

# Darwin Initiative – Final Report

## Darwin project information

Project Reference	162/13/033
Project Title	Combating alien invasive plants threatening the East Usambara mountains in Tanzania
Host country(ies)	Tanzania
UK Contract Holder Institution	Tropical Biology Association
UK Partner Institution(s)	Centre for Ecology and Hydrology, Banchory
Host Country Partner Institution(s)	Amani Nature Reserve & Sokoine University of Agriculture
Darwin Grant Value	£153,120
Start/End dates of Project	1 Apr 2005/31 Mar 2008
Project Leader Name	Dr Rosie Trevelyan
Project Website	<a href="http://www.tropical-biology.org/training_research/dip/darwin.htm">www.tropical-biology.org/training_research/dip/darwin.htm</a>
Report Author(s) and date	R Trevelyan, P Hulme, C Sawe June 25th, 2008

## 1 Project Background

The project focused on Tanzania's East Usambara Mountains, a global biodiversity hotspot. The project developed much needed capacity of Tanzanian institutions to monitor and manage invasive plants and train others in this field, and raised awareness among conservation managers, including Government. Invasive species have now become key management goals of several institutions' management plans. Locally-led research projects resulting from the training generated new data on priority invasive species and identified protocols for their management. The project developed the first database of non-native plants for the Usambara Mountains and has already resulted in three peer-reviewed publications.

## 2 Project support to the Convention on Biological Diversity (CBD)

a) The project has directly supported the following CBD objectives in the following ways:

### Article 8. In-situ Conservation

The project has promoted "the protection of ecosystems and natural habitats" (8d) and "control of those alien species which threaten ecosystems, habitats or species" (8h). It has done this through building the capacity of Tanzanian conservation managers to monitor, assess invasions risks and understand management methods of alien plant species as well as through the greater significance being given to invasive species in management strategies.

### Article 12. Research and Training

A large element of the project involved both research and training. A total of 21 Tanzanian conservation managers gained new skills and knowledge on invasive plant ecology and management through three tailor-made workshops and follow-up mentoring. Two trainees gained MSc's in invasive plant management. Training materials that were generated, coupled with the increased skills based resulting from the workshops, mean that nine institutions can now conduct their own training activities on invasive plants. Tanzania's two main universities are incorporating invasive species into their teaching.

The research component of the project produced the first thorough survey of the introduced woody species to Amani Nature Reserve and identified to managers the high risk species that are invasive or could become invasive. The project produced the most up to date database of non-native plants in the Usambara's that will continue to be available to researchers beyond the life of the project. Three peer reviewed papers and two MSc theses have been published. Five additional research projects were possible because of the new techniques and information gained by the trainees. These generated new data on the status of invasive species in important forests and reserves in Tanzania and resulted in two trial management protocols being launched. All of the research outputs have been made available through the project's website.

### **13. Public Education and Awareness**

The project raised awareness about invasive alien plant species through a variety of activities including a stakeholder workshop held in Dar es Salaam; education posters in English and Swahili on invasive plants; through the sensitisation of farmers in the Usambaras as well as conservation authorities in the Usambaras, Ulugurus and Udzungwas. Wider dissemination occurred through two articles in Tanzania's national newspapers, and one radio interview.

b) the project specifically and directly related to the 2010 target theme of "addressing the major threats to biodiversity, including those arising from invasive alien species"

c) the project interacted with Tanzania's CBD focal contact who played an active role in the final stakeholder workshop

## **3 Project Partnerships**

The project worked in close partnership with Tanzanian government and non-government institutions in order to ensure that activities were relevant and would continue beyond the lifetime of the project. This was also an important means of sharing expertise between the UK and Tanzania. The project was based on demand for greater knowledge and skills on terrestrial invasive plants among Tanzanian natural resource managers and researchers.

The two major project partners, Amani Nature Reserve and Sokoine University of Agriculture, were involved from the initial planning stages of the project through to designing the training curriculum, contributing to teaching and contributing to the final stakeholder workshop. Other partners were involved in specific activities relevant to them. Another major project partner, the Forestry and Beekeeping Division of the Ministry of Natural Resources played an important role in ensuring its outputs were discussed with the relevant decision makers.

The project established MoU's with the Ministry of Natural Resources and Tourism and Sokoine University of Agriculture. It built on an existing MOU with the Amani Nature Reserve and Tanzania Forestry Research Institute

There are important lessons to be learned from these partnerships. The project would not have been as successful without these partnerships which strengthened during the lifetime of the project and which will continue with the Tropical Biology Association afterwards.

The two key UK institutions in the project were Centre for Ecology and Hydrology and the Tropical Biology Association. CEH also collaborated with Aberdeen University for the research aspects of the project.

## 4 Project Achievements

See Annex 1

### 4.1 Impact: achievement of positive impact on biodiversity, sustainable use or equitable sharing of biodiversity benefits

In the long term, the direct impact on biodiversity will result from more active and effective management of invasive plants in Tanzania with a concomitant reduction in threat levels to native biodiversity. This is one of the CBD 2010 targets. This will result from the capacity development activities of the project coupled with the new information on the ecology and risks of invasives that the project generated.

A global outcome, of wider relevance beyond Tanzania, was to raise awareness worldwide of the risk that tropical botanic gardens pose to the integrity of neighbouring forests. A forthcoming, peer reviewed paper reviews the evidence of alien species spreading from botanic gardens and, by using Amani Botanic Garden as a case study, highlights the steps and approaches managers must adopt in assessing the risks of their collections to the wider environment. This risk was highlighted at the 2nd World Botanical Gardens Congress and resulted in a recommendation that all botanical gardens carry out invasive species risk assessments of their collections and management practices. Yet until now appropriate guidance relating to risk assessments of established collections is scarce.

Another outcome that will impact biodiversity more broadly is a test that reliably identifies risk of invasion of woody weeds that was developed during the project (yet to be published). This suggests that for the first time, a reliable tool might be available to managers in Africa to address future risks of invasion and hence reduce the threat to biodiversity from invasives. This will be an important legacy of the project that has international significance.

### 4.2 Outcomes: achievement of the project purpose and outcomes

The project achieved its primary purpose of empowering Tanzanian researchers to map, monitor and manage invasive plants in the East Usambaras. The project ended up achieving a wider impact than initially envisaged, since it incorporated institutions who work outside the Usambaras and who identified invasive species as a priority area. A global outcome (described in 4.1) was to raise awareness of the risk that tropical botanic gardens pose to the integrity of neighbouring forests.

A major outcome of the project is the training and empowerment of 21 Tanzanian conservation managers from 9 institutions to undertake invasion scenarios and manage invasive plants. This resulted in five new research and monitoring projects in four key sites in Tanzania, as well as the launch of Tanzania's first trial management projects. One of the MSc students is now recognized as Tanzanian leading expert on invasive species and is employed by the Tanzanian Forestry research institute.

Another outcome was the increased awareness and change in behaviours of managers towards invasive species. Invasive species are now given higher significance in the management plans of participating institutions. An Eastern Arc Mountains Strategy has been produced which incorporated the bulk of the Darwin Projects materials into a section on the theme of invasive species. At the political level, the acting Director of the Environment "Recognised that, as a country, Tanzania appreciates that invasive alien plants are a major threat to its rich biological resources and that the Darwin project addressed the limited national expertise and awareness to tackle the threats invasive species pose to Tanzania's environment" He also "noted that the Vice President's Office will take up the task of ensuring that recommendations from this project, as well as deliberations from the workshop discussions, are strategically applied in improving how they manage invasive alien plants, not only in the Eastern Arc region, but in Tanzania as a whole."

The project generated a variety of useful resources for partner institutions and the wider community through the website. These include a comprehensive database of alien woody plants in the East Usambaras and an assessment of the invasion potential of key species and management protocols. All of these resources are being used (described elsewhere). Publications include 3 peer reviewed papers and further peer reviewed articles are expected in the year following the end of the Darwin project and these will also be posted on the project website. All participants in the project were given training manuals on the mapping, monitoring, risk assessment and management of invasive alien plants and feedback shows they are passing on the knowledge to others in their institutions.

The project leaves behind a network of likeminded researchers with new skills and resources who are well placed to continue to have an impact on the monitoring and management of invasive plants in Tanzania. The project organisers have received requests from other African countries to carry out similar work there, and we hope to launch new programmes based on the experience gained on the Darwin Project in the near future.

