



Darwin Initiative Main Project Annual Report

Important note: *To be completed with reference to the Reporting Guidance Notes for Project Leaders:
 it is expected that this report will be about 10 pages in length, excluding annexes*

Submission Deadline: 30 April

Darwin Project Information

Project Reference	21-002
Project Title	Building mycological capacity for sustainable resource management in Lao PDR
Host Country/ies	Lao PDR
Contract Holder Institution	The James Hutton Institute, Invergowrie, Dundee, DD2 5DA, UK
Partner institutions	Royal Botanic Garden Edinburgh; Biotechnology and Ecology Institute, Ministry of Science and Technology, Laos
Darwin Grant Value	£243619
Funder (DFID/Defra)	Defra
Start/end dates of project	April 2014 – March 2017
Reporting period (e.g., Apr 2015 – Mar 2016) and number (e.g., Annual Report 1, 2, 3)	April 2014 _ March 2015. Annual report year 1
Project Leader name	Andrew Taylor
Project website/blog/Twitter	http://www.hutton.ac.uk/research/projects/building-mycological-capacity-sustainable-resource-management-lao-pdr
Report author(s) and date	Andrew Taylor, Mark Newman, Kongchay Phimmakong, April 2015

1. Project Rationale

Lao PDR (Fig. 1) is one of Asia's most forested countries and supports some of the richest biodiversity within the region. However, Lao is also one of the poorest countries within the region with ca. 75% of the population still relying upon non-timber forest products for food and income generation. Fungi have long been utilised in this context being consumed by locals but also sold at markets and, increasingly, exported to neighbouring countries – often in large quantities. Fungi are pivotal organisms in forest ecosystems but in Lao their functions and diversity are virtually unknown: they are absent from the Laotian National Biodiversity Strategy to 2020. This is despite the fact that fungi constitute a major income source in some regions. This project originated from an expression of need raised by the Lao biological community for training and capacity building to enable Lao to realise its commitments to the CBD and manage the mycological resources sustainably.

The project addresses the lack of formal mycological expertise *via* a number of avenues. These include training workshops, both theoretical and practical, and the establishment of a National reference collection of mycological materials, including dried fungal collections. A basic molecular laboratory will also be established to allow the extraction and amplification of DNA from fungal materials. This laboratory will also act as a focal point to encourage foreign interest and visits. There is anecdotal evidence that between 15-20 people succumb to often fatal fungal poisoning each year. The project will establish if there is evidence that this is correct and, if so, how measures can be taken to reduce this number. In collaboration with local aid agencies, field studies will be carried out to assess the ecological and economic importance of wild fungi harvesting. In particular, a special study will be made of the highly-prized Matsutake mushroom as recent international interest may be encouraging unsustainable harvesting techniques in Xieng Khouang province (Fig.1), where it is collected for export to China and Japan.



Figure 1. Political map of Lao PDR. The capital Vientiane and Xieng Khouang province, where training courses are given and a study of the ecology and harvesting techniques for the Matsutake mushroom are studied, respectively.

2. Project Partnerships

There are a number of partners within the project and they can be grouped based on their roles within the project.

Partners within Laos:

The main partner in Laos is the Biotechnology and Ecology Institute (BEI), with the main contact person being Ms Kongchay Phimmakong, Director, Technical Service Division. Dr Souriodong, who was the named partner in the application has been promoted within the ministry and is no longer directly involved in the project. There is still close contact between Dr Souriodong and Ms Phimmakong and his support for the project still apparent. The partnership with BEI has developed well during the first year of the project, with Ms Phimmakong acting as coordinator for logistics during the four visits to Laos made during the reporting period. The involvement of ministerial personnel within Laos is critical in initiating contacts and arranging visits to other ministries and other national institutions. Members of Ms Phimmakong's staff have provided excellent support during visits with transportation, secretarial and translation issues.

