

The progress and problems of the 'Endemic Section' of St Helena Island

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St Helena is a small Atlantic island with an unusual and remarkable flora and fauna but with a legacy of ecological destruction typical of oceanic islands. The efforts of the island's governmental Endemic Section in the conservation of the flora and fauna is examined alongside the objectives of the section as listed in its current business plan. The worthy level of progress that is evident (including the rediscovery of species, habitat restoration and a high level of environmental awareness) is attributed to local ownership, an emphasis on education, and pragmatism and flexibility. The problems that limit the section's long-term effectiveness are funding, limited baseline ecological information and limited technical understanding.

Background

St Helena is a small isolated island (122 sq km) in the South Atlantic Ocean (15°56'S, 5°42'W), which arose from volcanic activity to the east of the mid-Atlantic rift over 14 million years ago. The island has a complex topography of ridges and deep gorges, plains and hills, the main feature of which is the high central ridge surrounded by radiating valleys. The island's coast consists largely of precipitous cliffs, interrupted by small bays. St Helena is often described as 'an emerald set in stone', alluding to its verdant centre of pasture, smallholdings, plantation forestry, and indigenous vegetation, surrounded by rocky wastelands and eroded 'badlands' (see Figure 1).

The geographical position of St Helena and the timing of its emergence have given rise to an endemic flora and fauna of exceptional taxonomic isolation and scientific interest, analogous in its level of endemism to that of New Caledonia (Mittermeier *et al.*, 1996). Recently Wilson (1992) described St Helena's biosphere as only 'one step removed from a satellite colony in space'.

Over a century ago, St Helena's plants were described by Hooker as 'fragments from the wreck of an ancient world' (Melliss, 1875). Almost all St Helena's indigenous flowering

plant species and 10 of the plant genera are endemic to the island (eight of the genera are monospecific, indicating their evolutionary isolation). There are 14 endemic fern species including the St Helena tree fern *Dicksonia arborescens*. Almost nothing is known of the island's lower plants.

Of St Helena's approximately 1100 terrestrial invertebrate species, 400 are endemic to the island: they include 77 endemic species of weevil (17 endemic weevil genera and four endemic weevil tribes) and 49 endemic species of spider (Basilewsky, 1970, P. Hammond pers. comm.). Subfossil evidence indicates the presence of a total of five endemic land birds on St Helena in recent history, including a large species of hoopoe *Upupa antaios* and a cuckoo *Nannococcyx psix*. One species of land bird remains: the wirebird *Charadrius sanctaehelenae*, which is a relative of Kittlitz's sand plover *C. pecuarius* of southern Africa. Two endemic petrels probably also remained on the island at the time of its discovery (Olsen, 1975). Now, indigenous seabirds are restricted to offshore islets owing to predation by cats and rats. The island's poorly studied marine life further affirms St Helena's status as an 'evolutionary laboratory' (Edwards, 1990).

Unfortunately, St Helena is typical of oceanic islands that suffered high levels of

destruction and degradation after their discovery by European naval powers. The decline of St Helena's biodiversity began following the island's discovery in 1502, when goats and pigs were established there for re-victualling purposes. Destruction intensified after settlement began in 1659 (Cronk, 1993). Past habitat destruction and fragmentation of the remaining indigenous habitat has left a legacy which, in combination with relentless introductions of exotic plants and invertebrate pests, continues to push the island's remarkable biodiversity into oblivion.

Currently, 13 of the island's endemic flowering plants have been categorized in the IUCN Critically Endangered category: this includes those that have been reduced to a tiny handful of individuals and those that, with 100–150 individuals remaining, are relatively common (Maunder, 1995). The decline in invertebrate species is unknown because the most recent thorough survey was carried out in the 1960s. It is feared that many of the island's invertebrates will have followed in the footsteps of the giant earwig *Labidura herculeana* which reaches up to 78 mm in length: 40 specimens of this earwig, the world's largest, were collected in 1967 but recent efforts to rediscover any individuals of this species have failed (Clarke and Veal, 1989).

