

# Ascension Island Biodiversity Action Plan

## ASCENSION PARSLEY FERN



Photo: AIG Conservation

### SUMMARY

**Taxonomy:** Kingdom: Plantae; Phylum: Polypodiophyta; Class: Polypodiopsida; Order: Pteridales; Family: Adiantaceae; Species: *Anogramma ascensionis*

**Nativeness:** Endemic to Ascension Island

**Description:** Tiny fern with small parsley-like fronds averaging 3-6 cm in height. Grows on moderately dry to wet banks and outcrops on the exposed south-facing slopes of Green Mountain where it is often associated with the native thalloid liverwort *Plagiochasma rupestre* (see photo).

**IUCN Red List status:** Critically Endangered 

**Local trend:** Unknown 

**Threats:** The major threat to *An. ascensionis* is competition with invasive plant species; secondary threats include landslips and climate change-induced habitat alteration.



Distribution	
Global	
<p><i>Anogramma ascensionis</i> is endemic to Ascension Island.</p>	
Local	
<p>Currently known from only 4 locations on the southern slopes of Green Mountain at altitudes of 600 – 750 m [1]. The highest concentration of plants has been recorded on a dry cinder bank at the westernmost end of Elliott’s Path, with smaller numbers found on two exposed cliff faces below Elliott’s (Phil’s Folly and an unnamed site above Breakneck Valley). In 2014 a small population was also established on Stedson’s Ledge, an exposed crag below Elliott’s Path which is one of the remaining locations of the endemic grass <i>Sporobolus caespitosus</i>. The native range of <i>A. ascensionis</i> is unknown but its current distribution is likely to be refugial due to displacement by more competitive introduced species [1].</p>	 <p>Distribution of <i>Anogramma ascensionis</i> in March 2014 (AIG Conservation Department, unpublished data). Symbol sizes are scaled according to total numbers of plants encountered.</p>

3. Status					
Population estimate:	1-40 mature individuals	Trend:	Unknown	IUCN status:	Critically Endangered
<p><i>A. ascensionis</i> was listed as extinct in the 2003 IUCN Red List of Threatened Species having not been seen in the wild since 1958. A small population was rediscovered in 2009 and the species has now been re-assessed as critically endangered (IUCN 2010). The number of mature individuals in the four known sub-populations has fluctuated between 1 and 40, although the inaccessibility of remaining habitat, the short life span of sporophytes and the cryptic nature of gametophytes make accurate status assessments difficult. The current trend is unknown, but it is clear that numbers have declined precipitously since the Island was settled in the 19th century. Indeed, based on the number of specimens collected by Hooker in 1842 (more than any other endemic) it seems likely that <i>A. ascensionis</i> was relatively widespread at that time [1].</p>					

4. Ecology	
Habitat	
<p>All extant populations occur on exposed, sparsely-vegetated, vertical cinder banks above 600m. However, <i>A. ascensionis</i> appears to have a lower exposure tolerance than other native inhabitants of the exposed bank community and probably once flourished in more sheltered and shaded parts of Green Mountain before these habitats were invaded by introduced species [1]. Sporophytes (spore-bearing fronds) of wild plants currently achieve a maximum height of 2 – 4 cm, although herbarium specimens suggest that heights in excess of 10cm were once attained [1]. Given its small size and limited competitive ability, <i>A. ascensionis</i> has probably always been an ephemeral, colonist species exploiting relatively bare habitat before later successional communities develop [2].</p>	
Reproduction & life history	
<p>Reproduces sexually [1]. Sporophytes release green spores which must germinate soon after dispersal [2]. The gametophytes are functionally perennial (i.e. persist for several years) whereas sporophytes function as short-lived</p>	