### **4.3 Outputs (and activities)**

The project broadly achieved the four major outputs set out in the logical framework and importantly increased the outputs overall as set out in the standard measures list. Some activities were modified and new ones added in order for the project to achieve the project aims. Some followed a different time line but all were completed by the end of the project. The number of institutions was increased from 4 to 9 in the capacity building element of the project as a response to the demand for knowledge and skills in this field and recommendations from our Tanzanian partners. This has resulted in significant knowledge transfer between leading UK researchers and Tanzanian organisations who are responsible for managing or researching invasive plants. The additional institutions increased the project's geographical focus from the East Usambaras to other Eastern Arc forests and key sites such as the high profile Ngorongoro Conservation Area.

#### **Output 1: Four partner institutions able to monitor and manage the long -term eradication of IAP in the East Usambaras (increased to nine institutions)**

Three tailor-made training workshops trained 21 individuals from 9 institutions (as opposed to 30 individuals from 4 institutions for reasons explained above); 2 MSc's were trained in invasions ecology and IAP management; and a further eight Tanzanians were trained in general ecology and conservation on TBA month-long training courses. Workshop participants were selected on the basis of their potential to train others and ability to implement and influence institutional policy on alien invasives. By being selective it meant that the workshop participants were at a broadly similar skills level so that the training was tailored closely to their needs. This was seen as a more effective way of achieving the project's purpose.

The three training workshops were rated highly by the participants and received an average overall score of 4.95 where 1=very poor, 2=poor, 3= average, 4=good and 5= excellent. 100% of the participants said that they would "use the knowledge and skills gained from the workshop afterwards". The workshops also received written testimonies, for example, one participant wrote *"I am very grateful .., through this workshop; we managed to learn vital issues which will help us in our research in the future management of IAP"*

The final project workshop was modified so that it was entirely Tanzania focussed and targeted managers, decision makers and policy makers rather than researchers. The workshop, "the growing threat of alien plants in Tanzania", was attended by 30 delegates representing 18 institutions including the Tanzanian Government. 89% of the delegates said they were "very likely" and 11% said they were "likely" to "take any ideas or issues from the workshop back to their work at their own institutions". The project recommendations were presented and are now being taken up by the Division of the Environment.

## **Output 2: Invasive alien plant identification guides produced**

The most up to date database and identification guide of non-native plants in the Usambara's was produced. This is web-based. Additional guidelines on specific alien species were circulated to the participating institutions, the DI and are also available on the web.

## **Output 3: IAP management strategy**

Workshop outputs from the project were used by the Forestry and Beekeeping division to produce a section on invasive plants within their wider "Management strategy for the Eastern Arc Mountains". This will have far greater and lasting impact than producing a "stand-alone" strategy for IAPs as originally envisioned. The project also influenced a number of individual management plans so that they have either added invasive plants or strengthened the sections on invasives to include management rather than just monitoring.

## **Output 4: Publications**

The project has already resulted in 3 peer reviewed publications, 2 MSc theses, and a further 5 research project reports. These are listed in Annex 5. Further publications will include i) an assessment of the spread of *Castilla elastica* in Amani Nature Reserve (target African Journal of Ecology); ii) the role of species traits in the naturalisation of alien trees in tropical forests (target Journal of Ecology); iii) the first test of the reliability of the international Weed Risk Assessment Scheme in Africa (target Biological Conservation); and iv) an analysis of spatial spread of alien trees in Amani Nature Reserve (target Biological Invasions).

## **Additional outputs**

The project also resulted in five extra research projects and two trial management projects that were catalysed and supported through the training workshops and follow-up activities. These research projects have generated new data and identified invasion risks for the first time in key sites in Tanzania. The two trial management projects are also firsts for Tanzania.

## **Problems**

The main problem encountered by the project was that there are conflicting views on what kinds of management intervention can be used. For example, in Amani Nature Reserve, there is a ban on the use of herbicides. A further complication is that previous technical advisers encouraged the blanket rehabilitation of the Botanic Garden – which is the major source of invasive species threatening the East Usambara forests. A key lesson learned from the project is that the scale of the problem in Amani, and the conflicting priorities of different stakeholders, means that some species probably cannot be eradicated given current funding levels and attitudes. However, the issue has now been firmly placed as a priority, as a result of the project, and hence there is a high probability that local solutions will be found and implemented beyond the life of the project.

## **4.4 Project standard measures and publications**

See Annex 4 and Annex 5

Given that publications are only just appearing in press, assessing their actual impact is not possible within the lifetime of the project. Nevertheless, the evidence to date from referees reports and feedback from conferences highlights that the research undertaken as part of the Darwin Initiative project will break new ground in the study of plant invasions in tropical ecosystems. The Amani Nature Reserve is a unique resource that through its detailed planting history enables such factors as residence time and propagule pressure to be controlled for in analyses, an almost unique situation anywhere in the world. Thus the work will generate fundamental scientific insights on why certain species are invasive while other are not and what

factors may prevent invasion. In addition, two forthcoming papers are likely to have a significant impact on the discipline. One is a paper that reviews the evidence of alien species spreading from botanic gardens. In consequence, it is likely that many more botanical gardens will carry out invasive species risk assessments of their collections and management practices. The second paper tests for the first time the reliability of an international Weed Risk Assessment Scheme in Africa which is highly likely to generate the first international risk assessments elsewhere in Africa.

#### **4.5 Technical and Scientific achievements and co-operation**

A large element of the project was relevant to CBD article 18. The project transferred skills in the monitoring and management of invasive alien plant species and promoted scientific cooperation that resulted in new and relevant information on Tanzania's alien species. Full details of the research information is given in Annex 5 and can be summarised as:

##### **1) Assessment of the risks of plant invasions from Amani Botanical Garden**

Staff: Dawson, W., Burslem, DFRP, Hulme, PE, Mndolwa, A.S

Methods: 1005 plots were surveyed and invasion status of 207 species was assessed

Results: 84 alien species introduced by the Amani Botanic Garden are regenerating of which 49 have naturalised with 17 of these spread widely. A further 18 species with unclear introduction records have also naturalised.

Method of publication: peer reviewed and published in *Biodiversity and Conservation*

##### **2) Herbivory is related to taxonomic isolation, but not to invasiveness of tropical alien plants.**

Staff: Dawson W, Burslem DFRP & Hulme PE

Methods: Survey of leaf herbivory of invasive and non-invasive alien plants in Amani

Results: Levels of herbivory were related to whether or not tree had close relatives in Amani Nature Reserve, in which case levels of damage were higher likely due to shared pests.

However, levels of herbivory did not vary between invasive and non-invasive tree species.

Method of publication: peer reviewed and published in *Diversity & Distributions*

##### **3) The Invasion of humid tropical forests by *Cordia alliodora* (Boraginaceae): relative roles of disturbance, biotic resistance and propagule pressure.**

Staff: Edward E, Munishi PKT & Hulme PE

Methods: Radial transects originating from a single plantation of *Cordia alliodora* in Amani Botanical Garden were used to explore the extent of spread and environmental correlates.

Results: Likelihood of seedling, sub adult, and adult establishment was a function of distance from the plantation and this overrode any effects of native species richness or disturbance on spread.

Method of publication: peer reviewed and published in *Biotropica*

##### **4) Distribution and abundance of an alien plant *Castilla elastica* in Amani Nature Reserve, Tanzania**

Staff: Darwin Fellow: John Richard

Methods: Plotless and transect sampling of Amani Botanical Garden examined the distribution and environmental correlates of *Castilla elastica* invasion

Results: *Castilla elastica* is a pioneer species, found primarily in forest edges rather than the forest interior. The distribution is strongly associated with canopy cover and disturbance.

Method of Publication: MSc Thesis, Sokoine University of Agriculture & project website

### **5) Population status and distribution of a potential invasive alien species *Cordia alliodora* in Amani Nature Reserve, Tanzania**

Staff: Darwin Fellow: Edward Ezekial

Methods: Radial transects originating from a single plantation of *Cordia alliodora* in Amani Botanical Garden were used to explore the extent of spread and environmental correlates.

Results: Likelihood of seedling, sub adult, and adult establishment was a function of distance from the plantation and this overlaid any effects of native species richness or disturbance on spread.

