

Section 8: Invasive species

Co-ordinators: Oliver Cheesman (Development Director, UKOTCF) & Karen Varnham (University of Bristol and UKOTCF Council)

Invasive species continue to represent a major environmental challenge, including (it has been argued) as the greatest threat to the biodiversity of island ecosystems. In addition, the substantial economic and human costs of managing invasive species and their impacts are increasingly clear. Difficulties in funding long-term programmes, particularly in support of measures such as biosecurity, which could vastly reduce long-term costs by preventing species introductions (and the need to manage the spread and impacts of invasive species, once they are established) remains a significant obstacle in the UKOTs. Nonetheless, valuable work is being undertaken at a local and cross-Territory level.

The Invasive Species session at the *Making the Right Connections* conference focused on discussion of practical aspects of tackling the invasive species threat. The first two speakers shared their experiences of work under the regional South Atlantic Invasive Species (SAIS) project, particularly those aspects relevant to St Helena and Ascension Island, and lessons learned from the management of an invasive insect pest which threatens the National Tree of the Turks & Caicos Islands. The audience then heard about work undertaken by JNCC to enhance available information on non-native species and related activities across the UKOTs/CDs, and about a cross-Territory project led by the Cayman Islands to help disseminate information and to raise public awareness of the invasive species threat. A lively discussion of the general issues raised then followed. Further examples of relevant work in the UKOTs/CDs was presented in poster form.



*From left: Dr John Cooper, Bryan Naqqi Manco, Tara Pelembe, Karen Varnham, Andrew Darlow
(Photos of participants in this section by Thomas Hadjikyriakou unless otherwise indicated)*

Framework Document: Invasive Species - What is needed for the future?

Co-ordinators: Oliver Cheesman (Development Director, UKOTCF) and Karen Varnham (UKOTCF Council and University of Bristol)



Cheesman, O. & Varnham, K. 2010. Framework Document: Invasive Species - What is needed for the future?. pp 266-269 in *Making the Right Connections: a conference on conservation in UK Overseas Territories, Crown Dependencies and other small island communities, Grand Cayman 30th May to 5th June 2009* (ed. by M. Pienkowski, O. Cheesman, C. Quick & A. Pienkowski). UK Overseas Territories Conservation Forum, www.ukotcf.org



Since discussions at the *Biodiversity That Matters* conference in Jersey in 2006, which focused particularly on priority setting, there has been much activity (globally, and in the UK) in relation to the environmental threats posed by invasive species. Valuable work has been undertaken in the UKOTs/CDs themselves (e.g. under local or cross-Territory projects), and there are also lessons to be learned from elsewhere (e.g. through experience gained in other island ecosystems). The Invasive Species session at the *Making the Right Connections* conference aimed to consider progress that has been made and to focus on discussion of practical aspects of tackling the invasive species threat, based on sharing of experience.

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Background

The *Dealing with Alien Invasive Species* session at the Jersey conference (Cheesman & Clubbe 2007) focused on the setting of overall priorities for invasive species projects. It concluded that there was no simple, generic formula for this, as the urgency of need for particular measures varied so greatly from one place to another and tended to be very context-specific. However, it was noted that the same fundamental elements occurred repeatedly in relation to invasive species management needs around the world. These included measures to:

- Raise awareness at all levels of society, and across all relevant sectors, including through education programmes (cf. Section 3: Environmental Education; Section 7: Raising Our Profile)
- Engage all relevant stakeholders in development of policy, management plans etc., and implementation activities (cf. Section 2: Progress on Environment Charter implementation)
- Enhance cooperation and communication between relevant sectors and authorities (including within governments) (cf. Session 10:

Joined-up Thinking)

- Develop and enforce appropriate legislation, voluntary codes of conduct etc.
- Establish facilities (including technical capacity) for research, monitoring, surveillance and control activities
- Apply risk assessment to characterise critical vectors, pathways and species
- Participate in relevant regional initiatives and establish linkages with relevant international instruments

In all cases, of course, significant progress was dependent on availability of resources.

With respect to the UKOTs, overall priority areas were identified as development of the information base on invasive species and the infrastructure (existing and required) for their management. In relation to the next steps, it was suggested that particular attention should be given to:

- Enhanced information gathering and information sharing, including development of the database arising from Varnham (2006) (cf. Varnham & Fleming 2007)
- An audit of measures that are already in place

in each UKOT for invasive species management (possibly as part of a broader Needs Assessment in each Territory)

- Planning for better co-ordination of activities, within and between UKOTs, and across the regions in which UKOTs are located
- The development of rapid response mechanisms.

The *Invasive Species* session of the *Making the Right Connections* conference aimed to consider progress that has been made in these areas and to focus on discussion of practical aspects of tackling the invasive species threat, based on sharing of experience.

Introduction

Since the Jersey conference, work on invasive species globally has continued to develop rapidly. There is an ever-expanding body of information on the impacts, biology and management of invasive species, of which the following are just a selection of the more general reviews and similar works: Brooke *et al.* (2007), Howald *et al.* (2007), Jones *et al.* (2008), Kenis *et al.* (2009), Russell *et al.* (2007), Towns *et al.* (2006) and Varnham (in press). There is also an increasing body of individual case studies, as particular threats and problems are tackled in particular localities.

At a policy level, things have also moved forwards. In the UK, building on earlier work in this area (cf. Moore 2007), a *Framework Strategy* for management of the invasive species threat was published in 2008, covering England, Wales and Scotland (Defra 2008). In continental Europe, the threat posed by invasive species has been increasingly recognised (e.g. Hulme *et al.* 2009), and a European Commission paper *Towards an EU Strategy on Invasive Species* was published towards the end of 2008 (EC 2008). This specifically notes the particular impact of species invasions on isolated islands with high biodiversity value, such as the Overseas Countries and Territories of EU Member States, and acknowledges that they do not receive appropriate attention in this regard.

In terms of international information and support networks, the Global Invasive Species Programme (GISP - <http://www.gisp.org/>) has published a new 2008-2010 strategy. The Invasive Species Specialist Group (ISSG - <http://www.issg.org/index.html>) continues its work on the Global Invasive Species

Database (GISD), and is preparing for a conference on *Island Invasives: Eradication & Management* in February 2010. As well as continuing work on its Caribbean regional initiative (see Cheesman & Clubbe, 2007, Box 2), CAB International is developing an *Invasive Species Compendium*, which, at the time of writing, has reached the 'alpha' test phase (see <http://www.cabi.org/datapage.asp?iDocID=180>). Also relevant to the Caribbean is a recently published pathways analysis (Meissner *et al.* 2009). With 2009's International Day for Biological Diversity (22 May) devoted to invasive alien species, the Convention on Biological Diversity (CBD) secretariat have produced a useful booklet providing an overview on this issue (see <http://www.cbd.int/idb/2009/resources/booklet/>).

In relation to work focused on the UKOTs specifically, the South Atlantic Invasive Species (SAIS) project (see Cheesman & Clubbe 2007, Box 1; Darlow, this volume) has made significant strides in Ascension, St Helena, Tristan da Cunha, the Falklands and South Georgia. JNCC organised a workshop on invasive species in the UKOTs in June 2007 (see <http://www.jncc.gov.uk/page-4081> and brief summary of conclusions in Cheesman & Clubbe 2007), followed by another in March 2009. The latter included discussion of the latest work commissioned from Karen Varnham in collating information on non-native species, and relevant activities and infrastructure for tackling the invasive species threat, in the UKOTs/CDs (see Varnham & Pelembe, this volume).

Framework for Invasive Species session discussion

Suggested areas for discussion:

Overcoming obstacles

What are the main obstacles to effective invasive species management in your Territory – either in relation to prevention (biosecurity) or control measures?

Have particular obstacles been overcome, and (if so) how?

Raising awareness

What examples have you seen of effective awareness-raising activities (including posters, leaflets, campaigns, training days, etc.) in your Territory or

elsewhere

Improving access to information and training

What sources of information and training have you found useful (e.g. in relation to invasive species impacts, invasive species control, biosecurity measures)?

What sources of information and training are most needed, either expert-practitioner or peer-peer?

Enhancing stakeholder involvement, co-operation and communication

How can information sharing and co-operation within and across UKOTs/CDs be encouraged?

Biosecurity

Development of comprehensive biosecurity systems (e.g. to reduce the risk of accidental introductions and for early detection of newly introduced species) is very costly – what simple measures can be taken to enhance biosecurity?

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The South Atlantic Invasive Species (SAIS) Project

Andrew Darlow (St Helena SAIS Project Officer)



Darlow, A. 2010. The South Atlantic Invasive Species (SAIS) Project. pp 270-273 in *Making the Right Connections: a conference on conservation in UK Overseas Territories, Crown Dependencies and other small island communities, Grand Cayman 30th May to 5th June 2009* (ed. by M. Pienkowski, O. Cheesman, C. Quick & A. Pienkowski). UK Overseas Territories Conservation Forum, www.ukotcf.org

The South Atlantic Invasive Species Project, funded by the European Union EDF 9, has entered its third and final year. The project has seen regional cooperation between five UK Overseas Territory governments and two NGOs, across the half a billion square miles of the South Atlantic. Early planning with local stakeholder workshops educed priority actions. Implementation of activities has been guided by the input of local steering groups, conservation organisations and advisory bodies in the UK. Additionally, a worldwide e-network has been established for exchange of ideas, information and advice. Representatives of this wider group and partner organisations constitute a regional steering group which consider invasive species which have a common theme across the region. On both Ascension and St Helena Islands, significant gaps in quantitative baseline data were highlighted as detrimental to the planning of invasive alien species management. To begin to address this, botanical surveys of both islands were completed in 2008, with support from Royal Botanic Gardens Kew. The outputs from this considerable dataset are now informing decisions on island in the management of invasives and beyond. The local project officer for St Helena and Ascension Islands describes some of the challenges, constraints and successes encountered in this and other activities undertaken by the project.

