaston, 1854 and was updated to *Aeoniacalles neptunus* Wollaston, 1854 (Stüben and Astrin, 2010).

Region for assessment:

- Global

Geographic range

Biogeographic realm:

- Palearctic

Countries:

- Portugal

Map of records:

Annex 3.3.1.8

Basis of EOO and AOO: Observed

Basis (narrative)

The EOO and AOO were calculated using all information available on species distribution, both published and unpublished data.

Min Elevation/Depth (m): 0

Max Elevation/Depth (m): 163

Range description

This beetle species is endemic to Selvagem Grande, Selvagem Pequena and Ilhéu de Fora (Stüben, 2016). The presence in Selvagem Grande is uncertain, but there are reported historical specimens collected on the island.

Extent of occurrence

EOO (km2): 16

Trend: Unknown

Justification for trend

The species has an EOO of 13.424 km2 (rounded to 16km2 following IUCN standards), but it is expected to reduce as a consequence of sea level rise (IPCC, 2023; Climate Central, 2025).

Causes ceased?: No

Causes understood?: Yes

Causes reversible?: No

Extreme fluctuations?: Unknown

Area of occupancy

AOO (km2): 16

Trend: Stable

Causes ceased?: Yes

Causes understood?: Yes

Causes reversible?: Yes

Extreme fluctuations?: Unknown

Locations

Number of locations: Unknown

Justification for number of locations

There are no known current threats to this species.

Trend: Unknown

Extreme fluctuations?: Unknown

Population

Trend: Unknown

Causes ceased?: Unknown

Causes understood?: Unknown

Causes reversible?: Unknown

Extreme fluctuations?: Unknown

Subpopulations

Number of subpopulations: At least 2

Trend: Unknown

Extreme fluctuations?: Unknown

Severe fragmentation?: Unknown

Habitat

System: Terrestrial

Habitat specialist: No

Habitat (narrative)

This species is widely distributed and is present in more sandy or rocky habitats of the Selvagens archipelago.

Trend in extent, area or quality?: Stable

Habitat importance: Major Importance

Habitats:

- 3.5. Shrubland - Subtropical/Tropical Dry
- 6. Rocky areas (e.g. inland cliffs, mountain peaks)
- 13.1. Marine Coastal/Supratidal - Sea Cliffs and Rocky Offshore Islands
- 13.3. Marine Coastal/Supratidal - Coastal Sand Dunes

Ecology

Size: 4.4 - 8.1 mm

Generation length (yr): Unknown

Dependency of single sp?: No

Dependent on species: This species can be found in the host plant *Cistanche phelypaea* or in the spurge *Euphorbia anachoreta*.

Ecology and traits (narrative)

The genus *Aeoniacalles* has 7 species restricted to just the Canary Islands and the Selvagens archipelago. The only species in the Selvagens is the endemic beetle *Aeoniacalles neptunus*, which has a total body length around 4.4-8.1mm (Stüben, 2019). Almost all *Aeoniacalles* species are usually found in the plant family Crassulaceae, particularly the genus *Aeonium* of the Canary Islands. In the Selvagens archipelago, the previous taxa is not present andso this beetle has developed a hosplant relationship with the Orobanchaceae *Cistanche phelypaea*, which was confirmed in situ and by transfering specimens to an evolutionary laboratory (Oromí et al., 1978; Stüben, 2016). At Ilhéu de Fora, the species was also collected in past expeditions from deadwood of *Euphorbia anachoreta* and obtained the hatched adults

in the laboratory (Arechavaleta et al., 2001). The island due to its small are and low on resources must have lead the species to also nurture and develop on the endemic spurge of Ilhéu de Fora, which is similarly a fleshy plant capable of storing water and nutrients. *A. neptunus* can be also collected under stones (Oromí et al., 1978; Erber and Wheater, 1987; Stüben, 2016) or under woodplanks brought by sea (Serrano, 1983), some of them were found during 2024 monitoring campaign on those near the rangers house in Selvagem Pequena. The presence of the species in Selvagem Grande is uncertain, however there are at least 3 specimens in collection (Erber and Wheater, 1987) that may be confused with the endemic species *Ficusacalles oceanicus* (Stüben, 2016), which is morphologically similar. During October 2014, the endemic beetle was intensely sought in Selvagem Grande and Selvagem Pequena, however it was only found in the latter (Stüben, 2016). During the March/April 2024 monitoring the species was found with active search, however was once again only detected in Selvagem Pequena and Ilhéu de Fora.

Threats

Threat type: Future

Threats:

- 9. Pollution
- 10.2. Geological events - Earthquakes/tsunamis
- 11. Climate change & severe weather

Justification for threats

The subpopulations of Selvagem Pequena and Ilhéu de Fora can be impacted by the cumulative effect of marine pollution on the shore and climate change leading to the rise of sea level. The individuals on Selvagem Grande and at higher elevations could be affected by extended periods of drought, extreme temperatures and storms.

Conservation

Conservation action type: In Place

Conservation actions:

- 1.1. Land/water protection - Site/area protection
- 2.1. Land/water management - Site/area management
- 2.2. Land/water management - Invasive/problematic species control

Conservation action type: Needed

Conservation actions:

- 4. Education & awareness

Justification for conservation actions

The entire range of the species is within the Selvagens Nature Reserve.

Other

Use type: International

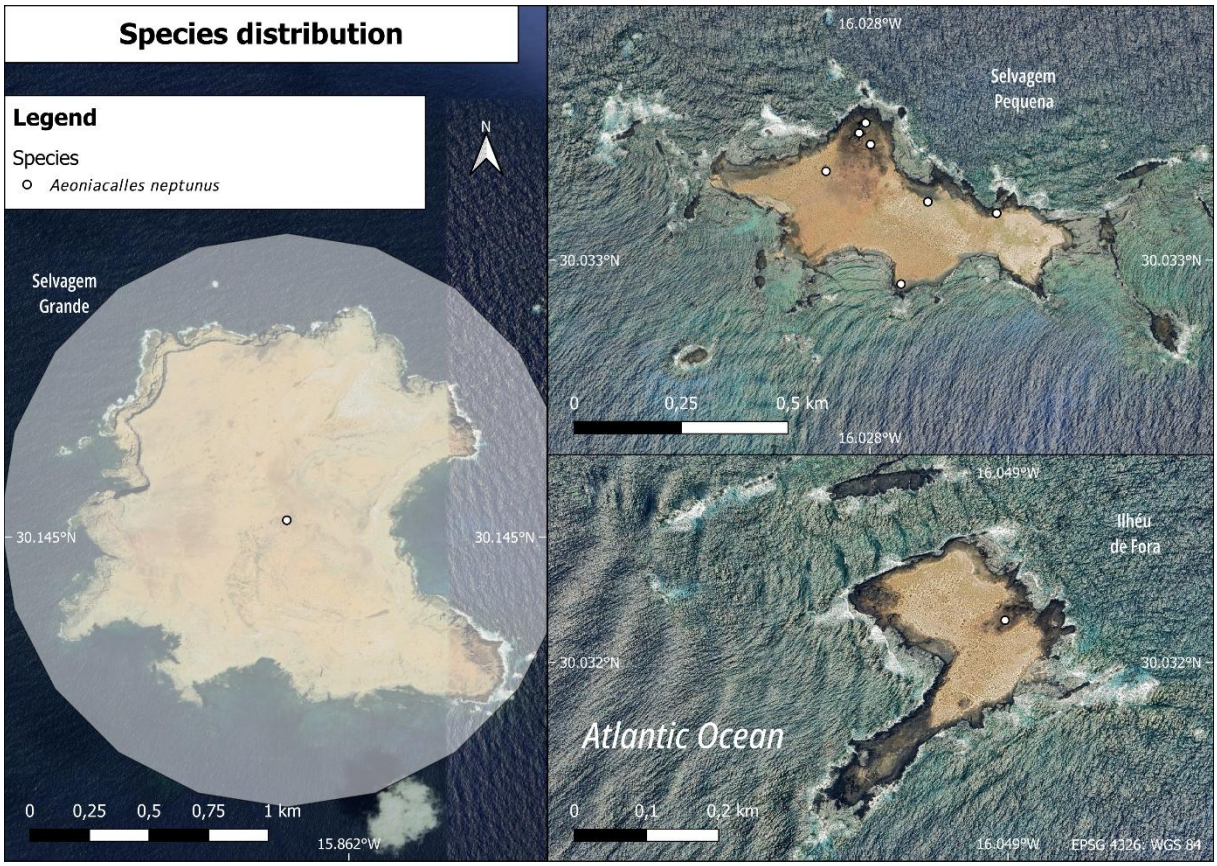
Ecosystem service type: Very important

Research needed:

- 1.2. Research - Population size, distribution & trends
- 1.3. Research - Life history & ecology
- 1.5. Research - Threats
- 3.1. Monitoring - Population trends
- 3.4. Monitoring - Habitat trends

Justification for research needed

There is potential for improvement in the understanding of population size, full distribution and aspects about its life history and ecology. The impact of all threats is not fully understood. The study of population and habitat trends should also be maintained moving forward.



Annex 3.3.1.8. Distribution of *Aeoniacalles neptunus*. The map was created using satellite image data (© Google Earth) and was generated with QGIS v.3.36.0.

Echinodera pallida Israelson, 1985

Species information

Taxonomy

Kingdom	Phylum	Class	Order	Family
Animalia	Arthropoda	Insecta	Coleoptera	Curculionidae

Region for assessment:

- Global

Geographic range

Biogeographic realm:

- Palearctic

Countries:

- Portugal

Map of records:

Annex 3.3.1.9

Basis of EOO and AOO: Observed

Basis (narrative)

The EOO and AOO were calculated using all information available on species distribution, both published and unpublished data.

Min Elevation/Depth (m): 0

Max Elevation/Depth (m): 163

Range description

The species is present in Selvagem Grande, Selvagem Pequena and Ilhéu de Fora (Stüben, 2016).

Extent of occurrence

EOO (km2): 30

Trend: Unknown

Justification for trend

The species has an EOO of 30 km2, but it is expected to reduce as a consequence of sea level rise (IPCC, 2023; Climate Central, 2025).

Causes ceased?: No

Causes understood?: Yes

Causes reversible?: No

Extreme fluctuations?: Unknown

Area of occupancy

AOO (km2): 20

Trend: Stable

Causes ceased?: Yes

Causes understood?: Yes

Causes reversible?: Yes

Extreme fluctuations?: Unknown

Locations

Number of locations: Unknown

Justification for number of locations

There are no known current threats to this species.

Trend: Unknown

Extreme fluctuations?: Unknown

Population

Trend: Unknown

Causes ceased?: Unknown

Causes understood?: Unknown

Causes reversible?: Unknown

Extreme fluctuations?: Unknown

Subpopulations

Number of subpopulations: At least 3

Trend: Unknown

Extreme fluctuations?: Unknown

Severe fragmentation?: Unknown

Habitat

System: Terrestrial

Habitat specialist: No

Habitat (narrative)

This species is widely distributed and is present in more sandy or rocky habitats of the Selvagens archipelago.

Trend in extent, area or quality?: Stable

Habitat importance: Major Importance

Habitats:

- 3.5. Shrubland - Subtropical/Tropical Dry
- 6. Rocky areas (e.g. inland cliffs, mountain peaks)
- 13.1. Marine Coastal/Supratidal - Sea Cliffs and Rocky Offshore Islands
- 13.3. Marine Coastal/Supratidal - Coastal Sand Dunes

Ecology

Size: 2.4 – 3.9 mm

Generation length (yr): Unknown

Dependency of single sp?: No

Ecology and traits (narrative)

The genus *Echinodera* ranges from the Mediterranean region to the Canary archipelago, comprising 97 species, with 16 taxa belonging to the subgenus *Echinodera* s.str. (Stüben and Astrin, 2010; Stüben, 2019). This taxa has not yet reached Madeira and Azores, having just one species in the Selvagens archipelago (Stüben, 2016). The endemic beetle *Echinodera pallida* is present on all three islands of the archipelago and has a body length ranging from 2.4–3.9mm (Stüben, 2019). This species has been mostly found under mulch of various native plants, with most specimens in collection being sieved under *Lotus glaucus*, *Suaeda vera* and *Patellifolia procumbens*. It was also found in dry *Mesembryanthemum crystallinum* (Israelson, 1985). Lower amounts of specimens were also collected under stones (Stüben, 2016; Stüben, 2019). The preference for mulch goes accordingly to other species of its genus, which are known to develop in ligneous plants and the deadwood substrate (Stüben, 2019).

Threats

Threat type: Future

Threats:

- 9. Pollution
- 10.2. Geological events - Earthquakes/tsunamis
- 11. Climate change & severe weather

Justification for threats

The subpopulations of Selvagem Pequena and Ilhéu de Fora can be impacted by the cumulative effect of marine pollution on the shore and climate change leading to the rise of sea level. The individuals on Selvagem Grande and at higher elevations could be affected by extended periods of drought, extreme temperatures and storms.

Conservation

Conservation action type: In Place

Conservation actions:

- 1.1. Land/water protection - Site/area protection
- 2.1. Land/water management - Site/area management
- 2.2. Land/water management - Invasive/problematic species control

Conservation action type: Needed

Conservation actions:

- 4. Education & awareness

Justification for conservation actions

The entire range of the species is within the Selvagens Nature Reserve.

