

The Prosperous Bay Plain Mole Spider



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Summary

The Prosperous Bay Plain Mole Spider is an organism that first received attention during the construction of St Helena's new airport. While it is not yet a described species, it is assumed to be endemic to the island, and confined to the rare semi-desert habitat found on Prosperous Bay Plain. This report builds on the Mole Spider report produced in 2018 (Dutton, 2018) with survey findings from 2020 and outlines further work still needed.

Introduction

St Helena

The island of St Helena is found 1800km from the west coast of Africa and 3200km from the east coast of South America. It is a small island, approximately 10km by 5km. The terrain is generally steep, with climatic conditions varying from hot and arid to cool and misty. It was formed from volcanic eruptions between 12 and 14 million years ago, and its isolation for this long period of time has resulted in the evolution of numerous plants and animals unique to this small island. While there are no native land mammals, and few birds, there is a high diversity of invertebrates, with over 420 endemic to the island, some of which are local to particular habitats within the island.

Prosperous Bay Plain

Prosperous Bay Plain is a rare area of flat semi-desert on St Helena, which is free draining and sparsely vegetated for most of the year. As such the plain has developed a unique faunal community, with a number of indigenous and endemic plants and animals (Ashmole and Ashmole, 2000). The invertebrate fauna of this area is particularly special, with this being the only known location of 20 endemic species and 5 endemic genera (Ashmole and Ashmole, 2004). A referendum was held in 2002 on whether an airport was required on St Helena and Prosperous Bay Plain was identified as the preferred location for its construction. An initial invertebrate survey was undertaken in 2003. The invertebrates of the region were identified as being at risk, particularly the Mole Spider, and work has since been undertaken to map this area to inform mitigation and management needs. The Central Basin of the Plain was protected as far as possible during construction.



Figure 1. Location of Prosperous Bay Plain, including Bradleys and the Central Basin, on St Helena

The Mole Spider

Of all the spiders found on Prosperous Bay Plain, and St Helena in general, the one that has attained significant interest is a wolf spider dubbed the Prosperous Bay Plain Mole Spider.

This cryptic species produces a small dome of discarded earth (Figure 2), similar in appearance, if not size, to those produced by the European Mole. It is assumed that it is one species which forms the mounds, due to their similar size and formation, and the density of these mounds in some areas.

Figure 2. Mole spider mound and habitat



The few specimens collected, along with documented behaviours appear to suggest that the 'Prosperous Bay Plain Mole Spider' is a species as yet unknown to science that has adapted to the semi-desert conditions of Prosperous Bay Plain. No similar species has been identified locally or internationally and it is assumed to be endemic.

Protection

With few specimens collected and no expert yet identified, this species is not yet formally described. As such it cannot be listed on the IUCN Red List of Threatened Species[™], where it would be likely assigned a high threat category due to its restricted range. However, as an undescribed species it is assumed to be endemic and is protected under the Environmental Protection Ordinance (2016).



Figure 3. Sign at Roadside

Timeline

The Ashmoles undertook the original survey of Prosperous Bay Plain prior to the construction of the airport (Ashmole and Ashmole, 2004). One of the two sites where the Mole Spider (originally noted as the Obscure Wolf Spider) was found now lies under the airport runway.

The Impact Assessment for the airport construction identified the need to account for disturbance to the endemic flora and fauna, particularly on Prosperous Bay Plain. Mole Spiders appear to be linked to the semi-desert habitat only found in this area of St Helena, and as such they have remained a focus of surveys in this area.

During airport construction, the construction company Basil Read, undertook surveys on subsequently identified Mole Spider areas, away from the most sensitive Central Basin area (Walmsley, 2015; 2016). Surveys across the Prosperous Bay Plain area were also commissioned and undertaken by independent specialists (Cairns-Wicks and Lambdon, 2013; Pryce and Paajanen, 2014; Pryce, 2019).

