

Ascension Island Biodiversity Action Plan

PTISANA PURPURASCENS



Photo credit: RBG Kew

SUMMARY

Taxonomy: Kingdom: Plantae; Phylum: Polypodiophyta; Class: Polypodiopsida; Order: Marattiales; Family: Marattiaceae; Species: *Ptisana purpurascens*

Nativeness: Endemic to Ascension Island

Description: This imposing fern is the largest of Ascension Island's endemic plant species, with dark green, twice pinnate fronds up to 1m in length. The stalks (or 'petioles') of the fronds are purplish in colour which gives the species its scientific name. It is only found on the damp, mist-drenched slopes around the summit of Green Mountain.

IUCN Red List status: Critically Endangered 

Local trend: Probably stable 

Threats: The major threat to *P. purpurascens* is competition with invasive plant species; secondary threats include grazing by introduced mammals and climate change-induced habitat alteration.

Citation: Ascension Island Government (2015) *Ptisana purpurascens* species action plan. In: *The Ascension Island Biodiversity Action Plan*. Ascension Island Government Conservation Department, Georgetown, Ascension Island





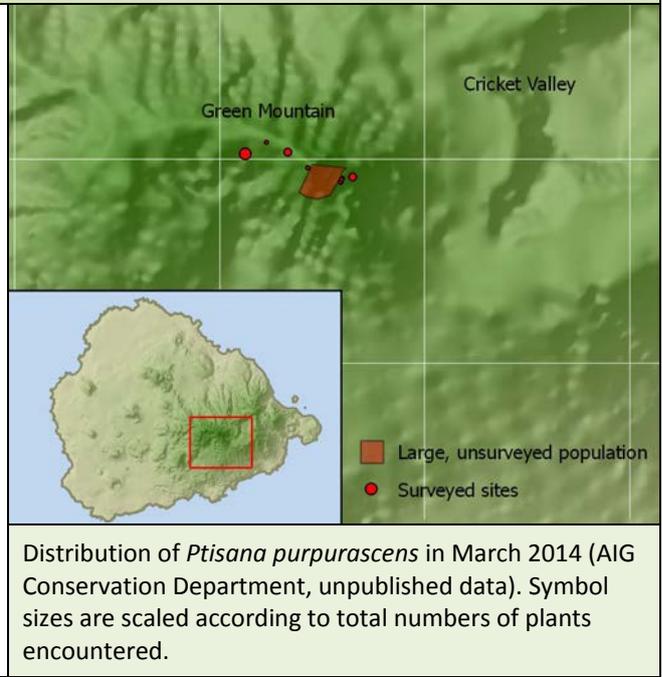
2. Distribution

Global

Ptisana purpurascens is endemic to Ascension Island.

Local

Ptisana purpurascens is known only from the central part of Ascension Island. It occurs on the uppermost slopes of Green Mountain at altitudes between 700 and 860m. The majority of the population is confined to a small area on steep, south and east facing slopes descending from the summit to the intersection of Elliott's Pass with Buddleia Ravine and Gooseberry Ravine. This area has retained the last vestiges of a fern-dominated community similar to that observed by early visitors to the island, although it is increasing invaded by non-native weeds. A few isolated patches are scattered in the highest parts of the south west slopes of Green Mountain, where it is very rare. A small number of individuals have also established in the adjacent bamboo thicket at the summit, and under cloud forest trees nearby. The total extent of occurrence is approximately 12 ha, and the area of occupancy less than 4.5 ha.



3. Status

Population estimate:	600-800 mature individuals	Trend:	Probably stable	IUCN status:	Critically Endangered
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Obtaining reliable population estimates for *P. purpurascens* is extremely challenging due to the inaccessibility of its main population centres, and the risks of damaging its remaining, fragile habitat during physical surveys. Several attempts to quantify the total population have been made: Cronk described a population of “several hundred” individuals in 1976 [1]; Gray et al. estimated the total population at over 500 individuals in 2005 [2]; and Niissalo et al. report a total of 600 – 800 mature individuals based on data collected between 2008 and 2010 [3]. *P. purpurascens* may never have been particularly common and numbers have probably not changed greatly in recent years since plants appear to be rather long-lived and are able to compete favourably with introduced vegetation when mature [1,4]. The main concern is the apparently low rate of seedling recruitment within major population centres [4]. Until further research has been conducted, it is not possible to be certain whether this is a natural phenomenon or indicates a potentially serious decline in ecological viability. One possible explanation is that the recruitment of young ferns was once concentrated on temporary patches of damp, open ground where land slips or the death of large, old *P. purpurascens* clusters had created gaps. These ephemeral habitats are now extremely rare. Any canopy gaps are rapidly in-filled by weeds, especially cow grass *Paspalum scrobiculatum*, which cover the ground before fern gametophytes can establish. If the rate of *P. purpurascens* recruitment has declined substantially due to habitat deterioration, then the consequences may only become evident over a long time period as older plants die.