Also within BEI, Mrs Somsanit Bouamanivong, Director, Ecology Division, who is also head of the National Herbarium of Lao PDR, has been directly involved in planning and development of the project. The National Herbarium under Mrs Bouamanivong is the recipient of equipment and several of the outputs generated from the project. There has been regular contact between the PI and Mrs Bouamanivong including four face to face meetings. Two staff members from the herbarium will participate in the course in May 2015. Mrs Bouamanivong was involved in the development of Outputs 1 and 2: Establishing a reference database and fungal collection (see section 3 for further details).

An inaugural project management meeting was held in May 2014 at BEI in Vientiane at which all Laotian partners were represented. It was decided during this meeting that BEI would act as the main contact point for the project for dealing with other Ministries and Institutes. Ms Phimmakong and Mrs Bouamanivong are both closely involved in the development and planning of the project.

National University of Laos: The partnership with the University has strengthened greatly in the reporting period. The Dean of the Science Faculty, Dr Somchanh Bounphanmy, has been very supportive of the project and has allocated the project two laboratories rooms within the department of Biology to house proposed molecular laboratory at the University. A staff member of the Biology Department, Mrs Toulaphone Keokene, has also been given responsibility for overseeing the establishment and running of the laboratory. Mrs Keokene and the PI are in regular email contact and have also had two face to face meetings during the reporting period. Mrs Keokene will participate in the training course to be held 4-8th May 2015 and is also responsible for selecting students for the training course (two MSc students will attend the course). The partnership at the University has established the basis for part of Output 2: a functional molecular laboratory (see section 3 for further details).

IUCN Laos: The named partner Mr Banethom Thepsombath has left IUCN and the main contact person is now Adam T. Starr MSc., Country Manager, Lao PDR Country Program. The PI has regular contact with Adam and has had two face to face meetings to discuss project planning and logistics.

AgroBiodiversity Project (ABP): Mr Ole Pedersen is chief technical advisor in the ABP and has been proactive from the inception of this project. Ole has been invaluable for the development of the project, with his local knowledge and network of contacts and the partnership has greatly strengthened in the reporting period. Ole has been integral in project planning and development and to achieving several of the project outputs (see section 3).

The Agrobiodiversity Initiative (TABI): Mr Chris Flint is chief technical advisor at TABI. A meeting was held in Vientiane in May 2014 between the PI, Ole Pedersen and Chris Flint. Plans were drawn up for joint field work to determine aspects of the harvesting of Matsutake in a number of villages in Xieng Khouang province. Unfortunately, this potentially very effective collaboration between the aid agencies and the project did not work out and joint ventures with TABI have not advanced.

New Contacts in Laos:

A visit was arranged, *via* Ole Pederson (ABP) to the **Plant Pathology group**, Ministry of Agriculture, in Vientiane during the visit in November 2014. Mrs Viengkham Sengsourivong, who heads the group, was very interested in the project and keen for her junior colleagues to take part in the training workshops: two of whom will participate in the training course in May 2015.

Contact was made *via* Alex Needham at the British Embassy with Professor Paul Newton who heads a Wellcome Trust Oxford based research group embedded within the Microbiology Laboratory of Mahosot Hospital, Vientiane. Prof Newton and his team are interested in the problem of fungal poisonings and the PI has been in regular contact with him via email and one face to face meeting (discussed further in section 3). Prof Newton is involved in developing Output 3: Report on poisonous fungi and poisonings in Laos (see section 3 for further details).

UK Partners:

Mark Newman, based at the **Royal Botanic Garden Edinburgh**, is the sole UK partner. Mark's experience in working in Laos and his linguistic skills have been invaluable during the reporting period. The PI and Mark are in regular contact *via* email and face to face meetings, as well as a project visit to Laos to develop the infrastructure of the project.

European partners:

The PI has been in regular contact with the three academic partners (Prof. Urmas Kõljalg, Estonia; Prof Mieke Verbeken, Gwent; Dr Manfred Binder, Munich) to develop strategies and ideas for knowledge transfer and for achieving the outputs for the project, especially Outputs 1, 2 and 3.