Other

Use type: International

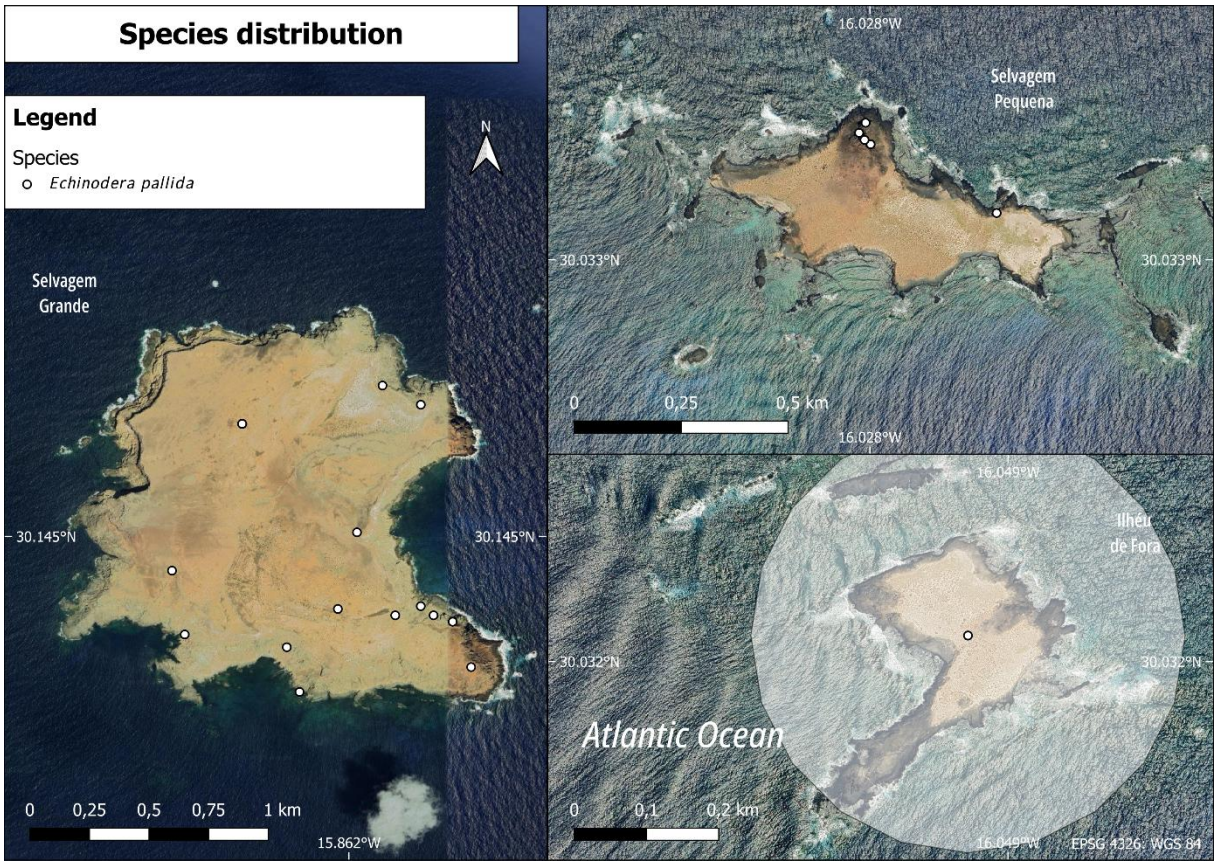
Ecosystem service type: Very important

Research needed:

- 1.2. Research - Population size, distribution & trends
- 1.3. Research - Life history & ecology
- 1.5. Research - Threats
- 3.1. Monitoring - Population trends
- 3.4. Monitoring - Habitat trends

Justification for research needed

There is potential for improvement in the understanding of population size, full distribution and aspects about its life history and ecology. The impact of all threats is not fully understood. The study of population and habitat trends should also be maintained moving forward.



Annex 3.3.1.9. Distribution of *Echinodera pallida*. The map was created using satellite image data (© Google Earth) and was generated with QGIS v.3.36.0.

Ficusacalles oceanicus (*S*tüben, 2002)

Species information

Synonyms

Acalles senilis oceanicus Stüben, 2002; *Ficusacalles senilis oceanicus* Stüben, 2002

Taxonomy

Kingdom	Phylum	Class	Order	Family
Animalia	Arthropoda	Insecta	Coleoptera	Curculionidae

Taxonomic notes

The species was described as *Acalles senilis oceanicus* Stüben, 2002 and was cited later as *Ficusacalles senilis oceanicus* Stüben, 2002.

Region for assessment:

- Global

Geographic range

Biogeographic realm:

- Palearctic

Countries:

- Portugal

Map of records:

Annex 3.3.1.10

Basis of EOO and AOO: Observed

Basis (narrative)

The EOO and AOO were calculated using all information available on species distribution, both published and unpublished data.

Min Elevation/Depth (m): 0

Max Elevation/Depth (m): 49

Range description

The species is found in Selvagem Pequena and Ilhéu de Fora (Stüben, 2016).

Extent of occurrence

EOO (km2): 12

Trend: Unknown

Justification for trend

The species has an EOO of 0.324 km2 (rounded to 12km2 following IUCN standards), but it is expected to reduce as a consequence of sea level rise (IPCC, 2023; Climate Central, 2025).

Causes ceased?: No

Causes understood?: Yes

Causes reversible?: No

Extreme fluctuations?: Unknown

Area of occupancy

AOO (km2): 12

Trend: Stable

Causes ceased?: Yes

Causes understood?: Yes

Causes reversible?: Yes

Extreme fluctuations?: Unknown

Locations

Number of locations: Unknown

Justification for number of locations

There are no known current threats to this species. However, in the future, the rise of sea level may impact the endemic beetle and its host plant, given their proximity to the shore.

Trend: Unknown

Extreme fluctuations?: Unknown

Population

Trend: Unknown

Causes ceased?: Unknown

Causes understood?: Unknown

Causes reversible?: Unknown

Extreme fluctuations?: Unknown

Subpopulations

Number of subpopulations: At least 2

Trend: Unknown

Extreme fluctuations?: Unknown

Severe fragmentation?: Unknown

Habitat

System: Terrestrial

Habitat specialist: No

Habitat (narrative)

The species is currently restricted to Selvagem Pequena and Ilhéu de Fora, where it is found mainly near the coastline. The endemic beetle depends on the host plant *Patellifolia procumbens*, which is frequently seen along the shore and in some parts of Pico do Veado.

Trend in extent, area or quality?: Stable

Habitat importance: Major Importance

Habitats:

- 13.1. Marine Coastal/Supratidal - Sea Cliffs and Rocky Offshore Islands
- 13.3. Marine Coastal/Supratidal - Coastal Sand Dunes

Ecology

Size: 3.8 - 4.9 mm

Generation length (yr): Unknown

Dependency of single sp?: No

Dependent on species: This species can be found in the host plant *Patellifolia procumbens* or in the spurge *Euphorbia anachoreta.*

Dependent on IUCN Status: Least Concern (LC)

Ecology and traits (narrative)

The genus *Ficusacalles* includes only 3 species, distributed by the Canary Islands and the Selvagens archipelago. The Canary Islands species are usually beaten from dried branches of cultivated trees *Ficus* spp. and can also appear on other perennial herbaceaus or woody plants, particularly at night (Stüben, 2019). At the Selvagens archipelago, *Ficusacalles oceanicus* is endemic to Selvagem Pequena and Ilhéu de Fora. It is a xilophagous and polyphagous species like its congeners and its body length varies between 3.8-4.9 mm (Stüben, 2019). In Selvagem Pequena, the species was sieved under mulch of different native plants like *Zygophyllum fontanesii, Suaeda vera* and *Patellifolia procumbens (*syn. *Patellifolia patellaris)*, the latter was confirmed to be the real host plant *F. oceanicus* (Stüben, 2016). In Ilhéu de Fora, the endemic beetle can also develop in the endemic *Euphorbia anachoreta*, since some specimens successfully hatched in the laboratory (Arechavaleta et al., 2001). Furthermore, it was already collected under wood or even under stones, however in lower amounts (Arechavaleta et al., 2001; Stüben, 2016).

Threats

Threat type: Future

Threats:

- 9. Pollution

- 10.2. Geological events - Earthquakes/tsunamis
- 11. Climate change & severe weather

Justification for threats

The host plant and the endemic beetle subpopulations of Selvagem Pequena and Ilhéu de Fora may be impacted by the cumulative effect of marine pollution on the shore and climate change leading to the rise of sea level. The individuals at higher elevations could be affected by extended periods of drought, extreme temperatures and storms.

Conservation

Conservation action type: In Place

Conservation actions:

- 1.1. Land/water protection - Site/area protection
- 2.1. Land/water management - Site/area management

Conservation action type: Needed

Conservation actions:

- 4. Education & awareness

Justification for conservation actions

The entire range of the species is within the Selvagens Nature Reserve.

Other

Use type: International

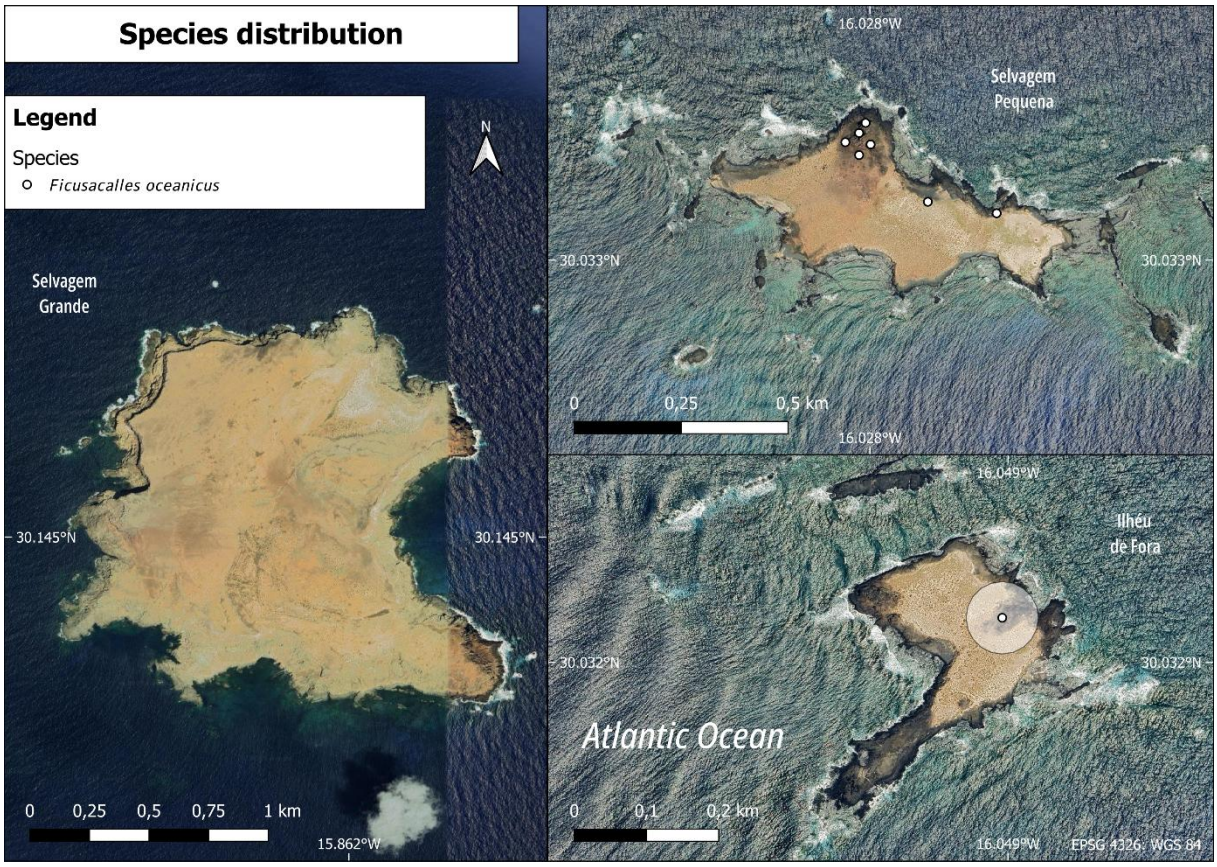
Ecosystem service type: Very important

Research needed:

- 1.2. Research - Population size, distribution & trends
- 1.3. Research - Life history & ecology
- 1.5. Research - Threats
- 1.6. Research - Actions
- 2.2. Conservation Planning - Area-based Management Plan
- 3.1. Monitoring - Population trends
- 3.4. Monitoring - Habitat trends

Justification for research needed

There is a lack of information about this species' population size, full distribution and aspects about its life history and ecology. The impact of all threats is not fully understood, excluding habitat loss. The population and habitat trends should also be studied to further support the conservation efforts that may need to be implemented.



Annex 3.3.1.10. Distribution of *Ficusacalles oceanicus*. The map was created using satellite image data (© Google Earth) and was generated with QGIS v.3.36.0.

Laparocerus garretai Uyttenboogaart, 1940

Species information

Taxonomy

Kingdom	Phylum	Class	Order	Family
Animalia	Arthropoda	Insecta	Coleoptera	Curculionidae

Taxonomic notes

The species has two subspecies: *Laparocerus garretai garretai* Uyttenboogaart, 1940 and *Laparocerus garretai albosquamosus* Machado, 2011.

Region for assessment:

- Global

Geographic range

Biogeographic realm:

- Palearctic

Countries:

- Portugal

Map of records:

Annex 3.3.1.11

Basis of EOO and AOO: Observed

Basis (narrative)

The EOO and AOO were calculated using all information available on species distribution, both published and unpublished data.

Min Elevation/Depth (m): 0

Max Elevation/Depth (m): 163

Range description

The nominotypical subspecies *Laparocerus garretai garretai* Uyttenboogaart, 1940 occurs only in Selvagem Grande and *Laparocerus garretai albosquamosus* Machado 2011 is present in Selvagem Pequena and Ilhéu de Fora (Stüben, 2016).

Extent of occurrence

EOO (km2): 32

Trend: Unknown

Justification for trend

The species has an EOO of 32 km2, but it is expected to reduce as a consequence of sea level rise (IPCC, 2023; Climate Central, 2025).

Causes ceased?: No

Causes understood?: Yes

Causes reversible?: No

Extreme fluctuations?: Unknown

Area of occupancy

AOO (km2): 16

Trend: Stable

Causes ceased?: Yes

Causes understood?: Yes

Causes reversible?: Yes

Extreme fluctuations?: Unknown

Locations

Number of locations: Unknown

Justification for number of locations

There are no known current threats to this species.

Trend: Unknown

Extreme fluctuations?: Unknown

Population

Trend: Unknown

Causes ceased?: Unknown

Causes understood?: Unknown

Causes reversible?: Unknown

Extreme fluctuations?: Unknown

Subpopulations

Number of subpopulations: At least 3

Trend: Unknown

Extreme fluctuations?: Unknown

Severe fragmentation?: Unknown

Habitat

System: Terrestrial

Habitat specialist: No

Habitat (narrative)

This species is widely distributed and is present in more sandy or rocky habitats of the Selvagens archipelago.

Trend in extent, area or quality?: Stable

Habitat importance: Major Importance

Habitats:

- 3.5. Shrubland - Subtropical/Tropical Dry
- 6. Rocky areas (e.g. inland cliffs, mountain peaks)
- 13.1. Marine Coastal/Supratidal - Sea Cliffs and Rocky Offshore Islands
- 13.3. Marine Coastal/Supratidal - Coastal Sand Dunes

Ecology

Size: 3.4 - 5.4 mm

Generation length (yr): Unknown

Dependency of single sp?: No

Ecology and traits (narrative)

The genus *Laparocerus* includes 261 taxa from Madeira, Selvagens and the Canary archipelagos and other two from Morocco. This genus has the greatest endemism per area ratio of any animal or plant of Macaronesia, where the Selvagens archipelago harbors the endemic beetle *Laparocerus garretai* (Machado, 2022). The *Laparocerus* genus is also formed by two monophyletic clades (Madeiran and Canarian), in which *L. garretai* integrates the Canarian clade (Machado, 2017). The species is subdivided into two subspecies, present on different islands of the archipelago. The nominotypical subspecies *Laparocerus garretai garretai* is exclusive to Selvagem Grande. The subspecies *L. garretai albosquamosus* appears in Selvagem Pequena and Ilhéu de Fora (Machado, 2011; Stüben, 2016). Their body length varies between 3.4-5.4mm (Erber and Wheater, 1987; Machado, 2011) and differ mainly in their elytral vestiture, which is uniformly covered with white scales in *L. garretai albosquamosus* (Machado, 2011). This endemic beetle has almost always been collected under rocks (Oromí et al., 1978; Erber and Wheater, 1987; Arechavaleta et al., 2001), but also was found underground and mulch when sieving sand under *Suaeda vera* (Oromí et al., 1978; Machado, 2011). During March/April 2024 monitoring campaign, apart from being collected under rocks, *L. garretai albosquamosus* was also found in *Cistanche phelypaea* in Ilhéu de Fora. The species must be nocturnal, since it is found in greater numbers in early summer, particularly in *Suaeda vera* bushes during nightime (Stüben, 2016) and during the day appears to take refuge under stones. The species was collected in almost every habitat inside the Selvagens archipelago, something that is expected by comparison to its congeners (Machado, 2022).