<p>annuals, sometimes surviving for just a few months [2]. Like other <i>Anogramma</i> species, <i>A. ascensionis</i> gametophytes may be able to remain dormant as a vegetative bud, or tubercle, during environmentally stressful periods and regenerate when more favourable conditions resume [1,3].</p>
<p><b>Taxonomy &amp; population structure</b></p>
<p>Phylogenetic analyses have indicated a close relationship between <i>A. ascensionis</i> and Brazilian populations of <i>A. chaerophylla</i>, suggesting a recent colonisation from the neotropics [1]. However, <i>A. ascensionis</i> is morphologically and ecologically distinct from all other members of the genus [2,4].</p>

4. Threats*		
<b>8.1.2 Invasive non-native/alien species/diseases (named species)</b>	<b>Impact:</b>	HIGH
<p>Competition with invasive, introduced weeds was almost certainly the major driver in the decline of <i>A. ascensionis</i> in the wild and remains the primary threat to the species' survival today [2,3]. Introduced maidenhair ferns (<i>Adiantum raddianum</i> and <i>Adiantum capillus-veneris</i>), grasses such as <i>Sporobolus africanus</i> and <i>Paspalum scrobiculatum</i>, and broadleaved weeds such as <i>Clidemia hirta</i> (Koster's curse) and <i>Begonia hirtella</i> now occupy most of the moist cinder banks that would formerly have provided habitat [1–3]. The few remaining individuals appear to be confined to exposed, marginal habitats on the edge of the species natural range and are considerably smaller and less fecund than 19th century herbarium specimens [1].</p>		
<b>11.1 Climate change &amp; severe weather: Habitat shifting &amp; alteration</b>	<b>Impact:</b>	UNKNOWN
<p>Although many <i>Anogramma</i> species are able to tolerate periods of dry weather in a vegetative state, sporophytes are only produced under suitably damp conditions [3]. Any reduction in precipitation and/or increase in evapotranspiration on Green Mountain as a result of anthropogenic climate change would therefore pose a potentially serious threat to the remaining populations of <i>Anogramma ascensionis</i>, which are already thought to be growing in sub-optimal conditions [1]. It is difficult to predict long-term changes in precipitation at Ascension Island with any degree of certainty [5]. However, many global climate models agree that rising temperatures are likely to lead to a reduction in low-level cloudiness and a gradual drying out of montane cloud forest ecosystems, such as that found on the upper reaches of Green Mountain [6].</p>		
<b>10.3 Avalanches/landslides</b>	<b>Impact:</b>	MEDIUM
<p><i>Anogramma ascensionis</i> is only known from four steep and potentially unstable cinder banks and is therefore highly vulnerable to landslips which occur periodically on the upper slopes of Green Mountain and could instantly destroy a large proportion of the world population.</p>		
<p>*Threats are classified and scored according to the <a href="#">IUCN-CMP Unified Classification of Direct Threats</a> [7]</p>		

Relevant policies and legislation
Local
<p><i>Anogramma ascensionis</i> is protected under the <a href="#">Wildlife Protection Ordinance 2013</a>, which prohibits the damaging, killing or possession of protected species without license.</p> <p>All populations are contained within Green Mountain National Park designated under the <a href="#">National Protected Areas Order 2014</a>. The <a href="#">National Protected Areas Regulations 2014</a> restrict all forms of development within the national park.</p>

Management notes
<p>Since its rediscovery in 2009, significant progress has been made in securing the future of <i>An. ascensionis</i>. <i>In vitro</i> propagation protocols have been developed at Royal Botanic Gardens Kew with good germination success, sporophyte production and survival rates [1]. A living collection of several thousand plants has also been established and a stock of 150 gametophytes is held in cryopreservation at the Conservation Biotechnology Unit. Since June 2013, 78 clusters of cultivated gametophytes (ca. 1400 individuals) have been repatriated from Kew to Ascension</p>



Island and a number of these have been successfully introduced into wild populations. In 2014, 7 sporophytes and approximately 60 gametophytes from cultivated stock were introduced to an exposed, seep area known locally as ‘Stedson’s Ledge’ and have established well, producing more than 175 sporophytes, 7 of which have reached maturity and produced spore.