Achievements, lessons, strengths or challenges with partnership

Most of the partnerships have functioned well during the reporting period with progress made towards several outputs (detailed in section 3). The main lesson has been that face to face meetings are an essential pathway to facilitate and foster understanding among and between partners. The greatest strength has been the partnership with BEI, facilitated by Ms Kongchay Phimmakong, Director, Technical Service Division. This has been crucial to the project. In addition, Ole Pederson, in both a professional and a personal capacity, has been very supportive and critical to the success of the project so far (see below). There have been a number of challenges during the first year of the project. The greatest of these involved the establishment of the molecular laboratory. The original plan was for this to be part of an existing facility at BEI. Unfortunately, this did not work out at a rather late state in the reporting period. Finding a new venue and institutional support was a major challenge as this had to be achieved within the 2014/15 financial year. Fortunately the contacts established earlier in the year at the National University of Laos provided an excellent alternative.

3. Project Progress

3.1 Progress in carrying out project activities

Output 1: *Mycological training workshops involving international experts training national participants. Establishment of databases.*

Activity 1.1: Visits were made by the PI to Laos in May and November 2014 and March 2015. During each visit, a considerable amount of time and effort was given to establishing contacts within different Ministries and Institutions and generating interest in project. This was done through face to face meetings and discussions. Whenever possible, commitments for participation in training workshops were sought. This has been successful with 9 participants attending the workshop in May 2015. The training workshop in May 2015 will take place at BEI under the auspices of Mrs Bouamanivong, using equipment already acquired through the project (see Activity 2.1).

Activity 1.2: Two visits to Laos involving international experts were planned for 2014, one in July and the other in November. The first visit included the PI and Neville Kilkenny (affiliated with RBGE) on a combined field study with Ole Pederson (ABP). The aims were to gather data on the ecology and harvesting of fungi Laos, in particular Matsutake, and to field train local members of the Ministry of Agriculture and Forestry. Unfortunately, due to ill-health the PI had

to cancel the trip. However, Ole Pederson and his team succeeded in carrying out the study (see Appendix 4A). The 2nd visit in November involved the UK and two European experts. Due to prior academic commitments it was not possible to arrange this visit earlier in the year during the fruiting season. This visit therefore focused on creating a database for storing information relating to fungal collections. This was highly successful and utilised material already available from Ole Pederson. The identity of the material was established as far as possible and the associated metadata was inserted into the database. Database entries were also linked to field photographs, when available. The database currently includes information on ca. 300 collections. The collections themselves will form the basis of the National fungal collection, once suitable conditions are established at the National Herbarium. Mrs Bouamanivong participated in this development.

Activity 1.3: A new building is currently under construction to house the BEI. When finished this will greatly expand the current computer facilities and web connections, which are limited at present. In the interim period, a high quality laptop has been purchased by the project to accommodate the project related material, including databases and workshop literature. This is housed at the National Herbarium. (see Activity 1.2 for information of database development).

Output 2: *A functional molecular laboratory supported by training manuals and Standard operating procedures (SOPs) for processing and establishing mycological collections from material collected locally and nationally.*

Activity 2.1: A suitable location for the laboratory has been found at The National University of Laos through the Dean of Science Faculty (see comment above in challenges to partnerships). Basic laboratory equipment including freezers, fridges, microwaves pipettes etc have already been purchased and delivered to the University during a visit by the PI. The main bulk of the specialised equipment (PCR machine, Electrophoresis and gel doc equipment, etc) has been purchased through Europ Continents Lao S.A. (Website: www.europ-continents.com) based in Vientiane. This will be delivered over the next two months. The agreement with the company includes installation and a maintenance contract. A member of the Biology Department, Mrs Toulaphone Keokene, has been appointed by the Dean to be the responsible person for the laboratory. Mrs Keokene has had training in basic molecular techniques during her education, but will receive training as part of this project. The PI is in regular contact with both the Dean and Mrs Keokene. Equipment has also been acquired for the National Herbarium to enable collection, processing and storage of fungal fruit bodies collections. This includes ten, second-hand teaching microscopes kindly donated by Prof Mieke Verbeken from Ghent University, Belgium. These have been transported to Laos and will be used in future training workshops. A new compound microscope, semi-professional digital camera, portable digital projector and two driers have also been purchased for the herbarium.