Method of Publication: MSc Thesis, Sokoine University of Agriculture & project website

### **6) Farmer's attitudes to *Cedreia odorata* in Amani Nature Reserve**

ANR staff and project trainee: Mathew Mpanda

Methods: 28 farmers were surveyed

Results: The majority of farmers preferred intercropping *Cedreia* with other exotics rather than with indigenous trees or alone.

Method of publication: produced a poster; listed on Darwin project website

### **7) The spread of *Cedreia odorata* in Amani Nature Reserve**

ANR staff and project trainee: Mathew Mpanda

Methods: 72 plots in 21 hectares were surveyed

Results: *Cedreia* has spread from its plantation areas and was the most abundant species in the plots. Local farmers exhibit a preference for on-farm planting of *Cedreia* and felt that cultivation of the species is increasing

Method of publication: presented at stakeholder workshop in Dar es Salaam; listed on Darwin project website

### **8) A study of the invasion of *Cedreia odorata* in the Uluguru Mountains**

Staff- project trainees: Jasson John, Chelestino Balama & Edward Ezekiel

Methods: transect surveys were used to assess the extent to which the species, planted as a boundary marker, had spread into the forest

Results: A total of 3423.6 stems per hectare was recorded with a maximum of dbh of 65 cm and. Five other alien woody species were recorded inside the forest of which *Acacia mearnsii* poses the greatest threat.

Method of publication: presented at stakeholder workshop in Dar es Salaam

### **9) A risk assessment of alien plant species in Ngorongoro Conservation Area**

Staff- project trainees: Hassan Nkya, Hildegard Aloyce & Martina Hagwet

Methods: Transect surveys were undertaken and a systematic screening process developed during the second of the DI project's workshop used to assess the invasive potential of all alien species encountered

Results: A total of 102 alien species from 44 families and 90 genera were recorded. The risk assessment rating used suggests that of these 36 have a high potential of becoming invasive with one, *Caesalpinia decapetala*, showing the potential for ecosystem transformation.

Method of publication: presented at stakeholder workshop; listed on Darwin project website

### **10) A preliminary survey of alien plants at Saadani National Park**

Staff- project trainees: Halima Penga

Methods: ad hoc surveys of alien species and their status was conducted in Saadani National Park

Results: The knowledge of aliens among park managers was found to be low. The study recorded 12 alien species and that existing management interventions had been unsuccessful.

Method of publication: presented at stakeholder workshop in Dar es Salaam

### **11) Trial management of *Azadirachta indica* in Saadani National Park**

Staff- project trainees: Halima Penga and Dos Santo Silayo

Methods: this is the first application of experimental management plots for an invasive species in Saadani National Park

Results: ongoing

## **12) Management and control options for *Cedrela odorata* in Kimboza forest reserve**

Staff- project trainees Chelestino Balama, Edward Ezekiel. John Richard, Mathew Mpanda & Andrew Samora

Methods: experimental plots are being used to assess the effectiveness of different control measures for *Cedrela odorata*

Results: ongoing

### **4.6 Capacity building**

Capacity building was a major thrust of the project. This was achieved through tailor-made training workshops with follow-up support coupled with close involvement of the main partner institutions and through provision of resources including field manuals and equipment. The approach of running a training workshop, providing grants to participants to apply their knowledge and sharing experiences at subsequent workshops was highly beneficial. This approach ensured participation and consolidation of material taught. Evidence for increased biodiversity work that resulted directly from the capacity building activities can be seen in the 7 additional projects generated (listed above). Evidence for individual and institutional capacity building can also be seen from the feedback from trainees (summarised in 4.3).

The UK lead institution has built its own capacity in its ability to work on and provide training in invasive alien plants.

### **4.7 Sustainability and Legacy**

Several of the project achievements are likely to endure. There is now a cohort of well-trained motivated Tanzanians in the system who are playing an important role in research and management of alien plant species, in raising awareness among other stakeholders, and in influencing policy. One of the project staff is now regarded as Tanzania's expert on invasive woody plants. Those from the two Tanzanian universities wish to change the curriculum to include invasives which will have a lasting impact in terms of training the next generation of ecologists. The direct involvement of Tanzanian government institutions means that the level of awareness of the risks posed by invasives has been raised among decision makers and that project recommendations are likely to be taken up. Knowledge that risk of invasion can be predicted and management prioritized will prove invaluable to management of national parks and reserves. The recent successful test of an international Weed Risk Assessment scheme under Tanzanian conditions should stimulate wider use of this tool in the region. The database of woody invasive plants and the training manuals are enduring assets that are being hosted by the UK partner's website.

The Tanzanian project staff are continuing to work on invasives even though the project has ended. We therefore have confidence that the project legacy outlined above will continue to grow into the future.

Partners are highly likely to keep in touch now that a strong network of likeminded researchers and managers has been developed. Although the project has finished, participants continue to keep in touch with the Tropical Biology Association Nairobi Office, and several have been seeking advice from the UK and New Zealand partners. Several workshop trainees are still collaborating on management trials.

## **5 Lessons learned, dissemination and communication**

A key lesson learned is the importance of being flexible when conducting a collaborative project that tackles a locally poorly understood topic. Second, our project would not have been possible without the relationships and networks that the UK partners had already developed in Tanzania prior to the project. Third, a key focus of a single threat to biodiversity, ensured knowledge was effectively targeted and capacity developed where most precisely required.



Information relating to the project's research achievements was disseminated through peer reviewed research papers and research talks to the international conservation community. Other research talks have been specifically aimed at Tanzanian natural resource managers both in government and non-government organisations. There have also been presentations on the wider project outlining its capacity building achievements to university audiences including as Aberdeen University, Cambridge University, Lincoln University, Indian Institute of Science, Bangalore and international audiences such as CABI. The project was presented in detail at a stakeholder discussion workshop for natural resource managers and researchers.

Dissemination is likely to continue after project completion through the main partners and staff members. The continuing activities described in 4.3 and 4.7 and elsewhere in the report are generating new results and ideas, some of which will be published internationally and others will be circulated in Tanzania and through the Tropical Biology Association website and network. The TBA international field courses in Amani will also incorporate project results into their curriculum.

## **5.1 Darwin identity**

The Darwin Initiative had a high profile throughout the project and was recognised as a distinct project with a clear identity. It was widely recognised as "The Darwin Project". This is evidenced by the fact that all the project partners were aware of the Darwin initiative and both Tanzanian newspaper articles recognised the Darwin Initiative identity. The Darwin logo was used on all materials including educational posters, training guides, and the website pages. As a result there is a good understanding of the Darwin initiative among the major Tanzanian forestry institutions, university departments working in conservation and national NGO's.

## **6 Monitoring and evaluation**

No major changes were made to the project design. Some minor changes have already been described in section 4.1 and are shown in the new logframe in Annex 1. Most changes were presented in the Third Year Half Year Report sent to Darwin and an anonymous reviewer. All changes were made in response to Tanzanian partners and as a natural evolution of a project covering new ground and whose capacity building activities were tailor made to demand. A significant change was that follow-up mentoring took place after the workshops so that follow-up projects in the years intervening the workshops could be successfully implemented.

The logframe based monitoring and evaluation system of DI projects broadly works. The main problems are that projects are likely to evolve between the time of the inception and implementation (this project was first submitted over a year before its start date). During this time, new information is gathered, and host country staff can change. There was perhaps a view among the UK and Tanzania partners that the log frame could not be changed to incorporate this. Therefore, this project tended to use more specific M&E criteria on an activity by activity basis that was incorporated into subsequent activities. For example, this resulted in small changes to the content and timing of workshops not reflected in the original logframe. It was also important that the project was flexible enough to respond to ongoing evaluations so that it could have maximum impact.

During the project, there were two Darwin internal evaluations of our Annual Reports. We did not receive these until towards the end of year three so they were not as helpful as they might have been. Nevertheless we found them useful since they highlighted weaknesses in our reporting mechanisms, though thankfully, not in our project outputs.

### **6.1 Actions taken in response to annual report reviews**

We responded to all issues to the annual report reviews in the 3<sup>rd</sup> Year half Year report which is when we received the reviews. We discussed the reviews with some of our partners and other collaborators.