Conservation on St Helena in the twentieth century

George Benjamin is a St Helenian who developed an expert knowledge of St Helena's flora during his work as a forest guard for the island's Agriculture and Forestry Department in the 1970s and 1980s. He, with others, rediscovered several St Helenian endemic plants that were previously assumed to be extinct: the she cabbage tree *Lachanodes arborea* in 1976; the St Helena olive *Nesiota elliptica* in 1977; and the St Helena ebony *Trochetiopsis ebenus* in 1980. In 1984, Benjamin established a small section of staff at the Agriculture and Forestry Department to work on the propagation of the endemic plant species.

This Environmental Conservation Section

(known as the Endemic Section) was based in a small nursery facility established in 1984 with financial help from the World Wide Fund for Nature (WWF). With the help of the International Institute of Biological Control, facilities were also established to rear and release biological control agents *Hyperaspis panthera* (Coleoptera: Coccinellidae) for a homopteran *Orthezia insignis* (Homoptera: Ortheziidae) which threatened the last small patches of indigenous gumwood woodland (*Commidendrum robustum*) that historically covered over 60 per cent of the island. The release programme was successful and the future of the woodland is now secure.

Benjamin also ensured that much of the section's time was spent educating the public and schoolchildren about St Helena's flora. There are now virtually no islanders who do not understand the meaning of the term 'endemic' or who cannot recognize a St Helena ebony, and public interest is reflected in membership of the recently formed St Helena Nature Conservation Group. The section pioneered habitat restoration and species rescue on St Helena, and is arguably at the forefront of global efforts in restoration ecology.

In 1993, prompted by the 1992 United Nations Conference on Environment and Development and by lobbying from the UK Dependent Territories Forum, St Helena's Agriculture and Forestry Department, in collaboration with the International Institute for Environment and Development (IIED) and Royal Botanic Gardens, Kew (RBG), initiated a Sustainable Environment and Development Strategy (SEDS; for a full discussion of SEDS see Maunder *et al.*, 1995). As part of SEDS, measures to conserve the endemic flora were intensified. A consultant from RBG visited the island in February 1995 to make recommendations for species rescue programmes and habitat conservation. Benjamin retired in 1995, but the section now has a larger number of staff than ever and key members of staff are receiving overseas training. Contemporary to the development of the SEDS was the first intensive academic research to be focused on any of St Helena's species: doctorate research in *Trochetiopsis*, an endemic genus of two

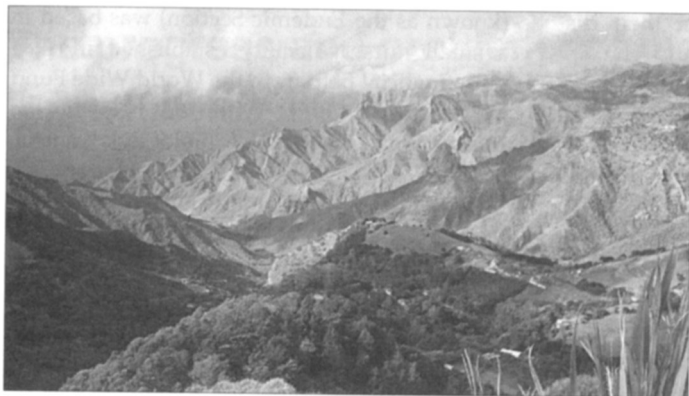


Figure 1. A view south-west from St Helena's central ridge. It indicates St Helena's remarkable topography and the dramatic contrast between the vegetated uplands and the encircling eroded wastelands (D. Smith).

species, one of which has passed through a bottleneck of two individuals while the other has endured a bottleneck of one (Rowe, 1995).

The Agriculture and Forestry Department hosted a conference in February 1995, to allow discussion of the SEDS among representatives of governmental organizations, the private sector and the public. Among the discussions Q. C. B. Cronk (who worked with Benjamin over many years) made two proposals: the creation of St Helena's first national park; and the establishment of a biological research station. The first proposal was taken forward and excited much public debate, culminating in the gazettelement of Diana's Peak National Park in March 1996. A management plan for the national park was completed at about the same time and is being implemented. The

park is refuge to almost all of the remaining fragments of St Helena's endemic tree-fern thicket, which are threatened by invasive New Zealand flax *Phormium tenax* (Smith and Williams, 1996; Smith, in press; see Figure 2).