Despite this, *A. ascensionis* remains extremely vulnerable to extinction in the wild and efforts to strengthen its precarious situation are urgently needed. Protecting existing localities from encroachment by introduced weeds is of highest priority and should be achievable through frequent, light management. In particular the spread of maidenhair ferns is believed to have been an important contributory factor in the decline of the species and its removal and the maintenance of free areas in these locations is likely to be essential. Bolstering existing wild populations and establishing new populations is also crucial to reduce the species susceptibility to catastrophic events such as landslips and droughts, as well as buffering against stochastic variation in demographic rates that could carry the species into extinction. Achieving this objective will require the establishment of a local cultivation programme on Ascension Island, both as a source of material for restoration efforts and as a source of spore for further propagation work. Sterile micro-propagation facilities are currently being developed on Island and will hopefully enable the replication of horticultural protocols developed at RBG Kew.

Reintroduction trials at Stedson’s Ledge demonstrate that cultivated *A. ascensionis* can be successfully restored into wild habitats, provided that suitable sites can be found. In this case, the presence of the closely-associated liverwort *Plagiochasma rupestre* was used as an indicator of habitat suitability and its distribution could be used to identify further reintroduction sites [3]. However, the number of existing, weed-free locations is likely to be rather limited and restricted to drier, more marginal habitat. In the longer term, therefore, the restoration of wetter, seep and drip areas will need to be attempted, probably as part of a wider restoration programme aimed at reinstating the native vascular plant and bryophyte communities of these habitats [3]. Given the limited competitive ability of the native flora, such areas are likely to remain highly susceptible to reinvasion by introduced weeds, so it is vital that on-going management requirements are assessed at a small scale before embarking on a larger programme.

Ultimately, the long term management objective for *Anogramma ascensionis* (and other endemic flora) must be to support the development of self-sustaining populations that are able to survive with little or no human intervention. However, unless the original causes of decline can be addressed it is difficult to envisage how this can be achieved at present. Manually restoring and maintaining extensive areas of native habitat is generally regarded as unfeasible with the resources available within the Territory. Instead, securing the long-term survival of species like *A. ascensionis* may depend upon finding permanent ways of reducing the dominance of key competitors (e.g. through biological control) and/or exploring whether stable, mixed communities of indigenous and introduced species can be encouraged to develop. Careful experimentation and reporting of results will be needed to assess these options.

## SPECIES ACTION PLAN

PROPOSED ACTION	OUTCOME(S)	TIMEFRAME	PROPOSED START	PRIORITY	LEAD
Safeguards & Management					
Maintain a viable, <i>ex situ</i> population of <i>Anogramma ascensionis</i> as a conservation failsafe and source of material for restoration efforts	50 individuals in cultivation	1 year then review	January 2015	HIGH	RBG Kew
Establish a local cultivation programme for <i>Anogramma ascensionis</i> on Ascension Island, developing facilities, protocols and skills as necessary	5 individuals in cultivation	1 year	June 2015	HIGH	Assistant Conservation Officer (AIG)
Reinforce existing wild populations of <i>Anogramma ascensionis</i> with plants from cultivated sources, monitoring their growth and survival on a monthly basis.	5 individuals re-introduced; 12 surveys completed	1 year then review	April 2015	HIGH	Assistant Conservation Officer (AIG)
Attempt to establish at least one new sub-population of <i>Anogramma ascensionis</i> within its probable former range.	5 individuals re-introduced	1 year	April 2016	MEDIUM	Assistant Conservation Officer (AIG)
Establish exclusion zones for maidenhair ferns and other problematic invasive weeds on cinder banks supporting populations of <i>Anogramma ascensionis</i> .	4 exclusion zones established	3 days	April 2015	HIGH	Assistant Conservation Officer (AIG)
Seek funding and partner support for a study to assess the suitability of established biological control agents of particularly problematic cloud forest weeds for introduction to Ascension Island. Possible targets include <i>Clidemia hirta</i> , <i>Alpinia zerumbet</i> , <i>Buddleja madagascarensis</i> and <i>Clerodendrum chinense</i> .	1 project initiated	1 year	April 2016	MEDIUM	Head of Conservation (AIG)

