

Topic 9: Species recovery including captive breeding

Session Organiser: Dr John Fa, Director of Conservation Services, Durrell Wildlife Conservation Trust

For the afternoon and evening of the last day, the main conference moved to Durrell Wildlife Conservation Trust, which had organised a programme. This started with an opportunity to see some of the live exhibits, including some which represented captive breeding programmes in support of conservation in the UKOTs.

After a refreshment break, we moved indoors for presentations on this and related work on species recovery. This started with a general welcome and introduction to Durrell and its vision by Dr Mark Stanley-Price, Chief Executive. This was followed by an outline of Durrell Wildlife Conservation Trust's approach to global conservation by Dr John Fa, Director of Conservation Science, in a presentation *Durrell's TopSpots: A Strategic Approach to Conservation Challenges*.

Turning then to particular projects in which Durrell is playing a key role in partnership with UKOT organisations and others, Fred Burton described work on the Cayman Blue Iguana. For these Proceedings, Fred has incorporated this presentation with that he gave in the Resources session, and it can be found in that section.

Dr Richard Young of Durrell, together with James "Scriber" Daley of Montserrat's Forestry Division and Calvin "Blacka" Fenton of the Montserrat Centre Hills Project, gave a vivid joint presentation on the work in the Centre Hills, and Richard's paper on *Biodiversity assessment of the Centre Hills, Montserrat* is included in this section.

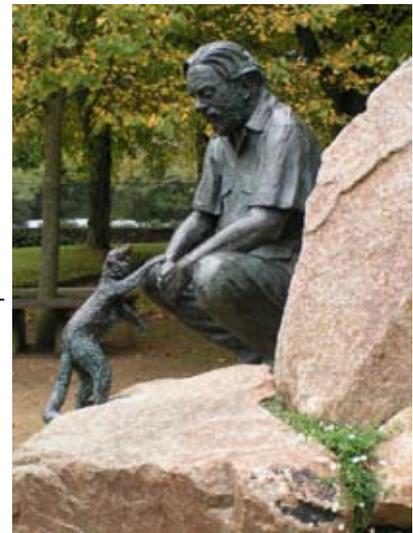
We include also in this section of the Proceedings, two posters on this topic by Dr Samia Sarkis, Department of Conservation Services, Bermuda. *Captive Breeding for Conservation in Bermuda* and *Bermuda Protected Species Programme* illustrate some of the ways in which the *Biodiversity Strategy and Action Plan* (BSAP) is being taken forward in this topic area.

The conference came to a fine climax with an excellent closing dinner hosted by Durrell Wildlife



Conservation Trust in their Dodo Restaurant. At the last, we were honoured with the presence and a closing address by Dr Lee Durrell. We were delighted to learn that the event coincided with the 50th anniversary of the publication of her late husband's classic book *My Family and Other Animals*. As UKOTCF's Chairman noted in his thanks, for many of us, this and Gerald Durrell's other books were key in stimulating our initial interest in wildlife and conservation.

Lee Durrell speaks at the closing dinner in the Dodo Restaurant, Durrell Wildlife Conservation Trust.



Gerald Durrell statue

Biodiversity assessment of the Centre Hills, Montserrat

Richard Young, Durrell Wildlife Conservation Trust

Young, R. 2007. Biodiversity assessment of the Centre Hills, Montserrat. pp 318-326 in *Biodiversity That Matters: a conference on conservation in UK Overseas Territories and other small island communities, Jersey 6th to 12th October 2006* (ed. M. Pienkowski). UK Overseas Territories Conservation Forum, www.ukotcf.org

Having lost 60% of its forest, it is vital that the remaining area in Montserrat's Centre Hills is managed effectively. This paper describes the biodiversity assessment being undertaken as part of the Darwin Initiative Centre Hills management plan project.

Richard Young, Durrell Wildlife Conservation Trust, Les Augrés Manor, La Profonde Rue, Trinity, JE3 5BP, Jersey. Richard.Young@durrell.org

Need for project

60% Montserrat's forest has been lost. The Centre Hills have:

- High conservation value
- Ecosystem services
- Partially protected but still threatened
- Agricultural history
- Better knowledge of patterns in biodiversity and processes to inform management

- Darwin Initiative Centre Hills management plan project.

Objectives

The Centre Hills Project is a collaborative project between Montserratian and international partners to:

1. quantify diversity of key taxa





2. map patterns of biodiversity to identify zones of high richness, endemism, and key areas for threatened species in the Centre Hills
3. develop a vegetation map
4. assess potential impact of invasive mammals and plants
5. assess status of endemic species and those of conservation concern
6. provide robust data to inform the Centre Hills management plan for biodiversity conservation and sustainable resource use
7. develop field research and data management skills in Montserrat institutions.

Which aspects of biodiversity?

It would be almost impossible to measure all biodiversity! 'Biodiversity assessment' instead addresses key surrogate groups of animals and plants. Questions then arise:

- How many species?
- Size of populations?
- Where can they be found?

The work includes field surveys and other research. Existing information – scientific and anecdotal – is also used, but scientific information is more

compelling.

The key project partners include Montserrat Department of Forestry, Durrell Wildlife Conservation Trust, Royal Botanic Gardens Kew, RSPB, University of Montana, South Dakota, Montserrat National Trust.