Activity 2.2: The tutors have been in regular contact during the reporting period to discuss suitable text books, a number of which have been purchased and transported to the herbarium. Guides and SOPs for collecting and processing field collected fungi fruit bodies have also been prepared (see appendix 4C for an example).

Activity 2.3: All the tutors for the workshops have prepared handouts of seminars for workshop participants. In addition, digital copies are available for the participants. These will also be uploaded onto the project laptop held by Mrs Bouamanivong at the National Herbarium.

Output 3: *Report on poisonous fungi and poisonings collected from markets and medical establishment.*

Activity 3.1: As noted above in 2, contact has been established with Professor Paul Newton who heads a Wellcome Trust Oxford based research group at Mahosot Hospital, Vientiane. Discussions with him have revealed that there is no central collation of medical cases in Laos, which will make compiling of poisoning cases very difficult. However, Prof Newton confirmed that fungal poisonings do occur every year primarily in the month of May, which coincides with the start of the rainy season. The cause of these poisonings is currently unknown. Prof Newton knew of a Vientiane provincial health official who has an interest in collating fungal poisoning cases. So far it has not been possible to meet with this official. Further attempts are planned.

Activity 3.2: Four visits to local markets by the PI and Ole Pederson during 2014 did not find any fungi for sale which could be considered potentially poisonous. Further market visits are

planned as part of this output. Prof Newton is trying to obtain examples of the fungi thought to be involved in the poisoning cases for determination by experts within the project.

Activity 3.3: This activity will only be possible when we have discovered the potential sources of the poisoning cases.

Output 4: *Report on the fungi sold at markets, including ecological data.*

Activity 4.1: The field visit planned for July 2014 had to be cancelled due to ill health. This has delayed the delivery of a report from the project on the fungi in local markets. However, Ole Pederson and his field team carried out a study of fungi in markets in Xieng Khouang province (see Appendix 4A)

Activity 4.2: Several visits were made to local markets around Vientiane in 2014 to determine which markets supplied the most fungi. One market, which is easily accessible from BEI, had several traders who supplied wild collected fungi (see Figure 2). After the workshop in May 2015, local expertise and equipment will be available to support regular visits to the market for the collection of fungi and data throughout the season of 2015.



Figure 2. Market trader with a range of wild fungi for sale in a local market near Vientiane.

Activity 4.3: This will be prepared in 2016

Output 5: *Data generated from molecular study of fungal communities in logged and unlogged areas, analysed and written up.* Planned for 2015

Output 6: *Data collected from interviews with local villagers involved in harvesting Matsutake, processed and written up.*

Activities in this output were originally planned for 2015 and 2016. However, the field work carried out by Ole Pederson in Xieng Khouang province has established very good contact with locals involved in harvesting Matsutake, which will greatly facilitate the planned fieldwork in May 2015.

3.2 Progress towards project outputs

Output 1: *Mycological training workshops involving international experts training national participants. Establishment of databases.*

One of the biggest challenges for the project is to establish a mycological infrastructure based on little existing expertise. Raising awareness and gaining commitment from a range of parties is critical to the success of the project. It has taken much longer than expected to organise a training workshop in Vientiane. However, the participants at the May 2015 workshop come from two different Ministries and the National University of Laos, illustrating the breadth of the potential base knowledge base that can be established. The logistics of carrying out training

workshops at this scale are considerable. In addition, coordinating the attendance of all the participants is difficult and it may be more efficient to carry out smaller training workshops at an Institute level with only one or two international experts. This will be discussed with the project partners during the visit in May 2015. The main indicators for this output - workshop occurrence and number of participants - remain very suitable for measuring the output. The database established during the November visit forms an excellent basis for building on during future visits. Prof Urmak Kōljalg is an expert in database development and management and he will give hand-ons tuition during the workshops.