4. Ecology

Habitat

P. purpurascens is predominantly found on high altitude, south and east facing slopes around the summit of Green Mountain. These areas are frequently bathed in mists carried on the prevailing south-easterly trade winds and remain continuously damp. Details of the original native community with which *P. purpurascens* co-existed are incomplete, but today the main native associate is the vigorous patch-forming fern *Histiopteris incisa*. As a cloud



forest has developed around the summit area, the population has adapted to this environment and it now occurs both as an epiphyte and as an under-storey species in densely-shaded areas, often growing on dead wood. However, it is still relatively uncommon in such habitats.

Reproduction & life history

The reproductive ecology of *P. purpurascens* is poorly known. Ex-situ attempts to grow this species from spore have failed unless in vitro techniques with sugars have been utilised which might suggest that the species requires or benefits from a symbiotic fungal partner [3], as in other members of the Marattiaceae [5]. In-situ, very little recruitment has been observed within the main population centres. However, rich growths of young sporophytes have been located on a few moist banks that have not been quickly overgrown by invasive weeds, largely due to heavy shading by stands of introduced shell ginger *Alpinia zerumbet*. This suggests that *P. purpurascens* may rely on ephemeral patches of damp, bare ground for gametophytes to establish, such as those created periodically by landslips or the death of mature plants. *P. purpurascens* plants can also propagate vegetatively via crown buds, although these usually appear to remain attached to the parent plant and do not disperse. *P. purpurascens* is long-lived and slow-growing, taking longer than 5 years to mature in cultivation [6].

Taxonomy & population structure

Previously classified as *Marattia purpurascens* but was placed in the new genus *Ptisana* by Murdock [7]. *Ptisana* is a tropical genus comprised of approximately 20 species, 18 of which occur in Oceania and South East Asia, 1 in Africa and Indian Ocean islands, and 1 on Ascension Island [7]. *P. purpurascens* is morphologically and genetically similar to the African and Indian Ocean *P. fraxinia* species complex [1,8] and could even be considered part of it [1]. Phylogenetic analysis has revealed strong affinities with the Seychelles endemic *P. fraxinia laboudallonia*, although several populations that are geographically closer to Ascension Island were not considered [9]. *P. f. robusta*, an endemic of Sao Tome, and two currently unnamed varieties native to continental tropical West Africa may be the closest relatives [9].

5. Threats*

8.1.2 Invasive non-native/alien species/diseases (named species)

Impact: HIGH

Habitat loss due to competition with introduced vegetation is currently the major threat to the survival of *Ptisana purpurascens*. A man-made cloud forest composed primarily of evergreen trees, shell ginger (*Alpinia zerumbet*) and dense stands of bamboo has replaced the native *Ptisana purpurascens* – *Histiopteris incisa* community across much of its probable former range. The last expansive area of intact habitat is highly fragmented and surrounded by a sea of grass. *Buddleja madagascarensis* and *Clerodendrum chinense* partially smother a large part of the lower habitat area and weeds such as blackberry (*Rubus pinnatus*), raspberry (*Rubus rosifolius*), Koster's curse (*Clidemia hirta*), buttonweed (*Diodia* spp.) and the pepper *Piper aduncum* are frequently found growing through the stands. The dense growths of introduced vegetation may be particularly problematic for seedling recruitment since bare patches of ground are rare and are rapidly colonised by weeds like cow grass (*Paspalum scrobiculatum*) before gametophytes can establish. Young plants are also often attacked by rabbits in more accessible locations which may further reduce recruitment rates [6].

11.1 Climate change & severe weather: Habitat shifting and alteration

Impact: UNKNOWN

Ptisana purpurascens only occurs on the mist-drenched, uppermost slopes of Green Mountain, where frequent immersion in clouds provides the continuously moist environment that it requires. This marginal niche makes it highly vulnerable to the effects anthropogenic climate change. According to many global climate models, rising temperatures during the 21st century will reduce low-level cloudiness and increase the altitude of montane ecotones by hundreds of metres, resulting in the drying out and displacement of cloud forest ecosystems from many mountain peaks [10]. Since *Ptisana purpurascens* is already confined to the highest, wettest habitats on Green Mountain there is no opportunity for altitudinal range shifts to track such changes.