## 7 Finance and administration

### 7.1 Project expenditure

Project expenditure and audits for the years 2005/6 and 2006/7 have been sent by CEH Banchory. Claims were based on actual expenditure and income received. The TBA is reporting on the 2008 expenditure.

Darwin Account code	2008 budget	2008 expend	notes
Rent, rates, heating, lighting, cleaning			
Darwin funding			*1
Office costs e.g. postage, telephone, stationery			
Darwin funding			
Travel and subsistence			
Darwin funding			
Printing			
Darwin funding			
Conferences, seminars etc			
Darwin funding			
Capital items			
Darwin funding			
Others (please specify)			
Msc studentship			
Minor field equipment			
<b>salaries</b>			
Rosie Trevelyan			*2
Phil Hulme			*2
SUA advisors & field assistants			
Darwin Fellow			
Darwin Fellow			
sub-total salaries Darwin			
TOTAL DARWIN COSTS			
TOTAL COSTS FROM OTHER SOURCES			
TOTAL PROJECT COSTS, 2008	84,983	85,418	

#### Notes

\*1 under spend because CEH no longer on the contract and TBA UK received rent in kind

\*2 increased line for Rosie Trevelyan and decreased for Phil Hulme because RT took over as project leader

### 7.2 Additional funds or in-kind contributions secured

The project raised additional funds of £17,000 over and above the matching funding from NERC/ Aberdeen towards the costs of the NERC PhD research activities.

### 7.3 Value of DI funding

This project would not have been possible without DI funding. The project had a major impact on the level of awareness and knowledge of alien invasive plants in Tanzania and has changed institutional policies as a result. Neither the UK partners nor the host partners would have been able to carry out such an ambitious project without DI funding.

## Annex 1 Report of progress and achievements against final project logframe for the life of the project

Project summary	Measurable Indicators	Progress and Achievements April 2005 - March 2008
<p><b>Goal:</b> To draw on expertise relevant to biodiversity from within the United Kingdom to work with local partners in countries rich in biodiversity but constrained in resources to achieve</p> <ul style="list-style-type: none"> <li>• The conservation of biological diversity,</li> <li>• The sustainable use of its components, and</li> <li>• The fair and equitable sharing of the benefits arising out of the utilisation of genetic resources</li> </ul>		<p>The project was successful in transferring UK expertise to Tanzanian partners in order to have a positive impact on biodiversity through more active management of invasive plants in Tanzania, hence reducing the threat that invasives pose to native biodiversity. More active approaches to invasives have already been started by four Tanzanian institutions.</p>
<p><b>Purpose</b></p> <p>To empower researchers in the Tanzanian Forestry Research Institute, East Usambara Conservation Management Programme, Amani Nature Reserve and Sokoine University to map, monitor &amp; manage invasive plants in East Usambaras so as to safeguard globally important biodiversity and satisfy Tanzania's CBD obligations</p>	<p>(insert original purpose level indicators)</p> <p>Distribution maps of IAP species abundance in the main forest areas of the East Usambaras used to direct IAP control programme. Invasion scenarios for priority problem species developed. Evidence of invasive plant species eradication and/or control</p>	<p>(report on progress towards achieving the project purpose, ie the sum of the outputs and assumptions )</p> <p>Database on alien woody species fully incorporated into website and correspondence received shows that people from outside the project are using it.</p> <p>Eastern Arc Mountains Strategy incorporated the bulk of the Darwin Project's materials into section on management of invasive plant species.</p> <p>Invasion scenarios for priority problem species tested and trialled by workshop participants</p> <p>Tanzania's first experimental management trials for invasive plants are being undertaken by four institutions.</p> <p>Stakeholder workshop attended by Government staff key managers who indicated that project recommendations will be taken up.</p>
<p><b>Output 1.</b> (insert original outputs with activities relevant to that outputs in lines below.)</p> <p>Four partner institutions able to monitor and manage the long term eradication of IAP in the East Usambaras</p>	<p>(insert original output level indicators)</p> <p>A minimum of 30 staff from 4 partner institutions &amp; 2 MSc's trained in invasion ecology and IAP management</p>	<p>(report general progress and appropriateness of indicator)</p> <p>A total of 21 Tanzanians from 9 institutions were trained on the workshops. This is a revised output: the number of institutions was increased from 4 to 9 in response to wide demand for this kind of training. The number of participants was reduced to 21 in order to select participants at similar skills levels. Workshop feedback shows that the majority of participants (94%) assessed the workshops excellent. 100% of participants said they would apply the lessons learned once the Darwin project ended and 7 additional projects were generated.</p> <p>2 Tanzanians successfully completed their MSc's in invasion ecology and are currently employed in positions where they are able to apply their skills.</p>

<p>Activity 1.1 <b>insert activities relevant to this out put</b></p> <p>Three tailor-made training workshops were held in the East Usambara's and Dar es Salaam. These taught i) the ecology, mapping and monitoring of biological invasions ii) assessing invasion risks and producing invasions scenarios and iii) the management of invasive plants.</p> <p>Training materials produced (see also Activity 1.2 and Output 3)</p>	<p><b>(report completed or progress on activities that contribute toward achieving this output), and what will be carried out in the next period</b></p> <p>Completed with very positive feedback (see above) Titles of workshops were revised from original logframe. Content remained the same and/ or was expanded</p> <p>Training materials ensured that participants could apply new knowledge as well as train others in their institutions.</p>	
<p>Activity 1.2</p> <p>Follow-up support and mentoring was provided trainees to ensure application of material taught.</p>	<p>7 new projects successfully generated through this programme. 5 complete and 2 ongoing.</p>	
<p>Activity 1.3</p> <p>A stakeholder workshop for managers and decision makers presented the project recommendations; raised awareness and provided a forum for discussing the way forward for managing invasives after the life of the project.</p>	<p>This was revised from the originally planned workshop of "Invasives in East Africa" in response to demand from project partners who felt that the awareness of invasives in Tanzania was sufficiently low that the entire focus should be in Tanzania. The workshop was attended by 30 delegates representing 18 institutions including the Tanzanian Government. 89% of the delegates said they were "very likely" and 11% said they were "likely" to "take any ideas or issues from the workshop back to their work at their own institutions". The project recommendations are now being taken up by the Division of the Environment.</p>	
<p><b>Output 2. (insert original output) IAP identification guides produced</b></p>	<p><b>(insert original output level indicators)</b></p> <p>Guidelines published, 100+ copies produced/distributed as hardcopies and on web</p>	<p><b>(report general progress and appropriateness of indicator)</b></p> <p>Database (including identification guidelines) of non-native woody plants in the Usambara's was placed on the website. It was too large to distribute in hard copy.</p> <p>IAP management protocols produced and given to participating institutions as well as placed on the web.</p>
<p>Activity 2.1. Field Research Programme: Desk top research produced the IAP database. The first thorough survey of the introduced woody species to Amani Nature Reserve contributed to the IAP identification guide</p>		
<p>Activity 2.2. Manual Development: all training materials compiled so that participants can apply new knowledge and train others at their institutions. This activity also relates to Output 1</p>		

<p><b>Output 3.</b> IAP management strategy in place</p>	<p>Strategy developed in collaboration with UK and Tanzanian staff</p>	<p>A stand alone strategy for IAPs as originally envisioned was not appropriate. Instead, the project provided material and expertise for to the section on invasive plants within the “Management strategy for the Eastern Arc Mountains” produced by the Forestry and Beekeeping Division.</p> <p>The project also influenced a number of individual management plans so that they have either added invasive plants or strengthened the sections on invasives to include management rather than just monitoring</p>
<p>Activity 3.1</p> <p>Trainees and SUA staff provided input to the Forestry and Beekeeping division “Management strategy for the Eastern Arc Mountains” to ensure there was a comprehensive section invasive plants.</p> <p>Trainees reviewed their institutional management plans for inclusion and detail on invasive plants.</p>		<p>.</p>
<p><b>Output 4</b> Publications</p>	<p>2+ newspaper articles, 4+ journal papers, workshop proceedings published</p>	<p>2 newspaper articles were published in Tanzania, both of which mentioned the Darwin Initiative. It proved difficult to get newspaper articles published in the UK.</p> <p>3 journal articles have already been published or accepted and 2 more are forthcoming. This is an unusually high output for a 3 year project with relatively few experienced researchers.</p> <p>All workshop reports were placed on the website and proceedings of the stakeholder workshop (activity 1.3) circulated widely.</p>
<p>Activity 4.1. Field research is described in part in 2.1. Training was given to 2 Tanzanian MSc students and 1 UK PhD student (co-financed) in paper writing</p>		