Part of the Darwin funded invertebrate project DPLUS040 (2016-2018) was to improve knowledge on the Mole Spider, primarily by mapping Mole Spider areas and then making a population estimate based on current knowledge. A summary document was produced as part of this project. Additional surveys funded by the St Helena Airport Project's Landscape and Ecology Mitigation Programme (LEMP), focussed on presence and extent, were conducted in February and March 2020 and are reported here.

Conditions

Being semi-desert, Prosperous Bay Plain and the surrounding area is predominantly bare, with scattered vegetation consisting of dryland species including shrubs, succulents and annuals. Permanent vegetation includes Creeper (*Carpobrotus edulis*), Samphire (*Suadea fruticosa*) and Tungi (*Opuntia spp.*). Fish Bone Grass (*Eragrotis cilianensis*) is also present.

Vegetation coverage differs through the seasons, with a flush of plants appearing in the wetter periods, including annuals such as Ice Plant (*Mesembryanthemum crystallium*) and the endemic Babies'-Toes (*Hydrodea cryptantha*).

St Helena entered drought conditions during 2019 which continued into 2020. This includes islandwide water restrictions. By the time of these additional surveys in February and March 2020 there had been a substantial period of drought, although some summer rains were experienced from February onwards. Surveys immediately after rain were avoided to prevent additional disturbance to the soil surface.

Severe grazing of the Samphire by rabbits was seen by February 2020, to both stems and roots. By the end of March 2020 some of this was regenerating. There were also large rabbit latrines across the area, and ground disturbance by rabbits in the form of scrapes and burrows. At least six rabbit remains were seen (predominantly skulls), and while some were potentially killed by feral cats, at least one carcass was undisturbed, indicating a largely uncontrolled population.

Figure 4. Evidence of rabbits



Some patches of Creeper are present on the plain, but there were substantial areas of dead Creeper waste compared with previous surveys in 2018. Apart from Samphire and Creeper, most vegetation was dead or completely dried out, with small shoots of some annuals and grass occasionally seen. This is not unexpected for this time of year.



Figure 5. Prosperous Bay Plain

June 2018

March 2020

The soil appears to have a similar consistency in mole spider sites across Prosperous Bay Plain, being coarse, sandy soil. The soil type across the plain, including the Central Basin varies from fine silts to rocks and boulders. There also remains evidence of disturbance from previous constructions (predominantly concrete plinths remaining) and tracks, blast scattered boulders and some litter. Disturbance is now kept to a minimum.

Figure 6. Soil appearances



Mole Spider area



Ground in other areas

Method

A simple walk over survey was undertaken across Prosperous Bay Plain, including Bradleys and the Central Basin in February and March 2020 with between one and two searchers to minimise disturbance. This included covering some areas of known Mole Spider presence, to provide a snapshot of the current status of these areas and compare with previous data. However, previous data was not scrutinised too closely beforehand, to reduce biasing observations within these areas during the surveys.

Mole Spider mounds were recorded using a GPS when located and observations made. Approximate density at set locations was also estimated.



Figure7. Map of 2020 search routes

Mole Spider searches
Central Basin outline

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Findings in 2020

Bradleys

Bradleys Camp is an area away from the main Central Basin, which was the subject of regular surveys by Basil Read during the airport construction. Previous surveys focussed on four 3mx3m quadrats. This area had not been visited during the 2018 surveys under DPLUS040.

Approximately 28 mounds were recorded across the site, within 8553m². The highest density area was 10 mounds in 30m². Mean distance was 7m (nearest neighbour analysis).

Figure 8. Map of Bradleys findings



Most individual mounds were well formed, with initial mounds found beside a live Creeper mat on the edge of the known area. While there may have been more between the surveyors search track and therefore density is likely to be underestimated, mounds were predominantly over a metre apart, with one area of similar density to previous surveys of approximately four mounds within 1m².