10.3 Avalanches/landslides

Impact: MEDIUM

Due to its very small area of occupancy, *Ptisana purpurascens* is potentially highly susceptible to catastrophic events such as landslides which could instantly destroy a large proportion of the world population.

*Threats are classified and scored according to the [IUCN-CMP Unified Classification of Direct Threats](#) [11]



6. Relevant policies and legislation

Local

P. purpurascens is protected under the [Wildlife Protection Ordinance 2013](#), which prohibits the damaging, killing or possession of protected species without license.

All populations are contained within Green Mountain National Park designated under [National Protected Areas Order 2014](#). The [National Protected Areas Regulations 2014](#) restrict all forms of development within the national park.

7. Management notes

In contrast to the other mountain endemic flora, a substantial patch of the original habitat of *P. purpurascens* still exists and may yet be salvaged. The *Histiopteris incisa* – *Ptisana purpurascens* community above Buddleia ravine has probably survived in a relatively intact state because the dense, vigorous sward is reasonably resistant to invasion. Nevertheless, the remaining habitat area is surrounded by a sea of introduced weeds and further losses will almost certainly occur without management. Steep gradients and dense vegetation make working in this area challenging and it will not be practical to manually control invasive weeds growing through the fern sward without causing significant damage. However, it may be feasible to maintain a perimeter around the remaining habitat area from which larger, thicket forming species such as buddleia, shell ginger and bamboo are excluded. Given the logistical difficulties of working in this area, it may also be worth exploring biological control options for key invasive species as a more permanent and sustainable management solution. Biocontrol agents for Koster's curse (*Clidemia hirta*), *Clerodendrum chinense* and related species of wild ginger (*Alpinia* spp.) and buddleia (*Buddleja* spp.) are currently being investigated elsewhere and these could be assessed for introduction to Ascension Island [12–14].

Assuming that existing habitat areas can be maintained, a longer term programme of habitat restoration aimed at reinstating the *H. incisa* – *P. purpurascens* community across a wider area may be appropriate [4]. Currently, the lack of repeatable methods for cultivating large numbers of these species from spore is a major barrier to any restoration efforts and this must be addressed as a matter of urgency. Techniques for propagating *P. purpurascens* from crown buds have been developed and may be suitable for small scale re-introductions, but it is not advisable to re-vegetate large areas with clones due to their limited genetic diversity [4]. Sterile micro-propagation facilities are currently being established in the Territory and will hopefully improve the success of cultivation trials. However, even if sufficient cultivated stock can be produced, experiences to date suggest that restoring *P. purpurascens* in the weed-dominated habitats surrounding its current stronghold will be extremely challenging. A restoration area above Elliott's Path that was cleared of introduced vegetation in 2013 to create space for a small population of mature *P. purpurascens* has been rapidly in-filled by fast-growing weeds and is already considered unmanageable. Clearly, any future restoration efforts in this area will need to rapidly establish a dense ground cover of *H. incisa* to exclude invasive weeds, and might even consider incorporating more benign exotic species to create stable, mixed communities. Further research into the ecological requirements of *P. purpurascens* is needed to guide future restoration work, in particular the conditions under which seedling recruitment occurs. If a recruitment deficit is apparent it may be necessary to create temporary re-colonisation zones within the main habitat area to encourage seedling establishment [4]. However, this would greatly increase the complexity and time demands of restoration.

Whilst the exposed locations traditionally occupied by *P. purpurascens* are essential for its survival, additional consideration must be given to the novel cloud forest habitats where it now occurs. These habitats are unlikely to host particularly high densities because the low light levels create an inhospitable environment. However, the damp, shady, evergreen forest at the summit of Green Mountain superficially resembles the habitat of related *Ptisana* species and there remains the potential that this area may yet support a significant proportion of the population. It is currently not clear whether plants fare better in the tree-dominated part of the forest or under bamboo stands, although most of the easily visible plants in the bamboo zone appear to be growing on decaying wood suggesting that this habitat may become less suitable as the remaining old trees decline. Small-scale restoration has already been trialled in both habitats with some success, although grazing of young plants by rabbits has caused significant damage outside of fenced enclosures and will need to be addressed if a wider restoration programme is to be initiated. The major competitor in this area is Koster's curse, which can grow as an epiphyte and is able to form a dense understory even in deep shade. As in more open habitats, biological control may be a suitable management option for this species. In the longer term, a programme to replenish ageing cloud forest trees may also be



beneficial. Many of these old-growth trees were deliberately planted during efforts to forest the summit of Green Mountain during the nineteenth century and natural recruitment appears to be low or absent [15]. Instead, when mature trees fall they are generally replaced by dense thickets of fast-growing shrubs which are unsuitable as habitat for *P. purpurascens*. Replacing existing trees and expanding the cloud forest canopy into areas currently overgrown with weeds would not only benefit *Ptisana*, but could also expand the habitat area for other native and endemic epiphytes such as the grammitid fern *Stenogrammitis ascensionis* which is now largely confined to these areas.