## Annex 2 Project's final logframe, including criteria and indicators

Project summary	Measurable Indicators	Means of Verification
<p><b>Goal:</b> To draw on expertise relevant to biodiversity from within the United Kingdom to work with local partners in countries rich in biodiversity but constrained in resources to achieve</p> <ul style="list-style-type: none"> <li>• The conservation of biological diversity,</li> <li>• The sustainable use of its components, and</li> <li>• The fair and equitable sharing of the benefits arising out of the utilisation of genetic resources</li> </ul>		<p>Feedback from Tanzanian partners indicates the project was successful in transferring UK expertise and encouraging more active management of invasive plants in Tanzania, hence reducing the threat that invasives pose to native biodiversity. A global outcome, of wider relevance beyond Tanzania, is the raised awareness of the risk that tropical botanic gardens pose to the integrity of neighbouring forests. A forthcoming, peer reviewed paper highlights the steps and approaches botanic garden managers must adopt in assessing the risks of their collections to the wider environment.</p>
<p><b>Purpose</b></p> <p>To empower researchers in Tanzanian institutions with the responsibility to manage and monitor invasive plants (including the Tanzanian Forestry Research Institute, East Usambara Conservation Management Programme, Amani Nature Reserve and Sokoine University) to map, monitor &amp; manage invasive plants so as to safeguard globally important biodiversity and satisfy Tanzania's CBD obligations</p>	<p>Capacity and data generated on the ecology and spread of IAP species used to direct IAP research and management programme. Invasion scenarios for priority problem species developed. Evidence of invasive plant species management trials.</p>	<p>Database on alien woody species being used</p> <p>Increased awareness and knowledge evidenced by more information included into natural resource management strategies and management plans.</p> <p>New IAP research takes place by partner institutions, including approaches to ecology, monitoring, risk assessment and management. Invasion scenarios for priority problem species tested and trialed</p> <p>Managers and decision makers show evidence that they will adopt project outputs and give greater significance to invasive plants in Tanzania.</p>
<p><b>Output 1.</b></p> <p>At least 8 Tanzanian institutions able to monitor and manage IAP in Tanzania, with a specific focus on East Usambaras</p>	<p>A minimum of 20 staff from 8 partner institutions &amp; 2 MSc's trained in invasion ecology and IAP management</p>	<p>Workshop reports show that a total of 21 Tanzanians from 9 institutions were trained on the workshops. Workshop feedback shows that the majority of participants (94%) assessed the workshops excellent. 100% of participants said they would apply the lessons learned once the Darwin project ended.</p> <p>5 additional projects on the ecology and status of invasive alien plants were generated.</p> <p>2 experimental management trials underway</p> <p>2 Tanzanians successfully completed their MSc's in invasion ecology and are currently employed in positions where they are able to apply their skills.</p>

<b>Activity 1.1</b> Three tailor-made training workshops were held in the East Usambara's and Dar es Salaam. These taught i) the ecology, mapping and monitoring of biological invasions ii) assessing invasion risks and producing invasions scenarios and iii) the management of invasive plants. Training materials produced (see also Activity 1.2 and Output 3)		Completed with very positive feedback (see above) Training materials ensured that participants could apply new knowledge as well as train others in their institutions.
<b>Activity 1.2</b> Follow-up support and mentoring was provided trainees to ensure application of material taught.		5 project reports received and 2 management trial proposals being applied (see output 1).
<b>Activity 1.3</b> A stakeholder workshop for managers and decision makers presented the project recommendations; raised awareness and provided a forum for discussing the way forward for managing invasives after the life of the project.		The workshop was attended by 30 delegates representing 18 institutions including the Tanzanian Government. 89% of the delegates said they were "very likely" and 11% said they were "likely" to "take any ideas or issues from the workshop back to their work at their own institutions". The project recommendations are now being taken up by the Division of the Environment.
<b>Output 2.</b> IAP identification guides and management protocols produced.	1 <sup>st</sup> comprehensive data base of woody alien invasive species produced. Management protocols for Tanzanian managers distributed to partner institutions. Training materials collated and distributed to workshop participants and partner institutions	Database (including identification guidelines) of non-native woody plants in the Usambara's was placed on the website and evidence that it is used collected IAP management protocols and all training materials produced and given to participating institutions as well as placed on the web.
<b>Activity 2.1.</b> Desk top research produced the IAP database.		
<b>Activity 2.2.</b> Manual Development: all training materials compiled so that participants can apply new knowledge and train others at their institutions. This activity also relates to Output 1		
<b>Output 3.</b> Management plans and strategies include provision for monitoring and	Participating institutors assess and modify the provision for IAP management in their management plans. Management strategy for the	The project provided material and expertise for the section on invasive plants within the "Management strategy for the Eastern Arc Mountains" produced by the Forestry and Beekeeping Division.

management of IAPs	East Usambara incorporates sufficient detail on IAPs.	The project also influenced a number of individual management plans so that they have either added invasive plants or strengthened the sections on invasives to include management rather than just monitoring
<p>Activity 3.1</p> <p>Trainees and SUA staff provided input to the Forestry and Beekeeping division “Management strategy for the Eastern Arc Mountains” to ensure there was a comprehensive section on invasive plants.</p> <p>Trainees reviewed their institutional management plans for inclusion and detail on invasive plants.</p>		.
<p><b>Output 4</b></p> <p>New data on invasive alien species generated and published to assist understanding, raise awareness, and contribute to future management activities in Tanzania.</p>	<p>4+ journal papers, project outputs disseminated through stakeholder workshop proceedings. 2+ newspaper articles,</p>	<p>3 journal articles have already been published or accepted and 2 more are forthcoming. This is an unusually high output for a 3 year project with relatively few experienced researchers.</p> <p>All workshop reports were placed on the website and proceedings of the stakeholder workshop (activity 1.3) circulated widely.</p> <p>2 newspaper articles were published in Tanzania, both of which mentioned the Darwin Initiative.</p>
<p>Activity 4.1. The first comprehensive survey of the introduced woody species to Amani Nature Reserve was completed. This identified to managers the high risk species that are invasive or could become invasive.</p> <p>Five additional research projects generated new data on the status of invasive species in the East Usambaras, the Ulugurus, the Ngorongoro Conservation Area and Sadaani Nation Park. (see output 1). Two trial management protocols are underway.</p> <p>Training was given to 2 Tanzanian MSc students and 1 UK PhD student (co-financed) in paper writing</p>		



## Annex 3 Project contribution to Articles under the CBD

### Project Contribution to Articles under the Convention on Biological Diversity

Article No./Title	Project %	Article Description
6. General Measures for Conservation & Sustainable Use		Develop national strategies that integrate conservation and sustainable use.
7. Identification and Monitoring		Identify and monitor components of biological diversity, particularly those requiring urgent conservation; identify processes and activities that have adverse effects; maintain and organise relevant data.
8. In-situ Conservation	40	Establish systems of protected areas with guidelines for selection and management; regulate biological resources, promote protection of habitats; manage areas adjacent to protected areas; restore degraded ecosystems and recovery of threatened species; control risks associated with organisms modified by biotechnology; control spread of alien species; ensure compatibility between sustainable use of resources and their conservation; protect traditional lifestyles and knowledge on biological resources.
9. Ex-situ Conservation		Adopt ex-situ measures to conserve and research components of biological diversity, preferably in country of origin; facilitate recovery of threatened species; regulate and manage collection of biological resources.
10. Sustainable Use of Components of Biological Diversity		Integrate conservation and sustainable use in national decisions; protect sustainable customary uses; support local populations to implement remedial actions; encourage co-operation between governments and the private sector.
11. Incentive Measures		Establish economically and socially sound incentives to conserve and promote sustainable use of biological diversity.
12. Research and Training	40	Establish programmes for scientific and technical education in identification, conservation and sustainable use of biodiversity components; promote research contributing to the conservation and sustainable use of biological diversity, particularly in developing countries (in accordance with SBSTTA recommendations).
13. Public Education and Awareness	20	Promote understanding of the importance of measures to conserve biological diversity and propagate these measures through the media; cooperate with other states and organisations in developing awareness programmes.
14. Impact Assessment and Minimizing Adverse Impacts		Introduce EIAs of appropriate projects and allow public participation; take into account environmental consequences of policies; exchange information on impacts beyond State boundaries and work to reduce hazards; promote emergency responses to hazards; examine mechanisms for re-dress of international damage.
15. Access to Genetic Resources		Whilst governments control access to their genetic resources they should also facilitate access of environmentally sound uses on mutually agreed terms; scientific research based on a country's genetic resources should ensure sharing in a fair and equitable way of results and benefits.