Output 2: *A functional molecular laboratory supported by training manuals and SOPs for processing and establishing mycological collections from material collected locally and nationally.*

This output was potentially one of the most difficult to achieve. However, the support of the Dean of Science at the National University of Laos has greatly facilitated the development of this output. A very suitable location has been found and is currently being prepared to receive the main bulk of the lab equipment which has been obtained *via* a specialist company in Vientiane. The choice of Mrs Keokene as the designated laboratory manager has also been a huge asset to the project. A visit later in 2015 is planned to ensure that the lab is functional prior to a molecular workshop. All of the international experts involved in the project teach at various academic levels and have considerable experience in teaching students in workshop settings. Manuals and seminars reflect the varied levels of knowledge of the participants. The donation of his personal collection by Ole Pederson to the project has formed an excellent basis on which to build the National collection. Each future visit will add to this collection.

Output 3: *Report on poisonous fungi and poisonings collected from markets and medical establishment.*

The lack of a system of sharing data among provinces or hospitals means that it will be very difficult to obtain a national assessment of the scale of poisonings in Laos. However, the priority at the moment is to identify the causal agent of the poisonings transferred to Prof Newton at Mahosot Hospital, Vientiane. The short temporal period over which cases are reported could mean that only a few fungi (or even a single species) are involved. If this is the case then it would greatly simplify the task of raising awareness with regard to potentially toxic species.

Output 4: *Report on the fungi sold at markets, including ecological data.*

With local expertise established at BEI following the workshop, the acquisition of data and material for this output can proceed as intended. The purchased examples will be processed and added to the National collection. Protocols for standardised gathering of metadata associated with material will be put in place to maintain the quality of the data.

Outputs 5 & 6: *Scheduled for 2015/16*

3.3 Progress towards the project Outcome

Project outcome: *There will be an increased academic and technical capacity in Laos PDR to carry out fundamental mycological research thereby contributing to safeguarding harvesters, consumers and the National fungal capital.*

Indicator 1: The initial evaluation of mycological expertise stated in the application was too severe. There are in fact a few individuals in Vientiane with some basic fungal knowledge. However, this is largely restricted to fungal pathogens of agricultural plants. The international tutors are all experts in different aspects of mycology. Participants in the training workshop will therefore receive a much broader awareness of the roles of fungi in the environment, practical and theoretical knowledge of fungal taxonomy, identification, conservation and ecology. The participation of personnel from across government and public sectors helps to ensure a legacy of training within the country.

Indicator 2: The National reference collection has been successfully established based on the personal material donated by Ole Pederson. This currently comprises ca. 300 collections.

Reference mycological literature has been purchased and deposited at the herbarium. Many of these collections are linked to photographs.

Indicator 3: Collaboration with Prof Paul Newton at Mahosot Hospital, Vientiane will ensure that any future poisonings will be documented. Once we have identified the causal agent(s), we can initiate an awareness campaign. It is possible that no cases will occur during the duration of the project. Regrettably this is unlikely as Prof Newton reported that this is an annual phenomenon. In order to increase the possibilities to identify toxic species being consumed, special attention will be given checking for potential toxic species in local markets.

Indicator 4: The case studies are planned for 2015 & 2016.

3.4 Monitoring of assumptions

Assumption 1: Finding possible participants in workshops was relatively easy but finding participants who will benefit and value participation in workshops has proved difficult. However, a set of 9 participants have now been compiled who will benefit greatly from the teaching workshop. It is likely that language may be an issue during the workshop and Mark Newman will act as interpreter when required. Prof Verbeken is also fluent in French, which is known to several of the participants. The assumption that materials and equipment could be transported to Laos for both the laboratory and the workshops has so far been justified. There was an issue with the availability of international expertise during 2014 – this was largely due to the prior commitments made before the outcome of the project application was known. Fortunately Mr Neville Kilkenny, a professional Mycologist affiliated with RBGE, Scotland, was available as a replacement.

Assumption 2: The assumption is unjustified. No student has so far been found who has sufficient English to pass the required standard. Alternative routes to training are being explored including Research Masters courses elsewhere in Europe.