Threats

Threat type: Future

Threats:

- 9. Pollution
- 10.2. Geological events - Earthquakes/tsunamis
- 11. Climate change & severe weather

Justification for threats

The subpopulations of Selvagem Pequena and Ilhéu de Fora can be impacted by the cumulative effect of marine pollution on the shore and climate change leading to the rise of sea level. The individuals on Selvagem Grande and at higher elevations could be affected by extended periods of drought, extreme temperatures and storms.

Conservation

Conservation action type: In Place

Conservation actions:

- 1.1. Land/water protection - Site/area protection
- 2.1. Land/water management - Site/area management
- 2.2. Land/water management - Invasive/problematic species control

Conservation action type: Needed

Conservation actions:

- 4. Education & awareness

Justification for conservation actions

The entire range of the species is within the Selvagens Nature Reserve.

Other

Use type: International

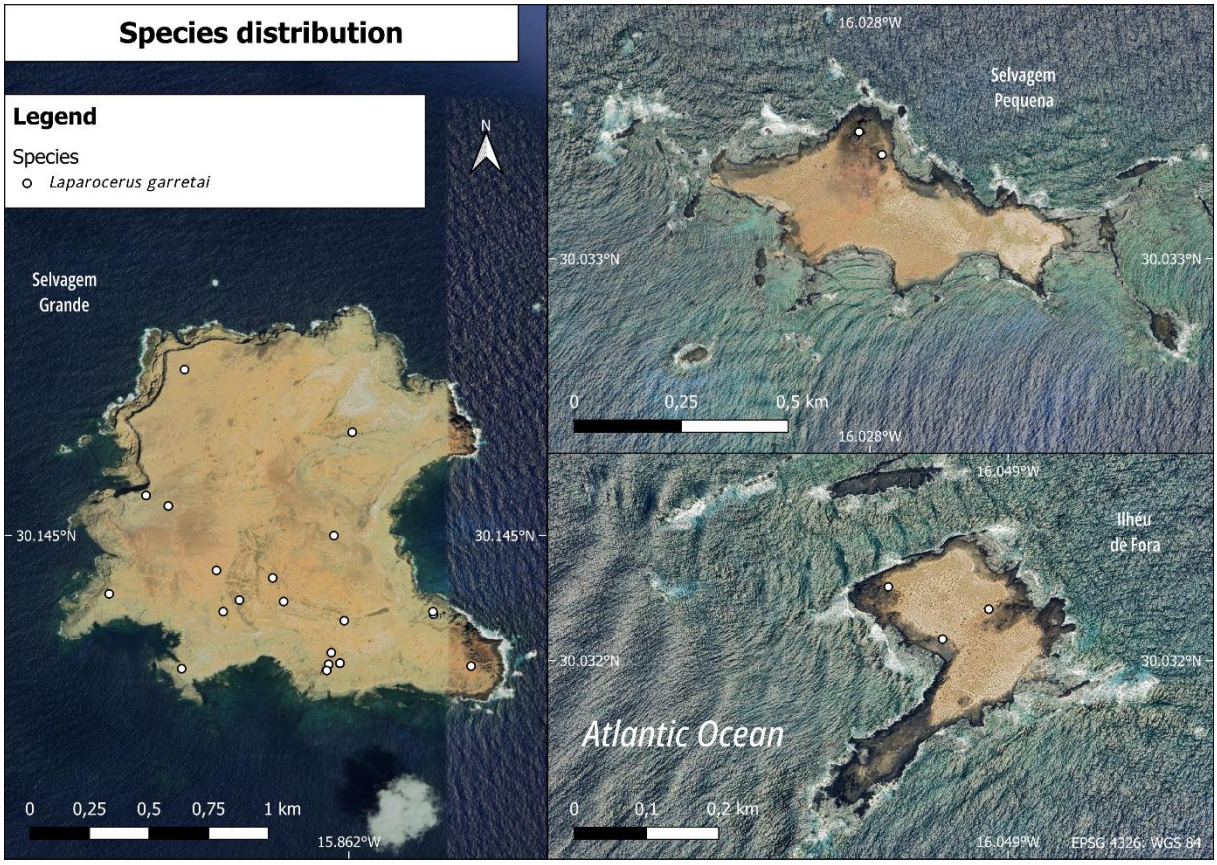
Ecosystem service type: Very important

Research needed:

- 1.2. Research - Population size, distribution & trends
- 1.3. Research - Life history & ecology
- 1.5. Research - Threats
- 3.1. Monitoring - Population trends
- 3.4. Monitoring - Habitat trends

Justification for research needed

There is potential for improvement in the understanding of population size, full distribution and aspects about its life history and ecology. The impact of all threats is not fully understood. The study of population and habitat trends should also be maintained moving forward.



Annex 3.3.1.11. Distribution of *Laparocerus garretai*. The map was created using satellite image data (© Google Earth) and was generated with QGIS v.3.36.0.

Aplocnemus zinoi Stüben, 2016

Species information

Taxonomy

Kingdom	Phylum	Class	Order	Family
Animalia	Arthropoda	Insecta	Coleoptera	Dasytidae

Region for assessment:

- Global

Geographic range

Biogeographic realm:

- Palearctic

Countries:

- Portugal

Map of records:

Annex 3.3.1.12

Basis of EOO and AOO: Observed

Basis (narrative)

The EOO and AOO were calculated using all information available on species distribution, both published and unpublished data.

Min Elevation/Depth (m): 0

Max Elevation/Depth (m): 163

Range description

The species is only known from Selvagem Grande (Stüben, 2016).

Extent of occurrence

EOO (km2): 4

Trend: Unknown

Justification for trend

There are two known sites. The species EOO is rounded to 4km2 following IUCN standards.

Causes ceased?: Yes

Causes understood?: Yes

Causes reversible?: Yes

Extreme fluctuations?: Unknown

Area of occupancy

AOO (km2): 4

Trend: Stable

Causes ceased?: Yes

Causes understood?: Yes

Causes reversible?: Yes

Extreme fluctuations?: Unknown

Locations

Number of locations: Unknown

Justification for number of locations

There are no known current threats to this species.

Trend: Unknown

Extreme fluctuations?: Unknown

Population

Trend: Unknown

Causes ceased?: Unknown

Causes understood?: Unknown

Causes reversible?: Unknown

Extreme fluctuations?: Unknown

Subpopulations

Number of subpopulations: At least 1

Trend: Unknown

Extreme fluctuations?: Unknown

Severe fragmentation?: Unknown

Habitat

System: Terrestrial

Habitat specialist: No

Habitat (narrative)

The species is currently known from Selvagem Grande. The endemic beetle was detected in the caldera habitat and "Chão dos caramujos", both points near the cliffs.

Trend in extent, area or quality?: Stable

Habitat importance: Major Importance

Habitats:

- 3.5. Shrubland - Subtropical/Tropical Dry
- 13.1. Marine Coastal/Supratidal - Sea Cliffs and Rocky Offshore Islands
- 13.3. Marine Coastal/Supratidal - Coastal Sand Dunes

Ecology

Size: 4.2 - 4.8 mm

Generation length (yr): Unknown

Dependency of single sp?: Unknown

Ecology and traits (narrative)

The species belongs to the subfamily Rhadalinae and the genus *Aplocnemus* with several species throughout Europe. The genus is Palaearctic and includes around 150 species that range from the Atlantic coast of France to the Altai mountain range in Central Asia. Congeners are generally able to fly and are found in vegetation, however their biology is still largely unknown, but some species have been confirmed as saproxylic. Depending on the altitude, adults are often active in spring or early summer, while certain species can be found in late fall or early winter (Liberti, 2019). In the Selvagens archipelagago, the endemic *Aplocnemus zinoi* is currently exclusive to Selvagem Grande. Its body length ranges from 4.2-4.8mm and has a brown to dark brown coloration. The only two known specimens were collected under a *Suaeda vera*. The holotype was found in a dry up steambed above Captain Kidd's Cave and the paratype at Ponta da Areia (Stüben, 2016). The new species was found in October 2014, however during April 2024 monitoring the species was not detected, which leads to believe the species is more active in the autumn.

Threats

Threat type: Future

Threats:

- 10.2. Geological events - Earthquakes/tsunamis
- 11. Climate change & severe weather

Justification for threats

The individuals on Selvagem Grande could be affected by climate change, causing extended periods of drought, extreme temperatures and storms.

Conservation

Conservation action type: In Place

Conservation actions:

- 1.1. Land/water protection - Site/area protection
- 2.1. Land/water management - Site/area management
- 2.2. Land/water management - Invasive/problematic species control

Conservation action type: Needed

Conservation actions:

- 4. Education & awareness

Justification for conservation actions

The entire range of the species is within the Selvagens Nature Reserve.

Other

Use type: International

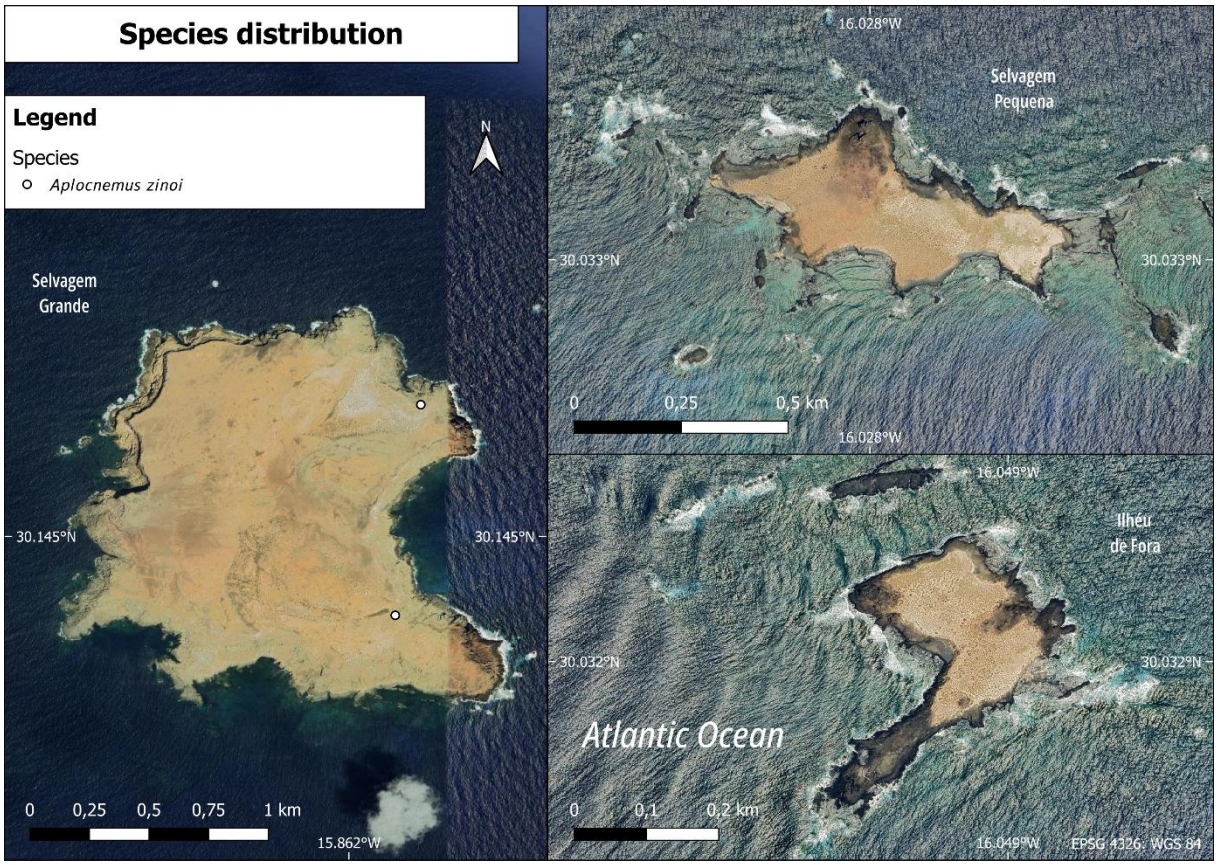
Ecosystem service type: Very important

Research needed:

- 1.2. Research - Population size, distribution & trends
- 1.3. Research - Life history & ecology
- 1.5. Research - Threats
- 3.1. Monitoring - Population trends
- 3.4. Monitoring - Habitat trends

Justification for research needed

There is a lack of information about this species' population size, full distribution and aspects about its life history and ecology. It is possible the species is more active during autumn/winter, given the existence of specimens only from that season. The impact of all threats is not fully understood. The population and habitat trends should also be studied to confirm the species status and further support the conservation efforts that may need to be implemented.



Annex 3.3.1.12. Distribution of *Aplocnemus zinoi*. The map was created using satellite image data (© Google Earth) and was generated with QGIS v.3.36.0.

Coptostethus oromii (Cobos, 1978)

Species information

Synonyms

Cardiophorus oromii Cobos, 1978; *Coptostethus putzeri* Schimmel, 2008; *Coptostethus selvagensis* Schimmel, 2008

Taxonomy

Kingdom	Phylum	Class	Order	Family
Animalia	Arthropoda	Insecta	Coleoptera	Elateridae

Taxonomic notes

The species was described as *Cardiophorus oromii* Cobos, 1978. Later two species were erroneously described: *Coptostethus putzeri* Schimmel, 2008 and *Coptostethus selvagensis* Schimmel, 2008 (Schimmel, 2008).

Region for assessment:

- Global

Geographic range

Biogeographic realm:

- Palearctic

Countries:

- Portugal

Map of records:

Annex 3.3.1.13

Basis of EOO and AOO: Observed

Basis (narrative)

The EOO and AOO were calculated using all information available on species distribution, both published and unpublished data.

Min Elevation/Depth (m): 0

Max Elevation/Depth (m): 163

Range description

This beetle species is endemic to Selvagem Grande and Selvagem Pequena (Stüben, 2016). The presence in Selvagem Pequena is uncertain, since the only record on the island was from an elytra.