<b>Article No./Title</b>	<b>Project %</b>	<b>Article Description</b>
16. Access to and Transfer of Technology		Countries shall ensure access to technologies relevant to conservation and sustainable use of biodiversity under fair and most favourable terms to the source countries (subject to patents and intellectual property rights) and ensure the private sector facilitates such assess and joint development of technologies.
17. Exchange of Information		Countries shall facilitate information exchange and repatriation including technical scientific and socio-economic research, information on training and surveying programmes and local knowledge
19. Bio-safety Protocol		Countries shall take legislative, administrative or policy measures to provide for the effective participation in biotechnological research activities and to ensure all practicable measures to promote and advance priority access on a fair and equitable basis, especially where they provide the genetic resources for such research.
Other Contribution		Smaller contributions (eg of 5%) or less should be summed and included here.
Total %	100%	Check % = total 100

## Annex 4 Standard Measures

Code	Description	Totals (plus additional detail as required)
<b>Training Measures</b>		
1a	Number of people to submit PhD thesis	1 this is an additional training measure that was added through co-financing after the project was accepted
1b	Number of PhD qualifications obtained	
2	Number of Masters qualifications obtained	2
3	Number of other qualifications obtained	
4a	Number of undergraduate students receiving training	
4b	Number of training weeks provided to undergraduate students	
4c	Number of postgraduate students receiving training (not 1-3 above)	6
4d	Number of training weeks for postgraduate students	24
5	Number of people receiving other forms of long-term (>1yr) training not leading to formal qualification( ie not categories 1-4 above)	
6a	Number of people receiving other forms of short-term education/training (ie not categories 1-5 above)	21
6b	Number of training weeks not leading to formal qualification	63
7	Number of types of training materials produced for use by host country(s)	5
<b>Research Measures</b>		
8	Number of weeks spent by UK project staff on project work in host country(s)	18
9	Number of species/habitat management plans (or action plans) produced for Governments, public authorities or other implementing agencies in the host country (s)	The Tanzanian government authorities produced a management strategy for Eastern Arc Forests as a whole, and the project provided the information on invasive species for this.
10	Number of formal documents produced to assist work related to species identification, classification and recording.	100
11a	Number of papers published or accepted for publication in peer reviewed journals	3
11b	Number of papers published or accepted for publication elsewhere	5 project reports produced internally and available on website Other papers are listed in 11a: rather than aiming for 11b as in the original application, the project aimed for 11a

<b>Code</b>	<b>Description</b>	<b>Totals (plus additional detail as required)</b>
12a	Number of computer-based databases established (containing species/generic information) and handed over to host country	2
12b	Number of computer-based databases enhanced (containing species/genetic information) and handed over to host country	
13a	Number of species reference collections established and handed over to host country(s)	
13b	Number of species reference collections enhanced and handed over to host country(s)	
<b>Dissemination Measures</b>		
14a	Number of conferences/seminars/workshops organised to present/disseminate findings from Darwin project work	5: this is an additional output to the original proposal
14b	Number of conferences/seminars/ workshops attended at which findings from Darwin project work will be presented/ disseminated.	4
15a	Number of national press releases or publicity articles in host country(s)	2
15b	Number of local press releases or publicity articles in host country(s)	
15c	Number of national press releases or publicity articles in UK	The NERC press office did not release any press releases as originally envisaged. This is partly because of difficulties encountered as CEH Banchory closed down
15d	Number of local press releases or publicity articles in UK	
16a	Number of issues of newsletters produced in the host country(s)	
16b	Estimated circulation of each newsletter in the host country(s)	
16c	Estimated circulation of each newsletter in the UK	
17a	Number of dissemination networks established	1: this is an additional output compared with the original application.
17b	Number of dissemination networks enhanced or extended	
18a	Number of national TV programmes/features in host country(s)	
18b	Number of national TV programme/features in the UK	
18c	Number of local TV programme/features in host country	
18d	Number of local TV programme features in the UK	

<b>Code</b>	<b>Description</b>	<b>Totals (plus additional detail as required)</b>
19a	Number of national radio interviews/features in host country(s)	
19b	Number of national radio interviews/features in the UK	
19c	Number of local radio interviews/features in host country (s)	1: this is an additional output compared with the original application
19d	Number of local radio interviews/features in the UK	
<b>Physical Measures</b>		
20	Estimated value (£s) of physical assets handed over to host country(s)	£1,200
21	Number of permanent educational/training/research facilities or organisation established	
22	Number of permanent field plots established	104
23	Value of additional resources raised for project	£20,000
<b>Other Measures used by the project and not currently including in DI standard measures</b>		

## Annex 5 Publications

Publications marked \* are included in the supporting materials accompanying this report

Type * (eg journals, manual, CDs)	Detail (title, author, year)	Publishers (name, city)	Available from (eg contact address, website)	Cost £
Journal	* Dawson W, Mndolwa AS, Burslem DFRP & Hulme PE (2008) Assessing the risks of plant invasions arising from collections in tropical botanical gardens. <i>Biodiversity &amp; Conservation</i> doi 10.1007/s10531-008-9345-0	Blackwells	Journal website	Free to subscribers
Journal	*Dawson W, Burslem DFRP & Hulme PE (2009) Herbivory is related to taxonomic isolation, but not to invasiveness of tropical alien plants. <i>Diversity &amp; Distributions</i>	Blackwells	Journal website (once in print)	Free to subscribers
Journal	*Edward E, Munishi PKT & Hulme PE (2009) The Invasion of Humid Tropical Forests by <i>Cordia alliodora</i> (Boraginaceae): Relative Roles of Disturbance, Biotic Resistance and Propagule Pressure. <i>Biotropica</i>	Blackwells	Journal website (once in print)	Free to subscribers
MSc	Distribution and abundance of an alien plant <i>Castilla elastica</i> in Amani Nature Reserve, Tanzania, Richard J, 2007	SUA, Morogoro	From SUA	Free
MSc	Distribution and abundance of an alien plant <i>Castilla elastica</i> in Amani Nature Reserve, Tanzania, Edward E, 2007	SUA, Morogoro	From SUA	Free

### Annex 5 b: Research project reports and conference talks

#### Conference Talks

- Wayne Dawson, David F.R.P. Burslem, Philip E. Hulme and Ahmed S. Mndolwa What determines plant invasion success? A case study of Amani Botanical Garden, East Usambaras, Tanzania *the 9<sup>th</sup> International Conference on the Ecology and Management of Invasive Plants, 17<sup>th</sup>-21<sup>st</sup> September, 2007, Perth, Australia*
- Wayne Dawson, David FRP Burslem and Philip E Hulme What determines plant species invasiveness? A case study of Amani Botanical Garden, East Usambara Mountains, Tanzania. *British Ecological Society Annual Meeting, September 2007, University of Glasgow.*
- Wayne Dawson, David F.R.P. Burslem, Philip E. Hulme and Ahmed S. Mndolwa What determines plant invasion success? Testing traits with tropical trees in Amani Botanical Garden. Tanzania. *20<sup>th</sup> Annual Meeting of the German Society for Tropical Ecology, 21<sup>st</sup>-25<sup>th</sup> February 2007, Alexander Koenig Museum, Bonn, Germany.*

- Wayne Dawson, David FRP Burslem and Philip E Hulme. Aliens in Amani: assessing plant traits and quantifying the threat of forest invasions *British Ecological Society Annual Meeting, September 2006, University of Oxford.*

#### **Education poster**

- Spishi za mimea vamizi isiyo ya asili Tanzania ni Zipi? Esther F Mvungi
- What are invasive species? Esther F Mvungi

