David Pryce Invertebrate Surveys

Rupert's Hill invertebrate, plant and lichen survey

Commissioned by Basil Read, St. Helena Airport Project

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1 INTRODUCTION

1.1 RATIONALE

As a result of the wharf development at Rupert's Bay it has proved desirous to locate a source of suitable high-grade rock. It is unlikely that there will be sufficient supply within Rupert's Valley itself. While material of this grade is available from the airport site at Prosperous Bay Plain the desire to avoid excessive costs and transport distances (including associated environmental and social impacts) has led Basil Read to look for sources closer to the site. While constructing the Haul Road between Rupert's Valley and Deadwood Plain a potentially suitable outcrop was located near the summit of Rupert's Hill. The area in question, 500 m WSW of the triangulation point, has never been surveyed intensively for invertebrates, plants or lichens. This survey was commissioned to provide baseline information on the species present and to inform mitigation and remediation works should the area prove to contain material of sufficient quantity and quality for the wharf development.

1.2 CONSTRAINTS

This survey, taking place over an eleven day period, is very much a snapshot of the species found at that time of year. It should be noted that the previous year had been unusually dry with, for example, lower than usual growth of dryland specialist species such as Babies' Toes (*Hydrodea cryptantha*) and Ice Plant (*Mesembryanthemum crystallinum*) in their normal ranges. It is impossible to say for certain how this will have affected the survey, but it is probable that tougher, more drought tolerant invertebrates will be over-represented and opportunistic species that feed on grass and other species that grow after the winter rains will be under-represented. Several weeks prior to the commencement of the survey the summer rains had begun in earnest; this may have gone some way to countering the effects of the earlier drought.

It was not possible to identify all taxa to species level as specialist knowledge, skills and experience are needed for some groups (*e.g*. many of the smallest hymenoptera). While further endemic species would almost certainly be found in these groups this information would add little to the overall survey as almost nothing is known of their ecology or wider distribution on the island.

One potential constraint is that the arid region is one of the most intensively surveyed portions of the island as a result of the airport development. In the Rupert's Hill area there are also stands of endemic Scrubwood and unusual lichens that will have attracted further attention. It is possible that species are more widespread away from the area in question but as relatively little survey work has undertaken elsewhere our knowledge of their wider distributions is not as clear.

1.3 SITE DESCRIPTION

The rock outcrop begins just below the westernmost point of the switchback on the top of Rupert's Hill, it continues due east diagonally up the slope back towards the road. The survey site took in an

area of hillside bounded by the Haul Road on three sides (NE, NW and SW), closed at the eastern end by a line from the road at 15°55.455'S 005°42.178'W (alt. 375 m) SSW down the slope to the road again at 15°55.374'S 005°42.109'W (alt. 303 m). A map of the survey area and its relationship to known sites for significant endemic species is given in Figure 1. General overviews of the site are given in Figure 2.

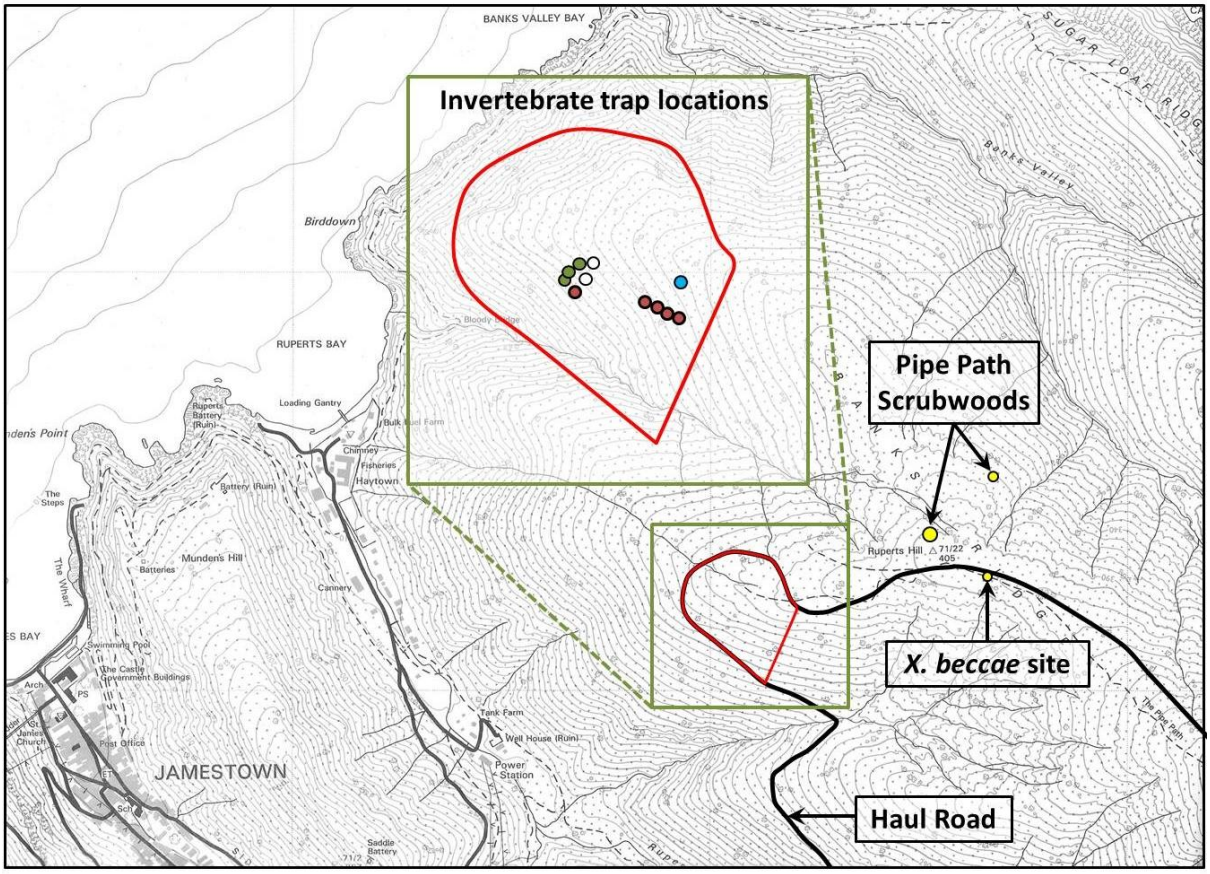

FIGURE 1 Extent of invertebrate survey (red line) and its relation to nearby sites for important endemic species (Scrubwoods and the rare endemic lichen *Xanthoparmelia beccae*). The enlarged section of the survey area gives the relative locations of the Malaise traps (white dots), pitfall traps in non-native vegetation (brown dots), pitfall traps in Samphire (green dots) and the BugVac sample (blue dot) within the survey area.

The site lies exclusively within the Banks (BK) land unit (Ordnance Survey, 1979b) and consists of a rounded summit and hill-slope descending to the south west. In the northern part the site is generally level and is dissected by several shallow (ca. 2-3 m) ravines; slopes increase south west to approximately 35-45° with occasional outcrops as steep as 60°.

The underlying geology consists of shield volcano basaltic extrusive lava flows with pyroclastics (Ordnance Survey, 1979a); these are sometimes considerably altered by later weathering. At the surface the most extreme alteration is evidenced by the presence of 'marls' where the rock has been

broken down to its component clay minerals. Soils consist of haplic xerosols and lithic phase haplic xerosols (lithosols) of the Donkey Plain complex (Ordnance Survey, 1979c).