Extent of occurrence

EOO (km2): 12

Trend: Unknown

Justification for trend

The species has an EOO of 12 km2, but it is expected to reduce as a consequence of sea level rise (IPCC, 2023; Climate Central, 2025).

Causes ceased?: No

Causes understood?: Yes

Causes reversible?: No

Extreme fluctuations?: Unknown

Area of occupancy

AOO (km2): 12

Trend: Stable

Causes ceased?: Yes

Causes understood?: Yes

Causes reversible?: Yes

Extreme fluctuations?: Unknown

Locations

Number of locations: Unknown

Justification for number of locations

There are no known current threats to this species.

Trend: Unknown

Extreme fluctuations?: Unknown

Habitat

System: Terrestrial

Habitat specialist: No

Habitat (narrative)

This species is relatively distributed and is present in more rocky habitats of the Selvagens archipelago.

Trend in extent, area or quality?: Stable

Habitat importance: Major Importance

Habitats:

- 3.5. Shrubland - Subtropical/Tropical Dry
- 6. Rocky areas (e.g. inland cliffs, mountain peaks)
- 13.1. Marine Coastal/Supratidal - Sea Cliffs and Rocky Offshore Islands

Ecology

Generation length (yr): Unknown

Dependency of single sp?: No

Ecology and traits (narrative)

The genus *Coptostethus* has 67 species ranging from the Cape of Good Hope to North America, with at least 12 species from the Canary Islands, Madeira and the Selvagem archipelagos (Schimmel, 2008; Douglas et al., 2018). The endemic beetle *Coptostethus oromii* shows color variation between individuals, shifting from dark black to unicolored yellow (Stüben, 2016). The difference in coloration was thought to be species-specific (Schimmel, 2008), but it can be attributed to the immature stage and the elytra not being completely hardened (Stüben, 2016). *C. oromii* has been collected across many expeditions in the plateau of Selvagem Grande. The species was also found in Selvagem Pequena, where it was confirmed from elytra sieved in sand under *Suaeda vera* (Arechavaleta et al. 2001). This beetle is mostly found under stones and all georeferenced points from October 2014 and March/April 2023/2024 reveal a southern distribution in Selvagem Grande.

Threats

Threat type: Future

Threats:

- 9. Pollution
- 10.2. Geological events - Earthquakes/tsunamis
- 11. Climate change & severe weather

Justification for threats

The subpopulation of Selvagem Pequena can be impacted by the cumulative effect of marine pollution on the shore and climate change leading to the rise of sea level. The individuals on Selvagem Grande and at higher elevations could be affected by extended periods of drought, extreme temperatures and storms.

Conservation

Conservation action type: In Place

Conservation actions:

- 1.1. Land/water protection - Site/area protection
- 2.1. Land/water management - Site/area management
- 2.2. Land/water management - Invasive/problematic species control

Conservation action type: Needed

Conservation actions:

- 4. Education & awareness

Justification for conservation actions

The entire range of the species is within the Selvagens Nature Reserve.

Other

Use type: International

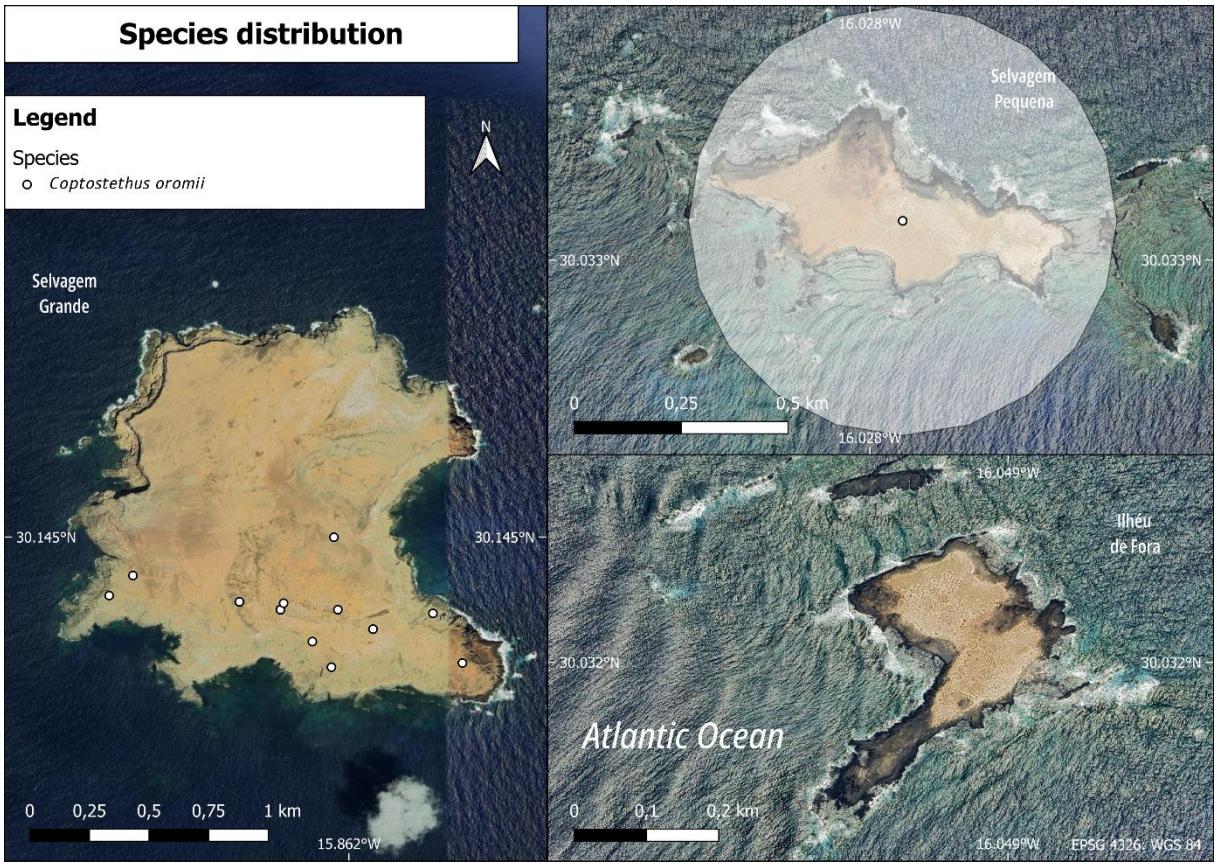
Ecosystem service type: Very important

Research needed:

- 1.2. Research - Population size, distribution & trends
- 1.3. Research - Life history & ecology
- 1.5. Research - Threats
- 3.1. Monitoring - Population trends
- 3.4. Monitoring - Habitat trends

Justification for research needed

There is potential for improvement in the understanding of population size, full distribution and aspects about its life history and ecology. The impact of all threats is not fully understood. The study of population and habitat trends should also be maintained moving forward.



Annex 3.3.1.13. Distribution of *Coptostethus oromii*. The map was created using satellite image data (© Google Earth) and was generated with QGIS v.3.36.0.

Attalus oceanicus Evers, 1971

Species information

Taxonomy

Kingdom	Phylum	Class	Order	Family
Animalia	Arthropoda	Insecta	Coleoptera	Malachiidae

Region for assessment:

- Global

Geographic range

Biogeographic realm:

- Palearctic

Countries:

- Portugal

Map of records:

Annex 3.3.1.14

Basis of EOO and AOO: Observed

Basis (narrative)

The EOO and AOO were calculated using all information available on species distribution, both published and unpublished data.

Min Elevation/Depth (m): 0

Max Elevation/Depth (m): 163

Range description

The species was recorded in Selvagem Grande and Selvagem Pequena (Stüben, 2016). Now it is also known from Ilhéu de Fora.

Extent of occurrence

EOO (km2): 28

Trend: Unknown

Justification for trend

The species has an EOO of 28 km2, but it is expected to reduce as a consequence of sea level rise (IPCC, 2023; Climate Central, 2025).

Causes ceased?: No

Causes understood?: Yes

Causes reversible?: No

Extreme fluctuations?: Unknown

Area of occupancy

AOO (km2): 16

Trend: Stable

Causes ceased?: Yes

Causes understood?: Yes

Causes reversible?: Yes

Extreme fluctuations?: Unknown

Locations

Number of locations: Unknown

Justification for number of locations

There are no known current threats to this species.

Trend: Unknown

Extreme fluctuations?: Unknown

Population

Trend: Unknown

Causes ceased?: Unknown

Causes understood?: Unknown

Causes reversible?: Unknown

Extreme fluctuations?: Unknown

Subpopulations

Number of subpopulations: At least 3

Trend: Unknown

Extreme fluctuations?: Unknown

Severe fragmentation?: Unknown

Habitat

System: Terrestrial

Habitat specialist: No

Habitat (narrative)

This species is widely distributed and is present in more sandy or rocky habitats of the Selvagens archipelago.

Trend in extent, area or quality?: Stable

Habitat importance: Major Importance

Habitats:

- 3.5. Shrubland - Subtropical/Tropical Dry
- 6. Rocky areas (e.g. inland cliffs, mountain peaks)
- 13.1. Marine Coastal/Supratidal - Sea Cliffs and Rocky Offshore Islands
- 13.3. Marine Coastal/Supratidal - Coastal Sand Dunes

Ecology

Generation length (yr): Unknown

Dependency of single sp?: No

Ecology and traits (narrative)

The softwing flower beetles (Malachiidae) are a taxa widely distributed across the globe. Most Malachiidae species are common on flowers, feeding on pollen and some predate aphids. This taxa developed pouches along the sides of the abdomen that can be drawn into the body or inflated like a sack. To entice the females with their secretions, the males have extra excitatory organs on their heads and wingtips. (Stüben, 2016). In the Selvagens archipelago, the endemic beetle *Attalus oceanicus* is present in Selvagem Grande, Selvagem Pequena and was also found in Ilhéu de Fora during the 2024 monitoring campaign. In Selvagem Pequena, the species was collected across different expeditions in the endemic plant *Argyranthemum thalassophilum* (Evers, 1971; Erber and Wheater, 1987; Arechavaleta et al., 2001). During the March/April 2023 and 2024 monitoring, *A. oceanicus* was found with specific plant sweeping on native species like *Astydamia latifolia*, *Chenopodium coronopus*, *Centaurea melitensis* and *Suaeda vera*, but was absent when searching on *Schizogyne sericea*. In Ilhéu de Fora, the species was only found in the transect with greater coverage of *Lotus glaucus*. Other plant sweeps along transects at Selvagem Grande, which covered *Lotus glaucus*, also had the endemic beetle. Furthermore, those transects of Selvagem Grande and samples on the parasitic plant *Cistanche phelypaea*, where the endemic beetle was found, presented a greater quantity of aphids. Those samples suggest *A. oceanicus* may be omnivorous on pollen and predate aphids like other softwing flower beetles.

Threats

Threat type: Future

Threats:

- 9. Pollution
- 10.2. Geological events - Earthquakes/tsunamis
- 11. Climate change & severe weather

Justification for threats

The subpopulations of Selvagem Pequena and Ilhéu de Fora can be impacted by the cumulative effect of marine pollution on the shore and climate change leading to the rise of sea level. The individuals on Selvagem Grande and at higher elevations could be affected by extended periods of drought, extreme temperatures and storms.

Conservation

Conservation action type: In Place

Conservation actions:

- 1.1. Land/water protection - Site/area protection
- 2.1. Land/water management - Site/area management
- 2.2. Land/water management - Invasive/problematic species control

Conservation action type: Needed

Conservation actions:

- 4. Education & awareness

Justification for conservation actions

The entire range of the species is within the Selvagens Nature Reserve.

Other

Use type: International

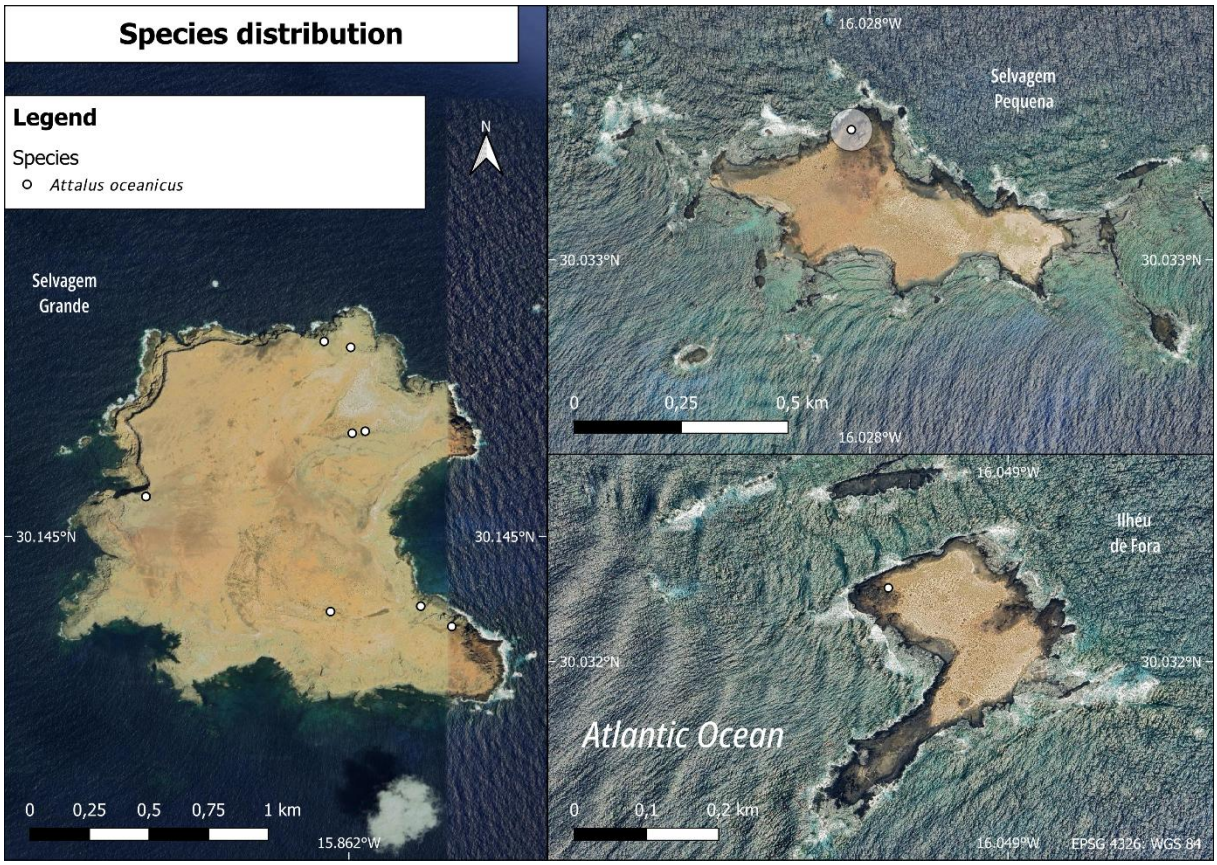
Ecosystem service type: Very important

Research needed:

- 1.2. Research - Population size, distribution & trends
- 1.3. Research - Life history & ecology
- 1.5. Research - Threats
- 3.1. Monitoring - Population trends
- 3.4. Monitoring - Habitat trends

Justification for research needed

There is potential for improvement in the understanding of population size, full distribution and aspects about its life history and ecology. The impact of all threats is not fully understood. The study of population and habitat trends should also be maintained moving forward.