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The South Atlantic territories span an area of 10 million square miles from the sub-Antarctic to the near equatorial. The invasive species problems facing each are diverse. The five territories have a combined population of less than 10,000. Only two of the territories, those with military installations, have air access. The remainder can be accessed only by a ship or boat trip of between 3 and 7 days. There are, however, areas of commonality. To address these, the project has operated also at a regional level, with a regional steering group made up of territory representatives and international experts. The region contains a wealth of biodiversity of native flora and fauna. This paper focusses mainly on St Helena and Ascension.

St Helena is one of the most remote inhabited islands in the world. It was formed by volcanic activity over a 6 million year period, becoming dormant around 7 million years ago. At least 8 endemic terrestrial bird species, 50 endemic plant species and genera, over 400 endemic invertebrates

and an established marine fauna evolved there. Following its discovery by man in 1502 and the subsequent stream of species introductions, 88% of native bird species have gone extinct, and over 99% of native plant life has been eradicated. Invertebrate loss is not fully quantified but a number of notable extinctions have been recorded, and several aggressive introduced species are now present.



Access problems: off-loading from RMS St Helena on to barges, Ascension Island.

St Helena today

Natural Environment: Degraded, subject to ongoing erosion, small permanently threatened pockets of relict flora and fauna.

Humans: Rapidly declining population driven by negligible economy propped up by grant-aid.

Man made environment: Labour intensive agriculture and forestry. Market and workforce constrained by depopulation and lack of economy, exacerbated by imports.

The cost of management of invasive plants and shortage of personnel are making marginal agriculture unprofitable and thwarting incentive schemes. Abandonment of worked land is accelerating, leading to more source areas of invasive species. Reinstatement requires substantial investment. Legal measures are limited, with government as a key 'offender'.

Little status is afforded to conservation employees, leading to de-motivation and loss of experienced and dedicated staff, and decline of this already under-resourced sector.

The South Atlantic Invasive Species Project is a regional project with seven project partners: the five territory governments of St Helena, Ascension, Tristan da Cunha, Falkland Islands, South Georgia and the South Sandwich Islands, and NGOs Falklands Conservation and St Helena National Trust.

The three-year project, which commencing in November 2006, has as its main objective: "increasing capacity to deal with the impacts of invasive species in the South Atlantic overseas territories". The project is funded by the EU from EDF-9 and is managed by RSPB on behalf of the project partners.

The approach of the project team has been to encourage participation. In order to identify concerns on each of the territories, background reports were undertaken by the initial core project team of three. The team worked with small groups or on a one-to-one basis to elicit as many concerns as possible. The reports informed workshops held with local stakeholders from government, NGOs and civil society. The key output from each workshop was a wish-list and set of prioritised activities. A steering group for each territory was set up from the stakeholder groups to assist with implementation of the defined actions across sectors.



Workshop

Prioritised actions on St Helena included: improvement of degraded pasture, horticultural and nursery support for ecosystem restoration, rabbit control, Indian myna bird control, rodent control and improved border controls. With the exception of pasture improvement, all these concerns were highlighted on Ascension too. Rodent control and improved border controls were common issues on all territories in the region.

Stakeholders highlighted shortfalls in: detailed baseline data, training in monitoring, assessment and control skills, funding for personnel, capital equipment and recurrent supplies.

The project team was asked to underpin gains made with: appropriate bio-security measures, improved (enforceable) legislation, and work towards self sustaining ecosystems.

Project personnel were asked to undertake public awareness, education and training in all aspects of project implementation. Notable successes to date include:

- Developing network of skills and support. Increasing involvement of Kew, RSPB and JNCC, and thanks are due to Colin Clubbe, Sarah Sanders and Tara Pelembe respectively.
- Collaborative working between agencies on island, the only way in many cases to increase personnel capacity. Cross-cutting activities between related projects are essential to achieve some objectives.
- Botanical surveys carried out across two territories, St Helena and Ascension, to give a distribution and abundance dataset of all plant and fern species.

- Improved ability to inform decision making locally. A dynamic repository of information across invasive taxa has been created.
- Volunteer involvement. A pilot exercise using visitors on extended sabbatical leave provided useful labour on island and new advocates in the UK.
- Increased awareness. Feedback is beginning to show that ongoing programmes of information are raising awareness of invasive species issues and control within the community
- Regional conference. A very successful and participatory meeting, which had as its key output a draft strategy for invasive species across the South Atlantic region to be launched in November 2009. Messages within the strategy include the need for a bio-security position on each territory with a coordinating support position across the region. An idea of a 'roving' task force was also put forward as one way of increasing capacity on territories.

Botanical survey

Invasive plants and their dispersal agents are at the heart of many of the issues on both islands. Therefore, much of the work to date has been botanically focussed. The project was fortunate to engage the interest of Dr Colin Clubbe and the UKOTs team at Kew early in the project. This is a partnership that has grown in strength and seen Kew becoming a key player in conservation on both islands.

It was recognised early in the project that we were lacking baseline data on the flora of the two




Botanical survey can be more intrepid than many assume.

islands. Endemics were quite well documented, but other species had not been surveyed for over 25 years. The project hired a botanist, Dr Phil Lambdon, and a survey was undertaken - a simple sentence which belies the three man-years of effort expended over 11 months last year. Drawing a grid and transects on a map is easy but, without local

Agavaceae

Status
Naturalized

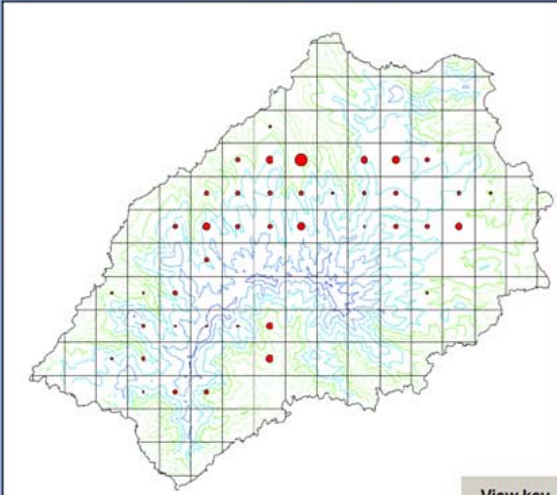
Local name
hedge aloe



Habitat	%
Sparsely vegetated hillside	23.8
Alien thickets/hedges	13.5
Vegetated/banked roadsides	11.1
Succulent scrub	7.3
Neglected tall alien herb areas	6.7

Habitats recorded, in descending order of importance. The % indicates the relative frequency of the species.

Agave angustifolia



[View key](#)

Part of plant database

knowledge, they are likely to be impossible to use effectively, given the terrain encountered on these two volcanic islands.

The results of the survey have yielded a database of the abundance, distribution and habitats for over 700 plant species. Detailed information was gathered for a list of twenty key invasives for each island. An endemic sedge, not recorded for over 200 years, was rediscovered, and a new endemic grass species described. These were real rewards for the survey team. The survey results, which reference earlier GIS work on the local St Helena Environmental Information System (SHEIS) system, will in turn be incorporated into SHEIS.

The dataset is now in use and has informed research on global island invasive species and a project-sponsored economic impacts study. Contributions to risk analysis and preparation of government papers have also drawn from the dataset. An OTEP project proposal was submitted to allow the production of a complete flora of St Helena utilising much of the data collected.

Additionally, much of the dataset can now be accessed through a simple interface, fulfilling part of the need for easily accessible data on invasive species.

Some lessons learned

Expectations vs involvement. Be realistic in what is offered to engage people in the project actions. If not enough, it 'won't be worth their time'; if too much, any shortfall will be deemed a failure.

Media. Provide media with information when they request it. Better still, provide regular output. Informative articles take time to prepare, but regular output will start to build a following. Feedback is useful to gauge effectiveness but, quite often, it is not forthcoming.

Capacity building. Consider how project initiatives will be maintained or extended. Try to develop realistic if less ambitious targets, ones that can be sustained by local resources post project funding.

Physical movement of people and equipment. Logistics have been a major challenge in this project. Three of the territories are accessible only by ship or boat; the other two have restricted air access. Places on flights and ships are often in demand; so



Volunteers at work clearing invasive flax from areas which could still support threatened endemic species.

most work revolves around transport. The other main challenge is finding and affording external experts who can commit to extended absences to undertake work.

Education. It is necessary to try and maintain ongoing education and to target multiple groups. Practical involvement is a good way to encourage engagement and ownership.

Communication. The core project team has acted as a communication node in an ever increasing network of information and skills. The benefit of this network was obvious at the recent regional meeting on Ascension. It is vital to understand, involve and value local stakeholders. Be honest if it goes wrong.

Funding. To ensure continuity, consider the next funding source from day one. Engage as many people at different levels as possible to advocate for this.