Assumption 3: The rainy season in Laos means that the fruiting of fungi occurs consistently from May through to October. This allows fungi to be collected throughout most of this period for inclusion in the National collection. Currently conditions in the National Herbarium are not conducive to keeping collections free from insect attack. Collections will therefore be split between the National Herbarium and a herbarium in Europe.

Assumption 4: This assumption was partly invalid. Without specific visits to individual provincial hospitals and doctors it will be very difficult to assemble past data on fungal poisoning. However, future cases near the capital Vientiane will be documented via new contacts established with the medical profession.

Assumption 5: It is proving difficult to find accessible areas of forest that have been logged. An alternative approach to investigate the potential impacts of selective logging is under review by the project partners. The study carried out by Ole Pederson in July 2014 demonstrated that it is possible to survey local approaches to harvesting the highly prized Matsutake.

3.5 Impact: achievement of positive impact on biodiversity and poverty alleviation

The majority (75%) of the Laotian population still rely on sustainable use of biodiversity, particularly forest non-timber forest products, with fungi being a major source of income in many areas. However, despite their importance as a source of food and in revenue generation, there is surprisingly little awareness of the importance of fungi in the provision of ecosystem services and their vulnerability to over- or incorrect harvesting. The project is focussed on building up the infrastructure whereby assessments can be made of the potentially huge mycological diversity in Laos. The established database and the reference collections coupled with literature and improved skills sets (ecological and identification knowledge) through the training workshops will enable surveys of both markets and field situations to be carried out.

These will in turn feed into the national knowledge of fungi and promote foreign interest particularly in neighbouring countries where mycology is much more developed (e.g. Thailand). The project has a number of identifiable impacts on the livelihoods of local peoples. Both harvesters and consumers of wild collected fungi will benefit from the identification of the causal agents of fungal poisoning by a reduction in the hardship and social disruption brought about by this issue. The highly prized Matsutake is the major source of income during the short, two month fruiting season in Xieng Khouang province. Increased foreign interest in the fungus may be leading to non-sustainable harvesting of this fungus. The long-term utilisation of this resource by locals will benefit from increased awareness amongst harvesters of the susceptibility of Matsutake to improper harvesting approaches, thereby safeguarding their livelihoods.

4. Project support to the Conventions (CBD, CMS and/or CITES)

The 2012 Assessment of the 2004 NBSAP 2020 produced by Lao PDR highlighted a need for increased focus and knowledge in 'lesser known groups'. The project addresses this need. An almost total lack of mycological knowledge and expertise in Laos means that the outputs from the project (reference collections, trained personnel, laboratory facilities) contribute across a broad range of goals and targets of the CBD. This project addresses the following CBD articles: 6 (Conservation & sustainable use, 10%); 7 (Identification and Monitoring, 10%), 12 (Training, 40%); 14 (Impact Assessment and Minimizing Adverse Impacts, 10%); 16 (Access and transfer of technology, 10%). It will also assist in the implementation of Articles 17 (Information exchange), 15 (Access to Genetic Resources) (5% each). Similarly, the project contributes to several cross-cutting themes including Public Awareness and Education (20%); Genetic Resources and Benefit Sharing (10%); Global Taxonomy Initiative (20%); Identification, Monitoring and Indicators (25%); Sustainable use of Biodiversity (25%).

5. Project support to poverty alleviation

Is there evidence that the project is working to poverty alleviation?

Quantitative evidence would be difficult to obtain but the aspect of this project which deals with poisonings will clearly alleviate poverty by reducing the amount that poor people have to spend on treating illness owing to misidentification of fungi. Fatalities resulting from poisonings can have considerable collateral impacts if the victims are the primary income generators within households. Reducing such occurrences will diminish such associated hardships. In addition, teaching people to harvest Matsutake sustainably will enable them to have a continuous income over many years. If they overharvest Matsutake in the short term, then their income source will vanish.

Who are the expected beneficiaries of this work?

The general population in the case of poisonings. Local gatherers of fungi in the case of Matsutake. The country as a whole will benefit from improved adherence to the conditions of the CBD which will result from a deeper understanding of the diversity of fungi in Laos.

Are there expected to be any direct impacts from this project?