Coverage includes:

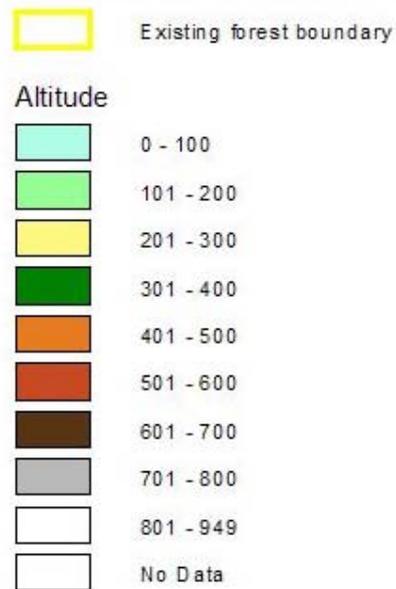
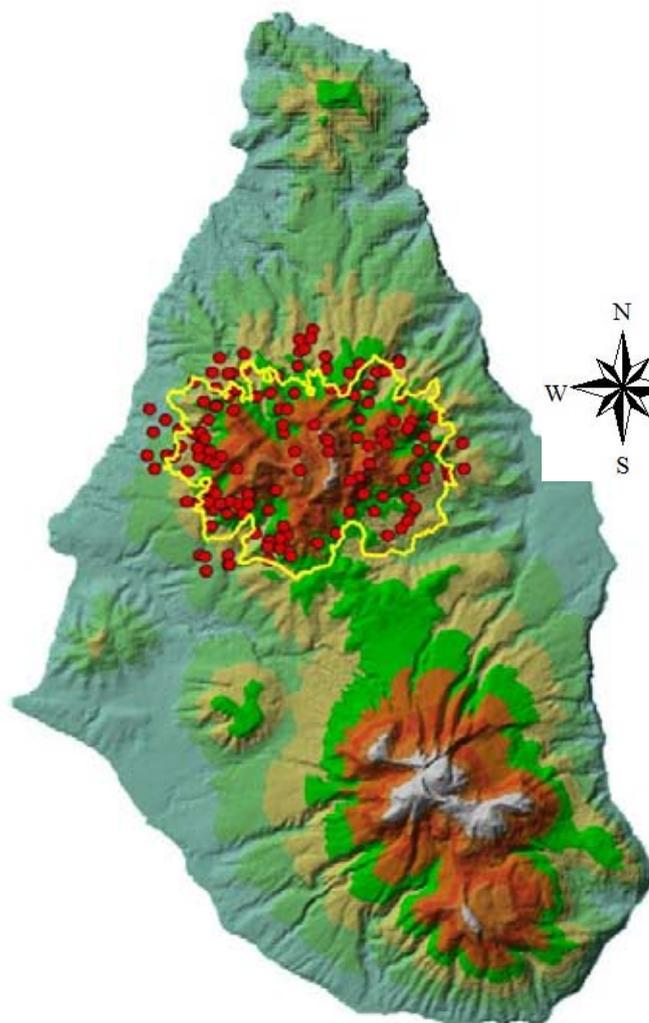
- Vascular plants and habitats
- Birds
- Amphibians and reptiles
- Bats
- Insects
- Invasive mammals

Survey Design

The sampling points are shown in relation to the existing forest boundary in the map on the following page.

Plant & Habitats

- The work includes:
- Review historical botanical data
- Plot sampling



rised in the table below:

Plant Status	Number
Endemic to Montserrat	3
Endemic to Lesser Antilles	70
Restricted range	32
Caribbean	109
Peri-Caribbean	31
Wider distribution	550
Introduced	146
Verified Species Totals	941
Candidate native	3
Candidate introduced	48
Candidate Species Totals	51
Verified and Candidate Species Totals	992



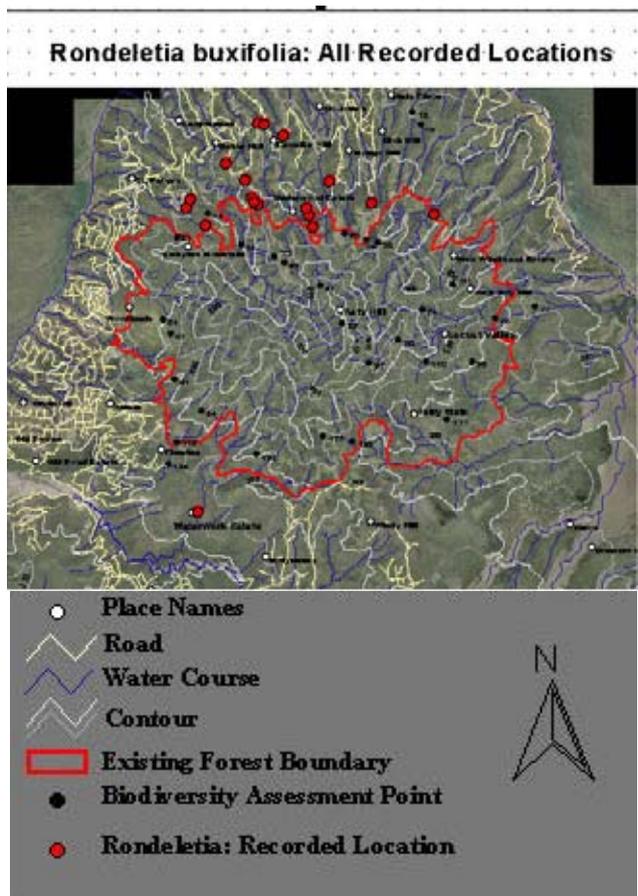
- Samples collected, processed and sent to Royal Botanic Gardens Kew
- Species list
- Index of plant diversity
- Vegetation structure and habitat mapping

The results of the plant survey work are summa-



The following endemic species are likely to be listed as Critically Endangered:

Species	Representation within Forest Boundary
<i>Epidendrum montserratense</i>	Very Poor
<i>Rondeletia buxifolia</i>	None
<i>Xylosma serratum</i>	?



Birds

The bird work includes:

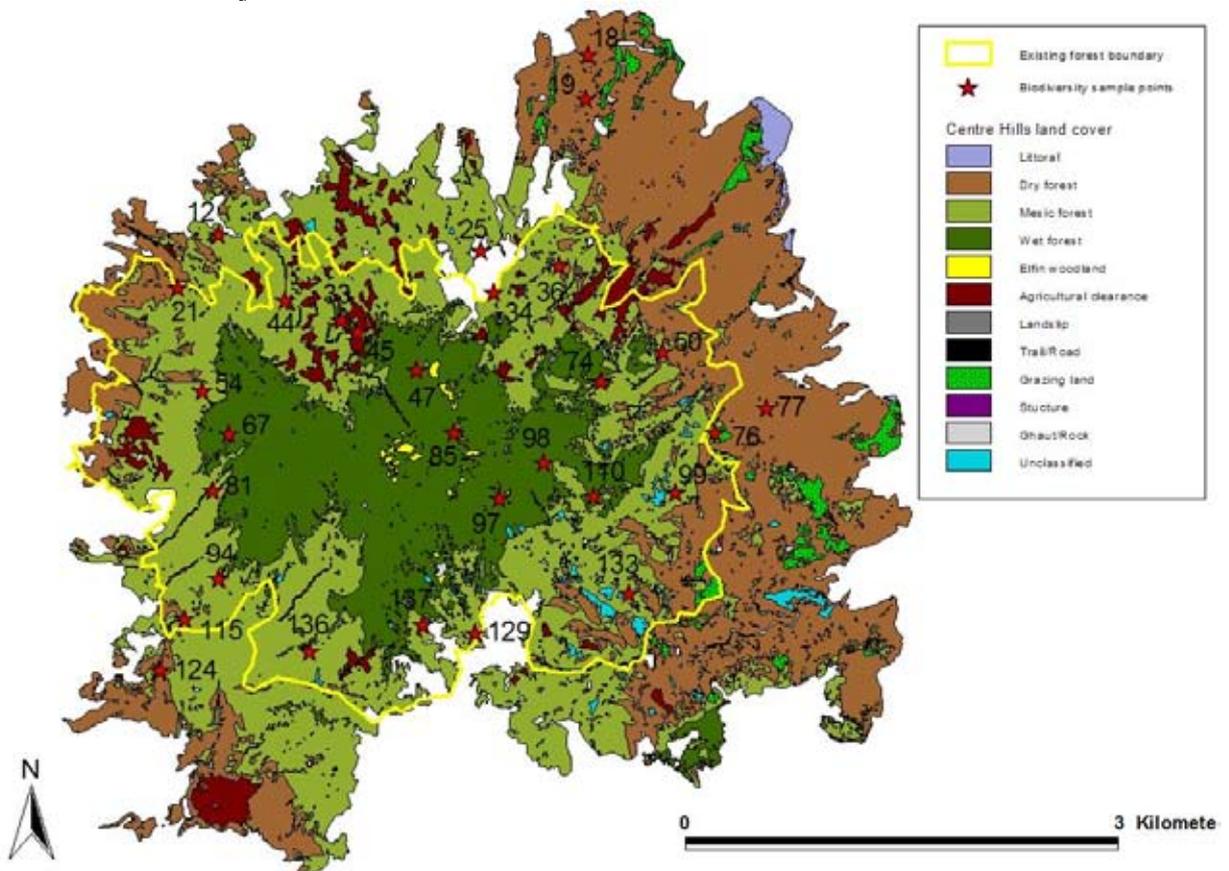
- Monitoring programme 1997 onwards
- Conservation of Montserrat oriole
- Point count surveys
- Excellent dataset, including trend monitoring and spatial patterns in diversity.



Some Montserrat forest birds

Habitats

The map below summarises the habitat information from this study.



The bird assemblage of Montserrat is not very diverse; the Centre Hills do not have many different bird species:

- About 15 true forest species nest
- About 25 species nest
- 27 migrant species.



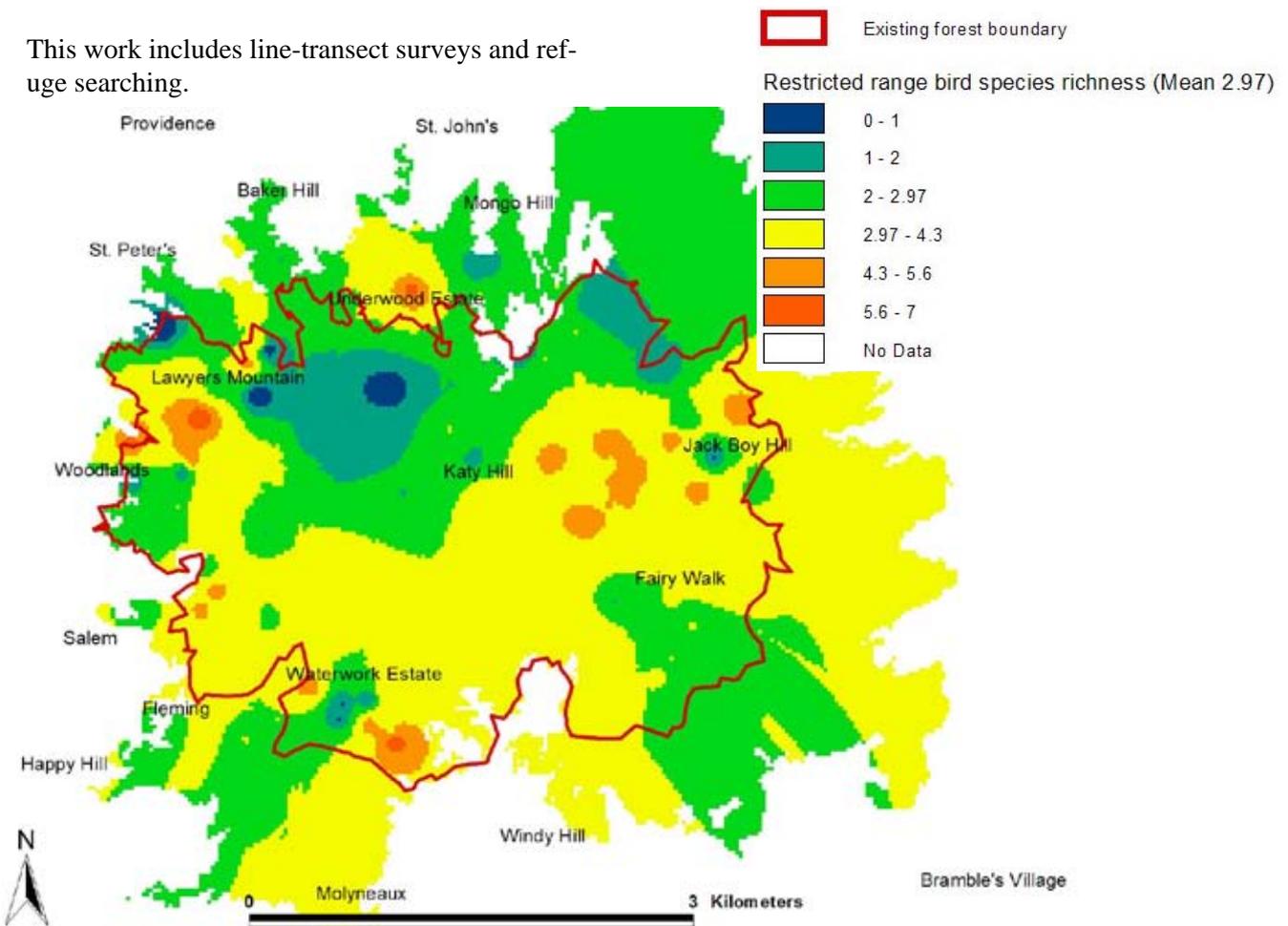
A similar forest in Central America might have 200 species! However, Montserrat is globally important for birds, with two globally threatened species:

- Montserrat Oriole: ‘Critically Endangered’ (above)
- Forest Thrush: ‘Vulnerable’ (opposite).

There are also eleven ‘Restricted-range Species’. The species richness of these is mapped below.

Amphibians and reptiles

This work includes line-transect surveys and refuge searching.



All 9 native species have been recorded during this biodiversity assessment – the first time in a single study! There is a high species richness, especially given the size of island. In comparison, there are only 6 reptile species in UK.

Montserrat holds two Critically Endangered species:

- Montserrat galliwasp lizard *Eleutherodactylus johnstonei*
- Mountain chicken frog *Leptodactylus fallax*.

Montserrat galliwasp

This is something of a ‘biogeographical enigma’ It was long thought to be extinct.

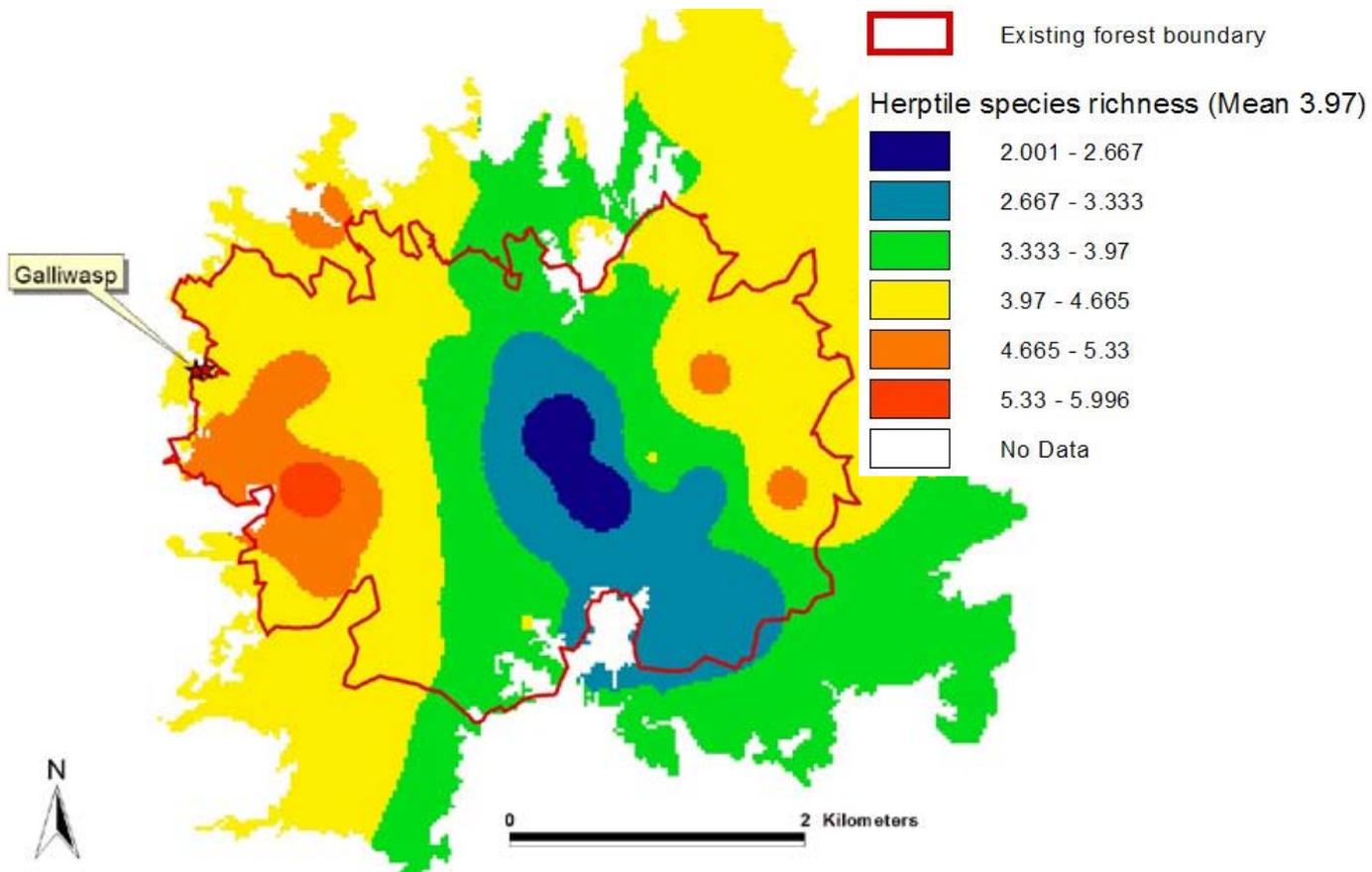


There were four sightings in the Woodlands area in 2006. The study has shown the first systematic evidence of highly restricted range and rarity.

There is an urgent need for:

- Research into status and conservation efforts
- Species action plan
- Habitat protection
- Rat control
- Habitat restoration
- Domestic pets - assessment of impact
- Possibly captive breeding.

The map below shows herptile species richness based on these studies.



Bats

Work has included mist-netting and bat detectors. All 10 species of bat have been recorded for the first time in one study. Two Endangered bats previously thought to be extinct were caught:

Sturnira thomasi vulcanensis

Chiroderma improvisum

There is a high number of species for the size of island.