And finally, if the rhetoric fails to deliver, just get out there and do it.



Radio interview on site.

Lessons from the Caicos Pine Scale

Bryan Naqqi Manco (Senior Conservation Officer, Turks & Caicos National Trust)



Manco, B.N. 2010. Lessons from the Caicos Pine Scale. pp 274-278 in *Making the Right Connections: a conference on conservation in UK Overseas Territories, Crown Dependencies and other small island communities, Grand Cayman 30th May to 5th June 2009* (ed. by M. Pienkowski, O. Cheesman, C. Quick & A. Pienkowski). UK Overseas Territories Conservation Forum, www.ukotcf.org

The Caicos Pine Recovery Project aims to safeguard the future of the Caicos pine *Pinus caribaea* variety *bahamensis*, which has suffered over 90% mortality in the Turks & Caicos Islands since the introduction of an invasive North American plant pest, the pine tortoise scale *Toumeylla parvicornis*. The Recovery Project, managed by the Turks & Caicos National Trust, in collaboration with the Royal Botanic Gardens at Kew, and funded primarily by the Turks & Caicos Islands Conservation Fund, aims to create an *ex-situ* conservation population of Caicos pines while documenting the extent of the damage to wild populations. The project aims also to establish an international working group, investigate the historic extent of pine-yard habitat and its fire-dynamics, and identify potential reintroduction areas.

Bryan Naqqi Manco (Senior Conservation Officer, Turks & Caicos National Trust), naqqi@aol.com

The Caicos Pine Recovery Project was launched in September 2008, for the purpose of safeguarding the future of the Caicos pine *Pinus caribaea* variety *bahamensis*, which has suffered over 90% mortality in its Turks & Caicos Islands range due to the introduction of an invasive North American plant pest, the pine tortoise scale *Toumeylla parvicornis*. The Recovery Project, managed by the Turks & Caicos National Trust, in collaboration with the

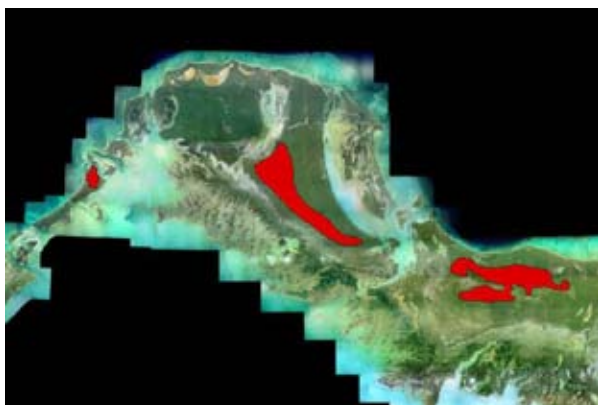
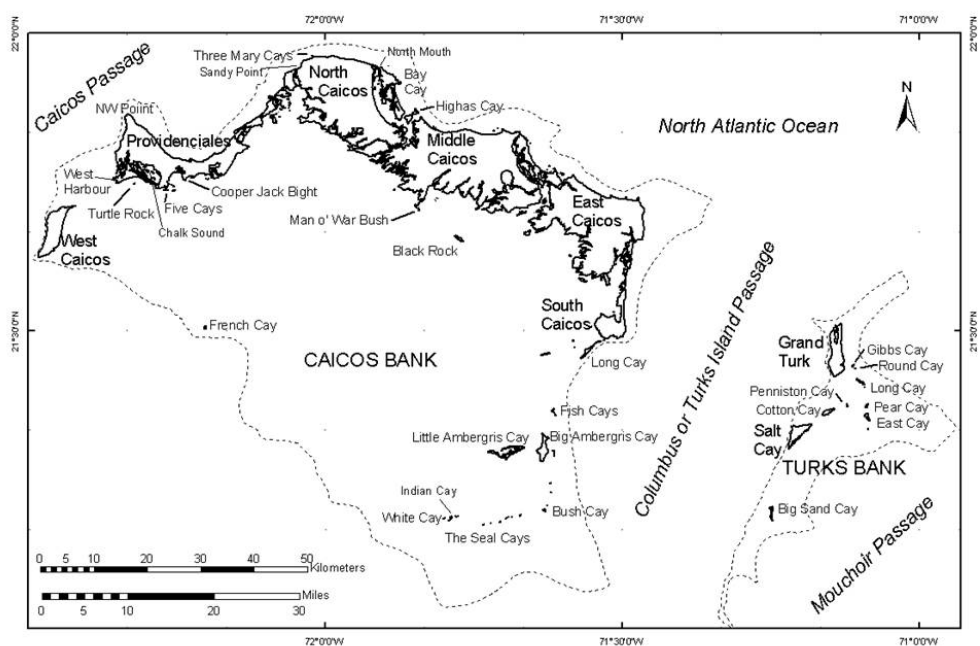
Royal Botanic Gardens at Kew, and funded primarily by the Turks & Caicos Islands Conservation Fund, aims to create an *ex-situ* conservation population of Caicos pines while documenting the extent of the infestation and damage to the wild populations. The project is a ten-year species recovery project, broken into three sub-projects and three long-term phases. Also included in the project is the creation of an international working group, mapping the historic extent of pine-yard habitat, establishing a history of fire in the pine-yards, and scouting potential reintroduction areas for managed and protected pine ecosystems.

Background: The pine and the scale insect

Caribbean pine *Pinus caribaea* variety *bahamensis* is the National Tree of the Turks & Caicos Islands. Caribbean pine ranges through Central America, Cuba, Hispaniola, and the Bahama Archipelago. the Bahama Archipelago variety of Caribbean Pine is restricted to islands in the Northern Bahamas (Grand Bahama, New Providence, Abaco, and Andros), and then in the Turks & Caicos Islands



Pinus caribaea var. *bahamensis*,
the National Tree of the Turks & Caicos Islands.
(Photo: M. Hamilton. RBG Kew)



Top: The variety's range in the Bahama Archipelago (outlined in red) includes Andros, New Providence, Abaco, and Grand Bahama in the northern Bahamas and Pine Cay, North Caicos, and Middle Caicos in the Turks & Caicos Islands. Base-map Copyright Google.

Middle: Turks & Caicos Islands (Map Copyright Dr Mike Pienkowski, UKOTCF)

Bottom: Close-up of part of TCI, showing (in red) the pine distribution in Pine Cay (westernmost), North Caicos and Middle Caicos.

(North Caicos, Middle Caicos, and Pine Cay) forming a disjunct population.

A scale insect was observed parasitizing Caicos Pines by RBG Kew Overseas Territories Programme Director Martin Hamilton in January 2005, as part of UKOTCF's OTEP-supported project in TCI.



Left: the UKOTCF Biodiversity Management Project group in January 2005 (Photo: Dr Mike Pienkowski, UKOTCF) which found the pine tortoise scale (above; Photo: M. Hamilton, RBG Kew).

Collections taken by RBG Kew confirmed the identity of the insect as the pine tortoise scale *Toumeyella parvicornis*, native to northern North America and a common pest on cultivated pines. TCNT staff collected some pine seedlings to begin an *ex-situ* nursery collection but these had a poor transplant success rate.

The Caicos Pine Recovery Project was proposed by RBG Kew and TCNT as a 10-year species recovery programme, comprising three component projects. Part One was to establish an *ex-situ* conservation collection of the Caicos pine in a nursery. Part Two was to map, monitor, and use remote sensing to establish the extent of the pine-yards and the scale infestation. Part Three was to set up an international pine scale working group.

Year One of all three projects was proposed to the Turks & Caicos Islands Government and was awarded funding from the Conservation Fund, through the Ministry of Natural Resources and Department of Environment and Coastal Resources for the 2008-2009 financial year. A project steering committee



was built, consisting of TCNT Pine Project staff and TCNT management, RBG Kew

TCNT field staff collecting pine seedlings to form an ex-situ population.

UKOTs Programme representatives, Department of Environment and Coastal Resources, Department of Environmental Health, and the Fire Department.

TCNT and RBG Kew made important international contacts with the Pine Rockland Working Group based in south Florida.

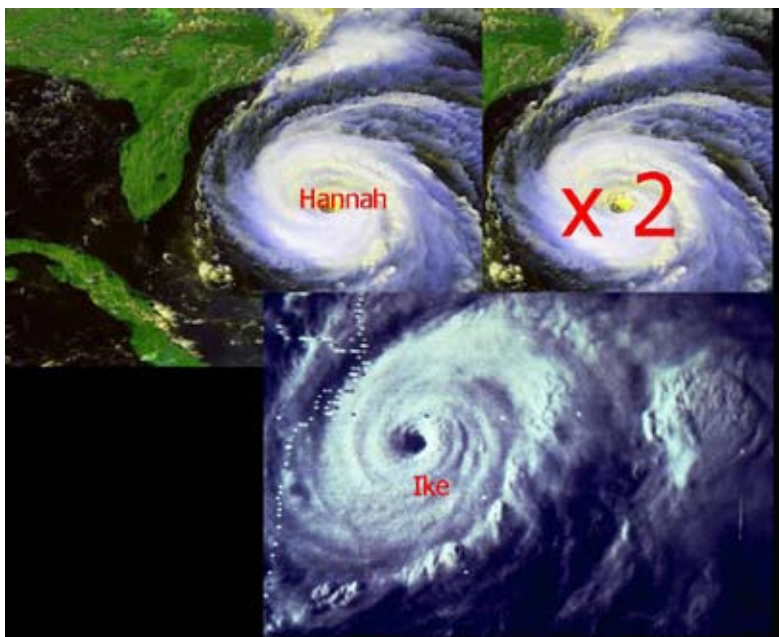
TCNT and RBG Kew representatives attended and presented at the February-March 2008 Pine Rocklands Working Group Conference in Miami (USA) and Andros (Bahamas). Team members gained important insights on the use of controlled burning in pine-yards, social and ecological impacts of burning, and the different structure and habitat type of the Bahamas pine-yards, compared with those in TCI.