Annex 3.3.1.14. Distribution of *Attalus oceanicus*. The map was created using satellite image data (© Google Earth) and was generated with QGIS v.3.36.0.

Ifnidius atlanticus Evers, 1981

Species information

Taxonomy

Kingdom	Phylum	Class	Order	Family
Animalia	Arthropoda	Insecta	Coleoptera	Malachiidae

Region for assessment:

- Global

Geographic range

Biogeographic realm:

- Palearctic

Countries:

- Portugal

Map of records:

Annex 3.3.1.15

Basis of EOO and AOO: Observed

Basis (narrative)

The EOO and AOO were calculated using all information available on species distribution, both published and unpublished data.

Min Elevation/Depth (m): 0

Max Elevation/Depth (m): 49

Range description

The species is endemic to Selvagem Pequena (Stüben, 2016).

Extent of occurrence

EOO (km2): 4

Trend: Unknown

Justification for trend

There is one known site. The species EOO is rounded to 4km2 following IUCN standards, but it is expected to reduce as a consequence of sea level rise (IPCC, 2023; Climate Central, 2025).

Causes ceased?: No

Causes understood?: Yes

Causes reversible?: No

Extreme fluctuations?: Unknown

Area of occupancy

AOO (km2): 4

Trend: Stable

Causes ceased?: Yes

Causes understood?: Yes

Causes reversible?: Yes

Extreme fluctuations?: Unknown

Locations

Number of locations: 1

Justification for number of locations

The species has a single subpopulation and occurs in a specific habitat. Historical information shows a decline in habitat quality due to pollution from oil contamination and marine trash that is deposited on shore (Friedlander et al., 2016). Additionally, the future climate scenarios project a rise of sea level to 1m over the next 100 years and consequently an almost complete reduction of its habitat (IPCC, 2023; Climate Central, 2025).

Trend: Decline (inferred)

Extreme fluctuations?: Unknown

Population

Trend: Unknown

Causes ceased?: Unknown

Causes understood?: Unknown

Causes reversible?: Unknown

Extreme fluctuations?: Unknown

Subpopulations

Number of subpopulations: At least 1

Trend: Unknown

Extreme fluctuations?: Unknown

Severe fragmentation?: Unknown

Habitat

System: Terrestrial

Habitat specialist: Yes

Habitat (narrative)

The specimen was found in Selvagem Pequena. The species is currently known to be under rocks in the supratidal coastline zone, which has limited area and there are considerable threats.

Trend in extent, area or quality?: Decline (inferred)

Habitat importance: Major Importance

Habitats:

- 13.1. Marine Coastal/Supratidal - Sea Cliffs and Rocky Offshore Islands

Ecology

Size: 2,9 mm

Generation length (yr): Unknown

Dependency of single sp?: Unknown

Ecology and traits (narrative)

The species belongs to an almost exclusive genus of Macaronesian region, which includes five more species (three from the Canary Islands, one from Cape Verde and another one from southwest Morocco at Sidi Ifni) (Stüben, 2016). The majority of *Ifnidius* species are lavicoles and are found in supratidal halophilous habitats, except *I. milleri* from Cape Verde that was collected inland (López et al., 2014). The only specimen of *Ifnidius atlanticus* known has 2,9mm and was collected in February 1976 (Evers, 1981). The species in this genus have not been caught using "typical" methods (Evers, 1981) and the specimen was found under a stone very close to the seashore of Selvagem Pequena (López et al., 2014; Stüben, 2016). Based on its similarity to its congeners, it is probably a species more adapted to living in the ground, unlike most Malachiidae which tend to be floricolous. Furthermore, the presence of very small eyes could also indicate that it lives underground, where there is little influence from the light (Evers, 1981).

Threats

Threat type: Past

Threats:

- 9. Pollution
- 11. Climate change & severe weather

Threat type: Ongoing

Threats:

- 9. Pollution
- 11. Climate change & severe weather

Threat type: Future

Threats:

- 9. Pollution
- 10.2. Geological events - Earthquakes/tsunamis
- 11. Climate change & severe weather

Justification for threats

The species is under the threats of marine pollution (past oil contamination and litter) and the ongoing rise of sea level, as it is confined to the supratidal zone of Selvagem Pequena. In the future, the remaining individuals may face even greater impact by the cumulative effect of marine pollution on the shore and climate change leading to loss of almost all the known habitat.

Conservation

Conservation action type: In Place

Conservation actions:

- 1.1. Land/water protection - Site/area protection
- 2.1. Land/water management - Site/area management

Conservation action type: Needed

Conservation actions:

- 3.1. Species management - Species management
- 4. Education & awareness
- 5.1. Law & policy - Legislation

Justification for conservation actions

The entire range of the species is within the Selvagens Nature Reserve.

Other

Use type: International

Ecosystem service type: Very important

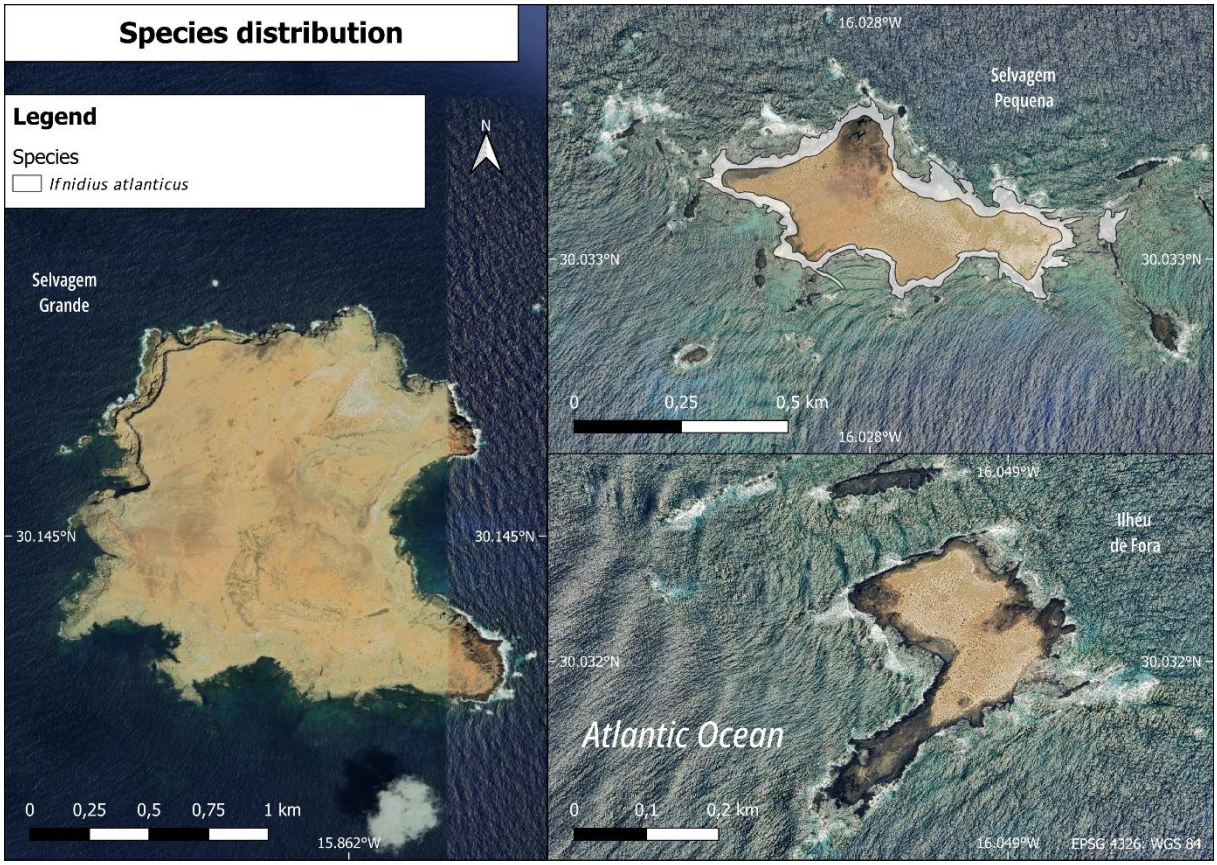
Research needed:

- 1.1. Research - Taxonomy
- 1.2. Research - Population size, distribution & trends
- 1.3. Research - Life history & ecology
- 1.5. Research - Threats

- 1.6. Research - Actions
- 2.1. Conservation Planning - Species Action/Recovery Plan
- 2.2. Conservation Planning - Area-based Management Plan
- 3.1. Monitoring - Population trends
- 3.4. Monitoring - Habitat trends

Justification for research needed

There is a lack of information about this species' population size, full distribution and aspects about its life history and ecology. The knowledge on taxonomy can be improved since there is one specimen in collection. The impact of all threats is not fully understood, excluding habitat loss and pollution. The population and habitat trends should also be studied to further support the conservation efforts that need to be implemented.



Annex 3.3.1.15. Distribution of *Ifnidius atlanticus*. The map was created using satellite image data (© Google Earth) and was generated with QGIS v.3.36.0.

Oligota selvagensis Assing, 2000

Species information

Taxonomy

Kingdom	Phylum	Class	Order	Family
Animalia	Arthropoda	Insecta	Coleoptera	Staphylinidae

Region for assessment:

- Global

Geographic range

Biogeographic realm:

- Palearctic

Countries:

- Portugal

Map of records:

Annex 3.3.1.16

Basis of EOO and AOO: Observed

Basis (narrative)

The EOO and AOO were calculated using all information available on species distribution, both published and unpublished data.

Min Elevation/Depth (m): 0

Max Elevation/Depth (m): 163

Range description

This species was recorded only in Selvagem Grande (Stüben, 2016).

Extent of occurrence

EOO (km2): 8

Trend: Unknown

Justification for trend

The species has an EOO of 1.211 km2 (rounded to 8km2 following IUCN standards).

Causes ceased?: Yes

Causes understood?: Yes

Causes reversible?: Yes

Extreme fluctuations?: Unknown

Area of occupancy

AOO (km2): 8

Trend: Stable

Causes ceased?: Yes

Causes understood?: Yes

Causes reversible?: Yes

Extreme fluctuations?: Unknown

Locations

Number of locations: Unknown

Justification for number of locations

There are no known current threats to this species.

Trend: Unknown

Extreme fluctuations?: Unknown

Population

Trend: Unknown

Causes ceased?: Unknown

Causes understood?: Unknown

Causes reversible?: Unknown

Extreme fluctuations?: Unknown

Subpopulations

Number of subpopulations: At least 1

Trend: Unknown

Extreme fluctuations?: Unknown

Severe fragmentation?: Unknown

Habitat

System: Terrestrial

Habitat specialist: No

Habitat (narrative)

This species is widely distributed and is present in more sandy or rocky habitats of the Selvagens archipelago.

Trend in extent, area or quality?: Stable

Habitat importance: Major Importance

Habitats:

- 3.5. Shrubland - Subtropical/Tropical Dry
- 6. Rocky areas (e.g. inland cliffs, mountain peaks)
- 13.1. Marine Coastal/Supratidal - Sea Cliffs and Rocky Offshore Islands
- 13.3. Marine Coastal/Supratidal - Coastal Sand Dunes

Ecology

Size: 1.50 - 1.75 mm

Generation length (yr): 1

Dependency of single sp?: No

Ecology and traits (narrative)

The *Oligota* genus is a cosmopolitan taxa, which larvae and adults are known as predators of spider mites and other small arthropods. The Staphylinidae *Oligota selvagensis* is an endemic species of Selvagem Grande. Its total length ranges from 1.50-1.75mm (Assing, 2000). The beetle appears to prefer sites with more humidity, it was already found in damp hollows and rainwater cisterns (Stüben, 2016). The species was also more active during a monitorization in March/April 2024 during a rainy period, when compared to previous data from the same season with no rain influence on March/April 2023. Furthermore, it can be found by sieving under bushes of *Suaeda vera* and *Schizogyne sericea* (Stüben, 2016). The endemic beetle was also found in sand between the roots of *Nicotiana glauca* (Arechavaleta et al., 2001). On Selvagem Grande, it seems not to be rare (Stüben, 2016), it is widespread on the island and may be more abundant in the sandy habitat (Chão dos caramujos). The past information on collection specimens also points to the species being more common on this sector of the island.

Threats

Threat type: Future

Threats:

- 10.2. Geological events - Earthquakes/tsunamis
- 11. Climate change & severe weather

Justification for threats

The individuals on Selvagem Grande could be affected by climate change, causing extended periods of drought, extreme temperatures and storms.