Interestingly, the main area monitored at Bradleys in previous years revealed very few mounds during the 2020 survey, and most mounds noted were from outside the original survey area. This may account for the large fluctuation counts experienced during Basil Read surveys (Dutton, 2018) if individuals are mobile and can move out of the survey area into other suitable habitat areas. As the surveyor was not familiar with this site or previous survey locations here, bias towards targeting searches to known areas within this area was avoided and the results are considered a good reflection of the spread of mounds within the area searched.

There is substantial rabbit disturbance in this area and the impact of this on the Mole Spider is unknown, but may cause detrimental disturbance if suitable substrate for the spider is negatively impacted. This may also reduce the detection of mounds, although mounds within disturbed areas would give a good indication of the ability of individuals to tolerate disturbance. More surveys would be of benefit, although it should be assumed that lower disturbance is preferable unless proved otherwise.

There was no evidence of recent human access to the site, although this is expected as Bradleys Camp is no longer in use at the time of writing. However, there is little to discourage anyone from entering the area currently or being aware that it is an area of conservation interest beyond a Wirebird sign on a small, dilapidated section of chain link fence.

Central Basin

The Central Basin is a large area, and without a large dedicated team, a full survey is difficult. However, this may be considered too much disturbance to this sensitive habitat and smaller searches appear to be a good option for providing some information on the Moles Spiders within this area without undue disturbance.

Figure 9. Map of selected Prosperous areas findings



Overall, almost 4.8 hectares were surveyed across the Central Basin. Eighty two Mole Spider mounds were seen in three distinct locations within this area, covering approximately 0.47ha. Distance between mounds in each location averaged between 1m and 4.2m, with 240-450m separating distinct areas. Mole spider mounds were seen in similar locations to previous surveys, although generally believed to be at a lower density, with no mounds seen on Mole Spider Hill.

Within the Central Basin, Mole Spider Hill (5) was targeted for surveying. As the name suggests, it was a known area for the species. This area was damaged as part of the airport construction and a portion still shows clear evidence of disturbance, with the substrate furrowed, easily compacted and covered in boulders. Although there were mounds found in this area in 2018, no mounds were recorded during the March 2020 survey. This finding may have been impacted by the season and it cannot be determined that the species is no longer present in this area without repeat surveys, particularly later in the season, as they were seen in the wetter month of June in 2018. There was no evidence of recent human access to the site, although there were subsequent reports of people entering the site, and it may be worth renewing the signs at the roadside as a deterrent with suggestions of alternative airport viewing locations.

Another area visited was an area of high density in the north of the Central Basin found in 2018 (1), although present, mounds were observed to be less dense than in the 2018 survey. Here, 40 mounds were seen across 4560m², with 32 in an area of 2073m². This gives a mean distance of 4.18m (nearest neighbour analysis) which may be a slight underestimate due to surveyor limitations but is considered to provide a sufficient estimate of spread from those seen. Observations in 2020 indicate that the distance between mounds was greater than 2018, at approximately 2m distance in the most dense clusters within this area, rather than the 30-50cm distances of the 2018 survey, which is supported by the higher number of individual mounds counted in 2018 (over 400) than 2020. This could indicate a lower number of individuals, or lower activity if individuals are responsible for more than one mound. Additional surveys at a similar time of year (June) would be beneficial to be able to draw a more informed conclusion on presence in this site.

Figure 10. Mole spider mound distribution within one search area in the Central Basin



There was some evidence of quad bike tracks next to part of the track towards the Central Basin, but appeared limited to one section of track. Footfall seen towards iron sheets likely to be due to conservation staff checking for invasive species (rabbits and geckoes) which has caused minimal disturbance. There was also a canine track across the basin, but there are few feral dogs on St Helena.

A further small area of Mole Spider presence was still detected in 2020 (**2**) and appears to have the highest density of any area surveyed in 2020, with 22 individual mounds between 50cm and 2.5m apart, averaging 1m distance (nearest neighbour analysis) but from observations this is still believed to be at a lower density than 2018.