The project began slowly amid a number of difficulties

A makeshift nursery was built to house pines collected by the Kew team in May 2008. Project officers arrived to TCI in late August. Hurricane Hanna hit Turks & Caicos Islands the day after the project staff arrived, destroying the nursery as well as the causeway between North and Middle Caicos, cutting off access to the site. Hurricane Hanna returned as Tropical Storm Hanna and flooded the Middle Caicos Conservation Centre yard and road.

Hurricane Ike struck Turks & Caicos about one week after Hanna, as a Category 5 hurricane; luckily Middle Caicos was spared the worst, but electricity was down for over a month; project staff members were evacuated to USA and UK to avoid Hurricane Ike.

The pine seedlings had been stowed in the wash-house of the Conservation Centre before hurricane



One week after Hanna hit TCI twice, Hurricane Ike arrived as a Category 5 hurricane. (Satellite images when the hurricanes were centred on TCI, in the case of Ike obscuring the ground geography)

Hanna; they remained there for over a month until the causeway was repaired.

When the project officers tried to return after the causeway was repaired, a security breach (not by them) at London's Heathrow Airport caused them to miss their flight, delaying arrival by a week.

The project manager arrived but the GIS officer was delayed. Nursery construction was delayed, due to necessary architectural redesign to fit building codes; budgeted costs proved too low and so a new makeshift nursery had to be constructed. Materials such as pots, media, fertilisers, and equipment proved difficult to procure locally and internationally. We expected the mosquitoes to be a problem for the project staff, but unexpectedly, blue land crabs proved to be a pest on young plants!

Through collaboration and perseverance, the project began taking shape.

Project 1 progress

The appointment and taking up of post of the project manager was an enormous step forward to begin the work on building an *ex-situ* collection of pines. Crucially, his residence on site had been made possible by work by UKOTCF-organised volunteers, Steve and Mary Cheeseman, who had donated more than 12 person-weeks of time to

making the Middle Caicos Conservation Centre useable and the adjacent building suitable for accommodation for visiting scientists (see Section 9).

Other National Trust staff members collaborated on work for nursery and pine work. DECR staff members shared in a great deal of fieldwork, nursery development, and materials procurement with TCNT. DECR recruited volunteers to assist with seedling rescue, seed collection, photography, and construction. Seeds were collected from Middle Caicos and Pine Cay through winter 2008, to plant in the nursery; seedlings were continually collected from pine-yards.

Project 2 Progress

The completion of the appointment of the new GIS officer in March 2009 allowed mapping and GIS work to begin; it also freed up other TCNT staff to work on other sites. Kew's GIS specialist, Susanna Baena, visited TCI in 2008 to begin work on remote sensing.

Martin Hamilton used remote sensing data to propose transects to locate pine areas. Exploration of areas of pine and areas suspected to have pine began and continues.

A genetic study by RBG Kew's Michele Sanchez aims to determine the relationship between Bahamas and TCI populations of *Pinus caribaea* var. *bahamensis*.



Second temporary nursery constructed and in use. (Photo: M. Hamilton, RBG Kew)

International collaboration to begin: Project 3 took shape.

A visit from pine rockland and pine fire specialists from The Nature Conservancy, Bahamas National Trust, US Forest Service, and Bahamas Department of Agriculture, along with RBG Kew, TCNT, and DECR personnel provided field data about fire history in TCI pine-yards.

The team visited Pine Cay, North Caicos, and Middle Caicos pine-yards to assess fire history and potential in pine-yards by looking at fuel load and evidence of past burns. Water quality became a concern in some areas of pine, because of increased salinity due to hurricane activity or sea-level rise. The feasibility of using controlled burning in TCI pine-yards was investigated.

A presentation to TCI Government was made in February 2009 by fieldwork participants, on the use of controlled burning as a pine rockland management tool in other areas (South Florida, Bahamas, Central America).



Fire in Ready Money pine-yard, North Caicos around Easter weekend 2009 (started by agricultural activity) swept through large areas of dead pine. (Photos: R. McMeekin, TCNT)



A fire in Ready Money pine-yard, North Caicos, around Easter weekend 2009 (started by agricultural activity) swept through large areas of dead pine and will provide a valuable lesson on the role of fire in TCI pine-yards and its effect on scale-insect infestation.

Work continues to save the pines... for how long?

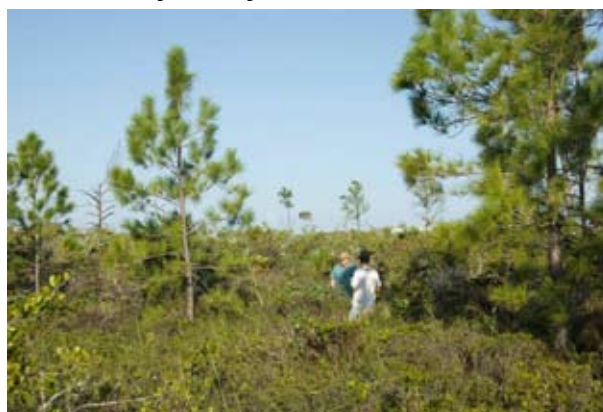
The nursery now contains about 350 pine seedlings and rescued saplings.

The project has generated a great deal of media and PR interest from magazines, newspapers, TV, radio, and education programmes.

The current project first-year funding ends in September 2009; this includes funding for project staff, supplies, water, and other consumables. No further funding has been identified, but some applications are being made.

What will happen in the future? Will the pine-yards recover and will our efforts to help this recovery receive the necessary funding?

The future for the Caicos Pine:



OR:



?

Invasive species in the UKOTs and CDs – What's new?

Karen Varnham (University of Bristol) and Tara Pelembe (JNCC)



Varnham, K. & Pelembe, T. 2010. Invasive species in the UKOTs and CDs – What's new? pp 279-281 in *Making the Right Connections: a conference on conservation in UK Overseas Territories, Crown Dependencies and other small island communities, Grand Cayman 30th May to 5th June 2009* (ed. by M. Pienkowski, O. Cheesman, C. Quick & A. Pienkowski). UK Overseas Territories Conservation Forum, www.ukotcf.org



Invasive species are continuing to cause serious problems for the UK Overseas Territories and Crown Dependencies. However, there is also a lot of work going on to control, eradicate and monitor invasive species, as well as to prevent the arrival of new species. The JNCC, as part of its Overseas Territories and Crown Dependencies Programme, has recently carried out a review of current activities on invasive species, pulling together information from a wide variety of sources. Collecting information on what is being done is a vital first step in identifying what remains to be done and how limited resources can best be applied to conserving the UKOTs and CDs most valuable species and habitats. The recent review also added new information to the non-native species database, first set up in 2006, collecting hundreds of new non-native species records as well as further information about those already included. In addition, a workshop was held at JNCC with a range of stakeholders to advise JNCC on how best to focus its efforts in addressing invasive species in UKOTs.

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Introduction

It is well known that invasive species are one of the biggest threats facing global biodiversity, and are arguably the greatest single threat to the biodiversity of small islands. Consultations with UKOTs have also shown that addressing invasives species issues is a high priority for UKOT personnel. Subsequently, this is one of the areas of work that JNCC is focussing on in its Overseas Territories and Crown Dependencies Programme.

This presentation gives a brief overview of JNCC's programme, outlining in more detail its targets under the invasive species component. There is significant focus on a recent piece of work commissioned by JNCC which builds on its 2006 review of non-native species in the UK Overseas Territories. We are very grateful to all those who contributed to the 2006 database. The report and database are available for download from the JNCC website (<http://www.jncc.gov.uk/page-3634>). They have been useful tools in raising the profile of invasive

species issues in the UKOTs.

As part of its UKOT and CD programme, in late 2008 the JNCC commissioned a piece of work to build on the 2006 review with four main components:

1. to gather more information for the database (both new species records and supporting information for existing records);
2. To identify high priority areas of action;
3. to collect data on past, current and planned actions to deal with non-native species in the UKOTs and CDs;
4. to identify the gaps where actions are not being taken or planned to address high priority areas.

This information will be used to help JNCC in its role as UK Government advisor, and will also help guide JNCC input into invasive species activities in the UKOTs.

Because of the scale of the task, and the range of stakeholders involved, the commissioned work is

the first phase of a process. Draft documents only were produced, and these will be used as a foundation for further development.

Collecting information for the 2008 review

As with the 2006 project, information was collected from a range of sources. The key contacts were people living and working in the UKOTs and CDs, including representatives of government and NGOs, local and international biologists, conservation organisations and biological recording services etc.

Potential contributors were asked for information on: non-native/ invasive species (especially those occurring since 2005), control or eradication measures related to non-native species and biosecurity policies or other measures in place to prevent new species arriving. Where relevant, people were prompted for information on specific projects or species mentioned in the database.