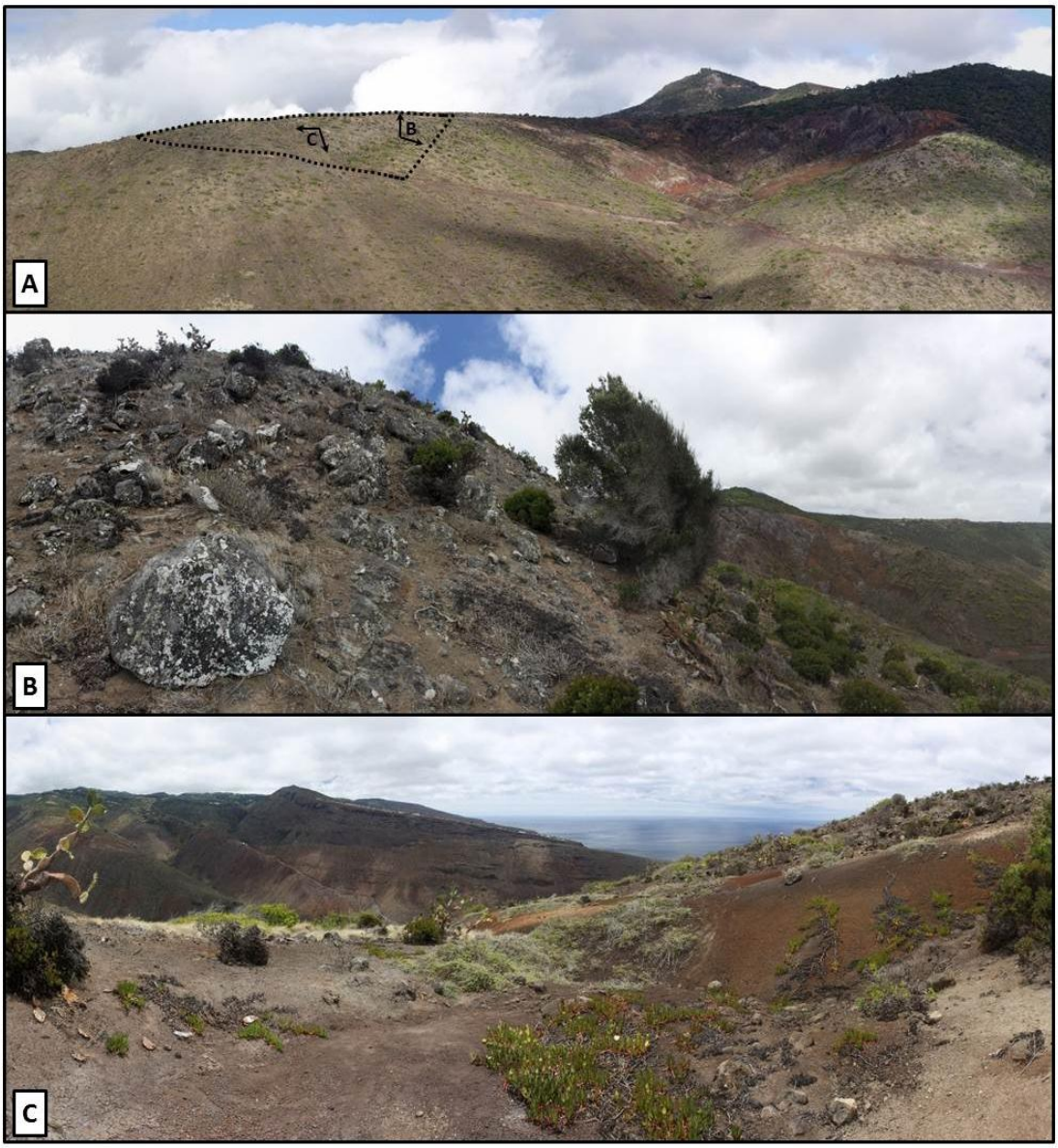

FIGURE 2 Site overview. A – Extent of survey area as seen from Saddle Battery on Munden's Hill with the orientation of figures 3B and 3C indicated. B – Panoramic view at the eastern end of the survey area immediately below the potential quarry site. C – Area of marl with Samphire, Creeper and African Fountain Grass.

The primary vegetation type is low *Opuntia-Lantana* scrub (Ordnance Survey, 1979d). There are currently five dominant species:

- Wild Coffee (*Chrysanthemoides monilifera*);
- Wild Mango (*Schinthus terebinthifolius*);
- Red Tungy (*Opuntia elatior*);

- Lantana (*Lantana camara*);
- Creeper (*Carpobrotus edulis*) [mainly on the summit of the hill and in the marl area].

Discrete but significant areas of Samphire (*Suaeda fruticosa*) and African Fountain Grass (*Pennisetum setaceum*) are also present. A more complete list of plant and lichen species is given in Appendix 1.

2 METHODOLOGY

The survey was undertaken over an 11 day period from 24th December 2013 to 4th January 2014. Invertebrates were surveyed using the following techniques:

- **Casual observation** of easy to identify species, particularly around flowers.
- **Sweep-netting** vegetation across the site.
- **Pitfall trapping**. Eight pitfall traps were installed on 25th December for the duration of the survey. Pitfalls 1-5 were installed in non-native vegetation (two adjacent to Wild Coffee bushes [*Chrysanthemoides monilifera*], two in more open areas adjacent to lichen-covered rocks and one adjacent to African Fountain Grass [*Pennisetum setaceum*]; traps 6-8 were installed in an area of Samphire (*Suaeda fruticosa*) as this was the largest area of indigenous vegetation present on site.
- **Malaise Traps**. Two of these flight intercept traps were set up in the vicinity of the Samphire on 26th December; this was the only relatively sheltered part of the site where the support poles could be driven into the ground. Malaise 1 (southern) was orientated SE to NW and Malaise 2 (northern) NE to SW, the differing orientations maximising the possibility of trapping different species.
- **Light trapping**. A light trap was operated on the night of 3rd January 2014 from 19:00 to 22:00; this was fastened to the support pole of Malaise trap 1. Conditions were almost ideal with only a thin crescent moon, partial cloud cover and occasional light drizzle.
- **Berlese extraction**. Dead Samphire branches and roots with evidence of invertebrate activity from the pitfall trap area were collected, broken up and placed in a funnel system; moth balls were placed in a bag on top of the sample to generate a chemical gradient of naphthalene vapour causing any invertebrates present to self-extract into a tube of alcohol below.
- **BugVac**. A 0.25 m² area of Crooked Awn Grass (*Bothriochlora radicans*) near the top of the slope was suction-sampled on 4th January 2014 with a modified Makita EH025 petrol-powered garden leaf vacuum.

A further site visit was made on 14th January with Rebecca Cairns-Wicks to undertake a rapid vegetation and lichen survey (see Appendix 1).

A map showing the relative locations of the fixed sampling points is included in Figure 1; GPS coordinates for these sites are given in Appendix 2.

Invertebrates were preserved in 70% ethanol and identified to species level (where possible) using a binocular zoom microscope at magnifications of 7 to 45x. Identifications were made using Ashmole & Ashmole (2000b, 2004) and Basilewsky (1970, 1972, 1976, 1977). Higher plants were identified using Lambdon (2012), bryophytes with Wigginton (2012) and lichens with Aptroot (2012).

3 RESULTS

3.1 INVERTEBRATES

A total of 1210 specimens representing 89 species were recovered during the survey from nine samples. Of the species identified 21 (32.9%) are endemic to St Helena with five of these (5.7%) belonging to endemic genera. Additional endemic species may well be present among the unidentified species (chiefly small parasitic wasps that would require specialist knowledge to identify). A complete species list, including details of their status, known scarcity and the number of specimens recovered is presented in Appendix 4. The most important invertebrates found are discussed separately below.

Helenolius dividens (Walker, 1858).

This endemic genus and species of cixiid plant hopper is known from three previous records:

- It was originally described from 'St Helena' (precise locality unknown) by Walker (1858) as *Cixius dividens* from a single female specimen now in the Natural History Museum (London). Stål (1859) later described *Cixius sanctae-helenae* (since proven to be a synonym of *dividens*) from two males and a female believed to have come from the same collector; these specimens are now split between the Naturhistoriska Riksmuseet (Stockholm) and the Koninklijk Belgisch Instituut voor Natuurwetenschappen (Brussels).
- A single specimen was collected during the second Belgian expedition by Jean Decelle and Narcisse Lelelup at 'Flagstaff, 2000-2200 feet' on 5th April 1967 (Basilewsky, 1976).
- Two males and a single female were collected by P.R. Messent at 'Flagstaff, near summit of, 2000 feet' from Scrubwood (*Commidendron rugosum*) in July-August 1970 (van Stalle, 1986).

Despite sampling at both Flagstaff and Pipe Path Scrubwoods in early 2006 Philip and Myrtle Ashmole failed to locate this species (Mendel *et al*., 2008).

During this survey *H. dividens* was initially detected while erecting Malaise trap 1 on 26th December when a female was found to have jumped into the collecting bottle before it was attached to the trap. On 27th December a male was found in the collecting bottle of Malaise trap 2; sweep netting adjacent Samphire (*Suaeda fruticosa*) (Figure 2C, centre) yielded a further female specimen.

Due to the extreme scarcity of this species it was decided to allocate a further day to the survey work to better ascertain the wider distribution of the species. *H. dividens* was found at three nearby sites (Figure 4). Survey work outside of the immediate area failed to find any further populations (Figure 5).

The largest population is at a sheltered patch of Samphire immediately below the main area of Pipe Path Scrubwoods (*Commidendron rugosum*); the population extends further down the hillside, however, once out of this sheltered area numbers are very much reduced and the species is entirely restricted to the sheltered gullies. The extent of this colony is denoted by the dotted lines joining the two ends of the population on Figure 3. Two other approximately equally sized populations were

discovered on Rupert's Hill, one around the ruins of the sheep fold and the other 110 m north of this; the combined footprint of the sites (the metapopulation) is approximately 500 m by 100 m.

FIGURE 3 *Helenolius dividens* female.