Progress

Progress in terms of sustainably increased survival prospects for the endemic species is summarized in Table 1. The table shows achievements against the four objectives of the Endemic Section as defined in the section's business plan drawn up in 1995. The small scale of the island and of its conservation problems may have aided the substantial progress that is evident. However, there are

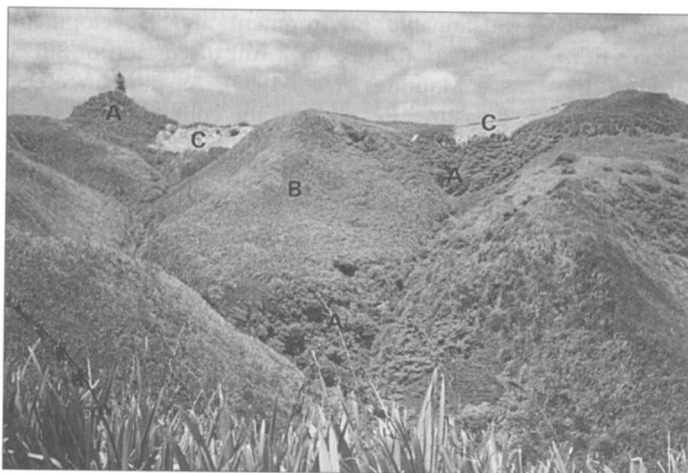


Figure 2. Fragments of tree-fern thicket (A) are shown surrounded by exotic New Zealand flax plantation (B) on this hillside in Diana's Peak National Park. Note also the areas cleared of flax plantation (C) in preparation for trials to investigate tree-fern thicket recreation (D. Smith).

key features of the work of the Endemic Section that I suggest have ensured success, irrespective of the island's small scale: local ownership; a focus on education; and pragmatism and flexibility.

Local ownership

As described above, conservation on St Helena was pioneered by George Benjamin: so from the very start the efforts were locally 'owned'; and the staff of the endemic section wanted to build gradually on the work, simply because it was their work and represented their personal endeavours. Furthermore, as the work gained more prominence, the public became proud of and sympathetic with work to conserve the endemic species because it was carried out by committed islanders and because the endemic plants represented something uniquely St Helenian.

This experience underscores the importance of ensuring local involvement to achieve long-term conservation success and is comparable to experience elsewhere (for example Child, 1995). Despite St Helena's small scale, it has a long history of development projects with no local ownership, which have ultimately failed. In contrast to conservation projects elsewhere, however, the work of the Endemic Section was unusual in having a reliable source of funds from the St Helena Government and the island has no direct land-use conflicts.

Focus on education

The emphasis that was placed on education, either through regular radio interviews or through work with primary school children, has further reinforced the interest that islanders have in their biological heritage and their wish to ensure success. The work of the UK Dependent Territories Forum and the St Helena Nature Conservation Group has also raised awareness through the sale of posters and the issue of 'endemic' postage stamps (Figure 3).

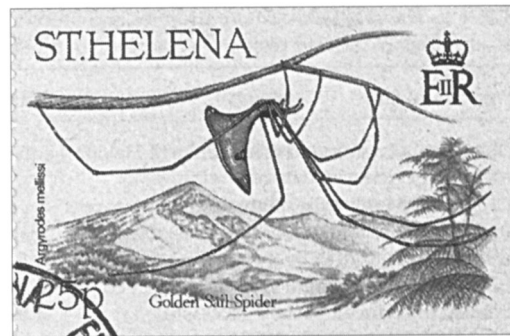


Figure 3. One of a set of stamps released in August 1995 depicting St Helena's unusual invertebrates. This example, the golden sail spider *Argyrodes mellissii*, is one of 48 species of spider endemic to the island.

Pragmatism and flexibility

The work of the section was based upon simple rules rather than complex theories of conservation biology. Despite the lack of scientific research into any of the endemic plants, the section did not hesitate to follow basic rules to stop and reverse species decline. A good example (which also illustrates the commitment to education) is the establishment of endemic trees within the grounds of a school in order to provide an informal and accessible seed orchard.