In addition, searches were made of the scientific literature and a variety of online sources. 'Invasiveness elsewhere' is still one of the best predictors of which species will go on to become invasive in a new area. Therefore, information from other lists and databases of invasive species were used to identify species that might be expected to become invasive in specific UKOTs and CDs. Data from these sources were used to supplement specific data from the OTs/CDs.

Results

Updated database

The project collected information on 484 additional species, plus additional information for many more. This increased the total number of non-native species included in the database from 2950 to 3434. In addition, more than 50 new references were added to the database, many of which have been collected in an electronic library to be held by the JNCC.

Who's doing what?

The project collected information on a wide range of activities, including biosecurity initiatives, monitoring known/ potential invasives, control and eradication projects, and invasive species strate-

gies. Examples of current eradication work include the Cayman Islands Department of Environment's ongoing efforts to eradicate monk parakeets from the island, which has involved intensive work in trapping and, where possible, neutering and then releasing the birds.

There has also been a range of biosecurity initiatives, such as the new quarantine store on South Georgia, funded by the Government of South Georgia and the South Sandwich Islands and the RSPB-managed South Atlantic Invasive Species SAIS) project. There have also been a number of monitoring projects, gathering data on non-native species for a variety of purposes. On Montserrat, for example, black and brown rats are being monitored in areas of the Centre Hills as part of an ongoing study to see if they can be controlled well enough to protect the Critically Endangered Montserrat Oriole. There have also been lots of training activities for people working in the UKOTs, notably that offered by SAIS, including training in the use of chain-saws, brush-cutters and herbicide spraying equipment.

Other relevant activities have included the production of invasive species strategies, such as those produced by Anguilla and Bermuda, and initiatives such as native plant nurseries. While these may not seem like a direct action against invasive species, they cut down on the use of introduced and possibly invasive species, as well as reducing the importation of plants which may also carry pests and diseases. Awareness raising and education activities have also taken place across many UKOTs and CDs.

As well as actions in individual territories there have also been a number of regional projects. The SAIS project has worked in all five territories in the region, evaluating and addressing the invasive species issues in each. Caribbean territories have also been included in a number of regional initiatives including CABI's 2003 report on invasive species in the Caribbean, as well as a more recent review of pathways of invasion in the region.

Funding

Projects are being funded by a range of sources, including the FCO/DFID Overseas Territories Environment Programme (OTEP), which has funded at least 15 projects involving non-native species, and the EU's European Development Fund which funded the SAIS project.

What are the priorities?

For some species, the database contains information on their known or suspected ecological impacts, so this was used as a proxy for invasiveness. One of the best predictors of which species will become invasive is whether they are invasive elsewhere, especially in similar environmental conditions. On this basis, species included on relevant lists (e.g. the Global Invasive Species Database and the Florida Exotic Plant Pest Council list of invasive species) were also flagged as being potentially invasive in a territory, even if no specific ecological impacts had yet been recorded for them there.

This combination of information from the database and from other lists/ databases was used to create 'long' and 'short' lists of priority species. Those on the 'long list' were those for which ecological impacts were recorded in the 2006 version of the database or appeared on at least one relevant list of species known to be invasive elsewhere. The 'short list' comprised those species that appeared on multiple lists. The total of almost 3500 species in the database was reduced to 818 on the 'long list', 261 of which made it onto the 'short list'.

These lists were then used to come up with a manageable number of species in each of three categories for each UKOT/ CD. The categories were:

- species recommended for immediate or ongoing control or eradication,
- those recommended for monitoring and/or gathering more information,
- those which were agricultural or other economic pests, even if they had no wider ecological consequences. It is important to recognise that people's lives are often more directly impacted by the ecological impacts of invasive species.

The next step is to get feedback from local experts to see if these lists make sense in individual UKOTs and CDs. Do they include all of the species that are known to cause problems and not too many of those which clearly don't? It is also important to incorporate some measure of which species are causing impacts on high value species and habitats, something which has not currently been included.

Prevention and Capacity

Although it is very important to deal with invasive species already present, this is not the only challenge currently facing the UKOTs and CDs. Ca-

capacity building and biosecurity are also extremely important. Without local capacity, that is to say trained, motivated and well-equipped staff, there can be no effective long-term action. And without good biosecurity measures to stop new species arriving, the ecological benefits of controlling and eradicating those already present will always be compromised.

What next?

The report commissioned by JNCC is currently in draft form. The first follow up to this was a small workshop in March 2009 at JNCC which focussed on the stakeholders present sharing their advice and expertise on the four areas of the report. This will be used by JNCC to determine its future input into this areas of work.

The second day of the workshop considered the potential for a regional UKOT Caribbean Invasives Project. This idea is now being progressed with the intention of submitting a concept note to the European Commission's ENTRP fund in a few months' time. The project will be led by the Cayman Island Government.

The draft document produced by the contractor will be available for input from all stakeholders. We are hoping to encourage UKOT personnel to input and to co-author the sections that relate to their territory, so that the overview can be strengthened, build on the work done, and become a useful tool for all involved.

JNCC has incorporated invasive species in the UKOTs into its internal strategy on invasives, and will continue to work in this very important area, giving advice and support as required.

Invasive species: awareness-raising and education – getting rid of stuff that people like, with little or no money

Mat DaCosta-Cottam (Cayman Islands Department of Environment)



DaCosta-Cottam, M. 2010. Invasive species: awareness-raising and education – getting rid of stuff that people like, with little or no money. pp 282-284 in *Making the Right Connections: a conference on conservation in UK Overseas Territories, Crown Dependencies and other small island communities, Grand Cayman 30th May to 5th June 2009* (ed. by M. Pienkowski, O. Cheesman, C. Quick & A. Pienkowski). UK Overseas Territories Conservation Forum, www.ukotcf.org

Control of invasive species presents an extraordinary problem for conservation managers. Because invasive species have an inherent capacity to overwhelm local species, conservation management is invariably set against the driving force of natural selection, albeit in a decidedly unnatural context. In some cases, single invasive species may overwhelm entire habitats or species complements, representing a wholesale loss of biodiversity.

(Photo: Dr Mike Pienkowski)

In many cases, the problems of implementing conservation management actions are compounded by lack of understanding. Shifting baselines and lack of awareness amongst members of the public often result in well-intentioned efforts geared towards the preservation of “charismatic” invasive species, media backlash, or the proposal of unrealistic management scenarios. In the face of public outcry, effective conservation strategies may be severely hampered, cancelled, or simply delayed until remedial action is no longer tenable.

While most conservation managers work within the confines of scant financial and human resources, such constraints are often particularly acute in the case of UKOTs and other small-island states, where the responsibility for research, assessment, public relations and implementation may fall to an individual, rather than to a department. While each country is unique, with a unique complement of potentials and challenges, the identification of commonalities can facilitate the establishment of frameworks for action – common resources which can be tailored to suit individual cases, disseminating expertise and information, saving time, and maximising effectiveness.

This approach helped to frame the recent OTEP bid “*nvasive Species in UKOTs: databases and awareness* – which provides the focus for this paper, illustrated with some examples from the Cayman Islands.

Dr Mat DaCosta-Cottam, Manager – Terrestrial Unit, Cayman Islands Department of Environment, Cayman Islands Mat.Cottam@gov.ky www.doe.ky

Control of invasive species poses a severe challenge to conservation managers. The concept that otherwise charismatic exotic creatures may constitute biological pollution can be highly problematic to communicate effectively to the public. This is one challenge faced by the *National Biodiversity Action Plan for the Cayman Islands*. The Plan, completed in 2009, includes action points aimed at the control of charismatic invasives, both in the marine environment (Lionfish *Pterois volitans*) and

the terrestrial environment (Casuarina *Casuarina equisetifolia* and Beach naupaka *Scaevola sericea*). Detailed habitat mapping established that *Casuarina equisetifolia* has established some 5,082 individual stands on Grand Cayman, covering an area of over 320 acres. The majority of occupied habitat is coastal, and together these invasives constitute a significant pressure on the native species associated with coastal shrubland and forest.

Once invasive species are established locally, control attempts effectively pit conservation managers against the forces of natural selection (although the situation was caused by human, rather than natural, actions). Conservation managers are faced with the need to make accurate decisions regarding the (often unplanned arrival of) exotic flora and fauna, about which they may have little or no knowledge, and anticipate the species response to a novel environment. To complicate matters, the control of invasive species may be perceived as a contradictory action by the public, especially by individuals with an overriding interest in animal welfare.