Conservation

Conservation action type: In Place

Conservation actions:

- 1. Land/water protection
- 1.1. Land/water protection - Site/area protection
- 2.1. Land/water management - Site/area management

Conservation action type: Needed

Conservation actions:

- 4.3. Education & awareness - Awareness & communications

Other

Use type: International

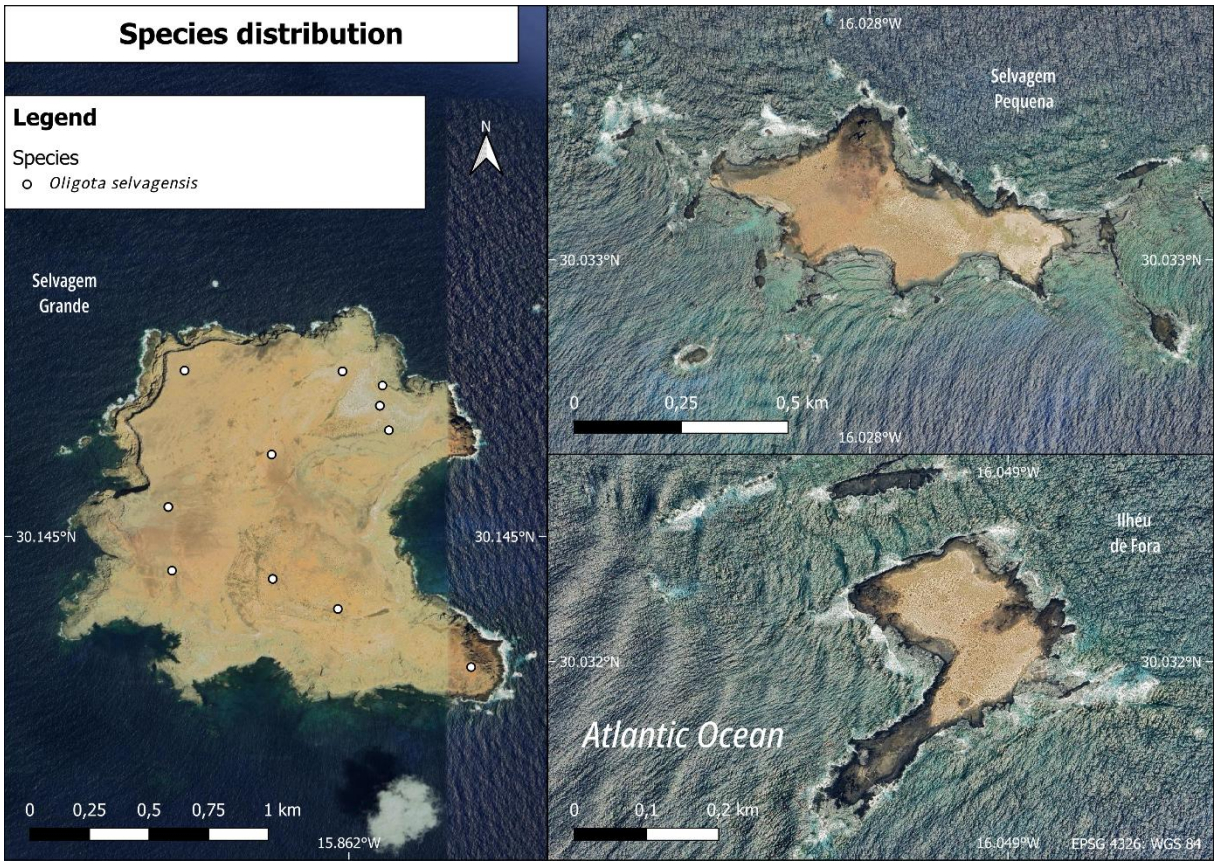
Ecosystem service type: Very important

Research needed:

- 1.2. Research - Population size, distribution & trends
- 1.3. Research - Life history & ecology
- 1.5. Research - Threats
- 3.1. Monitoring - Population trends
- 3.4. Monitoring - Habitat trends

Justification for research needed

There is potential for improvement in the understanding of population size, full distribution and aspects about its life history and ecology. The impact of all threats is not fully understood. The study of population and habitat trends should also be maintained moving forward.



Annex 3.3.1.16. Distribution of *Oligota selvagensis*. The map was created using satellite image data (© Google Earth) and was generated with QGIS v.3.36.0.

Leptobium paivae (Wollaston, 1865)

Species information

Synonyms

Dolicaon paivae Wollaston, 1865

Taxonomy

Kingdom	Phylum	Class	Order	Family
Animalia	Arthropoda	Insecta	Coleoptera	Staphylinidae

Taxonomic notes

The species was described as Dolicaon paivae Wollaston, 1865.

Region for assessment:

- Global

Geographic range

Biogeographic realm:

- Palearctic

Countries:

- Portugal

Map of records:

Annex 3.3.1.17

Basis of EOO and AOO: Observed

Basis (narrative)

The EOO and AOO were calculated using all information available on species distribution, both published and unpublished data.

Min Elevation/Depth (m): 0

Max Elevation/Depth (m): 163

Range description

The species was recorded in Selvagem Grande and Selvagem Pequena (Stüben, 2016). Now it is also known from Ilhéu de Fora.

Extent of occurrence

EOO (km2): 26

Trend: Decline (observed)

Justification for trend

The species has an EOO of 26 km2, but it is expected to reduce as a consequence of sea level rise (IPCC, 2023; Climate Central, 2025).

Causes ceased?: No

Causes understood?: Yes

Causes reversible?: No

Extreme fluctuations?: Unknown

Area of occupancy

AOO (km2): 16

Trend: Stable

Causes ceased?: Yes

Causes understood?: Yes

Causes reversible?: Yes

Extreme fluctuations?: Unknown

Locations

Number of locations: Unknown

Justification for number of locations

There are no known current threats to this species.

Trend: Unknown

Extreme fluctuations?: Unknown

Population

Trend: Unknown

Causes ceased?: Unknown

Causes understood?: Unknown

Causes reversible?: Unknown

Extreme fluctuations?: Unknown

Subpopulations

Number of subpopulations: At least 3

Trend: Unknown

Extreme fluctuations?: Unknown

Severe fragmentation?: Unknown

Habitat

System: Terrestrial

Habitat specialist: No

Habitat (narrative)

This species is widely distributed and is present in more rocky habitats of the Selvagens archipelago.

Trend in extent, area or quality?: Stable

Habitat importance: Major Importance

Habitats:

- 3.5. Shrubland - Subtropical/Tropical Dry
- 6. Rocky areas (e.g. inland cliffs, mountain peaks)

- 13.1. Marine Coastal/Supratidal - Sea Cliffs and Rocky Offshore Islands

Ecology

Generation length (yr): Unknown

Dependency of single sp?: No

Ecology and traits (narrative)

The species from the genus *Leptobium* are distributed in the Palaearctic region, comprising over 65 species and subspecies (Assing, 2009). The majority of adult individuals are found in two seasons, the maximum in spring and another in late autumn and early winter, suggesting a bivoltine life cycle (Assing, 2005). Almost every species is brachypterous and has restricted distributions given their low dispersal power (Assing, 2005). The endemic beetle *Leptobium paivae* like many other endemic beetles from Selvagens has those morphological characteristics. It is endemic to Selvagem Grande, Selvagem Pequena and was found to be also endemic to Ilhéu de Fora in 2024. It was already found in detritus under *Lotus glaucus* and *Suaeda vera* (Stüben, 2016). The endemic beetle appears to prefer sites with more humidity. Collection specimens between November/December 2006 were found in great numbers on Selvagem Grande after heavy rainfall (Assing, 2009), which matches data collected from March/April 2024. During March/April 2024 it was found with direct sampling methods, under stones with visible moist soil underneath and the habitats in which the species is found to match those with more water acumulation. Previous collection specimens were also collected under stones (Serrano, 1983; Erber and Wheater, 1987; Arechavaleta et al., 2001) and were found in the slopes of Selvagem Grande (Oromí et al., 1978; Stüben, 2016) and "Chão dos caramujos" (Stüben, 2016). It is plausible that the species has a subterranean habit and is dependent on edafoclimatic conditions, like its congeners. Unlike the other endemic Staphylinidae *Oligota selvagensis* it was not collected on pitfall traps, nor in March/April 2023 or March/April 2024 (with heavy rainfall). The species was already collected from piles of wings of huntted *Puffinus khuli*, on Selvagem Grande during 1911 (Garreta, 1911).

Threats

Threat type: Future

Threats:

- 9. Pollution
- 10.2. Geological events - Earthquakes/tsunamis
- 11. Climate change & severe weather

Justification for threats

The subpopulations of Selvagem Pequena and Ilhéu de Fora can be impacted by the cumulative effect of marine pollution on the shore and climate change leading to the rise of sea level. The individuals on Selvagem Grande and at higher elevations could be affected by extended periods of drought, extreme temperatures and storms.

Conservation

Conservation action type: In Place

Conservation actions:

- 1.1. Land/water protection - Site/area protection
- 2.1. Land/water management - Site/area management
- 2.2. Land/water management - Invasive/problematic species control

Conservation action type: Needed

Conservation actions:

- 4. Education & awareness

Justification for conservation actions

The entire range of the species is within the Selvagens Nature Reserve.

Other

Use type: International

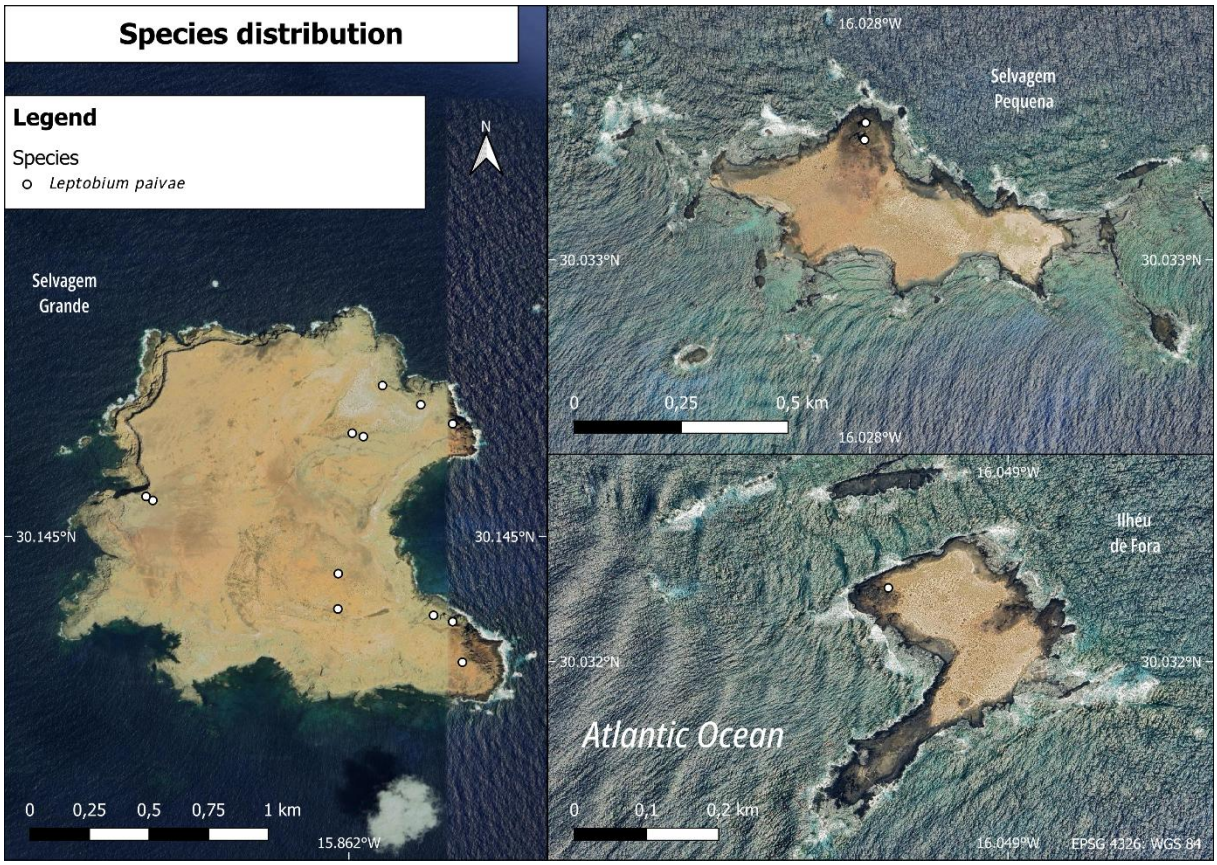
Ecosystem service type: Very important

Research needed:

- 1.2. Research - Population size, distribution & trends
- 1.3. Research - Life history & ecology
- 1.5. Research - Threats
- 3.1. Monitoring - Population trends
- 3.4. Monitoring - Habitat trends

Justification for research needed

There is potential for improvement in the understanding of population size, full distribution and aspects about its life history and ecology. The impact of all threats is not fully understood. The study of population and habitat trends should also be maintained moving forward.



Annex 3.3.1.17. Distribution of *Leptobium paivae*. The map was created using satellite image data (© Google Earth) and was generated with QGIS v.3.36.0.

Hegeter latebricola Wollaston, 1854

Species information

Taxonomy

Kingdom	Phylum	Class	Order	Family
Animalia	Arthropoda	Insecta	Coleoptera	Tenebrionidae

Region for assessment:

- Global

Geographic range

Biogeographic realm:

- Palearctic

Countries:

- Portugal

Map of records:

Annex 3.3.1.18

Basis of EOO and AOO: Observed

Basis (narrative)

The EOO and AOO were calculated using all information available on species distribution, both published and unpublished data.

Min Elevation/Depth (m): 0

Max Elevation/Depth (m): 163

Range description

This species is found in Selvagem Grande, Selvagem Pequena and Ilhéu de Fora (Stüben, 2016).

Extent of occurrence

EOO (km2): 37

Trend: Unknown

Justification for trend

The species has an EOO of 37km2, but it is expected to reduce as a consequence of sea level rise (IPCC, 2023; Climate Central, 2025).

Causes ceased?: No

Causes understood?: Yes

Causes reversible?: No

Extreme fluctuations?: Unknown

Area of occupancy

AOO (km2): 20

Trend: Stable

Causes ceased?: Yes

Causes understood?: Yes

Causes reversible?: Yes

Extreme fluctuations?: Unknown

Locations

Number of locations: Unknown

Justification for number of locations

There are no known current threats to this species.

Trend: Unknown

Extreme fluctuations?: Unknown

Population

Trend: Unknown

Causes ceased?: Unknown

Causes understood?: Unknown

Causes reversible?: Unknown

Extreme fluctuations?: Unknown

Subpopulations

Number of subpopulations: At least 3

Trend: Unknown

Extreme fluctuations?: Unknown

Severe fragmentation?: Unknown

Habitat

System: Terrestrial

Habitat specialist: No

Habitat (narrative)

The species is widely distributed and is present in more sandy or rocky habitats of the Selvagens archipelago.

Trend in extent, area or quality?: Stable

Habitat importance: Major Importance

Habitats:

- 3.5. Shrubland - Subtropical/Tropical Dry
- 6. Rocky areas (e.g. inland cliffs, mountain peaks)
- 13.1. Marine Coastal/Supratidal - Sea Cliffs and Rocky Offshore Islands
- 13.3. Marine Coastal/Supratidal - Coastal Sand Dunes

Ecology

Generation length (yr): Unknown

Dependency of single sp?: No

Ecology and traits (narrative)

Hegeter latebricola is a darkling beetle found in all three islands of the Selvagens archipelago. The species is more active at night and appears to be detritivorous and polyphagous like its congeners of the Canary Islands (De Los Santos et al., 2000; Arechavaleta and Oromí, 2015). During previous expeditions it was usually found under stones in daytime and more recently in mulch at different plant species of Selvagem Pequena (Stüben, 2016). In Selvagem Grande it was also observed hiding in trunks of *Nicotiana glauca* (Erber and Wheater, 1987), an exotic invasive plant that is being erradicated from the island. This Tenebrionidae was reported as abundant in dead wood of *Euphorbia anachoreta* from Ilhéu de Fora (Arechavaleta et al., 2001) and also inhabits under wood planks brought inland in Selvagem Pequena. The species is thought to be more abundant in Selvagem Pequena, where most specimens were observed and deposited in collections across expeditions (Oromí et al., 1978; Erber and Wheater, 1987). This could result from no competition of its congeneric *Hegeter tristis*, which is only present in Selvagem Grande (Oromí, 1983). During the March/April 2023 and 2024 monitorings, *H. latebricola* was more common than *H. tristis*. During the latest monitoring, the endemic beetle was abundant and widespread in Selvagem Pequena (most under planks near the rangers house) but also in Ilhéu de Fora. Comparing the notes on previous expeditions and collection specimens, it appears to be gregarious and associated with the endemic species of the same family (*Nesotes leacoccianus*) (Fea 1883; Oromí et al., 1978). During the recent monitorizations, the species was found also under a corpse of *Calonectris borealis* and in another sample was lodged in *Cistanche phelypaeae*. The information supports the idea of utilizing various food sources and refuges. It also consolidates the historical observations of being widespread, abundant and related to its ecology.