The endangered white-lined bat *Chiroderma improvisum* was caught in dry deciduous forest at Corbett Spring. Fewer than a dozen of these bats have ever been examined. One specimen

was caught on Montserrat 20 years ago, but it had been presumed extinct since volcanic eruptions destroyed the habitat where it was found. It still exists in small numbers on the neighbouring island of Guadeloupe. The specimen caught on this expedition was a lactating female, suggesting that there is still a breeding colony on Montserrat.

The yellow-shouldered bat *Sturnira thomasi vulcanensis* is an endemic subspecies (if a subspecies can be described from a single specimen), of which a single individual was caught on Montserrat (by Scott) 10 years ago. It had also been presumed extinct, but the individual caught this year was also a lactating female, suggesting a breeding colony on Montserrat.

Additionally, a bat was caught at Bottomless Ghaut this year and passed over as an Ardops, but following discussions with Gary Kwiecinsky, it is believed that this may have been a *Stenoderma rufum*, a species which has not previously been described further south than the Virgin Islands.

Bats are the only extant native mammals in the Lesser Antilles. They are vital for forests, because of roles in flower pollination and seed dispersal. Some plants completely rely on bats for their reproduction. They play a role also in insect control.

Bats are wide-ranging and use seasonal resources. Protection of key resources is required in and outside Centre Hills:

- Roosts
- Water bodies
- Fruiting and flowering trees.

Key areas mapped are shown below.

Insects

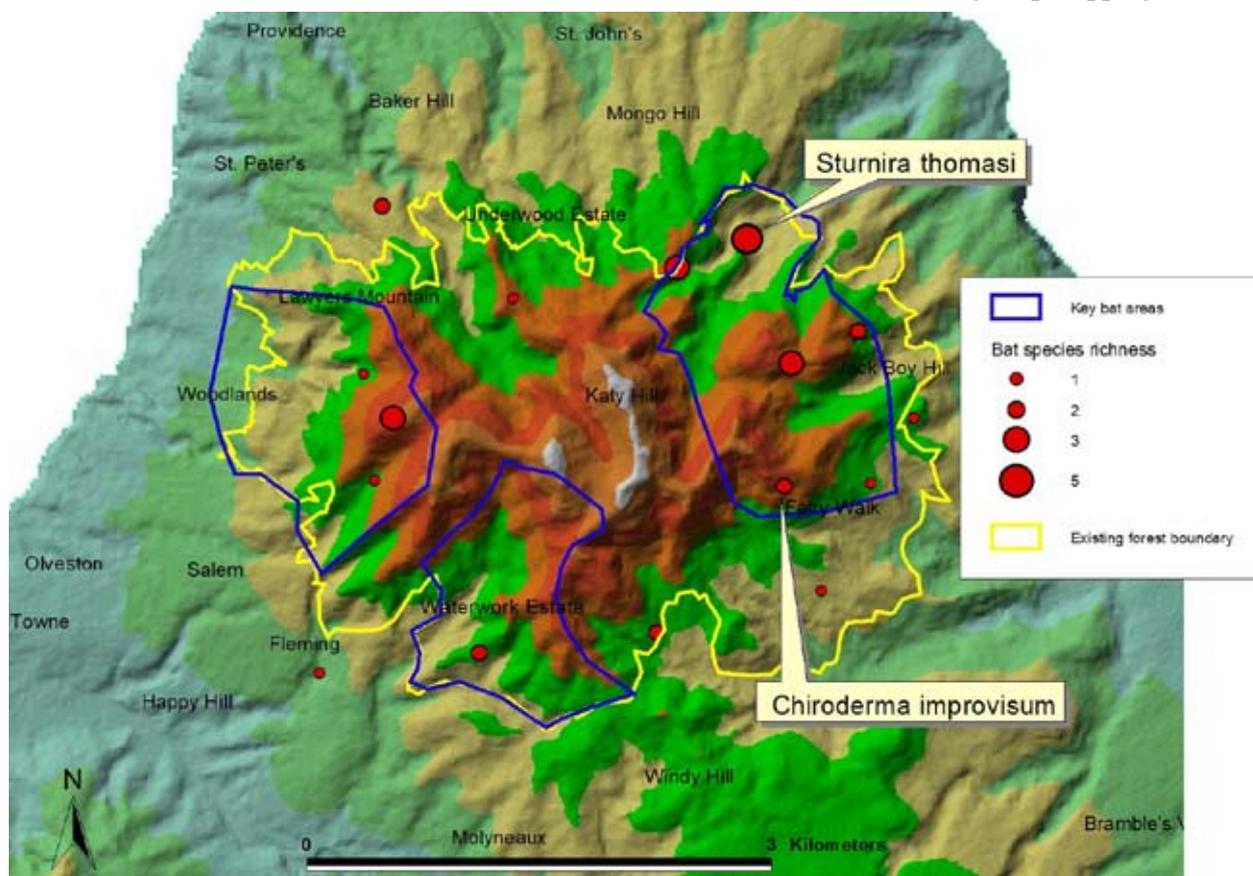
Insects represent the majority of the non-microbial biodiversity, with Coleoptera in the lead role. A species list is being generated, based on a variety of trapping techniques. About 1 million specimens have been collected.