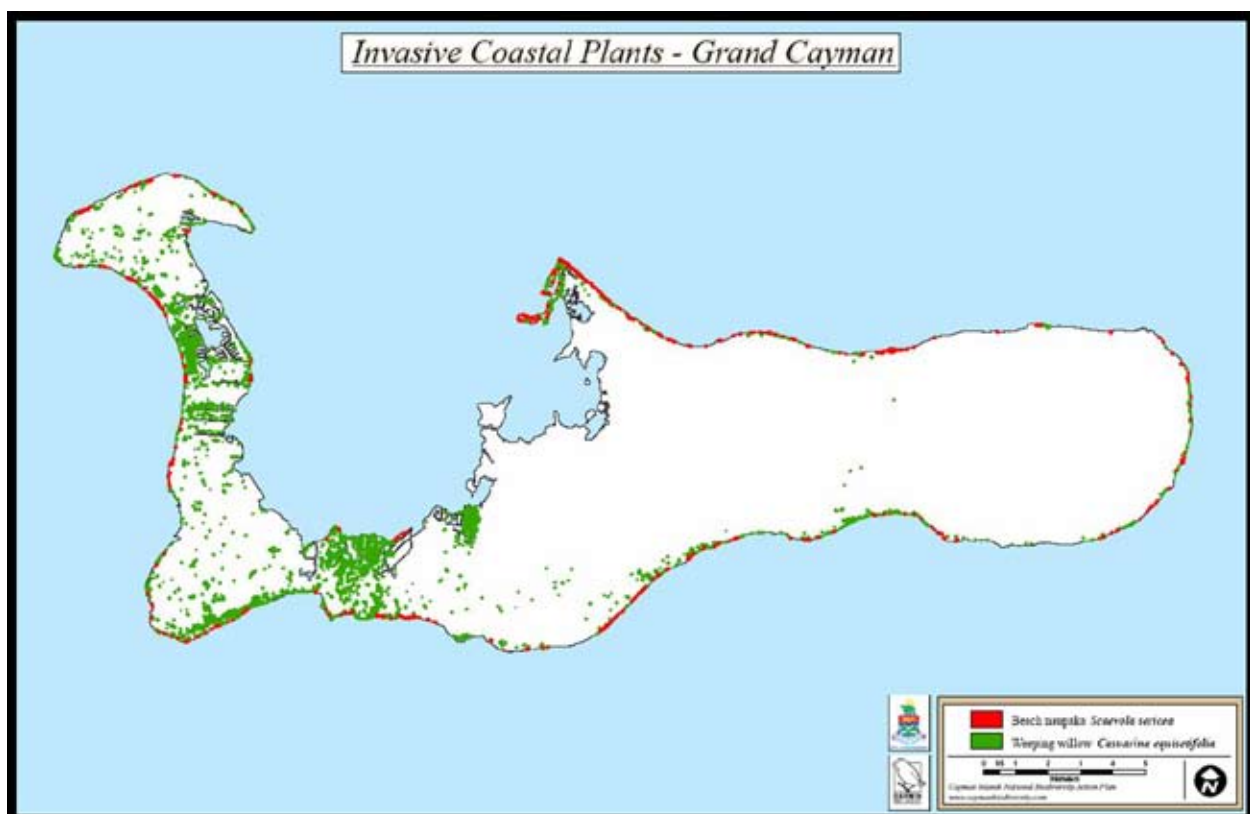
More often than not, lack of information and delayed action leads to a lost opportunity for prevention / early control, and a predisposition towards late control, at greater cost, both financially and with respect



Control of Lionfish is necessary to protect the diversity of native reef fish in the Cayman Islands. (Photo: Patrick Weir, Cayman Islands Department of Environment)

to impact on the environment and need for restoration. Additionally, the longer eradication is delayed, the greater the potential for shifting-baselines to enable the invasive to establish a foothold in the popular psyche.

UKOTs are scattered around the world; however, the great majority are small islands. Small islands share a disproportionate compliment of globally important biodiversity, and a concomitant propensity for loss of that biodiversity – 80% of all recorded extinctions have occurred on islands. The cost of conservation managers making the wrong decision can be very expensive. In the United States, ecosystem services lost to *Tamarix* over 55 years are estimated at \$7,331 -16,062 billion (Moon-ey & Hobbs 2000). In the case of small islands, this cost is more likely to be expressed as the loss of unique biodiversity.



Distribution of invasive coastal plants in 2004. Red is Beach naupaka Scaevola sericea, and green is Casuarina Casuarina equisetifolia for which 5,082 stands occupy 320 acres.

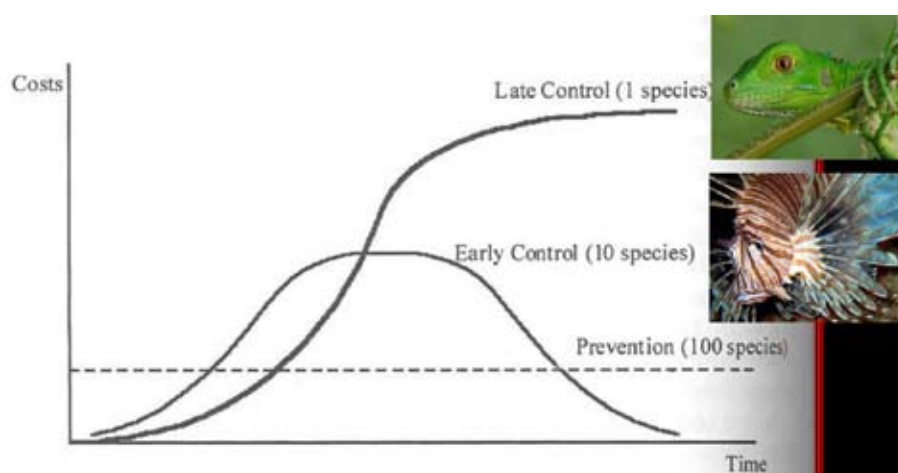


Illustration of the trade-off between target specificity and cost of control for three control strategies. Late control of a single species that actually becomes invasive will be less costly in the short run, but far more costly in the long run, than prevention measures for a much larger number of species, many of which may never invade. (From Figure 11.2 of Mooney & Hobbs 2000)

In 2009, the Cayman Islands Department of Environment was successful in a cross-territories bid for OTEP Project XOT603 *Invasive Species in UKOTs - databases and awareness*. The objective of this project is to help address the public relations and informational challenges facing conservation managers, and to help facilitate early control of invasive species.

Towards addressing informational challenges, this project will take the data compiled by Varnham (2006) and, additionally, more recent data compiled by Royal Botanic Gardens, Kew, on invasive plants in the UKOTs, and upload these to the Global Invasive Species Database.

This will serve to improve the UKOT presence within this global reference resource, and present local issues and initiatives to a global forum. We anticipate that this will benefit conservation managers in UKOTs through facilitation of transfer and updating of information. Additionally, this should benefit conservation managers in other small islands outside the UKOTs/CDs network, enabling them to learn from our problems and our initiatives – successful and otherwise – through the provision of information, management case-studies, contacts and references.

Towards addressing public relations challenges, working in partnership with the International Reptile Conservation Foundation, this project will produce a high quality poster series. Background artwork and formatting will be standardized, to reduce production costs. However, unique text and images provided by each UKOT will be used to individualize print runs. Each run will feature the top five worst invasives for each UKOT, set alongside the native counterpart (species and or habitat) which is most at risk as a result of estab-

lishment or spread of the invasive. By presenting the information in this balanced format, it is the objective of the poster campaign that members of the public will see for themselves that regulation and early control measures, aimed at curtailing the establishment and spread of invasive species, do not represent the premature persecution of exotic plants and animals. Rather, they are an unfortunate but necessary measure for the minimization of the impact of invasive species and the maintenance of local biodiversity.

References

- Mooney, H. A. & Hobbs, R.J. (eds) 2000. *Invasive Species in a Changing World*. Island Press.
Varnham, K. 2006. *Non-native species in UK Overseas Territories a review*. JNCC Report No. 372.

Websites

- Global Invasive Species Database - www.issg.org/database
International Reptile Conservation Foundation - www.ircf.org
Cayman Islands Department of Environment - www.doe.ky



Public Relations Challenges

Poster: Planning to reduce rodent impacts on seabird colonies at Tristan da Cunha and Gough Island

Andrea Angel, Derek Brown, John Cooper, Richard J. Cuthbert, Trevor Glass, Geoff M. Hilton, John Parkes, Peter G. Ryan & Ross M. Wanless

Angel, A., Brown, D., Cooper, J., Cuthbert, R.J., Glass, T., Hilton, G.M., Parkes, J., Ryan, P.G. & Wanless, R.M. 2010. Planning to reduce rodent impacts on seabird colonies at Tristan da Cunha and Gough Island. pp 285-286 in *Making the Right Connections: a conference on conservation in UK Overseas Territories, Crown Dependencies and other small island communities, Grand Cayman 30th May to 5th June 2009* (ed. by M. Pienkowski, O. Cheesman, C. Quick & A. Pienkowski). UK Overseas Territories Conservation Forum, www.ukotcf.org

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The Tristan da Cunha Group, including Gough Island, support some of the World's greatest albatross and petrel colonies, along with many endemic plant, invertebrate and bird taxa. In common with many of the World's oceanic islands, introduced rodent species have caused massive reductions in seabird populations, and threaten further losses.

Tristan da Cunha has Black or Ship Rats *Rattus rattus* and House Mice *Mus musculus*, and formerly held feral and domestic cats *Felis catus*. Consequently, the great majority of the millions of pairs of petrels that previously nested has been lost, leaving only tiny remnants.

By contrast, Gough Island, which has only House Mice, still supports several million pairs of 20 seabird species. However, it is now clear that the mice of Gough have evolved to be devastating predators of albatross and burrowing petrel chicks, and threaten to destroy much of the island's biodiversity value (Angel & Cooper 2006).

Meanwhile, Inaccessible and Nightingale Islands, near to Tristan, are still rodent-free, but are continuously at risk of rodent introduction, particularly via boats from Tristan.