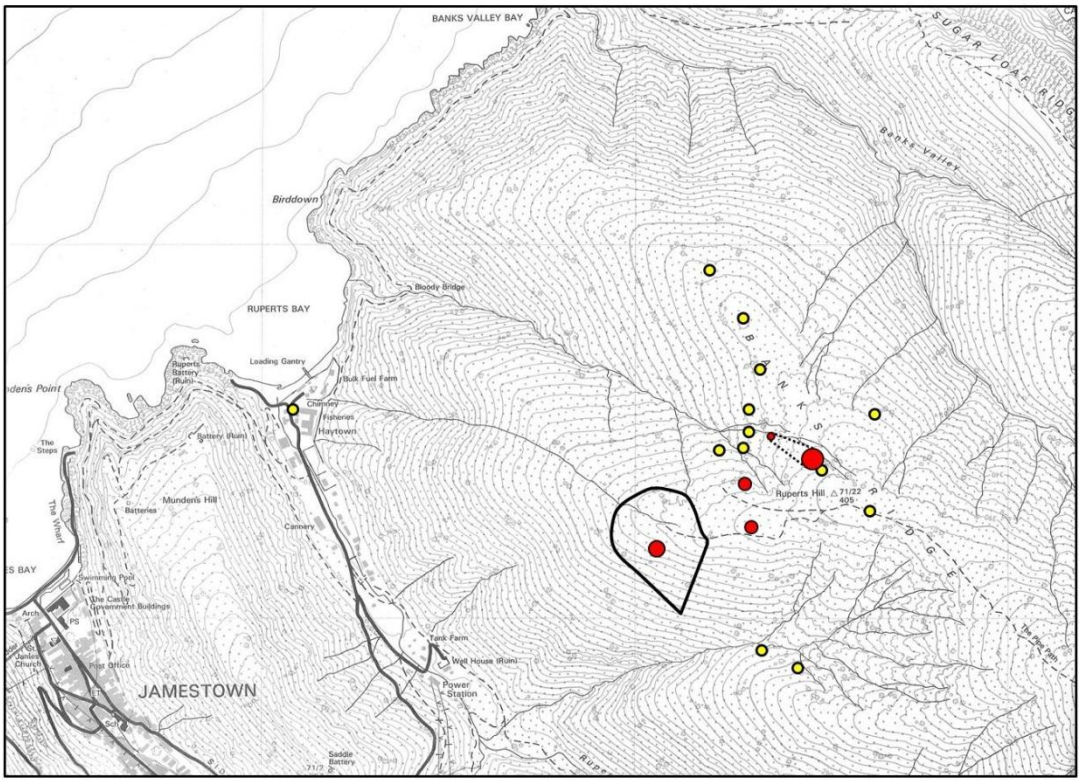

FIGURE 4 Extent of the population of *Helenolius dividens* on Rupert's Hill with respect to the survey area, presence is indicated by red circles, their size being proportional to population size, absence is indicated by yellow circles.

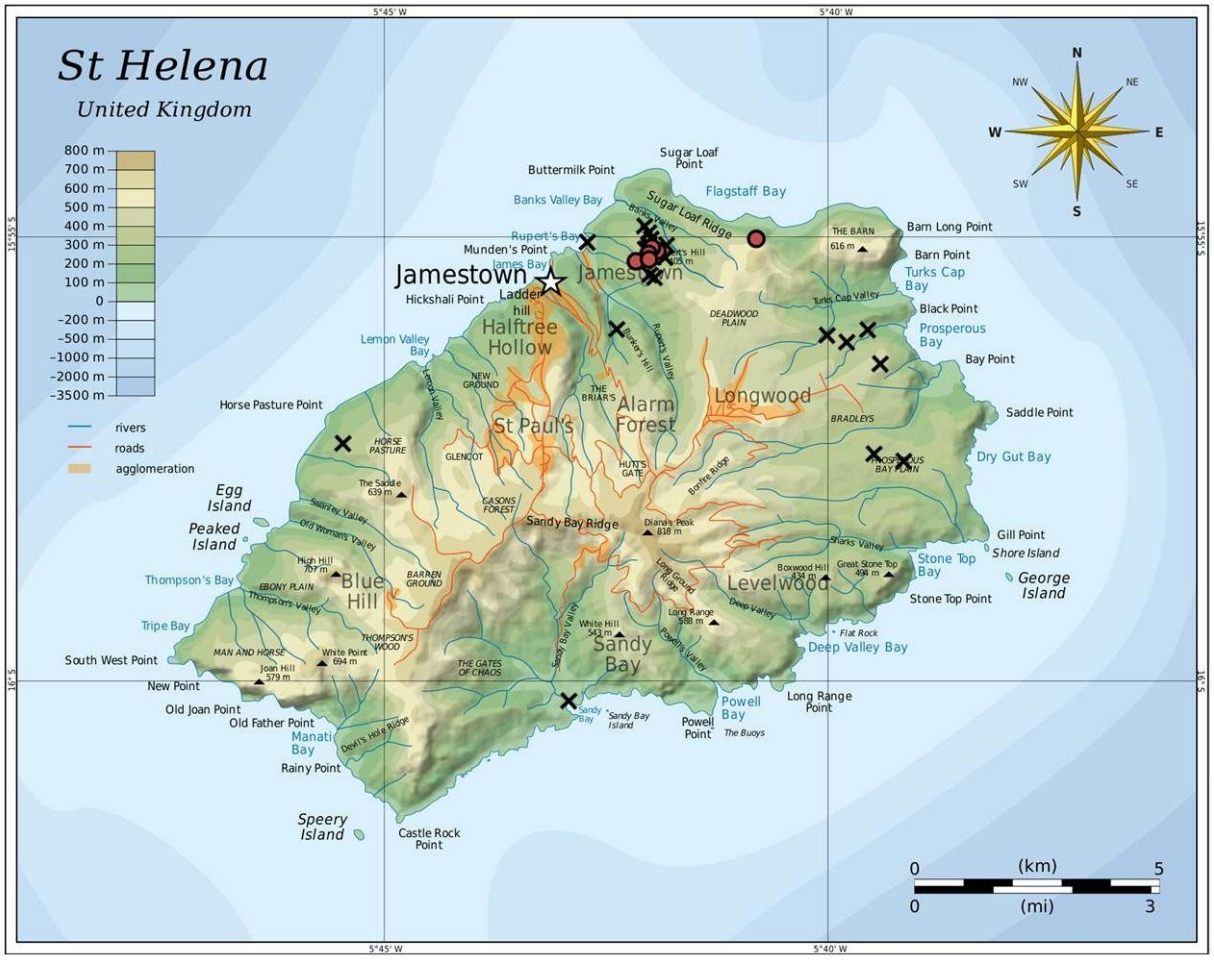

FIGURE 5 The current known distribution of *Helenolius dividens* (red circles) and the location of other Samphire sites sampled during the survey (black crosses).

Flagstaff Scrubwoods (15°55.107'S 005°40.853'W, alt. 595 m) were surveyed on 10th January 2014; one male and two females of *H. dividens* were found on Scrubwoods; there was no nearby Samphire. On comparison under the microscope some significant differences in wing venation became apparent between these two populations:

- The Flagstaff specimens have narrower wings;
- The wing veins are brown in the Flagstaff population and almost black at Rupert's Hill.
- Two of the major cross-veins, separated by almost their own length in the Flagstaff male are near-contiguous in the Rupert's Hill males.

Until further research has confirmed the consistency of these differences and taking into account the different host plants these populations are restricted to, there is no option but to consider the population at Rupert's Hill a new, as yet unnamed subspecies of *H. dividens*. Further research is needed to clarify the precise relationship between these two populations.

The nymphs of cixiidae generally feed on the subterranean roots of their host plants although some species are fungiverous on rotten wood (Holzinger *et al.*, 2002). While some species are polyphagous the majority appear to be monophagous. Females deposit the eggs in or on soil protected by a mass

of wax threads exuded from plates on the end of the abdomen (the white mass visible in Figure 3). This species is sexually dimorphic with males 5.8 mm long and females 8-9 mm, consequently it is easy to record the abundance of the two sexes in the field without risking harm to the population.

A list of GPS coordinates of the sites surveyed for this species is given in Appendix 3.

Peripsocus species.

Three species of the psocid (barkfly) genus *Peripsocus* are known from St Helena, these are:

- *P. pauliani* – an African species with a **U**-shaped subgenital plaque in the female; recorded by the Belgians from Fisher's Valley irrigations in January 1967 (2 females).
- *P. leleupi* – an endemic species with a **V**-shaped subgenital plaque and some obscure wing markings; recorded by the Belgians from Teutonic Hall in November 1965 (1 female) and Longwood in April 1967 (1 male). This species was also found by the Ashmoles at Earwig Gully on Prosperous Bay Plain in 2003 (Ashmole & Ashmole, 2004a) and at Peak Dale Gumwoods in early 2006 (Mendel *et al.*, 2008).
- *P. decellei* – an endemic species with a **V**-shaped subgenital plaque and uniformly clouded wings; a single female collected in lower Rupert's Valley (alt. 0-30 m) in May 1967.