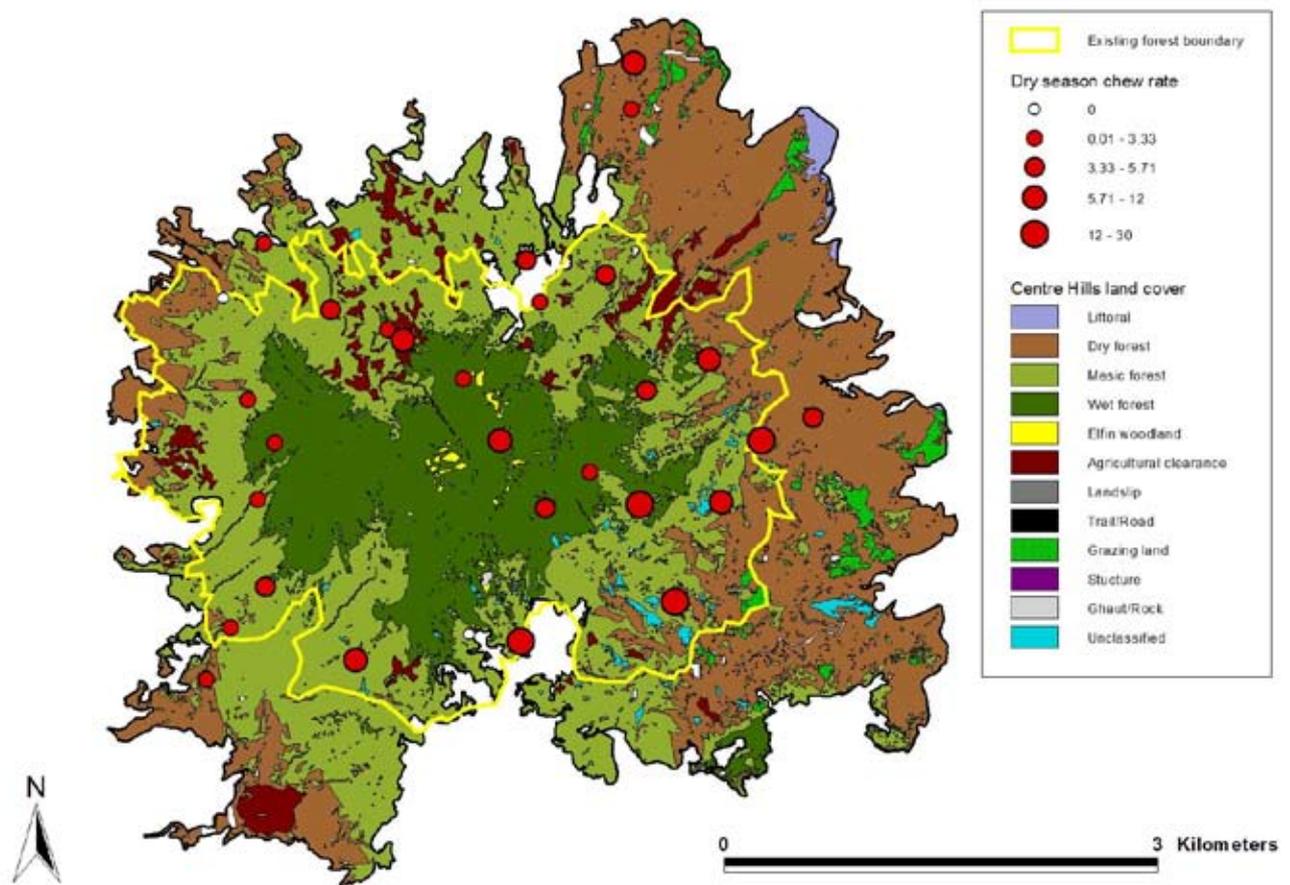
Taxonomy is being handled by Montana State University, who have found more than 1000 species of insects, including over 700 species of beetles. Many species are new to science. Species richness is high, given the size of the island.

Invasive mammals

These include feral pigs and rats. Rats are nest predators of oriole and forest thrush, but their impacts are likely to be pervasive.

Studies are conducted using snap-trapping and





chewsticks. Rats are distributed across the Centre Hills (see map above). There are high densities of brown and black rats.

Rats densities are correlated with numbers of exotic fruiting trees (and altitude). Experiments are in progress to quantify impact of rats on native flora and fauna, as well as on how to reduce impact.

Major components may include both lethal control and habitat restoration.

Centre Hills biodiversity

The study has underlined the high conservation and biodiversity value of the Centre Hills. The area is internationally important on a variety of measures.

Biodiversity That Matters: a conference on conservation in UK Overseas Territories and other small island communities, page 325

This gives responsibilities to the UK as well as to the UK Overseas Territory of Montserrat.

The project has delivered robust information and recommendations for management. Intensive management is needed for long term conservation, and there is a requirement for zoning.

How to prioritise biodiversity?

This could be based of a variety of factors:

- Globally threatened species
- Endemic species
- Areas of highest species richness
- Optimal habitats
- A full range of habitat types
- Plants and animals that are used by humans
- All of the above.