Threats

Threat type: Future

Threats:

- 9. Pollution
- 10.2. Geological events - Earthquakes/tsunamis
- 11. Climate change & severe weather

Justification for threats

The subpopulations of Selvagem Pequena and Ilhéu de Fora can be impacted by the cumulative effect of marine pollution on the shore and climate change leading to the rise of sea level. The individuals on Selvagem Grande and at higher elevations could be affected by extended periods of drought, extreme temperatures and storms.

Conservation

Conservation action type: In Place

Conservation actions:

- 1.1. Land/water protection - Site/area protection
- 2.1. Land/water management - Site/area management
- 2.2. Land/water management - Invasive/problematic species control

Conservation action type: Needed

Conservation actions:

- 4. Education & awareness

Justification for conservation actions

The entire range of the species is within the Selvagens Nature Reserve.

Other

Use type: International

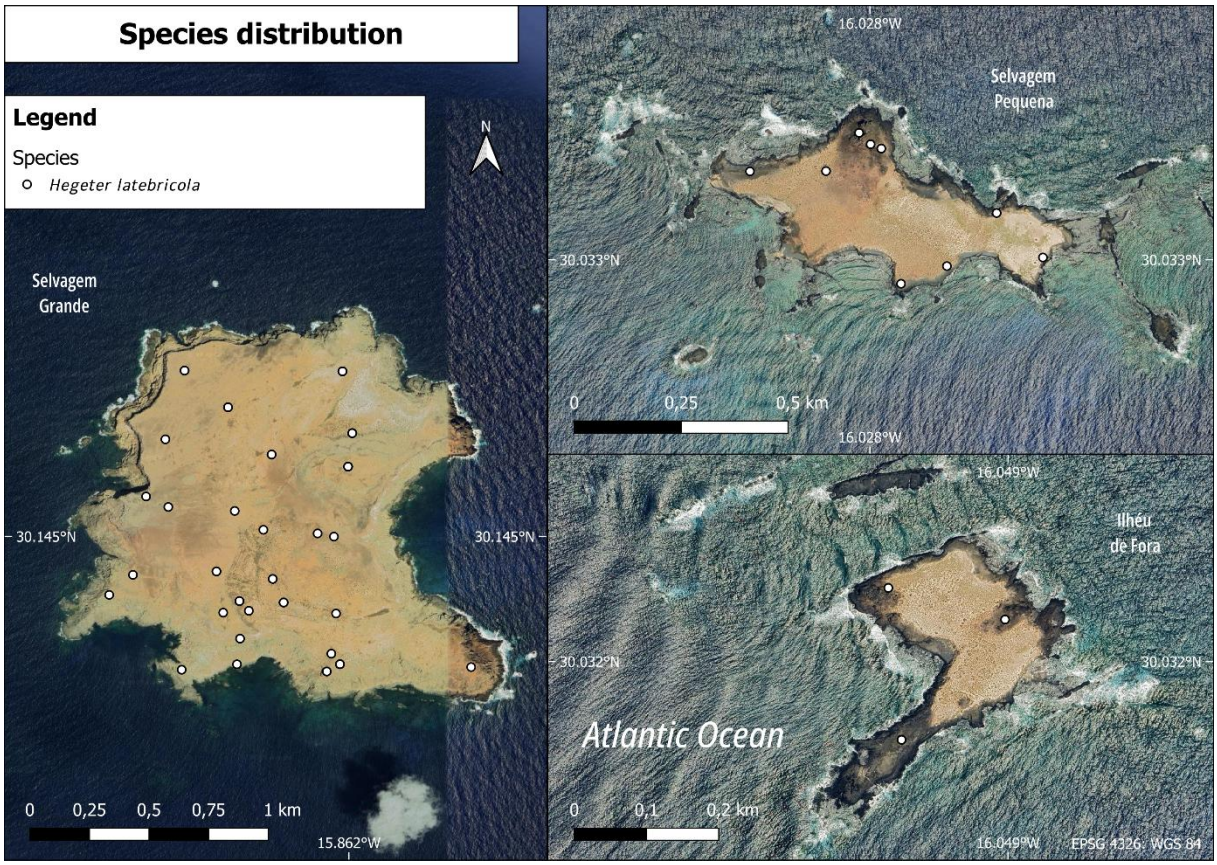
Ecosystem service type: Very important

Research needed:

- 1.2. Research - Population size, distribution & trends
- 1.3. Research - Life history & ecology
- 1.5. Research - Threats
- 3.1. Monitoring - Population trends
- 3.4. Monitoring - Habitat trends

Justification for research needed

There is potential for improvement in the understanding of population size, full distribution and aspects about its life history and ecology. The impact of all threats is not fully understood. The study of population and habitat trends should also be maintained moving forward.



Annex 3.3.1.18. Distribution of *Hegeter latebricola*. The map was created using satellite image data (© Google Earth) and was generated with QGIS v.3.36.0.

Gonocephalum dilatatum (Wollaston, 1854)

Species information

Synonyms

Opatrum dilatatum Wollaston, 1854

Taxonomy

Kingdom	Phylum	Class	Order	Family
Animalia	Arthropoda	Insecta	Coleoptera	Tenebrionidae

Taxonomic notes

The species was described as Opatrum dilatatum Wollaston, 1854.

Region for assessment:

- Global

Geographic range

Biogeographic realm:

- Palearctic

Countries:

- Portugal

Map of records:

Annex 3.3.1.19

Basis of EOO and AOO: Observed

Basis (narrative)

The EOO and AOO were calculated using all information available on species distribution, both published and unpublished data.

Min Elevation/Depth (m): 0

Max Elevation/Depth (m): 163

Range description

This species is endemic to Selvagem Grande, Selvagem Pequena and Ilhéu de Fora (Stüben, 2016).

Extent of occurrence

EOO (km2): 36

Trend: Unknown

Justification for trend

The species has an EOO of 36km2, but it is expected to reduce as a consequence of sea level rise (IPCC, 2023; Climate Central, 2025).

Causes ceased?: No

Causes understood?: Yes

Causes reversible?: No

Extreme fluctuations?: Unknown

Area of occupancy

AOO (km2): 20

Trend: Stable

Causes ceased?: Yes

Causes understood?: Yes

Causes reversible?: Yes

Extreme fluctuations?: Unknown

Locations

Number of locations: Unknown

Justification for number of locations

There are no known current threats to this species. However, in the future, the rise of sea level may cause impacts, given its proximity to the shore.

Trend: Unknown

Extreme fluctuations?: Unknown

Population

Trend: Unknown

Causes ceased?: Unknown

Causes understood?: Unknown

Causes reversible?: Unknown

Extreme fluctuations?: Unknown

Subpopulations

Number of subpopulations: At least 3

Trend: Unknown

Extreme fluctuations?: Unknown

Severe fragmentation?: Unknown

Habitat

System: Terrestrial

Habitat specialist: No

Habitat (narrative)

The species can be found on the three islands of the archipelago. However, in Selvagem Grande the endemic beetle has been collected on top of the cliffs and at its base, close to the sea level. In the other islands, it seems to be mainly near the coastline.

Trend in extent, area or quality?: Stable

Habitat importance: Major Importance

Habitats:

- 3.5. Shrubland - Subtropical/Tropical Dry
- 13.1. Marine Coastal/Supratidal - Sea Cliffs and Rocky Offshore Islands
- 13.3. Marine Coastal/Supratidal - Coastal Sand Dunes

Ecology

Generation length (yr): Unknown

Dependency of single sp?: No

Ecology and traits (narrative)

The genus *Gonocephalum* is represented by 415 taxa distributed worldwide (Iwan et al., 2010). *Gonocephalum dilatatum* is a species endemic to all three islands of the Selvagens archipelago. This Tenebrionidae was collected across the expeditions under stones and was also found by sieving detritus of different bushes, such as *Suaeda vera* (Stüben, 2016). Despite being widely present in the Selvagens Islands, the species has a distinct distribution, particularly in Selvagem Grande. During the recent long-term monitoring, the species has shown to appear only in the perimeter of Selvagem Grande, at the top of the cliffs and its base, close to the sea level. On the other islands, Selvagem Pequena and Ilhéu de Fora, it was also present along the shore and in Pico do Veado, however it should be confirmed if it appears further inland. The more central areas of the latter islands were not possible to reach since it was an interdict seabird nesting ground. This beetle species may have a peripheral distribution since specimens in collection with coordinates also point to these conclusions.

Threats

Threat type: Future

Threats:

- 9. Pollution
- 10.2. Geological events - Earthquakes/tsunamis
- 11. Climate change & severe weather

Justification for threats

The subpopulations of Selvagem Grande, Selvagem Pequena and Ilhéu de Fora may be impacted by the cumulative effect of marine pollution on the shore and climate change leading to the rise of sea level.

The individuals on Selvagem Grande and at higher elevations could be affected by extended periods of drought, extreme temperatures and storms.

Conservation

Conservation action type: In Place

Conservation actions:

- 1.1. Land/water protection - Site/area protection
- 2.1. Land/water management - Site/area management
- 2.2. Land/water management - Invasive/problematic species control

Conservation action type: Needed

Conservation actions:

- 4. Education & awareness

Justification for conservation actions

The entire range of the species is within the Selvagens Nature Reserve.

Other

Use type: International

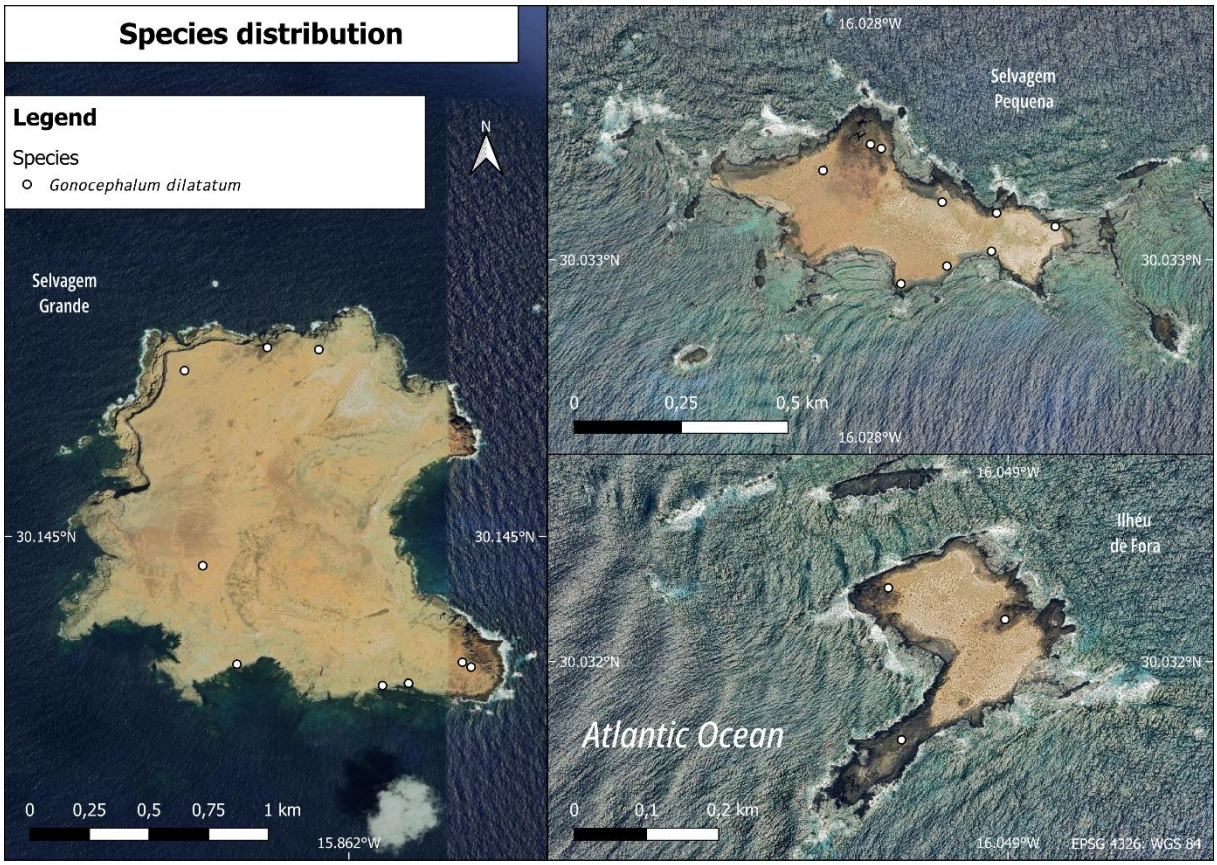
Ecosystem service type: Very important

Research needed:

- 1.2. Research - Population size, distribution & trends
- 1.3. Research - Life history & ecology
- 1.5. Research - Threats
- 1.6. Research - Actions
- 2.2. Conservation Planning - Area-based Management Plan
- 3.1. Monitoring - Population trends
- 3.4. Monitoring - Habitat trends

Justification for research needed

There is a lack of information about this species' population size, full distribution and aspects about its life history and ecology. The impact of all threats is not fully understood, excluding habitat loss. The population and habitat trends should also be studied to further support the conservation efforts that may need to be implemented.



Annex 3.3.1.19. Distribution of *Gonocephalum dilatatum*. The map was created using satellite image data (© Google Earth) and was generated with QGIS v.3.36.0.

Nesotes leacoccianus (Wollaston, 1854)

Species information

Synonyms

Helops leacocianus Wollaston, 1854; *Helops leacokianu*s Wollaston, 1854

Taxonomy

Kingdom	Phylum	Class	Order	Family
Animalia	Arthropoda	Insecta	Coleoptera	Tenebrionidae

Taxonomic notes

The species was described as *Helops leacocianus* Wollaston, 1854 and erroneously cited as *Helops leacokianus* Wollaston, 1854.

Region for assessment:

- Global

Geographic range

Biogeographic realm:

- Palearctic

Countries:

- Portugal

Map of records:

Annex 3.3.1.20

Basis of EOO and AOO: Observed

Basis (narrative)

The EOO and AOO were calculated using all information available on species distribution, both published and unpublished data.

Min Elevation/Depth (m): 0

Max Elevation/Depth (m): 163

Range description

The species is found in Selvagem Grande, Selvagem Pequena and Ilhéu de Fora (Stüben, 2016).