Figure 6A shows three female *Peripsocus* from Malaise trap 2; the two paler specimens belong to *P. leleupi*, the obscure wing markings are just visible in places; the location of these specimens further increases the known range of this species. The third specimen in Figure 6A also has a **V**-shaped subgenital plaque, however, it is larger, has a darker body and much more strongly marked wings than the other two endemic species. Considering that its affinities lie with *P. leleupi* and *decellei* there is a high probability that this specimen represents a hitherto undescribed endemic species.

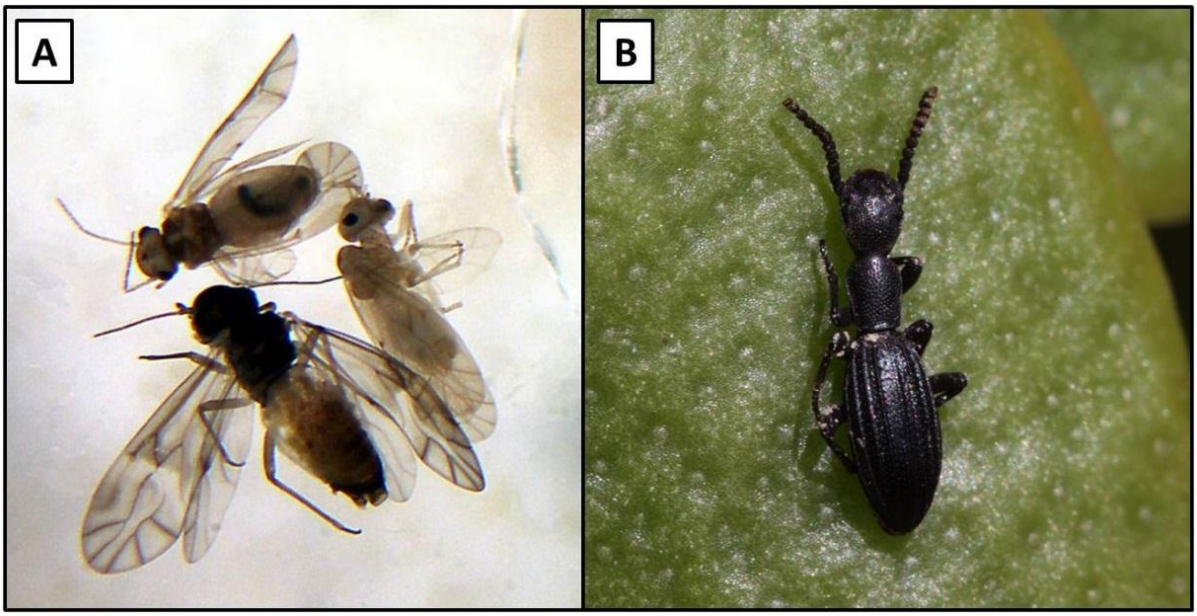

FIGURE 6 A - *Peripsocus leleupi* (smaller, paler specimens) and *Peripsocus* sp. n.? B – *Stenosis sanctaehelenae*.

Stenosis sanctaehelenae Ardoin, 1972.

This 6-7 mm long beetle was first encountered during the two Belgian expeditions; a total of 105 specimens were recovered from lower Rupert's Valley (alt. 0-30 m) in December 1965 and January 1966 with a further 160 from the same locality between 13 and 24 May 1967 (Basilewsky, 1972). This species was not found by the Ashmoles. During this survey a single specimen (Figure 6B) was found pitfall trap no. 1. The collection of a specimen away from the immediate vicinity of the type locality is significant considering the large amount of development that has occurred along the base of Rupert's Valley since the 1960s, this development being particularly intense in the last two years. Further survey work for this species in and around Rupert's Valley should be considered a priority in order to assess its current status.

Anarista vittata Sabrosky, 1977.

A single female specimen of this extremely rare endemic asteiid fly was collected in Malaise trap 1. This fly is known only from three other specimens:

- A female collected by the Belgians on 26th January 1967 in the base of Fisher's Valley;
- A female collected by the Belgians on 13th May 1967 in lower Rupert's Valley (alt. 0-30 m);
- A female collected from a BugVac sample on 20th May 2013 in upper Little Dry Gut (Pryce, 2013).

The collection of a further specimen using a different sampling technique to those previously employed (it appears that the Belgians did not use Malaise traps), indicates that this fly is probably present over the whole of its currently known range and probably further afield, but at extremely low density. The biology of this obscure group of flies is very poorly known; however, it is suspected they may be scavengers on the frass of other species of insect (Sabrosky, 1987).

3.2 ANALYSIS OF SAMPLING EFFECTIVENESS

Sampling effectiveness was assessed using EstimateS v.8.2.0 statistical software for analysis of species richness and shared species (Colwell, 2009). This program produces a synthetic species accumulation curve from the data collected. It is then possible to take the generated curve and fit a trendline in Microsoft Excel and, using the associated R^2 and trendline equation, estimate the effectiveness of the survey.

The synthetic species accumulation curve generated from the data collected in this survey is shown in Figure 7 (red line) with the associated power law trendline generated from the last four of the nine synthetic samples (using the last four data points only generated a markedly improved fit).

The formula for the trendline can now be used to predict the number of taxa that would be recovered if additional work were undertaken. If a 'survey' is defined as 9 samples, the calculated figures for the number of taxa that should be recovered by repeating this survey with identical methodology multiple times is given in Table 1.

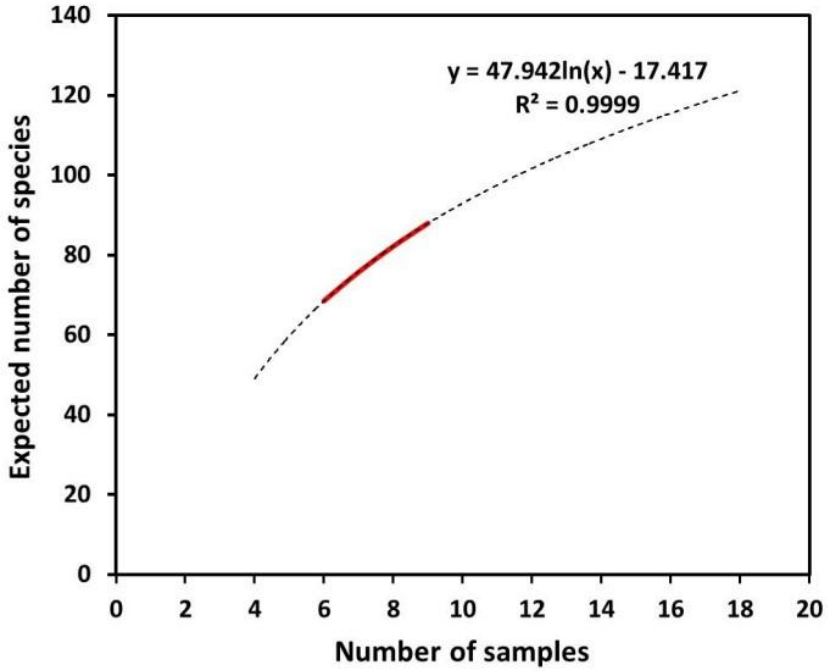

FIGURE 7 Synthetic species accumulation curve generated by EstimateS with power law trendline, associated equation and R^2 value.

Number of Surveys	Predicted no. of taxa	% increase
2	121.15	37.80
3	140.59	59.90
4	154.38	75.59
5	165.08	87.76
6	173.82	97.70
7	181.21	106.11
8	187.61	113.39
9	193.26	119.81
10	198.31	125.55

TABLE 1 EstimateS prediction of taxon diversity increase by multiplying survey effort.

Sample	No. of species	No. of individuals
General observation	16	53
Sweep netting	10	35
Light trap	10	22
Pitfall traps (general)	9	128
Pitfall traps (Samphire)	11	563
Malaise 1	**32**	**76**
Malaise 2	**38**	**120**
Berlese extraction	2	128
BugVac	8	83

TABLE 2 Number of species and specimens recovered from the nine samples collected.

It can be seen that the amount of effort necessary to double the number of taxa recovered would need to be between six and seven surveys (approximately 56 samples). This is considerably lower than that of the Dry Gut Open Channel survey (Pryce, 2013) where it would have been necessary to repeat just over four surveys of 22 samples each (approximately 90 samples) in order to obtain the same increase. This difference is explained by the use of Malaise traps (a particularly efficient sampling technique) during this survey where it was not possible to deploy them at Dry Gut. A tabulation of the number of species and total number of individuals recorded using the various techniques is given in Table 2; the significant contribution of Malaise traps to the species list is immediately apparent.