#### **Follow-up research projects by Darwin workshop participants**

- Cultivation of *Cedrela odorata*: an alien species (Matthew Mpanda)
- *Cedrela odorata* invasion in the Uluguru Mountains (Jasson John, Chelestino Balama & Edward Ezekiel)
- Results of a risk assessment of alien plant species in Ngorongoro (Hassan Nkya, Hildegard Aloyce & Martina Hagwet)
- Risks associated with alien plants at Saadani National Park (Halima Penga)
- Spread of *Cedrela odorata* in Amani Nature Reserve (Mathew Mpanda)

#### **Follow-up management trials by Darwin workshop participants**

- Management and control of *Azadirachta indica* in Saadani National Park, Tanzania. (Halima Penga & Dos Santos Silayo)
- Management and control options for *Cedrela odorata*, a potential invasive woody species in Kimboza forest reserve, Morogoro, Tanzania. (Samora M. Andrew, John Richard, Chelestino Balama & Edward Ezekiel)

## Annex 6 Darwin Contacts

Ref No	162/13/033
Project Title	Combating alien invasive plants threatening the East Usambara mountains in Tanzania
<b>UK Leader Details</b>	
Name	Rosie Trevelyan
Role within Darwin Project	Liaison with Tanzanian partners, Lead on the capacity building
Address	Tropical Biology Association, Dept Zoology, Downing Street, Cambridge, CB2 3EJ
Phone	
Fax	
Email	
<b>Other UK Contact (if relevant)</b>	
Name	Phil Hulme
Role within Darwin Project	Principle investigator for research, trainer (former leader)
Address	PO Box 84 Lincoln University Canterbury, New Zealand (formerly CEH, Banchory, now closed)
Phone	
Fax	
email	
<b>Partner 1</b>	
Name	Corodius Sawe
Organisation	Amani Nature Reserve
Role within Darwin Project	Lead Tanzanian partner for training and research
Address	PO Box 1, Amani, Tanga, Tanzania
Fax	
Email	
<b>Partner 2 (if relevant)</b>	
Name	Pantaleo Munishi
Organisation	Sokoine University of Agriculture
Role within Darwin Project	Supervisor of MSc project, workshop teacher
Address	P.O.BOX 3000 Chuo Kikuu, Morogoro
Fax	
Email	



## **Additional Annexes to the Report (see also supporting materials)**

- Annex 5b**      **List of research outputs (see Annex 5)**
- Annex 7a:**      **List of workshop trainees**
- Annex 7b:**      **List and contacts of delegates at stakeholder discussion workshop**
- Annex 8:**      **Workshop assessments and feedback**
- Annex 9:**      **Report from stakeholders on Darwin Project outputs with statement from the Minister**

**Annex 7 a) List of workshop trainees 2006 to 2008**

<b>Institution</b>	<b>Name</b>	<b>Position/Dept</b>	<b>Year of workshop</b>		
<b>Collage African Wildlife Management-Mweka</b>	Martina Hagwet Boay	Assistant Lecturer	2006	2007	2008
<b>Forest and Beekeeping Division</b>	Mathew Mpanda	Research and Training Officer	2006	2007	2008
<b>Sokoine University of Agriculture</b>	Christina M. Ngalawa	Research Assistant	2006		2008
	Ezekiel Edward	MSc Student	2006	2007	2008
	Raymond Killenga	Assistant regional Manager	2006		2008
	John Richard	Forest Research Officer	2006	2007	2008
	Andrew Samora M	Forest Biology		2007	2008
	Dos Santos Silayo	Forest ecology	2006		2008
<b>Tanzania Forest Conservation Group</b>	Simon Mosha	Senior Project Officer	2006		2008
<b>Tanzania Forest Research Institute</b>	Ahmed Mndolwa	Forest Research Officer	2006	2007	
	Chelestino Balama	Research Officer	2006	2007	2008
	Nancy Eliad Pima	Forest Research Officer	2006	2007	
	Zakia Hassan	Research Officer	2006		
	Hamza Khalid Kija	Research Scientist	2006		
	Wilfred Njama Marealle	Research Assistant	2006		
<b>Tanzania National Parks</b>	Banga Paul B.	Udzungwa Mts. National Park		2007	
<b>Tanzania Wildlife Research Institute</b>	Penga Halima R.	Sadaani National Park		2007	2008
	Nkya Hassan M.	Head Office, Arusha		2007	
<b>University of Dar es Salaam</b>	Esther F. Mvungi	Assistant Lecturer	2006	2007	
	Jasson John	Assistant Lecturer	2006	2007	2008
<b>Wildlife Conservation Society</b>	Aloyce Hildergarde	Wildlife management Areas		2007	2008

**Annex 7 b) List of Tanzanian participating institutions in stakeholder workshop (excludes UK partners)**

<b>Delegate</b>	<b>Institution</b>	<b>Department/Work Station</b>
Dr. Mohamed Rose-Anne	Ministry of Agriculture	Plant Health Services
Mr. Celestino Balama	Tanzania Forestry Research Institute	Morogoro Office
Mr. Corodius Sawe	Amani Nature Reserve	Amani
Mr. Dos Santos Silayo	Sokoine University of Agriculture	Forest Engineering
Mr. Francis Sabuni	Eastern Arc Mts Conservation Endowment Fund	Morogoro
Mr. Inyasi Lejora	Tanzania National Parks	Arusha
Mr. Jasson R. M. John	University of Dar es Salaam	Botany
Mr. John Richard	Tanzania Forestry Research Institute	Lushoto Silviculture Res. Centre
Mr. Joseph Marco	Daily News	News
Mr. Lawrence Mbwambo	Tanzania Forestry Research Institute	Morogoro
Mr. Lota Melamari	Wildlife Conservation Society of Tanzania	Dar es Salaam
Mr. Mathayo M. Mathew	Sokoine University of Agriculture	Forest Mensuration & Managemt
Mr. Nasser Kigwangallah	The Guardian	News
Mr. Raymond R. Killenga	Forestry and Beekeeping Division	Tanga Catchment Forestry
Mr. Richard Muyungi	Vice President's Office, Rep. of Tanzania	Division of Environment
Mr. Samora M. Andrew	Sokoine University of Agriculture	Forest Biology
Mr. Simon Mosha	Tanzania Forest Conservation Group	Dar es Salaam
Mr. Stephen Mariki	World Wide Fund for Nature	Tanzania Programme Office
Mr. Thomas Bwana	Vice President's Office, Rep. of Tanzania	Division of Environment
Mr. Wayne Dawson	Aberdeen University	Centre of Ecology and Hydrology
Mrs. Halima R. Penga	Tanzania National Parks	Saadani National Park
Ms. Christina M. Ngalawa	Sokoine University of Agriculture	Forest Mensuration & Managemt
Ms. Ezekiel Edward	Sokoine University of Agriculture	Forest Biology
Ms. Hildergarde Aloyce	Community Conservation Films Project	Dar es Salaam
Ms. Nike Daggart	Tanzania Forest Conservation Group	Dar es Salaam
Prof. Pantaleo Munishi	Sokoine University of Agriculture	Forest Biology
Prof. Seif S. Madoffe	Sokoine University of Agriculture	Forest Biology

## Annex 8: Workshop assessments and feedback

The full list of questions and assessments of each workshop are included in the accompanying material.