PROPOSED ACTION	OUTCOME(S)	TIMEFRAME	PROPOSED START	PRIORITY	LEAD
Attempt to restore a section of the native, wet bank plant community on Green Mountain, using the site as a trial for developing methods and assessing on-going management requirements.	20 metres of bank restored	2 years	January 2017	MEDIUM	Assistant Conservation Officer (AIG)
Research & monitoring					
Establish an island-wide network of precipitation/temperature monitoring stations to refine habitat classifications and expand the range of baseline meteorological data available for climate change monitoring and research.	10 monitoring stations deployed	1 month	May 2015	MEDIUM	Chief Scientist (AIG)
Produce an endemic plant monitoring manual to clarify the aims of the monitoring programme and document methods for data collection, storage and analysis.	1 report produced	2 months	February 2015	LOW	Assistant Conservation Officer (AIG)
Clean existing endemic plant monitoring data stored in departmental databases and update database structures in line with current monitoring and research needs.	1 database produced	1 year	September 2014	MEDIUM	Assistant Conservation Officer (AIG)
Conduct biannual censuses of <i>Anogramma ascensionis</i> sporophytes in known natural populations, timing surveys to coincide with the peaks of the hot and cool seasons,	2 censuses completed	7 months	March 2015	MEDIUM	Assistant Conservation Officer (AIG)
Communication & Awareness Raising					
Erect visitor information boards at access points and key features within all nature reserves and national parks, establishing a strong protected areas identity and awareness on Ascension Island.	10 signs installed	6 months	January 2016	MEDIUM	National Park Warden (AIG)

PROPOSED ACTION	OUTCOME(S)	TIMEFRAME	PROPOSED START	PRIORITY	LEAD
Publish a free guide booklet on Ascension Island's protected areas network to be made available at ports of entry, visitor attractions and other outlets.	500 booklets produced	3 months	June 2015	LOW	Tourism & Media Officers (AIG)
Produce an updated information leaflet on the flora of Ascension Island.	250 leaflets produced	3 months	June 2015	LOW	Tourism & Media Officers (AIG)

## References

1. Baker K et al. (2014) Rescue, ecology and conservation of a rediscovered island endemic fern (*Anogramma ascensionis*): ex situ methodologies and a road map for species reintroduction and habitat restoration. *Botanical Journal of the Linnean Society* **174**, 461–477.
2. Lambdon PW, Stroud SA, Gray A, Niissalo M, Renshaw O & Sarasan V (2010) *Anogramma ascensionis*. In: *IUCN Red List of Threatened Species. Version 2013.2* (ed. IUCN 2013).
3. Lambdon P, Stroud S, Clubbe C, Gray A, Hamilton M, Niissalo M, Pelembe T & Renshaw O (2009) *A plan for the conservation of endemic and native flora on Ascension Island*.
4. Cronk QCB (1980) Extinction and survival in the endemic vascular flora of Ascension Island. *Biological Conservation* **17**, 207–219.
5. Gray A (2009) *Ascension Spurge Euphorbia origanoides L. climate and viability study: Final Report*. Unpublished report. Centre for Ecology and Hydrology, Edinburgh Research Station.
6. Foster P (2001) The potential negative impacts of global climate change on tropical montane cloud forests. *Earth-Science Reviews* **55**, 73–106.
7. Salafsky N et al. (2008) A Standard Lexicon for Biodiversity Conservation: Unified Classifications of Threats and Actions. *Conservation Biology* **22**, 897–911.