Investigations into the potential for reducing the impact of rodents on the UK Overseas Territory have been ongoing since 2005. The impacts of ro-



One less rat on Tristan: Black Rat Rattus rattus, 13 February 2008. Photo: John Cooper)

dents have been reviewed (Angel & Cooper 2006), and independent experts have conducted feasibility studies into the potential for rodent eradication from both Tristan and Gough, and for bio-security for Inaccessible and Nightingale (see <http://www.rspb.org.uk/ourwork/conservation/projects/tristan-dacunha/publications.asp>).

Research to develop an operational plan for mouse eradication on Gough Island is continuing, since such a programme would break new ground in terms of island size for this species, and there are several areas of uncertainty to be resolved before an eradication exercise can commence. These include the possibility of caves acting as refugia for mice, deciding on bait type and sowing density by helicopter, and ensuring the survival of endemic land birds, probably by resorting to the catching, husbanding and then releasing of “re-founder” populations.

Reference

Angel, A. & Cooper, J. 2006. *A review of the impacts of introduced rodents on the Islands of Tristan da Cunha and Gough (South Atlantic)*. RSPB Research Report No. 17. Sandy: Royal Society for the Protection of Birds.

Poster: Invertebrate Conservation in the UKOTs: Tackling Invasives in South Georgia

Roger Key (independent consultant), Rosy Key (Natural England) & Jamie Roberts (Buglife)

Key, R., Key, R. & Roberts, J. 2010. Invertebrate Conservation in the UKOTs: Tackling Invasives in South Georgia. pp 287-288 in *Making the Right Connections: a conference on conservation in UK Overseas Territories, Crown Dependencies and other small island communities, Grand Cayman 30th May to 5th June 2009* (ed. by M. Pienkowski, O. Cheesman, C. Quick & A. Pienkowski). UK Overseas Territories Conservation Forum, www.ukotcf.org

Roger Key (independent consultant), Rosy Key (Natural England) & Jamie Roberts (Buglife). Buglife, First Floor, 90 Bridge Street, Peterborough, PE1 1DY. (Jamie Roberts attended the Conference in his new role as Executive Director, St Helena National Trust: sth.natrtrust@cwimail.sh)

South Georgia (53°55'S 36°33'W) is an isolated island, 170km in length, between 40 and 2 km in width, partly a remnant of the Gondwanaland supercontinent. Situated south of the Antarctic Convergence, half its area is permanently covered in ice or snow, and much of the remainder is bare rock. The remaining area is vegetated and supports just 25 indigenous vascular plants. There are about 45 indigenous insects and 55 other invertebrates.



Maiviken - Mt Buse walk.

Alien Species

Indigenous island faunas are commonly threatened by introductions from elsewhere. The objective of the Buglife expedition was to survey the invertebrate fauna of South Georgia to produce a baseline against which further introductions and species spread can be monitored. A parallel group

of botanists from the Royal Botanic Gardens at Kew surveyed the non-indigenous vascular flora of the island. The results will help to inform future control and monitoring strategies.



New non-native hoverfly – probably Eristalis croceimaculata

Invertebrate Sampling

We stopped at 18 separate sites along the coast, taking a total of 655 separate samples from 177 locations - an estimated 88,000 individual invertebrate specimens. Standard samples were taken using a vacuum sampler, Malaise, pitfall and water traps and by sweeping, searching and Berlese extraction of plant litter.



*New invasive Pill beetle –
possibly Chalciosphaerium sp.*

Interim Results

The Buglife project found all of the known introduced invertebrates, and helped to delimit their current range. The surveys also identified at least two additional non-natives, and there may be more amongst the yet-to-be identified samples. In addition we found apparently thriving populations of many of the indigenous species. The photographic record of the fauna and flora of South Georgia is at http://www.flickr.com/photos/roger_key/

Invertebrate work in other UK Overseas Territories

Buglife is currently developing a project to address invertebrate survey and monitoring needs on other UKOTs.

Acknowledgements

The Buglife project is part of the South Atlantic Invasive Species project, funded by the European Commission, and managed by RSPB. We also acknowledge the support of the South Georgia Government.

Poster: Action to reduce the impacts of invasive species on the South Atlantic UK Overseas Territories

Clare Stringer, Brian Summers & Andrew Darlow (RSPB)

Stringer, C., Summers, B. & Darlow, A. 2010. Action to reduce the impacts of invasive species on the South Atlantic UK Overseas Territories. pp 289-292 in *Making the Right Connections: a conference on conservation in UK Overseas Territories, Crown Dependencies and other small island communities, Grand Cayman 30th May to 5th June 2009* (ed. by M. Pienkowski, O. Cheesman, C. Quick & A. Pienkowski). UK Overseas Territories Conservation Forum, www.ukotcf.org

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Andrew Darlow Project Officer St Helena and Ascension. adarlow@cwimail.sh

About the project

Invasive species are a problem for all of the South Atlantic Territories. They affect livelihoods, lifestyles and endemic biodiversity. Each of the South Atlantic Territories has unique values that may be threatened by the arrival of new non-native species, and by the impacts of those species that have already arrived.

A project proposal submitted to the European Commission's European Development Fund (EDF-9), was awarded funding of some 1,900,000 Euros over three years. The project began in December 2006, and will finish at the end of November 2009. The RSPB is managing the project's implementation in the five Territories concerned – the Falklands, St Helena, Ascension, Tristan da Cunha and South Georgia and the South Sandwich Islands.



An albatross soars over Tristan waters. The nesting sites of many seabirds in the Territories are threatened by invasive species: problems range from rodents eating chicks and eggs to plants encroaching on nest sites. (All photos in this article are by Clare Miller, RSPB, except thistles by Brian Summers, RSPB)

The objectives of the project are:

Overall: To conserve native biodiversity, and therefore enhance economic prosperity and quality of life for people living on the South Atlantic UK Overseas Territories.

Specific: To develop regional capacity to reduce the threat that invasive species pose to the native biodiversity of the South Atlantic UK Overseas Territories. The project works with local communities and stakeholders on the South Atlantic Territories to focus on those issues that people feel are most important and have the highest current or potential impacts. A multi-disciplinary approach is needed to address issues in areas such as policy, infrastructure, capacity building and training, as well as practical surveys and control activities. The focus of the project will vary in each Territory according to specific needs. The descriptions below illustrate the diversity of the Territories and their problems with invasive species.

Ascension

Ascension Island is no stranger to invasive species issues – in 2006, the island was declared “feral cat free”. Post-eradication, Ascension's seabirds have started to re-colonise the mainland, freed from the pressure of intense cat predation. However, new threats continue to arise. Mexican thorn *Prosopis julifera* is spreading over most habitats on the island, and may lead to degradation of volcanic features, make seabird nesting habitat unusable and prevent turtles from nesting as it encroaches on beaches.

Other problems on Ascension include a suite of other introduced plants (including *Lantana camara*, *Paspalum conjugatum* and *Heliotropium curassavicum*) that are out-competing threatened endemic species on Green Mountain. Rabbits, rats and myna birds are also having unknown impacts.

In the first 18 months of project operation, actions on Ascension have included supply of equipment and training to combat some of the invasive plants; and assessment of rabbit numbers and training for Ascension staff in rabbit survey techniques. Future work may include developing education materials; assessing rat impacts on seabirds; carrying out botanical surveys island-wide to assess the distribution of introduced plants; and assessing the effectiveness of current Ascension legislation in preventing introduction of further invasive species.



Raymond Benjamin and Stedson Stroud work in the endemic plant nursery on Ascension. Many endemic plants are threatened by more vigorous introduced invasive plants, as well as by grazing mammals.



Location of the UK Overseas Territories in the South Atlantic

St Helena

St Helena was discovered in 1502, and the introduction of invasive species began almost immediately, with the release of goats to provide food for visiting ships. Rats, mice, livestock and various plant species have had a devastating effect on St Helena's endemic species, and continue to do so – the St Helena Olive became extinct in 2004. Invasive species are having an impact on many aspects of life on St Helena, including agriculture, recreation and way of life. Plants such as whiteweed (*Eupatorium pallescens/Austroeupatorium inulifolium*), bilberry (*Solanum mauritanum*) and gorse or furze (*Ulex europaeus*) encroach on pasture and necessitate expensive management. Conservation and restoration efforts in the national park are being complicated by the need to remove invasive plants prior to replanting with native species, and to prevent the return of invasive plants into restored areas. In the first 18 months of project operation on St Helena, actions have included starting an island-wide botanical survey with the aim of determining the distribution of all invasive plant species. Future work will include: the development and implementation of management plans for key invasive plant species; working with landowners to improve pasture management; and the development of education materials and support for government in improving nursery production of endemic plants, to facilitate restoration and prevent re-colonisation by invasive species.

Tristan da Cunha

Tristan da Cunha is the world's most isolated inhabited island – it requires a six-day boat trip, usually from Cape Town, to get there. The 300 Tristanians are rightfully proud of their islands and their unique biodiversity. Unfortunately, the impacts of invasive species have reached even this remote corner of the world. Mice *Mus musculus* on Gough Island have been observed eating live albatross and petrel chicks of several species. On Tristan, mice and rats are affecting wildlife and livelihoods. If rats and/or mice ever reached the rodent-free islands of Inaccessible and Nightingale, the impacts would be devastating. Introduced plants have become problematic more recently, and are starting to affect crops and become naturalised in some sensitive areas. To-date, project activities on Tristan have included: supply of equipment for control of invasive plants; provision of equipment and advice on improving rodent control on



Fishing boats on Tristan: fishing is a significant part of most South Atlantic territories economies. Invasive marine species could devastate fisheries, with flow-on effects through these small communities.

control thistles and European ragwort. Surveys of the distribution of introduced plants are ongoing, and will continue throughout the project. Other future actions will include: a workshop related to rat eradications; training for border staff; development of education materials; and further support for practical eradication and control projects targeting introduced mammals.