How much have you worked on aliens	Survey of trainees 2006
not at all	53%
a little	40%
a moderate	7%
a lot	0%

	% respondents – all years
<b>How did you rate the workshop overall</b>	
1. Very poor	
2. Poor	
3. Average	
4. Good	6%
5. Excellent	94%
<b>How did you rate the teaching on the workshop</b>	
1. Very poor	
2. Poor	
3. Average	
4. Good	3.5%
5. Excellent	96.5%
<b>Would this workshop have been useful to others in your institution?</b>	
1. not useful	
2. somewhat useful	
3. useful	17%
4. very useful	83%
<b>Do you think you will use the knowledge and skills gained from the workshop afterwards?</b>	
no	
yes	100%

### Selection of participants comments

#### Workshop 1

- *I have been inspired to do my MSc on invasive plants*
- *Knowledge gained will be useful to my institution*

#### Workshop 2

- *I am very grateful ..., through this workshop; we managed to learn vital issues which will help us in our research in the future management of IAP"*
- *I have learned lot and knowledge gained is .. really practical*
- *The workshop was very well organised and conducted*

#### Workshop 3

- *Fantastic workshop, the support of Tanzania Government through VPO's [Vice President's Office] is highly acknowledged and an opportunity not to loose [lose]*
- *The concept was very well covered. Very useful comments*
- *Well organised. Involved many potential stakeholders*



## The growing threat of invasive alien plants in Tanzania

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**Report of Stakeholder Workshop to Discuss the Darwin Initiative Project:  
*Combating Invasive Alien Plants threatening the East Usambara Mountains, Tanzania***

Peacock Hotel, Dar es Salaam: 1<sup>st</sup> February 2008



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<http://www.tropical-biology.org/research/dip/darwin.htm>

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# The growing threat of alien plants in Tanzania:

## Lessons from the Eastern Arc and beyond

Peacock Hotel, Dar es Salaam: 1 Feb 2008

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### Participating institutions

The workshop brought together 30 participants from the following institutions:

Aberdeen University

Community Conservation Films Project

Division of Environment, VP's Office, Republic of Tanzania

Eastern Arc Mountains Conservation Endowment Fund

Forestry and Beekeeping Division (FBD) of the Ministry of Natural Resources and Tourism

- Amani Nature Reserve

- Tanga Catchment Forestry

National Centre for Advanced Bio-Protection Technologies, University of Lincoln New Zealand

Plant Health Services, Ministry of Agriculture

Sokoine University of Agriculture

Tanzania Forest Conservation Group

Tanzania Forestry Research Institute

Tanzania National Parks

Tropical Biology Association, UK and Kenya

University of Dar es Salaam

Wildlife Conservation Society of Tanzania

World Wide Fund for Nature – Tanzania Programme Office

(**Apologies:** Conservation and Management of the Eastern Arc Mountain Forests Project, IUCN Tanzania Office, National Environment Management Council, and Tanzania Wildlife Research Institute)

### List of presentations on the Darwin Project's activities

- Introduction to the problem of alien species. Summary and recommendations from the three year Darwin Project's research activities,
- Summary of the project's capacity building activities and their outputs,
- The ecology and threat of alien plants in East Usambara,
- Population status and distribution of *Cordia alliodora* in Amani Nature Reserve
- The potential threat of *Castilla elastica* in East Usambaras
- Spread of *Cedrela odorata* and attitudes of local farmers
- Are forest boundaries of *Cedrela odorata* a threat in Uluguru Mountains?
- Results of a risk assessment of alien plant species in Ngorogoro Conservation Area
- Management and risks of alien plants in Saadani National Park

### Outcomes of the workshop discussions

#### 1) **Current level of management activities on invasive alien plants in Tanzania**

The workshop listed the plant species that have been subject to some management activities. Aside from water hyacinth, there has been relatively little management of alien invasive plants in Tanzania. Management activities that have taken place have tended to be small in extent and, crucially, there has been little monitoring or publication of results.

## **2) How well do existing management plans cater for alien species management**

Several, though not all, management plans specify inventorying, control and monitoring as part of alien species management, while a few also advocate restoration. For example, TANAPA advocates removal of all alien species from protected areas, coupled with conducting monitoring programmes and restoration activities where necessary. Some management plans mention specific species (such as *Maesopsis emenii* and *Psidium cattelium* in the ANR GMP, and *Senna spectabilis* in TANAPA) while others do not.

## **3) The main barriers and constraints to managing alien invasive plants in Tanzania**

The workshop identified the following key barriers that are hindering the effective management of invasive alien plants in Tanzania

- Insufficient knowledge and awareness of the threats and impacts of invasive plants at all levels (from institutional to local communicates)
- Lack of understanding of appropriate technology and methods for control of aliens (especially concerning chemical control methods)
- Insufficient access to information on ecology of invasives as well as guidelines for their control
- Inadequate capacity (people and finances)
- Inadequate communication and sharing of information between the different sectors concerned with invasive alien plants
- Lack of national mainstreaming of acts and policies, etc. to cover all environments in Tanzania and existing legislation not always implemented

## **4) Recommendations to managers on the way forward to managing alien invasive plants in Tanzania**

### ***a) Effective legislation for the management of invasive species***

Management plans need to include adequate detail for the management and control of invasive species and existing legislation and management plans needs to be implemented.

### ***b) Raise awareness and build capacity among all stakeholders***

In order for this to be effective, players such as FBD, NGO's and Universities need to have sufficient understanding of alien invasive plants so that they can communicate clear messages. The outcome of awareness raising activities should include less planting of invasives near forest boundaries, a greater commitment of funds nationally and internationally to address the issue and a greater component of invasive species ecology and management in Tanzania's university curricula.

### ***c) Carry out capacity building activities in invasive plant risk assessment and management***

While the project made an important contribution to Tanzania's capacity research and manage invasive plants, capacity building activities are needed among managers from a wider sector.

### ***d) Establish pilot control studies into the effectiveness of different management methods and carry out long term monitoring of management interventions currently underway***

### ***e) Create a national database and network for sharing information on invasive alien species***

Information on the status of invasive species and their management is currently scattered among institutions and not readily available. Therefore, a national database is required that can be

accessed by all stakeholders. Surveys of the abundance and distribution of invasive species in less well known areas are required in order to assess their threat elsewhere in Tanzania.

***f) Promote and research the use of alternative, non invasive, species for agricultural and forestry activities and investigate the trade-offs between ecological impacts and economic impacts of invasive plants***

**5) Statement made by Mr. Richard Muyungi, Acting Director, Division of Environment, Vice President's Office, Republic of Tanzania, focal contact for the CBD**

"Invasive species have been identified worldwide as one of the main threats to the environment and its biodiversity. Tanzania puts much value to its environment as it provides resources for virtually all national socio-economic activities. We believe a healthy and resilient environment is the basis for our livelihood and foundation for eventual alleviation of abject poverty in the country. As a country, we have taken steps to ensure our environment is protected through policy and legal frameworks and institutional arrangements. Tanzania is a signatory to Convention on Biological Diversity (CBD). By ratifying to the CBD we have in part committed ourselves "to strictly control the introduction of non-indigenous species" to Tanzania. I am pleased to inform you that my office's serves as Tanzania's focal point to the CBD and as a Division, we take great interest on issues of invasive alien plants.

Ladies and gentlemen, the Division of Environment's assessment indicate that, we have made little but growing progress in managing invasive alien plants existing in our country. Already, NEMC, TAFORI, TANAPA, etc, have made major steps in addressing this issue and have some programmes of invasive alien plants management. More important, as a country, we now appreciate that invasive alien plants are a major threat to our rich biological resources and the discussions here today will attest to that. Further, we recognise the limited national expertise to tackle invasive alien plants and the general lack of interest and awareness on the threats invasive species pose to our environment. I am pleased that this project has tackled these challenges as you have all heard from the results presented here today.

I am confident that we have all, not only learnt a great deal today, but also gained invaluable insights and understanding of invasive species in Tanzania. We must now take the bull by its horns and translate the excellent results presented here and the outputs of this workshop to do something for our country. As persons and institutions able to influence policy in this country, it is imperative that we:

- prevail upon our leaders to establish an all inclusive national action plan on IAPS
- continue to create awareness on this grave problem threatening our natural inheritance
- work towards developing programmes that go beyond the current project to ensure continued monitoring and ultimately management of invasive alien plants in this country
- Strengthen the network of individuals and institutions already formed by this project so that they can be more effective in their work on tackling the risks Invasive alien plants pose to our environment.

The Division, ladies and gentlemen, works to formulate policies on the environment, and co-ordinate and monitor environmental issues as well as environmental planning. We share the country's concern on invasive plants and we will take upon ourselves the task of ensuring that recommendations from this project, as well as deliberations from our discussions today are



strategically applied in improving how we manage invasive alien plants, not only in the Eastern Arc region, but in Tanzania as a whole.

Finally, I thank all institutions involved in this project for their good work. My office recognises and is highly encouraged by this initiative and want to guarantee you that the findings from this project will be used to contribute to our reports for the CBD. I also want to thank the Darwin Initiative of the British government for financial support that allowed you undertake this work. Last but not least, I acknowledge the hard work and commitment of the project team for finding it fit to come and share their excellent results with us today. With those few remarks, let me take this opportunity to wish you a safe journey back to your institutions.

Thank you.