Mole Spiders were also known to be in an area that was consequently impacted by the installation of the airport security fence (**4**). Mounds were found this year slightly to one side of previous findings, and the 2020 search area did not cover all of the previously known sites in this area, but show that they are still present in the area. Average distance between mounds in this area was approximately 3m (nearest neighbour analysis) so are of intermediate density compared to other areas. The area within the security fence has not been surveyed since the fence installation in 2016 and would provide an interesting opportunity to assess site use by the species following disturbance.

An area where individual mounds were observed in 2018 closer to one of the security gates (3) did not reveal any mounds, but these had been sparse in the previous survey and may have been missed or may no longer be present. Areas with few mounds provide a challenge to detect in the large area of Prosperous Bay Plain, and also provide a different outlook on the activity and mobility of the species. Locations appear to have shifted slightly from previous findings, however the areas of mound presence are similar, likely restricted to the same soil conditions, reflecting previous assumptions that individuals are mobile. Individual mounds further away from areas of density indicate high mobility of some individuals, including potential overground movement where soil conditions are not conducive to burrowing. However, this is subject to the assumption that all mounds observed are also created by the same species. Clearly, further in depth investigation is needed.

Figure 11. Mole Spider Mounds seen



Seasonal and Other Impacts

There was substantial rabbit disturbance and minimal live vegetation present during the time of the February and March 2020 surveys on Prosperous Bay Plain.

Rabbit disturbance to areas of Mole Spider presence may interfere with individual activity, including prey or mate detection, or reduce the amount of undisturbed habitat available. It also reduces the ability to detect mounds within these areas, so estimates on activity and presence may also be affected.

Spiders are predatory and rely on the presence of prey species, particularly smaller invertebrates. These prey species are likely to include phytophagous or detritivorous species dependent on the permanent and seasonal vegetation, although other species may be soil dwelling or lichen feeders. Therefore where vegetation reduces in dry conditions prey may become less available and the spiders adapt to this by reducing activity. However, where rabbits put additional pressure on vegetation available, including roots, this may further reduce prey availability for the Mole Spider, potentially threatening this species.

Many of the mounds observed during 2020 surveys were well formed and clear. This may be due to the periods of rain which have stimulated activity of invertebrates, including the Mole Spider. Conversely, the lower levels of rain compared to the winter (June to August) may mean that mounds formed exist in good condition for longer.

While 2020 is potentially an extreme year regarding drought and loss of vegetation, additional surveys in different seasons, but also regularly in summer (January to March) would help to determine fluctuations in numbers, distribution and density.

Future Work and Needs

The Mole Spider is clearly still present on Prosperous Bay Plain, and appears to be mobile within its habitat. The seasonal impacts, and conservation requirements are still not clear and while its ecology remains relatively unknown its resilience to disturbance can only be estimated.

There is still a need for this species to be described, to allow it to be assessed on the Red List, potentially opening up funding opportunities. Previous discussions with experts have suggested a local description, supported by specialists within the IUCN Spider and Scorpion specialist group, but this has still not progressed any further. Additionally, the taxonomy of this group requires reviewing; South African species are also undergoing a review, showing that this area is a challenge not only for St Helena, but on a global level.

Surveys should continue on selected sites, to gain the best data for conclusions but reduce disturbance across Prosperous Bay Plain. While *ad hoc* surveys can provide information on presence and density, regular surveys could increase information on other areas including;

- Length of time of Mound presence
- Movement of mounds or formation of new mounds
- Density, including evaluation over seasons

This information would provide further information for inferences on the species' likely ecology.

Increasing knowledge on the soils of Prosperous Bay Plain, including mapping areas which may be suitable for the Mole Spider, may be a good way of identifying areas for targeted surveying or increased protection.

As a semi-desert species, general work including minimise rabbit disturbance and colonisation of non-native species, both plant and animal, would provide general benefits to the habitat and therefore likely benefit the Mole Spider.

While there is little evidence of human disturbance to the site other than access for conservation actions (invasive species control), signage should be maintained and access continue to be restricted to continue to preserve this site.

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