Extent of occurrence

EOO (km2): 29

Trend: Unknown

Justification for trend

The species has an EOO of 29km2, but it is expected to reduce as a consequence of sea level rise (IPCC, 2023; Climate Central, 2025).

Causes ceased?: No

Causes understood?: Yes

Causes reversible?: No

Extreme fluctuations?: Unknown

Area of occupancy

AOO (km2): 16

Trend: Stable

Causes ceased?: Yes

Causes understood?: Yes

Causes reversible?: Yes

Extreme fluctuations?: Unknown

Locations

Number of locations: Unknown

Justification for number of locations

There are no known current threats to this species.

Trend: Unknown

Extreme fluctuations?: Unknown

Population

Trend: Unknown

Causes ceased?: Unknown

Causes understood?: Unknown

Causes reversible?: Unknown

Extreme fluctuations?: Unknown

Subpopulations

Number of subpopulations: At least 3

Trend: Unknown

Extreme fluctuations?: Unknown

Severe fragmentation?: Unknown

Habitat

System: Terrestrial

Habitat specialist: No

Habitat (narrative)

The species is widely distributed and is present in more sandy or rocky habitats of the Selvagens archipelago.

Trend in extent, area or quality?: Stable

Habitat importance: Major Importance

Habitats:

- 3.5. Shrubland - Subtropical/Tropical Dry
- 6. Rocky areas (e.g. inland cliffs, mountain peaks)
- 13.1. Marine Coastal/Supratidal - Sea Cliffs and Rocky Offshore Islands
- 13.3. Marine Coastal/Supratidal - Coastal Sand Dunes

Ecology

Generation length (yr): Unknown

Dependency of single sp?: No

Ecology and traits (narrative)

The genus *Nesotes* ranges from the Macaronesia to North Africa and the Iberian Peninsula. In the Macaronesia is represented by 21 species and subspecies, from the Canary Islands and 16 from the Madeira archipelago. Outside the Selvagens archipelago, the genus inhabits zones other than xeric coastal areas such subalpine scrub, pine and laurel forests (Stüben, 2016). The endemic beetle *Nesotes leacoccianus* is present in the three islands of the archipelago of Selvagens. Their larvae are endophagous of roots and dead basal stems, and the adults appear to feed on organic matter at night (Arechavaleta and Oromí, 2015). Most of the specimens in collection with the habitat of collection describe to be found under stones during daytime (Oromí et al., 1978; Erber and Wheater, 1987). The recent monitorizations confirmed this observation and found it under wood planks in Selvagem Pequena. At Ilhéu de Fora, the species is also found under rocks near the shore and further inland in the spurge ground, where specimens were already found refuged in *Euphorbia anachoreta* (Arechavaleta et al., 2001). This endemic beetle was also collected in *Nicotiana glauca*, the exotic invasive plant that is being erradicated from Selvagem Grande (Arechavaleta et al., 2001). Comparing the historical data to the most recently collected specimens, it appears to be gregarious and associated with an endemic species of the same family (*Hegeter latebricola*) (Fea, 1883; Oromí et al., 1978).

Threats

Threat type: Future

Threats:

- 9. Pollution
- 10.2. Geological events - Earthquakes/tsunamis
- 11. Climate change & severe weather

Justification for threats

The subpopulations of Selvagem Pequena and Ilhéu de Fora can be impacted by the cumulative effect of marine pollution on the shore and climate change leading to the rise of sea level. The individuals on

Selvagem Grande and at higher elevations could be affected by extended periods of drought, extreme temperatures and storms.

Conservation

Conservation action type: In Place

Conservation actions:

- 1.1. Land/water protection - Site/area protection
- 2.1. Land/water management - Site/area management
- 2.2. Land/water management - Invasive/problematic species control

Conservation action type: Needed

Conservation actions:

- 4. Education & awareness

Justification for conservation actions

The entire range of the species is within the Selvagens Nature Reserve.

Other

Use type: International

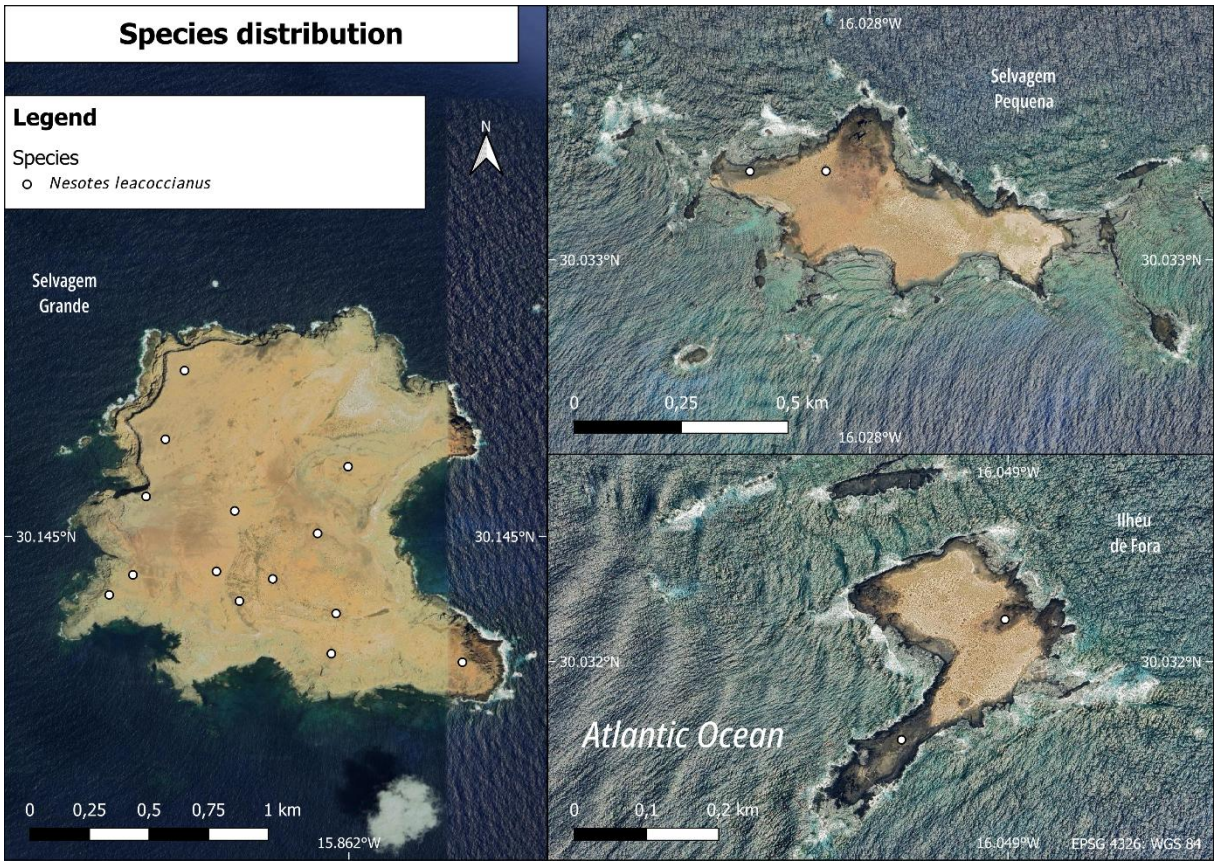
Ecosystem service type: Very important

Research needed:

- 1.2. Research - Population size, distribution & trends
- 1.3. Research - Life history & ecology
- 1.5. Research - Threats
- 3.1. Monitoring - Population trends
- 3.4. Monitoring - Habitat trends

Justification for research needed

There is potential for improvement in the understanding of population size, full distribution and aspects about its life history and ecology. The impact of all threats is not fully understood. The study of population and habitat trends should also be maintained moving forward.



Annex 3.3.1.20. Distribution of *Nesotes leacoccianus*. The map was created using satellite image data (© Google Earth) and was generated with QGIS v.3.36.0.

Nesotes monodi Alluaud, 1935

Species information

Taxonomy

Kingdom	Phylum	Class	Order	Family
Animalia	Arthropoda	Insecta	Coleoptera	Tenebrionidae

Region for assessment:

- Global

Geographic range

Biogeographic realm:

- Palearctic

Countries:

- Portugal

Map of records:

Annex 3.3.1.21

Basis of EOO and AOO: Observed

Basis (narrative)

The EOO and AOO were calculated using all information available on species distribution, both published and unpublished data.

Min Elevation/Depth (m): 0

Max Elevation/Depth (m): 163

Range description

This species was recorded only in Selvagem Grande (Stüben, 2016).

Extent of occurrence

EOO (km2): 8

Trend: Unknown

Justification for trend

There are two known sites. The species EOO is rounded to 8km2 following IUCN standards.

Causes ceased?: Yes

Causes understood?: Yes

Causes reversible?: Yes

Extreme fluctuations?: Unknown

Area of occupancy

AOO (km2): 8

Trend: Stable

Causes ceased?: Yes

Causes understood?: Yes

Causes reversible?: Yes

Extreme fluctuations?: Unknown

Locations

Number of locations: Unknown

Justification for number of locations

There are no known current threats to this species.

Trend: Unknown

Extreme fluctuations?: Unknown

Population

Trend: Unknown

Causes ceased?: Unknown

Causes understood?: Unknown

Causes reversible?: Unknown

Extreme fluctuations?: Unknown

Subpopulations

Number of subpopulations: At least 1

Trend: Unknown

Extreme fluctuations?: Unknown

Severe fragmentation?: Unknown

Habitat

System: Terrestrial

Habitat specialist: No

Habitat (narrative)

The species is currently known from Selvagem Grande. The endemic beetle was detected in the caldera habitat near Pico do Inferno and in another instance near "Pico da Atalaia".

Trend in extent, area or quality?: Stable

Habitat importance: Major Importance

Habitats:

- 3.5. Shrubland - Subtropical/Tropical Dry

- 6. Rocky areas (e.g. inland cliffs, mountain peaks)

Ecology

Generation length (yr): Unknown

Dependency of single sp?: Unknown

Ecology and traits (narrative)

The Tenebrionidae *Nesotes monodi* is a single-island endemism of Selvagem Grande, collected in low numbers across several expeditions to the Selvagens archipelago. All the specimens collected that state the habitat refer to be found under stones. Only a single specimen was found by sieving under *Lotus glaucus* on Pico do Inferno (Stüben, 2016).

Threats

Threat type: Future

Threats:

- 10.2. Geological events - Earthquakes/tsunamis
- 11. Climate change & severe weather

Justification for threats

The individuals on Selvagem Grande could be affected by climate change, causing extended periods of drought, extreme temperatures and storms.

Conservation

Conservation action type: In Place

Conservation actions:

- 1.1. Land/water protection - Site/area protection
- 2.1. Land/water management - Site/area management
- 2.2. Land/water management - Invasive/problematic species control

Conservation action type: Needed

Conservation actions:

- 4. Education & awareness

Justification for conservation actions

The entire range of the species is within the Selvagens Nature Reserve.

Other

Use type: International

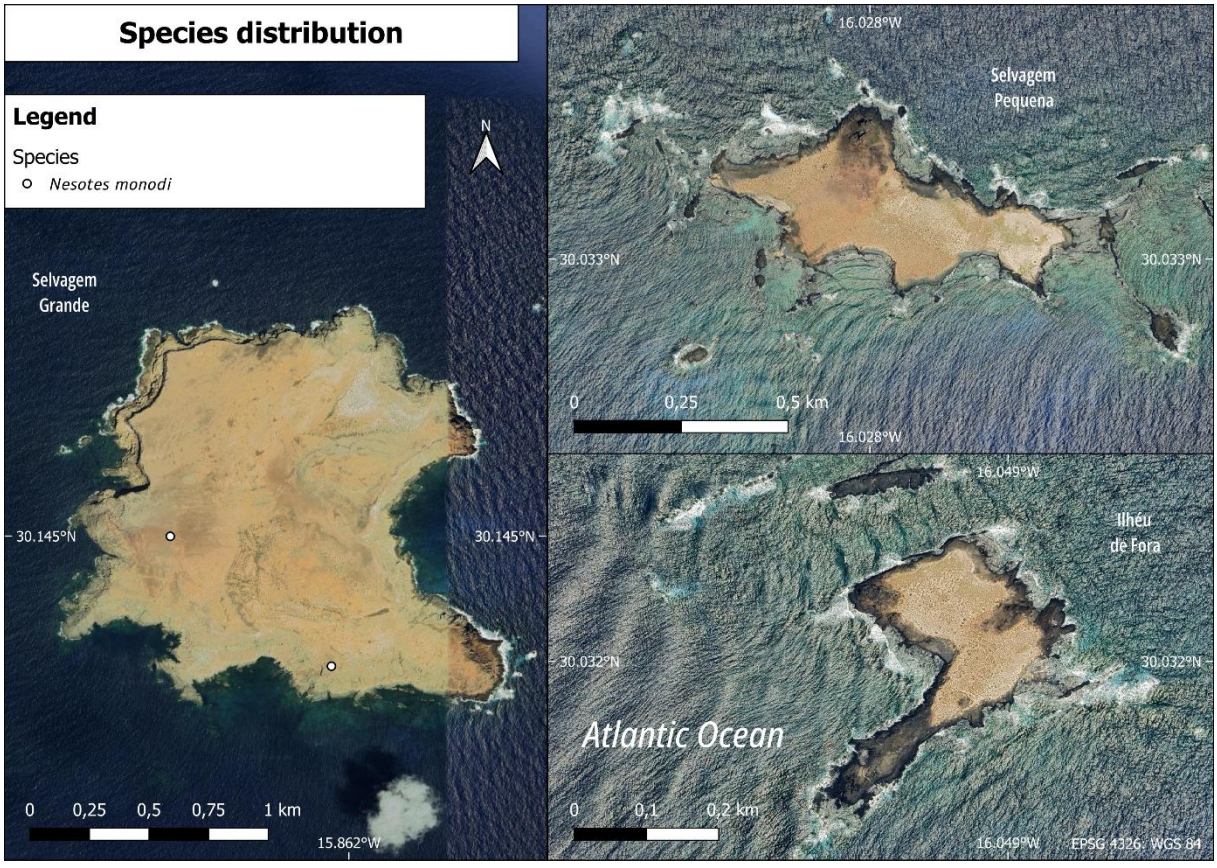
Ecosystem service type: Very important

Research needed:

- 1.2. Research - Population size, distribution & trends
- 1.3. Research - Life history & ecology
- 1.5. Research - Threats
- 3.1. Monitoring - Population trends
- 3.4. Monitoring - Habitat trends

Justification for research needed

There is a lack of information about this species' population size, full distribution and aspects about its life history and ecology. It is possible the species is more active during autumn, given the large proportion of specimens in collection from that season. The impact of all threats is not fully understood. The population and habitat trends should also be studied to confirm the species' status and further support the conservation efforts that may need to be implemented.



Annex 3.3.1.21. Distribution of *Nesotes monodi*. The map was created using satellite image data (© Google Earth) and was generated with QGIS v.3.36.0.