Tristan, and on preventing establishment of rodents on Nightingale or Inaccessible; and support for introduced plant surveys. In the future, there will be investment in training for Tristan conservation staff, development of education and training materials, and development of a quarantine manual.

The Falkland Islands

The Falklands is the largest of the South Atlantic Territories in terms of its land area – some 12,173 km². There are around 700 islands in the archipelago, most with some assemblages of introduced species. Most land is privately owned, and land-owners take a variety of approaches to dealing with invasive species. Mammalian predators (rats, cats, foxes) have caused problems on many islands in the Falklands; in its first 18 months, the project has supported purchase of equipment and transport for projects related to fox and rat eradications. Actions have also been undertaken to investigate methods of control for calafate *Berberis buxifolia*, and to

South Georgia

South Georgia is probably best known for glaciers, penguins and albatrosses. It has a spectacular landscape, and is visited by tourists from around the world who marvel at its history and wildlife. However, rats *Rattus norvegicus*, introduced reindeer *Rangifer tarandus* and various introduced plant species do appear to be having negative impacts on South Georgia. As climate change continues to warm the islands, these impacts are predicted to increase. Already, biologists who have a long association with South Georgia have remarked on the increased distribution of some plant species. A programme to eradicate wavy-leaved bittercress *Cardamine flexuosa* at King Edward Point has been started, and this will continue throughout the project. A survey of other introduced plants and invertebrates will be undertaken in the coming months, together with an analysis of which are likely to become invasive in the future. Improvements to quarantine systems are also planned.



Above and right: Plants such as thistles and calafate encroach on agricultural land and require ongoing management to reduce economic impacts.



Common Ground

All of the South Atlantic UK Overseas Territories are unique and have distinct problems related to invasive species, but they have several features in common.

- All have small human populations, and a corresponding shortage of trained personnel to undertake work on invasive species.
- All are isolated – though travelling times range from a fairly short flight from Chile to the Falklands, to a minimum of six days on a boat to get to Tristan da Cunha.
- All have economies centred on one or two main areas that depend heavily on the environment (e.g. fisheries, tourism).

Through action plans designed in consultation with stakeholders, this project will reduce the current effects of invasive species in the Territories and help to prevent future impacts occurring. For all of the

Territories concerned the long-term outcomes will include:

- a regional invasive species strategy;
- a regional early warning system;
- a programme of education, awareness raising and training activities.

This should enable the development of regional skills and networks, and enhanced capacity for the Territories to address invasive species issues and to avoid ongoing or increased impacts on biodiversity and the unique communities of these islands.

This project is a partnership of the RSPB, the Falklands Islands Government, the St Helena Government, the Ascension Island Government, the Government of South Georgia and the South Sandwich Islands, the Tristan da Cunha Government, Falklands Conservation and the St Helena National Trust. This project is funded by the European Union.

Guided discussion: What is needed for the future?

With thanks to those taking notes of discussions (in this case mainly Dr John Cooper), summarised below are the discussions resulting from this session. Attention is drawn also to the brief session summaries in the introductory section of these proceedings.

What are the main obstacles? How to overcome them?

The need for research in order to tackle invasive species issues effectively was raised several times. In response to a question about the Caicos Pine Scale, Bryan Naqqi Manco reported that the scale does occur in all three dif-

ferent groups of pines, but as yet the transport method within TCI was unknown (although the arrival in TCI was thought to be via Christmas trees imported from North America). It may be avian, as the infestation was thought to have moved against the wind. There are some apparently resistant trees, and trees on sand do better (but are still infested) than those on limestone where there is more access to water. In answer to a question about research on the rats on Anguilla's Dog Island, it was confirmed that there had been some work looking at impacts, particularly diet. JNCC were also collecting data, but it was more difficult to get information on marine than terrestrial species.

Lack of adequate biosecurity facilities was felt to be one of the main obstacles (see also further references to biosecurity issues below). Issues raised here were the importation of other taxa of plants, for example amphibians, and the large funding needed for the big biosecurity projects required. An example from South Georgia noted the exclusion of such projects from EU funds. However, there was a suggestion that even small measures could be effective, for example mandatory and monitored boot-washing before people were allowed to land on sensitive islands.

The problem of obtaining funding for such work was also raised in the context of rat eradication in BIOT. Not only were the islands remote, so lacked facilities and infrastructure for an eradication programme, but it was difficult to see where the large-scale funding for such work would come from. It was suggested that work needed to concentrate on one island at a time, with considered prioritization of which ones to tackle first, but that on-going long-term support would be needed from UK Government.

Further suggestions for strategies to make the most effective use of limited funds, especially in remote places, were to look for opportunities to co-ordinate project work at these locations at the same time, thereby using economy of scale to maximise the efficacy of limited funds. In addition, it was suggested that cross-territory projects and increased volunteer involvement would allow for skilled personnel to move between territories and contribute to the training of local personnel.

In answer to a question about how the work of the South Atlantic Invasives Species project would continue post-funding, it was explained that the project aims to build capacity among territory inhabitants. They were also aiming for a project extension, as the project has started rather slowly.

Another issue was that the necessary habitat restoration takes longer than the life of an eradication project. Awareness of this was also required at high levels of policy and decision-

making. In this regard, the suggestion was made that the project title should highlight positive aspects, such as habitat and species restoration, and not refer solely to the removal of alien species. This had been done with the cat eradication programme on Ascension Island, which was referred to as seabird restoration (its objective, rather than its method).

Clearly, more funding was required to support all kinds of work on invasive species in the UKOTs/CDs. However, it was also agreed that more strategic approaches to funding were required. Individual projects could tackle specific challenges, but different elements needed to be addressed together, in longer-term programmes, if sustained successes were to be achieved. This would require funding mechanisms that could support integrated activities, e.g. linking prevention measures to control, and control to ecosystem restoration, and all activities to enhanced local capacity.

Raising awareness

One issue raised here was the importance of getting public support for invasive species eradication programmes. Many people in the public arena felt that alien species also had rights. In addition many alien species were attractive, and the example of the reindeer on South Georgia was given. Projects for the eradication or control of attractive species gained global media attention, and the question was raised as to whether there was the need for professional public relations in such instances. It was certainly felt to be important to work with the public to explain issues.

It was felt important to avoid demonizing species, and to talk about stewardship, and the responsibility to protect native species. In this regard, it was important to emphasise the positive legacies of projects, such as masked booby returning to breed on Ascension Island following the feral cat eradication. Another persuasive argument which could be made here was the need to maintain the genetic variation of native populations and their adaptation to their environment. An example was given of

the stresses which climate change is causing, and native vegetation being more resilient. On Nonsuch Island in Bermuda, the native vegetation had been more resilient to hurricanes than introduced vegetation. Again, the importance of habitat restoration after an eradication project was cited.

Where land for which an eradication programme was necessary was in private ownership, it was obviously vital to get the agreement and support of the landowners, and arguments such as those given above could be used persuasively.

Clearly schools curricula should be used as much as possible to educate children about the issues of invasive species.

Several ways of raising public awareness were given as examples. The British Birdwatching Fair was an important publicity opportunity, and not only for the public, but also for eco- and adventure-tour companies. Visitor centres and conservation body offices could strive to have invasive-free sites, and publicise this (although in locations such as the Channel islands the closeness to the mainland could be a problem). Where invasive species threatened resources linked to commercial interests, novel ways could be used to encourage public support to deal with the problem. Many Caribbean Islands, as part of their strategy for dealing with the Pacific Lionfish which was devastating the coral reef ecosystems, were advertising the fact that it was good to eat. Distributing donated native seedlings to plant, to new home owners and through other organisations, like schools, had also been shown to be successful.

Where policy-makers were the target for awareness raising, it was felt that an emphasis on the economic costs of managing invasive species impacts was important. This seemed to be the most effective means of communicating, at a high level, the severity of the threat, and the need for control and (particularly) prevention measures.

Biosecurity

Lack of expertise was one problem. An example was given for Diego Garcia (BIOT), where introduction of a snake from Guam was a threat, as were invasive widow spiders, but there was no expertise on Diego Garcia.

Many places (as mentioned earlier in problems to be overcome) lacked biosecurity facilities, or the funding to provide these, despite the incredible value for money that investment in prevention measures represented.

It was felt that, as this was such a huge issue, with lack of trained personnel and facilities, and no funding to address these, a prioritisation exercise was needed, and the worst problems should be addressed first.

Other points

Turning an invasive species into a resource could be one way of supporting invasive species eradication. Eating Lionfish had already been suggested, other suggestions were hunting feral pigs and donkey bounties. This approach could support the argument that not every eradication or control programme necessarily had a cost.

Another discussion point raised the sometimes difficult question of what is a non-native species. It was suggested that self-introduced species were not alien, but part of an evolving ecosystem, whereas human-induced or facilitated introductions were a different matter. The question was also posed as to whether human beings are an invasive species.