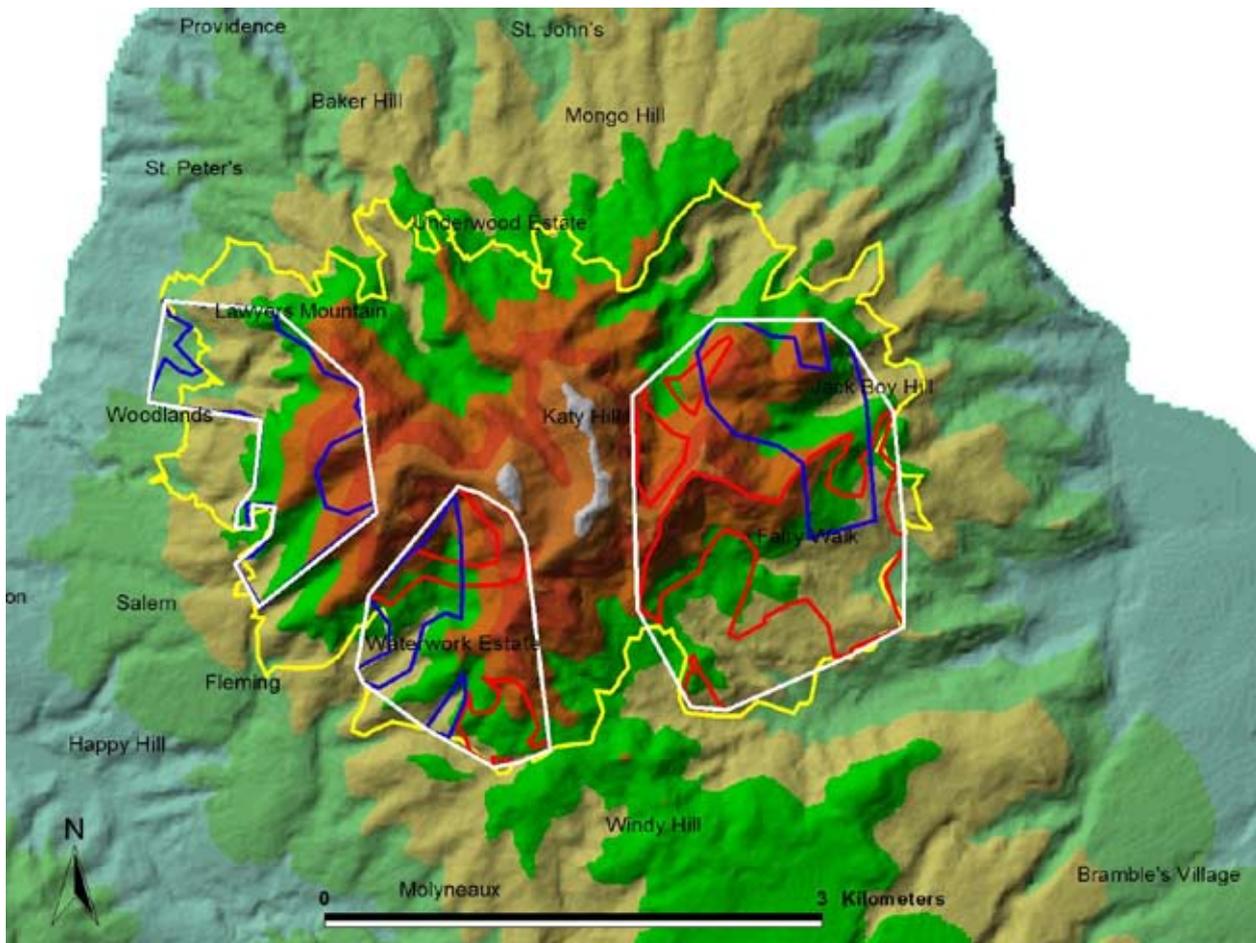
Conservation objectives need to be defined.

Other aspects could include:

- Irreplaceability
- Representativeness
 - of Species
 - of Communities
- Viability

A mapping approach is illustrated on the next page. Here:

- yellow indicates the existing forest boundary;



- red indicates the most important areas for Oriole, Forest thrush, Mountain chicken;
- blue those for herptiles, bats, and restricted-range birds; and
- white possible priority biodiversity areas on the basis of these.

Project outputs

The project outputs will be:

- Improved knowledge
- Report
- Maps
- A biodiversity database-GIS
- Baseline data for monitoring (pressure, state and response)
- Improved ecological survey and monitoring skills.



Poster: Captive Breeding for Conservation in Bermuda

Samia Sarkis, Department of Conservation Services, Bermuda

Sarkis, S. 2007. Captive Breeding for Conservation in Bermuda. pp 327-328 in *Biodiversity That Matters: a conference on conservation in UK Overseas Territories and other small island communities, Jersey 6th to 12th October 2006* (ed. M. Pienkowski). UK Overseas Territories Conservation Forum, www.ukotcf.org

The recovery plan framework, discussed in *The Bermuda Protected Species Programme* provides the rationale for capacity building as well as acting as leverage in the securing of funds. As some of these plans call for breeding programmes for certain terrestrial and aquatic species, the facilities for such conservation care are essential.

Terrestrial conservation has been very proactive in Bermuda, and has proved successful in the recovery of some flowering species, such as the Bermuda Cedar. This particular project is a good example of community engagement through the development of *Plant One on Me* programme, resulting in the existence of cedars in almost every Bermudan backyard. Government has supported this through the propagation of seedlings at Tulo Valley, a government-operated nursery. Government is further showing its commitment to the preservation of biodiversity by planting endemics and natives in National Parks, thanks to seedling production by Tulo Valley Nursery. This nursery has been recently upgraded (2006) to accommodate the growing needs for threatened endemic and native plants. It is also anticipated that this upgraded facility will allow for the propagation of more delicate endemics, such as Governor Laffan's Fern, currently extinct in the wild. Emergency measures for this fern species were necessary to prevent its loss, and a collaborative programme with the propagation laboratory at Omaha Zoo, was initiated in 2003. Several trials have been made to transfer prothalli cultures to Bermuda for acclimation, growth and transfer to the natural environment. It is anticipated that the improved facilities at Tulo Valley will result in successful growth and survival of fern cultures. There are a total of 6 fern species and 11 flowering plants listed under the Protected Species Act, of which several will benefit from the improved nursery facilities at Tulo Valley.

The existing Bermuda Aquarium Museum & Zoo (BAMZ) also provides opportunities for captive breeding of terrestrial species. Bermuda's endemic landsnail, *Poecizolonites circumfirmatus*, is the object of a collaborative programme with the London Zoo. The main focus is the production of juveniles under controlled conditions, for release in selected sites in the natural environment. This species is currently under threat from loss of habitat, due for the most part to human development, and from the effect of introduced predatory snails and flatworm species. A preliminary trial by the London Zoo has demonstrated the possibility of breeding juveniles; the know-how is to be transmitted to staff at BAMZ, for a comprehensive recovery programme.

Marine conservation has been conducted mainly through passive protection by the prevention of collection, damaging, etc. of marine species. However, several of these threatened species have been protected since 1972, and have shown little sign of recovery since. It is for this reason that a facility dedicated to the rearing of the early life stages of marine species, providing the capacity to investigate the requirements for growth and survival for a range of threatened species, has been built. This "marine conservation care" facility has been completed in 2006, partially funded by OTEP. Proposed work in the first year of operation focuses on the Queen Conch *Strombus gigas*, Seahorse species, including *Hippocampus erectus*, native scallop species (*Euvola ziczac* and *Argopecten gibbus*), corals and killifish. All of the species listed above are native to Bermuda, and are threatened globally. This global status provides an added dimension to the work carried out in Bermuda, contributing to international conservation initiatives for these species. They have been selected

locally as priority species, in part due to the current public interest and their nature as local flagship species, resulting in available funds and commitment from the community, and in part due to the existing available knowledge, facilitating the first actions towards implementation and creating a positive public image of conservation efforts. A substantial component of this marine conservation care work is education, namely for the youth of Bermuda, in the tools available for preservation of the marine environment. Hands-on workshops are planned for students demonstrating some of the species requirements for reproduction, growth and survival. It is also anticipated that thanks to the well-developed culture techniques for some of these species, namely for Queen Conch and scallops, the rearing work will not only result in boosting of the natural stocks, but may even lead to future use of the resources in a sustainable manner.