3.3 PLANTS AND LICHEN SURVEY

See Appendix 1.

4 IMPACT OF THE PROPOSED WORKS ON ENDEMIC SPECIES

Despite the initially unpromising nature of the habitat this site harbours a significant proportion of endemic invertebrate species including 5 nationally scarce or rare species. All of these species, with the exception of '*Peripsocus* sp. n.?' have been recorded at sites outside of the survey area; however, as they are seldom encountered we have little information on their true distribution, biological relationships or ecology. It should also be noted that the extra survey work undertaken for *Helenolius dividens* that has highlighted its patchy distribution was undertaken on an organism that is both easy to identify and locate. For species that are more cryptic, or have no easy and reliable field capture technique available, our knowledge is essentially zero; with the exception of *H. dividens* all four of the remaining species discussed fall into this category.

If the *H. dividens* metapopulation on Rupert's Hill turns out to be taxonomically distinct from the 'true' *H. dividens* at Flagstaff Scrubwoods (which is strongly suspected to be the case) the removal of the Samphire within the survey area will result in the loss of approximately 25% of its known range. If, after further research, the two populations prove to be a single, morphologically variable population this figure decreases to 20%.

It is not possible to quantify the impact of the works on the remaining four species due to the reasons outlined above.

As the area has proven to hold a considerable stock of scarce endemic species it is also possible that some of the more difficult to identify taxa present (particularly the tineid moths of the genus *Opogona*, the smaller hymenoptera and the mites) also belong to scarcer elements of the endemic fauna.

5 IMPLICATIONS FOR MITIGATION AND REMEDIATION

5.1 MITIGATION

The surface rocks along the line of the proposed works hold a diverse lichen community, the size of some colonies indicating that they may be several hundred years old. Prior to the commencement of any work an effort should be made to remove and store as many of these as possible off site, preferably to the east of the proposed works to avoid dust created by blasting or movement of heavy plant.

It will not be possible to mitigate for the loss of *H. dividens* larvae present amongst Samphire roots as attempts to remove them are likely cause extreme disturbance to the larvae; it would be almost impossible to relocate them successfully to a suitable surrogate habitat as we do not know the precise soil structure, depth, moisture gradient or symbiotic relationships required. If the works go ahead an effort should therefore be made by suitably trained personnel to collect a selection of larvae as scientific specimens in order to further our understanding of the ecology and taxonomy of the species. It should be possible to relocate any adults found to the nearby colonies.

The dead Samphire wood present on site holds a particularly strong colony of the flightless beetle *Acanthinomerus armatus* (Common Samphire Weevil). This species was found to be present throughout the Samphire on the north side of the ridge; however, it was absent from the Samphire in the area of gullies to the south of Rupert's Hill. If this material has to be removed it is suggested that suitably trained personnel gather as much dead wood as possible and transfer it into this area. Particular emphasis should be placed on recording how much material is moved and precisely where and how it is placed. Locations should be recorded as accurately as possible (preferably with DGPS) with records of how the material is placed along with general photographs of the shrubs in which it is placed. This will enable success or failure of the translocation to be monitored in the long term.

It is not possible to mitigate for any of the other important invertebrate species present, although reinstalling Malaise trap 2 for a period prior to the commencement of any works would be of benefit if further specimens of the two *Peripsocus* species were collected, particularly if the unknown males were found.

5.2 REMEDIATION

Should the rock prove to be of suitable quality, be available in sufficient quantity and the quarrying option given the go-ahead the main goal of remediation should be to return the site to the most natural looking state possible. This site is particularly sensitive in this respect as it forms a particularly prominent part of the landscape. The side and crest of this ridge are clearly visible from Deadwood, Alarm Forest, Two Gun Saddle, Dana's Peak and many parts of the High Central Ridge, The Dungeon, Francis Plain, St. Pauls, High Knoll, Half-Tree Hollow, Ladder Hill and parts of New Ground and Horse Pasture. It is strongly recommended that a landscape impact assessment be undertaken prior to commencing any work as this was beyond the remit of this survey.

This site has lost most of its native vegetation, this being replaced largely by invasive, non-native species (principally Wild Coffee, Wild Mango, Red Tungy and African Fountain Grass). It is suggested that topsoil and marl removed from site should be retained nearby so that it can be replaced

afterwards to form the basis of a soil. An attempt should be made to restore the site to a more natural state with the planting of Samphire, Scrubwoods and other endemics of the dry lands. Further suggestions for mitigation and remediation can be found in the recommendations section of the plant and lichen survey (page 21); it is advised that these also be taken into account.

African Fountain Grass (*Pennisetum setaceum*) poses a particular threat in this area and could potentially spread widely across this part of the island over the next decade or so. This spread could be halted by careful application of herbicide to the areas it currently occupies providing this is done in accordance with the spraying guidelines. If this were carried out across the Rupert's Valley, Rupert's Hill, Bank's Ridge and Sugarloaf Ridge area the risk of significant degradation of remaining habitat fragments and consequently the surprisingly large proportion of endemic invertebrates that can still be found in the area will be averted for the near future.

6 CONCLUSIONS

This site contains a significant proportion of the known population of the endemic cixiid plant hopper *Helenolius dividens*; additionally specimens from this site appear to differ from those of *H. dividens* at its previously known site (Flagstaff Scrubwoods). It is recommended that the area of Samphire containing this population be avoided while survey work is undertaken to assess the suitability of the rock for the purposes required.

Care should be taken while assessing the quality of the rock to preserve as much of the lichen covered surface material as possible for later reinstatement. If the rock is not of sufficient quality then an alternative source or sources should be sought. If the rock is of sufficient quality but the quantity available is not sufficient for the required purpose it is recommended that an alternative source also be sought as the impact on *H. dividens* combined with the landscape impact of open quarrying at this site would be significantly negative on both the species and the scenery of Rupert's Hill.

If both the quality and quantity of the rock meet the specifications required and permission is obtained for the proposed work it is strongly recommended that a landscape assessment be undertaken prior to any work. Options should also be considered, if at all possible, to produce a design that retains the area of Samphire *in situ*. It is also suggested that serious consideration be given to the potential mitigation and remediation measures outlined above and in the recommendations section of Appendix 1 (plant and lichen survey).

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8 GLOSSARY

DGPS	Differential Global Positioning System.
Frass	The usually pellet-like excreta of insects.
Fungivorous	Feeding primarily upon fungi.
Metapopulation	A metapopulation consists of a group of spatially separated populations of the same species which interact with each other at some level.
Monophagous	Organisms that feed exclusively (or nearly so) on a single other species.
Polyphagous	Organisms that feed on two or more other species.
Subgenital plaque	In the insect order Psocoptera this consists of a strengthened region on the underside just in front of the egg-laying apparatus, it is often much darker than the rest of the abdomen and usually has a different shape in each species, although these differences may be subtle in closely related taxa.

9 ACKNOWLEDGMENTS

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APPENDIX 1 PLANT AND LICHEN SURVEY – REBECCA CAIRNS-WICKS

1 SITE DESCRIPTION

A description and map of the survey area is provided in Section 1.3 and Figures 1 and 2 of the main document. The extent of the plant survey area is within the red line shown in Figure 1.

2 METHODOLOGY

The site was traversed on foot and observation of the species present and their abundance within the survey area recorded using the DAFOR scale as described in Lambdon & Darlow (2008). The survey provides a basic overview of the whole study area.

3 CONSTRAINTS

The survey was carried out on the 14th January 2014. A day was dedicated to the survey and subsequent analysis. Many annual species had already died away or were unrecognisable dried out skeletons.

It was not possible to provide a complete assessment of lichens present. The obvious and more common lichens were recorded, with a focus on endemic species.

4 RESULTS

The table below provides a list of plants and lichens found, their status and relative abundance within the survey area.

The survey area comprises predominantly dry shrubland along the north-west and south west falling slopes which are rocky areas of cliff, boulder fields and rocky ground with soil. Coffee (*Chryanthemoides monilfera*) and Lantana (*Lantana camara*) are frequent throughout the area and form the dominant species group together with Wild Mango (*Schinus terebinthifolius*) and Red Tungy (*Opuntia elatior*). Red Tungy was generally in poor condition and presence of Cactus Moth (*Cactoblastus cactorum*) noted. The more level area of ridge summit is marl and here the ground is predominantly barren, with some soil crusts and Creeper (*Carpobrotus edulis*) is the dominant vegetation type. There had been notable die back of Wild Coffee, Creeper and Lantana and this could be symptomatic of the dry seasonal weather experienced in 2013. Seedlings of Wild Coffee, Lantana and Creeper were observed. The bio-control agent for Lantana, the Lantana Bug *Teleonemia scrupulosa*, was also evident.