Problems

Despite the progress that has been made, certain factors affect the potential for the current success to result in sustainably reversed conservation threats (see Table 1). These include restricted funding, lack of basic ecological information and technical problems.

Funding

The most outstanding constraint upon continued conservation success on the island will be restricted funding, especially amid the current climate of public sector reform and economic recession on the island. St Helena, as a dependent territory of the UK, is not eligible for funding from the Global Environmental

Table 1. The progress, current priorities and problems of the Endemic Section of St Helena summarized against each of the four respective objectives of the section in the business plan for 1996/7

Progress so far	Priorities now	Problems
Objective 1. To save and rehabilitate St Helena's endemic habitats and increase their extent		
<p>1.1 Since 1984 relict flax plantation was cleared and stands of endemic trees were established at High Peak.</p> <p>1.2 Patches of gumwood woodland rescued from an introduced pest by successful biocontrol, beginning in 1993.</p> <p>1.3 Clearance of exotic scrub separating the two remaining patches of endemic gumwood woodland (which covered 60% of the island in 1502).</p> <p>1.4 Implementation of a rescue plan for the tree fern thicket of Diana's Peak began in 1995 (8.4 ha of tree fern thicket cleared of invasive flax; 2-ha restoration trial set up).</p> <p>1.5 Diana's Peak National Park declared in March 1996, to complement the 5-year rescue plan.</p> <p>1.6 Flax cleared around isolated tree ferns in 'the Depot' in 1996.</p> <p>1.7 Leader of habitat management team undergoing training in South Africa.</p>	<p>1.1 Clearance of invasive plants from tree fern thicket at High Peak.</p> <p>1.2 Integrated control of introduced pests of endemic species.</p> <p>1.3 Establishment of endemic gumwood seedlings to link the fragments.</p> <p>1.4 Continuation of the rescue plan to remove invasive flax from all tree fern thicket and to begin tree fern thicket recreation of key locations.</p> <p>1.5 Pursuit of further funding to support rescue plan and interpretation for the park.</p>	<p>1.1 No scientific basis of ecological understanding of endemic habitats.</p> <p>1.2 Very steep terrain limits physical work in many areas.</p> <p>1.3 No technology for cheaper and more successful control of invasive plants and pests.</p> <p>1.4 Limited seedling supply for supplementation planting.</p>
Objective 2. To recreate endemic habitats in selected areas as they originally grew		
<p>2.1 Successful control of feral goats since 1960s has allowed recolonization of endemic halophytes in dry rocky coastal zone of St Helena.</p> <p>2.2 Successful establishment of gumwood trees at Horse Point Plain, an eroded part of the island.</p> <p>2.3 Establishment of stands of St Helena ebony in a further eroded area.</p>	<p>2.1 Continued surveillance for feral livestock.</p> <p>2.2 Further and more species-diverse plantings at Horse Point Plain.</p> <p>2.3 Control of rabbits and prevention of new exotic colonization in the south-west of the island where natural colonization of endemic plants is most successful.</p>	<p>2.1 Habitat rescue in the wetter parts of the island is higher priority than habitat recreation in drier parts: funding is limiting.</p> <p>2.2 Limited seedling supply.</p>
Objective 3. To rescue endemic species from the brink of extinction (ensuring all genetic variation is retained)		
<p>3.1 Rediscovery of several plant species thought to be extinct.</p> <p>3.2 Nursery establishment.</p> <p>3.3 Successful propagation of most rediscovered species.</p> <p>3.4 Programme of propagule collection and seed orchard (<i>ex situ</i> genebank) development under way.</p> <p>3.5 Doctorate research on endemic redwood.</p> <p>3.6 Further nursery improvements including purchase of equipment for seed storage.</p>	<p>3.1 Intensive rescue and breeding programmes for each of the critically endangered plant species to ensure propagation and seedling production is based on genetic security.</p>	<p>3.1 Technical problems of pollination and propagation: for example the St Helena olive has a self-incompatibility mechanism and is reduced to four individuals.</p> <p>3.2 Hybridization problems in certain genera, uncertain knowledge of taxonomy of certain genera.</p>

continued...