In conclusion, the improved facilities described above are a first step towards optimising conservation care efforts by changing our approach to recovery from a passive mode to an active mode; this is especially true for aquatic species in Bermuda. Enabling such capacity building paves the way for the implementation of a number of recovery plans for listed species.

Dr Samia Sarkis, Department of Conservation Services, P O Box FL145, Flatts FLBX. Bermuda. scsarkis@gov.bm

Poster: Bermuda Protected Species Programme

Samia Sarkis, Department of Conservation Services, Bermuda

Sarkis, S. 2007. Bermuda Protected Species Programme. pp 329-330 in *Biodiversity That Matters: a conference on conservation in UK Overseas Territories and other small island communities, Jersey 6th to 12th October 2006* (ed. M. Pienkowski). UK Overseas Territories Conservation Forum, www.ukotcf.org

The Protected Species Programme in Bermuda addresses some of the objectives of the Biodiversity Strategy and Action Plan (BSAP), and is supported by the newly enacted Protected Species Act 2003. This Act mandates the listing of threatened species according to IUCN criteria, and requires the development of a recovery plan within 1 year for those species classified as “Critically Endangered” and “Endangered”, and within 3 years for those classified as “Vulnerable”. Care was taken in selecting the species for listing, as future recovery actions necessitate the use of limited resources, in terms of both personnel and facilities. The aim of the programme is to develop practicable plans, which will lead to positive results in species restoration. For this reason, the list of Protected Species was in a first instance kept short; however, it is considered a working list, to be reviewed and modified if needed, every two years.

The listing of species has been conducted over the past year in a systematic fashion, considering first endemic species, and then native species. A total of 291 endemic species are recorded as extant in Bermuda; 53 endemic species, of which 23 are cave organisms, and 25 native species have been listed. Although it can be argued that all endemic species in Bermuda should be listed, considering the small extent of occurrence constrained by Bermuda’s land mass (50 km²), several of the endemics are common in Bermuda, making it difficult to justify locally the dedication of resources for their well-being. For this reason, not all endemics were listed. Furthermore, the endemic status for some of the species is debatable, when records rely on limited sightings, (for example the Bermuda Bank Bass, collected twice from deep waters). Finally, such groups as insects, diplopods, turbellarians, were not considered in this first listing for lack of expertise on these groups and for practical reasons. This first list was presented to Cabinet for approval during 2006, with a summary of the recovery actions and associated budgets required. One full-time staff member has been dedicated to the development of the recovery plans, supported in part by OTEP.

Conservation efforts in Bermuda have been on-going for several decades, focusing on species appealing to the public, and very dependent on personnel expertise and interest. For this reason, conservation has had a somewhat haphazard approach to date. The main goal of the recovery plans is therefore to encompass data obtained from previous efforts and current work, and to provide the framework for continued action. The recovery plans are an excellent means of providing cohesion and ensuring continuity in these conservation efforts. These have also given the opportunity to conduct an Audit of Resources, outlining the available resources (both facilities and personnel), as well as those lacking but necessary to the implementation of recovery plans. Finally, this wider approach to the recovery of Bermuda’s fauna and flora provides the capability of prioritizing actions and drawing a list of emergency measures preventing the further loss of our endemic species.

The main approaches to recovery include:

- Habitat Protection
- Translocation of mature individuals to adequate habitats
- Active propagation through breeding surveys
- Population surveys for data deficient species
- Public Awareness and Education
- Community Involvement

Habitat Protection is essential for survival of species, and is probably the most difficult to achieve in such a highly populated island like Bermuda. It is an essential component to many of the recovery plans and requires the identification of important habitats or ecosystems, such as mangroves and seagrass beds. There exists several levels of habitat protection in Bermuda, under the Parks Act, such as Woodland Reserves, National Parks, Nature Reserves, and Agricultural land. There are furthermore a total of 15 RAMSAR sites and also Marine Protected Areas. A further classification, “Critical Habitats”, has stemmed from the recovery plans. A total of 16 well-defined terrestrial sites and all caves have been identified as critical habitats. This listing has been achieved by answering the following question: “Should this habitat disappear, will it entrain the extinction of the species dependent on it?” Severe restrictions are placed on these sites, such as no public access, no building, cutting or removing of any species, etc. The Protected Species Act provides the legislation to classify any site as “Critical Habitat”, whether it is owned privately or not. However, negotiations have been initiated with the private landowners to obtain their support, and resolve this issue in an amicable manner. Habitat management is the responsibility of the Department of Conservation Services, in this way ensuring control of invasives, and minimizing the responsibility of the private landowner. A first negotiation has been successful to date. Fortunately, most of the Critical Habitats are government owned, facilitating the process. Currently, 23% of the land is protected in Bermuda (excluding caves), and approximately 32% of the Reef Area, under the classifications mentioned previously.

The recovery plans can be species-specific, as for the Bermuda Skink for example, or can be group recovery plans, as for several of the flowering species, which require similar strategies of surveys, translocation and/or active propagation. All plans have a public awareness and education component to engage the community in various conservation efforts. As explained in the “Captive Breeding” poster, some of these community-based initiatives have proved very successful.

Finally, all recovery plans include the following:

- Identification of threats
- Identification of emergency measures
- Actions for enhancing public awareness
- Step-by-step implementation schedule
- List of criteria for defining recovery
- Estimated time for recovery

The ultimate goal is the removal of species from the Protected Species List as they achieve self-sustainability in the natural environment.

Dr Samia Sarkis, Department of Conservation Services, P O Box FL145, Flatts FLBX. Bermuda. scsarkis@gov.bm