This survey underestimates the diversity and abundance of annual vascular plants extant in the area. Referring to data from previous records (St Helena Biological Records Database) it is possible that up to five annual species may be present during the year but not growing at the time of the survey. These annuals can be expected to be naturalised non-natives and one possibly native. The abundance of annuals recorded and which have flowered early within the survey area is also likely to be under recorded. This being the case, the interpretation of results is not considered to be significantly impacted.

The survey does not provide a full species list for lichens as it was not possible to survey them within the time available or to identify them all without a specialist and so underestimates the diversity of lichens present. This dryland site has a wide range of lichen habitats, if only covering small areas of the site as a while: soil crusts, boulder field, vertical and overhanging cliffs and ledges) and has good lichen diversity. The number of lichens recorded here is 27, but this figure is likely to increase if a more thorough lichen survey was carried out. Based on previous records across a similar area (St Helena Biological Records Database) the survey has recorded >50% of lichens possibly present. The individual species recorded, including the endemics are all rather common on St Helena and not of conservation concern. The only exception that has been identified so far is a ground crust near the summit of the ridge which is unusual and has not been formally identified. It may not be of any conservation significance but as it is not one that is easily recognisable the identity of it should, if possible, be confirmed. This is a nice site with good diversity of lichens which are commonly found across similar arid areas; the size of some colonies indicates that they may well be up to several hundred years old.

While the vegetation type is predominantly non-native there are a number of native species which constitute an important element of the habitat. Notable natives include: Bayonet Grass (*Tribolium obliteratum*) which was found to be generally scarce across the site but common in some areas. Samphire (*Suaeda fruticosa*) was found in three small fragmented patches, the largest of which (extending over an area of approximately 10 x 10 m) supported important communities of invertebrates (David Pryce, *pers. comm*.). A small patch of grass (covering approx. 10 x 10 m), dominated by the provisionally identified as *Eragrostis barrelieri*, a naturalised long standing inhabitant (Lambdon, 2012) also provided good invertebrate habitat (David Pryce, *pers. comm*.). The results of the invertebrate survey show that native species, even small and fragmented stands, provide habitat for rare endemic invertebrate communities. We know very little about the role of our native species in providing essential habitat for the island's native and endemic invertebrates. We know even less about the role of the vegetation structure, including non-native naturalised species in supporting invertebrate diversity.

A single plant of the rare native Crevice Fern (*Cheilanthes multifida*) was found (Figure 2) in a crevice on a south-west facing boulder at WGS84 15°55.402'S 005°42.164'W, AstroDos71/4 0210095 8238170, altitude 347 m. Despite a search of the area no more plants were found. Colonies of Crevice Fern are highly fragmented across the island and only consist of a few plants. According to Lambdon (2012) it is likely that the Crevice Fern is under recorded across its range, and this individual find reinforces the suggestion that plants may still be present in other sites. However this is a scarce species which is scattered widely across its range and one that should be considered threatened.

5 Conclusions

A mixed community comprising remnant populations of native species within an area of mixed arid shrubland dominated by non-natives, principally Wild Coffee and Lantana with Red Tungy and Wild Mango. A single large satellite (approx. 10 x 10 m) of the aggressive invasive African Fountain Grass (*Pennisetum setaceum*) has become established close to the Samphire colony on the south-west

facing slope. Other satellite colonies have become established across the Munden's and Sugarloaf ridges and are a worrying development. Their establishment poses a significant threat to the native flora and fauna of the area.

The rocky outcrops and boulder fields, most notably on the south west sloping hillside provide habitat for a good variety of lichens.

FIGURE 8 Rare native Crevice Fern (*Cheilanthes multifida*).

6 Recommendations

The location and identity of one of the soil crusts provisionally identified as *Hyperphyscia* sp. should be confirmed just in case it is of any particular interest.

The location and identity of the supposed *Eragrostis barrelieri* to be confirmed so that its value to invertebrates can be better understood. This information to be made available to David Pryce.
The test drilling sites should be identified and the least disturbing route to them, avoiding the Samphire patches, is to be identified and marked out.

All top soil and surface rocks at the test site should be removed for re-application post drilling.

If test drilling indicates that the potential rock capture warrants an application for development of the site as a quarry then an assessment of the landscape impact is highly recommended. Whilst this is beyond the scope of the plant survey, this site is a highly prominent one in the landscape, visible from urban areas, roads and conservation areas to the south-west and west.

Notwithstanding any findings of a landscape impact assessment. An application for development permission should consider the following:

- The consideration of alternative sites.
- The area of cut and footprint of the development be kept to a minimum.
- The pre-quarry removal of lichen rocks. A range of rocks and boulders should be identified and removed to a safe site for storage and later re-location to be agreed with the Engineer. The services of someone who can identify lichens will be required to identify a representative sample and confirm that it is stored correctly.
- The removal of the crevice fern and its translocation to a safe site agreed with the Engineer. This could be the EMD nursery.
- Seed collection of native grasses for re-seeding as part of site reinstatement.
- Seed and cuttings of extant Samphire collected. Where and if appropriate (to be taken under advisement of David Pryce) the translocation of live plants and deadwood.
- The eradication of African Fountain Grass (*Pennisetum setaceaum*) from within the site and adjacent to it, including along the access route.
- Adoption of appropriate species mixes and density for seeding and planting to be identified. Key species to include will be Samphire, Scrubwood (*Commidendrum rugosum*), Bayonet Grass, Fish-bone Grass, Crooked Awn Grass and other endemic and possibly native grasses.
- The finishing of the quarried slopes to reflect natural profiles.

7 Author

The plant survey was carried out by Dr Rebecca Cairns-Wicks. The observations and opinions expressed are those of the author in relation to the plant survey only.

8 References

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ST HELENA BIOLOGICAL RECORDS DATABASE.

PLANT AND LICHEN SPECIES LIST

A – Plants

Group	Family	Species	Common Name	Status	Site abundance
Vascular plants	Cupressaceae	*Juniperus bermudiana*	Bermudan Cedar	Naturalised	Rare
	Chenopodiaceae	*Atriplex semibaccata*	Common Saltbush	Naturalised	Rare
	Chenopodiaceae	*Suaeda fruticosa*	Samphire	Native	Rare
	Aizoaceae	*Carpobrotus edulis*	Creeper	Naturalised	Occasional
	Cactaceae	*Oputia elatior*	Red Tungy	Naturalised	Occasional
	Oxalidaceae	*Oxalis corniculata*	Creeping Sorrel	Naturalised	Very rare
	Anacardiaceae	*Schinus terebinthifolius*	Wild Mango	Naturalised	Frequent
	Anacardiaceae	*Schinus molle*	Peruvian Pepper Tree	Naturalised	Rare
	Primulaceae	*Anagallis arvensis caerulea*	Blue Pimpernel	Naturalised	Rare
	Verbenaceae	*Lantana camara*	Lantana	Naturalised	Frequent
	Oleaceae	*Olea europaea africana*	Black Olive	Naturalised	Rare
	Asteraceae	*Chrysanthemoides monilifera*	Wild Coffee	Naturalised	Frequent
	Asteraceae	*Conyza bonariensis*	Hairy Fleabane	Naturalised	Very rare
	Asteraceae	*Xerochrysum bractaetum*	Everlasting	Naturalised	Rare
	Poaceae	*Bothriochloa radicans*	Crooked Awn Grass	Naturalised	Rare
	Poaceae	*Bromus pectinatus*	Nodding Brome	Naturalised	Occasional
	Poaceae	*Bothriochlora radicans*	Crooked Awn Grass	Naturalised	Rare
	Poaceae	*Eragrostis cilianensis*	Fish-bone Grass	Prob. native	Very rare
	Poaceae	*Eriochloa procera*	Coastal Cup-grass	Poss. native	Very rare
	Poaceae	*Pennisetum setaceum*	African Fountain Grass	Naturalised	Very rare
	Poaceae	*Tribolium obliteratum*	Bayonet Grass	Native	Occasional
	Poaceae	*Sporobolus africanus*	Cape Grass	Poss. native	Occasional
	Poaceae	*Urochloa panicoides*	Signal Grass	Adventive	Rare
	Poaceae	*Vulpia bromoides*	Squirrel-tail Fescue	Naturalised	Frequent
Ferns	Adiantaceae	*Cheilanthes multifida*	Crevice Fern	Native	Very rare
Bryophytes	Exormotheceae	*Exormotheca pustulosa*	–	Native	Presence
	Aytoniaceae	*Plagiochasma rupestre rupestre*	–	Native	Presence
	Pottiaceae	*Weissia* sp.	–	Native	Presence