Table 1. (Continued) The progress, current priorities and problems of the Endemic Section of St Helena summarized against each of the four respective objectives of the section in the business plan for 1996/7

Progress so far	Priorities now	Problems
<p>3.7 Monitoring survey established for the species of dryland areas usually assumed to be abundant.</p> <p>3.8 Monitoring of the endemic wirebird and some monitoring of invertebrates carried out at intervals.</p> <p>3.9 Nursery manager on training at Royal Botanic Gardens, Kew.</p>		<p>3.3 Breeding programmes to ensure genetic security have to be based upon assumptions regarding phenotypic fitness, take years to implement, and require sustainable funding.</p>
Objective 4. To raise public awareness and appreciation of St Helena's endemic heritage		
<p>4.1 Regular radio talks by section staff continuing for some years.</p> <p>4.2 Sales of endemic seedlings as garden plants to public very popular.</p> <p>4.3 Tree planting and education in schools.</p> <p>4.4 Establishment of the George Benjamin Arboretum of endemic trees for public education.</p> <p>4.5 Regular conservation bulletin established in local newspaper from 1995.</p> <p>4.6 Improved access and interpretation for Diana's Peak National Park and High Peak.</p> <p>4.7 Colour National Park leaflet/poster for public sale.</p>	<p>4.1 Formalized education in schools across the curriculum through information packs for teachers.</p> <p>4.2 Continued work in local newspaper and radio.</p> <p>4.3 Further improvements in access to Diana's Peak and High Peak.</p>	<p>4.1 Time and funding for educational activities are constrained by the Section's other priorities.</p>

Facility, a problem experienced by other dependent territories of former colonial powers (Mittermeier *et al.*, 1996).

Lack of basic ecological information

Technical solutions that enable more effective solutions from each conservation pound or dollar are limited while scientific studies of the island's terrestrial and marine fauna and flora are few and far between. Furthermore, St Helena's biological interest has received virtually no publicity owing to the lack of botanical and zoological research. Thus the world at large (including donor agencies) remains unaware of, and therefore indifferent to, St Helena's conservation value, and applications for funding are less likely to meet with success.

The absence of global publicity also undermines the ability of the island to 'add value' to its flora and fauna through ecotourism as part of the developing 'high value – low volume'

tourism industry (St Helena Government, 1996). This was the reasoning for Cronk's proposal for a biological research station. In fact carrying out research on St Helena is very straightforward because of the co-operative government and a friendly public.

Technical problems

Technical problems continue to hinder progress with the rescue of particular species. The lack of understanding of flower structure and pollination mechanisms will pose particular problems for plant propagation. For example cross-pollinations cannot yet be carried out on the endemic whitewood *Petrobium arboreum* because of its unusual composite flowers. The St Helena olive *Nesiota elliptica* is reduced to four individuals (one vegetatively propagated from the last wild individual and three offspring of self-pollinations from that individual) but can produce

no more than very occasional seeds due to a self-incompatibility mechanism. Furthermore, there is a hybrid species *Trochetiopsis* × *benjaminii* between *T. ebenus* and *T. erythroxyton*, and a possibility of hybridization problems in three further genera. Such hybridization was avoided in historical times due to allopatry or to the absence of subsequently introduced generalized pollinators.

In the rescue of habitats, invasive exotic plants and pests present technical problems: New Zealand flax *Phormium tenax* invades tree-fern thicket through the copious production of seeds and it is impossible to completely physically remove the flax on the very steep ground to which the indigenous tree fern thicket is now limited; exotic moth larvae (*Opogona* spp.) threaten adult trees of some species such as the he cabbage tree *Pladaroxyton leucadendron*.

Conclusion

The remarkable flora and fauna of St Helena is now in a critical period of its long history: it has been devastated since human discovery of the island in 1502, but great progress has recently been made in conservation and restoration efforts. With sustained attention, funding and an improved technical know-how, such progress can be maintained and built upon; without these things the island's species and habitats will enter a brief final phase – of extinction.

Acknowledgements

Thanks to Nick Williams, Vanessa Thomas, Hazel Bowers, Barry Thomas, Georgie Henry, Collie Richards, Mark Williams, Germaine Fowler, Leslie Benjamin, Eric Henry and the St Helena Government.

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