SPECIES ACTION PLAN

PROPOSED ACTION	OUTCOME(S)	TIMEFRAME	PROPOSED START	PRIORITY	LEAD
Management					
Produce a site management plan for the last extensive fragment of the native <i>Ptisana purpurascens</i> - <i>Histiopteris incisa</i> community above Buddleia Ravine, including a timetable for the routine control of invasive species.	1 management plan produced	1 months	April 2015	HIGH	Head of Conservation (AIG)
Establish an <i>ex situ</i> population of <i>Ptisana purpurascens</i> on Ascension Island using crown buds collected from a broad and representative sample of wild individuals.	50 individuals in cultivation	2 years	January 2015	HIGH	Assistant Conservation Officer (AIG)
Establish an <i>ex situ</i> spore bank of <i>Ptisana purpurascens</i> spores on Ascension Island to act as a conservation fail safe.	5 plants sampled	1 year	January 2015	LOW	Assistant Conservation Officer (AIG)
Develop propagation techniques for cultivating <i>Ptisana purpurascens</i> and <i>Histiopteris incisa</i> from spore, investing in additional facilities and training as necessary.	25 individuals in cultivation	1 year	March 2015	HIGH	Assistant Conservation Officer (AIG)
Attempt the reintroduction of cultivated <i>Ptisana purpurascens</i> sporophytes into novel tree and bamboo-dominated cloud forest habitats at the peak of Green Mountain, using camera traps to monitor grazing by introduced herbivores.	20 individuals re-introduced	1 week	September 2015	MEDIUM	Assistant Conservation Officer (AIG)
Initiate a trial on the use of introduced shade trees to exclude aggressive, invasive weeds within the montane cloud forest and expand the area of habitat available for epiphytic and shade-tolerant native and endemic plants.	500 square metres cleared; 20 saplings planted	3 years	March 2015	MEDIUM	National Park Warden (NPW)

PROPOSED ACTION	OUTCOME(S)	TIMEFRAME	PROPOSED START	PRIORITY	LEAD
Introduce additional dead wood into the bamboo forest at the summit of Green Mountain to create germination sites for <i>Ptisana purpurascens</i> , with results to be carefully monitored and reported.	20 logs introduced	1 week	September 2015	LOW	National Park Warden (NPW)
Research & monitoring					
Map the current extent of the <i>H. incisa</i> – <i>P. purpurascens</i> habitat patch above Buddleia Ravine and the distribution of encroaching weeds as a baseline for future monitoring and management.	1 GIS layer produced	1 month	September 2015	HIGH	Chief Scientist (AIG)
Conduct annual fixed point photographic surveys of the <i>H. incisa</i> – <i>P. purpurascens</i> habitat patch above Buddleia Ravine to assess encroachment by invasive species and management requirements.	2 photographic surveys completed	2 years then review	March 2015	HIGH	Assistant Conservation Officer (AIG)
Develop a population monitoring protocol for <i>Ptisana purpurascens</i> that includes individuals growing in inaccessible and easily-damaged habitat; incorporate into the monitoring manual.	1 report produced	6 months	June 2016	MEDIUM	Chief Scientist (AIG)
Establish an experimental re-colonisation plot within the <i>H. incisa</i> – <i>P. pupurascens</i> habitat above Buddleia Ravine to characterise successional cycles, gametophyte recruitment and invasion rates.	10 m ² cleared; 1 report produced	1 year	March 2017	MEDIUM	Assistant Conservation Officer (AIG)
Establish a 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.	6 monitoring stations deployed	1 month	May 2015	MEDIUM	Chief Scientist (AIG)

PROPOSED ACTION	OUTCOME(S)	TIMEFRAME	PROPOSED START	PRIORITY	LEAD
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	1 month	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)
Seek funding and partner support for a project to catalogue Ascension Island's terrestrial invertebrate fauna, including a reassessment of the distribution and status of endemic species and a detailed study of invertebrate pests effecting endemic plants.	1 project initiated	1 year	April 2015	MEDIUM	Head of Conservation (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)
Communication & Awareness Raising					
Produce an updated information leaflet on the flora of Ascension Island.	250 leaflets produced	3 months	June 2015	LOW	Tourism & Media Officers (AIG)

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