B – Lichens

Group	Family	Species	Common Name	Status	Site abundance
Lichens	Stereocaulaceae	*Leprocaulon tenellum*	–	Native	Presence
	Ramalinaceae	*Ramalina geniculata*	–	Endemic	Presence
	Ramalinaceae	*Ramalina rigidella*	–	Endemic	Presence
	Ramalinaceae	*Ramalina sanctae-helenae*	–	Endemic	Presence
	Roccellaceae	*Roccella linearis*	–	Native	Presence
	Roccellaceae	*Roccellina jamesii*	–	Endemic	Presence
	Candelariaceae	*Candelaria concolor*	–	Native	Presence
	Parmeliaceae	*Parmatrema austrosinense*	–	Native	Presence
	Parmeliaceae	*Xanthoparmelia pseudocongensis*	–	Native	Presence
	Parmeliaceae	*Xanthoparmelia molybdiza*	–	Native	Presence
	Physciaceae	*Dermatiscum pusillum*	–	Native	Presence
	Physciaceae	*Dirinaria applanta*	–	Native	Presence
	Physciaceae	*Hyperphyscia* [1]	–	Native	Presence
	Physciaceae	*Pyxine* sp.	–	Native	Presence
	Teloschistaceae	*Caloplaca bolacina*	–	Native	Presence
	Teloschistaceae	*Caloplaca flavovirscens*	–	Native	Presence
	Lecideaceae	*Lecidella beulliastrum*	–	Native	Presence
	Lecideaceae	*Lecidella chodati*	–	Native	Presence
	Coccocarpiaceae	*Coccicarpia palmicola*	–	Native	Presence
	Pannariaceae	*Pannaria fulvescens*	–	Native	Presence
	Buellia	*Buellia* sp.	–	Native	Presence
	Graphidaceae	*Diploschistes muscorum*	–	Native	Presence
	Haematommataceae	*Haematomma fenzlianum*	–	Native	Presence
	Lecanoraceae	*Lecanora sanctae-helenae*	–	Endemic	Presence
	Lecanoraceae	*Lecanora sulfurescens*	–	Native	Presence
	Stereocaulaceae	*Lepraria* sp.	–	Native	Presence
	Ochrolechiaceae	*Orchrolechia africana*	–	Native	Presence

[1] Preliminary identification. The species identification is uncertain. Microscopic examination and or chemical tests will be needed of a sample. It is of interest and will be helpful to facilitate a confirmed identification.

APPENDIX 2 SAMPLE SITE LOCATIONS

Site name	WGS84	AstroDos 71/4	Altitude (m)
Malaise trap 1 (and light trap site)	15°55.385'S 005°42.186'W	0210054 8238201	354
Malaise trap 2	15°55.375'S 005°42.182'W	0210061 8238218	358
Pitfall trap 1	15°55.407'S 005°42.137'W	0210142 8238160	357
Pitfall trap 2	15°55.405'S 005°42.143'W	0210131 8238164	355
Pitfall trap 3	15°55.401'S 005°42.149'W	0210122 8238171	359
Pitfall trap 4	15°55.398'S 005°42.155'W	0210110 8238177	359
Pitfall trap 5	15°55.392'S 005°42.192'W	0210044 8238187	351
Pitfall trap 6	15°55.385'S 005°42.197'W	0210034 8238200	353
Pitfall trap 7	15°55.380'S 005°42.196'W	0210038 8238209	355
Pitfall trap 8	15°55.376'S 005°42.189'W	0210048 8238217	360
BugVac sample	15°55.387'S 005°42.136'W	0210143 8238198	372

APPENDIX 3 *HELENOLIUS DIVIDENS* SURVEY LOCATIONS

A – Sites where *H. dividens* was present

Site name	WGS84	AstroDos 71/4	Altitude (m)	No. found
Rupert's Hill Samphire (survey site)	15°55.385'S 005°42.186'W	0210054 8238021	354	9
Below Pipe Path Scrubwoods	15°55.261'S 005°41.947'W	0210476 8238432	387	>20
Gully below Pipe Path Scrubwoods	15°55.230'S 005°42.009'W	0210364 8238491	372	1
Ruined sheepfold on Rupert's Hill	15°55.356'S 005°42.043'W	0210310 8238257	389	4
Valley 110 m north of sheepfold	15°55.297'S 005°42.051'W	0210294 8238367	368	4
Flagstaff Scrubwoods	15°55.107'S 005°40.853'W	0212430 8238745	594	3

B – Sites where *H. dividens* was absent

Site name	WGS84	AstroDos 71/4	Altitude (m)
Sandy Bay	16°00.197'S 005°42.830'W	0209021 8229305	14
Prosperous Bay Plain	15°57.488'S 005°39.164'W	0215523 8234364	308
Tungy Flats	15°57.430'S 005°39.479'W	0214935 8234489	360
Horse Point	15°56.441'S 005°39.432'W	0214997 8236316	413
Valley north of Horse Point	15°56.074'S 005°39.583'W	0214719 8236989	269
Ridge below Meterological Station	15°56.215'S 005°39.814'W	0214310 8236723	354
Lower Mulberry Gut	15°56.144'S 005°40.037'W	0213910 8236849	290
Pipe Path Scrubwoods (small site)	15°55.201'S 005°41.852'W	0210646 8238547	372
Pipe Path Scrubwoods (large site)	15°55.279'S 005°41.935'W	0210501 8238402	398
Xanthoparmelia beccae lichen area	15°55.336'S 005°42.862'W	0210632 8238297	410
North of summit of Bank's Ridge	–	0210199 8238918	351
Summit of Bank's Ridge	15°55.065'S 005°42.051'W	0210289 8238794	373
South of summit of Bank's Ridge	–	0210335 8238661	356
Gullies in upper Bloody Bridge Valley 1	–	0210304 8238559	351
Gullies in upper Bloody Bridge Valley 2	–	0210304 8238501	347
Gullies in upper Bloody Bridge Valley 3	–	0210290 8238460	344
Upper Bloody Bridge Valley, south side	15°55.249'S 005°42.089'W	0210224 8238453	340
Gullies south of Rupert's Hill 1	–	0210437 8237892	300
Gullies south of Rupert's Hill 2	15°55.530'S 005°42.029'W	0210339 8237938	276
Rupert's Bay, behind sea wall	15°55.168'S 005°42.732'W	0209074 8238588	21
Upper James Valley, south of Newbridge	15°56.127'S 005°42.635'W	0209271 8236822	109
Horse Pasture	15°57.437'S 005°45.406'W	0204355 8234337	380

APPENDIX 4 INVERTEBRATE SPECIES LIST

For each species the up-to-date taxonomic name is given along with the species authority and common name where appropriate.

The species status is defined as follows:

- \- Non-endemic species (non-native or indigenous);
- * Endemic species;
- ** Endemic genus and species;
- ? Indicates uncertainty.

The scarcity status is defined as follows:

Common	Widespread on the island (5 or more sites in different areas);
Scarce	Either less than 5 sites, or all sites restricted to one portion of the island;
Rare	Only known from one or two sites or less than 10 individuals;
?	Indicates uncertainty.

	Species	Author	St Helena common name	Status	Scarcity	No. samples	No. specimens
Collembola							
Entomobryomorpha							
Entomobryidae	*Entomobrya multifasciata*	(Tullberg, 1871)	Zebra-striped Springtail	-	Common	2	9
Insecta							
Blattodea							
Blattidae	*Periplaneta australasiae*	(Fabricius, 1775)	Australian Cockroach	-	Common	1	1
Corydiidae	*Euthyrrhapha pacifica*	(Coquebert, 1804)	Pacific Cockroach	-	Common	1	1
Ectobiidae	*Balta longicercata*	(Bolívar, 1924)	Ghost Cockroach	-	Common	1	1
Kalotermitidae	*Cryptotermes brevis*	(Walker, 1853)	West Indian Dry-wood Termite	-	Common	1	1
Coleoptera							
Cerambycidae	*Curtomerus flavus*	(Fabricius, 1775)	Orange Longhorn	-	Scarce	2	4
Coccinellidae	*Cheilomenes lunata*	(Fabricius, 1775)	Lunate Ladybird	-	Common	1	2
Coccinellidae	*Exochomus flavipes*	(Thunberg, 1781)	Orange-cheeked Ladybird	-	Common	2	2

Insecta contd.							
Coccinellidae	*Nephus binaevatus*	(Mulsant, 1850)	Minute ladybird	-	Common	3	4
Curculionidae	*Acanthinomerus armatus*	Boheman, 1859	Common Samphire Weevil	**	Common	2	90
Curculionidae	*Phlyctinus callosus*	Schönherr, 1826	Banded Fruit Weevil	-	Common	1	1
Curculionidae	*Pseudostenoscelis longitarsis*	Wollaston, 1877	Dryland Broadsnout Weevil	**	Common	1	1
Nitidulidae	*Carpophilus dimidiatus*	(Fabricius, 1792)	Corn Sap Beetle	-	Scarce	1	1
Tenebrionidae	*Stenosis sanctaehelenae*	Ardoin, 1972	Narrow Darkling Beetle	*	Scarce	1	1
Diptera							
Asteiidae	*Anarista vittata*	Sabrosky, 1977	St Helena Frass Fly	*	Rare	1	1
Calliphoridae	*Lucilia sericata*	(Meigen, 1826)	Common Green Bottle Fly	-	Common	1	1
Calliphoridae	*Sarcophaga haemorrhoidalis*	(Fallén, 1816)	Red-tailed Flesh Fly	-	Common	1	1
Chloropidae	Chloropidae indet.	-	-	?	?	1	1
Drosophilidae	*Drosophila repleta*	Wollaston, 1858	Dark-eyed Fruit Fly	-	Common	2	9
Muscidae	*Coenosia humilis*	Meigen, 1826	Tiger Fly	-	Common	1	1
Muscidae	*Limnophora helenae*	Pont, 1977	Striped House Fly	*	Common	2	6
Muscidae	*Musca autumnalis*	De Geer, 1776	Face Fly	-	Scarce	1	1
Phoridae	*Dohrniphora cornuta*	(Bigot *in* Sagra, 1857)	-	-	Scarce	2	5
Sciaridae	Sciaridae sp. 1 (med. antennae)	-	-	?	?	2	18
Sciaridae	Sciaridae sp. 2 (long antennae)	-	-	?	?	2	2
Syrphidae	*Eumerus lugens*	Wiedemann, 1830	Widow Hoverfly	*	Common	2	3
Syrphidae	*Syritta stigmatica*	Loew, 1857	Thick-legged Hoverfly	-	Common	1	1
Hemiptera							
Aphididae	Aphididae indet.	-	-	-		1	2
Cicadellidae	Typhlocybinae indet.	-	-	?	?	1	1
Cixiidae	*Helenolius dividens*	(Walker, 1858)	Samphire Hopper	**	Rare	3	9
Lygaeidae	*Nysius ericae*	(Schilling, 1829)	False Chinch Bug	-	Common	3	6
Tingidae	*Teleonemia scrupulosa*	Stål, 1873	Lantana Lace Bug	-	Common	2	20
Hymenoptera							
Aphelinidae	*Aphelinus* sp.	-	-	?	?	1	1
Aphelinidae	*Encarsia formosa*	Gahan, 1924	Encarsia	-	Common	1	3
Apidae	*Apis mellifera*	Linnaeus, 1758	Honey Bee	-	Common	1	4
Formicidae	*Cardiocondyla emeryi*	Forel, 1881	Emery's Sneaking Ant	-	Common	1	4
Formicidae	*Paratrechina bourbonica*	(Forel, 1886)	Robust Crazy Ant	-	Common	2	3
Formicidae	*Pheidole megacephala*	(Fabricius, 1793)	Big-headed Ant	-	Common	5	475
Formicidae	*Plagiolepis alluaudi*	Emery, 1894	Alluaud's Little Yellow Ant	-	Common	4	9

Mymaridae	*Anaphes nitens*	(Girault, 1928)	Minute Fringe-winged Wasp	-	Scarce	2	11
Sphecidae	*Podalonia canescens*	(Dahlbom, 1843)	Cutworm Wasp	-	Common	1	2
Scelionidae	*Macroteleia gracilicornis*	Dodd, 1920	-	-	Scarce	1	1
Chalcididae	Chalcididae indet.	-	-	?	?	1	1
Encyrtidae	Encyrtidae indet.	-	-	?	?	1	1
Ichneumonidae	Ichneumonidae(?) indet	-	-	?	?	1	1
Hymenoptera indet.	Hymenoptera indet. 1	-	-	?	?	1	1
Hymenoptera indet.	Hymenoptera indet. 2	-	-	?	?	1	1
Hymenoptera indet.	Hymenoptera indet. 3	-	-	?	?	1	1
Hymenoptera indet.	Hymenoptera indet. 4	-	-	?	?	1	4
Hymenoptera indet.	Hymenoptera indet. 5	-	-	?	?	2	3
Hymenoptera indet.	Hymenoptera indet. 6	-	-	?	?	2	3
Hymenoptera indet.	Hymenoptera indet. 7	-	-	?	?	2	6
Lepidoptera							
Danaidae	*Danaus chrysippus*	(Linnaeus, 1758)	African Monarch	-	Common	1	1
Crambidae	*Helenoscoparia nigritalis*	(Walker *in* Melliss, 1875)	-	**	Common	1	1
Crambidae	*Spoladea recurvalis*	(Fabricius, 1775)	White-striped Moth	-	Common	1	1
Gelechidae	*Phthorimaea operculella*	(Zeller, 1873)	Potato Tuber Moth	-	Common	2	6
Lycaenidae	*Lampides boeticus*	(Linnaeus, 1767)	Long-tailed Blue	-	Common	2	3
Noctuiidae	*Agrotis ipsilon*	(Hufnagel, 1766)	Dark Sword-grass	-	Common	1	4
Noctuiidae	*Aletia ptyonophora*	(Hampson, 1905)	-	*	Common	1	4
Noctuiidae	*Ctenoplusia limbirena*	(Guenée, 1852)	Scar Bank Gem	-	Common	1	6
Noctuiidae	*Helicoverpa helenae*	Hardwick, 1965	-	*	Common	1	1
Pyralidae	*Cactoblastis cactorum*	(Berg, 1885)	Cactus Moth	-	Common	1	1
Tineidae	Tineidae indet. 1	(Wollaston, 1879)	-	*	?	2	2
Tineidae	Tineidae indet. 2	-	-	*	?	3	8
Tineidae	Tineidae indet. 3	-	-	*	?	2	4
Tineidae	Tineidae indet. 4	-	-	*	?	2	21
Tineidae	Tineidae indet. 5 (flightless)	-	-	*	?	2	6
Orthoptera							
Acrididae	*Primnia sanctaehelenae*	(Stål, 1861)	Dryland Grasshopper	**	Common	4	15
Gryllidae	*Gryllus bimaculatus*	De Geer, 1773	African Field Cricket	-	Common	1	1
Psocoptera							
Ectopsocidae	*Ectopsocus briggsi*	McLachlan, 1899	Brigg's Barkfly	-	Common	3	17

Insecta contd.							
Ectopsocidae	*Ectopsocus strauchi*	Enderlein, 1906	Strauch's Barkfly	-	Common	1	3
Peripsocidae	*Peripsocus leleupi*	Badonnel, 1976	Lelelup's barkfly	*	Rare	1	2
Peripsocidae	*Peripsocus* n. sp.	-	-	*	Rare	1	1
Trogiidae	*Cerobasis annulata*	(Hagen, 1865)	Scale-wing Barkfly	-	Common	2	4
Trogiidae	*Helenatropos abrupta*	Lienhard, 2005	South African Barkfly	-	Scarce	1	3
Thysanoptera							
Thripidae	*Thrips tabaci*	Lindeman, 1888	Onion Thrips	-	Common	1	4
Thysanoptera indet.	Thysanoptera indet. (red)	-	-	?	?	2	16
Arachnida							
Araneae							
Araneidae	*Neoscona hirta*	(Koch, 1844)	Hairy Field Spider	-	Common	2	3
Dysderidae	*Dysdera crocata*	Koch, 1839	Red Spider	-	Common	1	1
Oecobiidae	*Oecobius* sp.	-	-	*	?	1	1
Salticidae	*Hasarius adansoni*	(Audouin, 1826)	Adanson's House Jumper	-	Common	1	1
Salticidae	*Pellenes inexcultus*	(Pickard-Cambridge, 1873)	-	*	Common	3	3
Acari							
Galumnidae	*Galumna ?elimata*	(Koch, 1841)	-	-	Common	1	7
Scheloribatidae	*Scheloribates* cf. *deficiens*	Wallwork, 1977	-	*	Scarce	3	49
Acari indet.	Acari indet. (rounded, red)	-	-	?	?	1	56
Diplopoda							
Julida							
Blaniulidae	*Blaniulus guttulatus*	(Fabricius, 1798)	Spotted Snake Millipede	-	Common	3	25
Julidae	*Ommatoiulus moreleti*	(Lucas, 1860)	Button Worm	-	Common	3	173
Crustacea							
Isopoda							
Porcellionidae	*Porcellionides pruinosus*	(Brandt, 1833)	Plum Woodlouse	-	Common	1	8
Gastropoda							
Helicoidea							
Helicidae	*Helix aspersa*	Müller, 1774	Garden Snail	-	Common	1	6