The most direct impacts relate to poisonings and sustainable harvesting of matsutake.

If indirect only, what evidence is there that the project will contribute to poverty alleviation in the long-term?

Little quantitative evidence at present but it is clear that the current method of managing fungal resources will result in some of them disappearing, causing material suffering by reduced income.

Are there any noticeable achievements this year?

Establishment of a basic National Mycological Herbarium.

6. Project support to Gender equity issues

There was no gender equity objective explicitly stated within the original project programme. Selection for participation in the formal training workshops has so far been based on the availability of suitable candidates. For the planned workshop in May 2015, eight of the 9 participants are female. The selection process for future workshops will endeavour to have a more balanced gender representation. With respect to Laotian project partners, the majority of contacts persons are female. The selection of a student to receive overseas training will be based upon personal merit but where two candidates of opposite gender have equal merit, preference will be given to the female candidate.

7. Monitoring and evaluation

The inaugural meeting of the project steering group (PSG) was held at BEI in May 2014, where implementation plans were discussed and where it was decided that BEI would function as the central contact point for the project for any Ministry associated issues. However, due to personnel changes and changes in principal contact personnel at partner institutions, and local incompatibility issues, the original complement of the PSG has changed and has been fluid during much of the reporting period. This has made implementation of some activities of the project more problematic, in particular having joint PSG meetings. However, the PI and Mark Newman have had regular contact with individual members of the PSG to maintain project activities. The complement of the PSG now appears to be more stable and a joint meeting is planned early in the next reporting period. The original plan was to employ a local assistant for 6 months per year. After discussion with Laotian partners, a more cost effective approach for local support was to remunerate BEI for local assistance. The PI is in very regular contact with Ms Phimmakong and Mrs Bouamanivong at BEI to assess progress towards outputs.

Measuring the progress of achievements is straightforward and inexpensive for a number of project outputs. The physical existence of the National reference collection, literature, and lab and field equipment allow these achievements to be readily assessed. Improved skills sets and knowledge are more difficult to assess but increases in the numbers of high standard submissions in the National reference collections and accumulating ecological data will be quantifiable measures of success.

8. Lessons learnt

One of the most important lessons learnt in the reporting period is that a scoping trip does not necessarily prepare the way for a smooth start to a project. The time lag between the scoping trip and the start of the project was sufficient for some contacts to be lost. It took a considerable amount of time to establish the most effective means of communication with partners. The need for courtesy one to one meetings cannot be underestimated. Partners are much more likely to respond to emails when a personal contact has been made.

The hardest lesson to learn was that the unexpected should be expected and that verbal agreements however well-developed may change at any time for undisclosed reasons. Alternative backup plans should be considered especially for major outputs and associated assumptions. The withdrawal of collaboration for setting up the molecular laboratory was a major setback. Fortunately a new location and personnel support was presented by the Dean of Science at the National University of Laos in time for the output to get back on schedule. A written agreement has been prepared between the University and the host Institute to formalise the responsibilities of both.

9. Actions taken in response to previous reviews (if applicable)

Not applicable.

10. Other comments on progress not covered elsewhere

One assumption that was not realised during the preparation of the project was the continued health of the main PI. The main field visit in July 2014, which was a joint venture between Ole Pederson (ABP), the PI and Neville Kilkenny (RBGE), was cancelled at the last minute due to the PI developing a blood clot. Fortunately Ole Pederson was able to complete a survey of the fungi in the intended area but the survey lacked the taxonomic and ecological inputs of the PI and Mr Kilkenny. Future visits are designed so that they can still proceed with a recurrence of illness issues.

The main risk in the coming year will be the failure to identify a suitable site for the study of impacts of logging on edible fungi. An alternative approach to obtain suitable data is under discussion. Since most of fungi observed at markets form obligate symbiotic associations with living trees, a broad study to determine which fungi associate with which trees would demonstrate which fungi would be lost if the trees were removed. This is under discussion with project partners.

11. Sustainability and legacy

The profile of the project has been raised within Laos through personal contacts with local aid agencies, The National University of Laos, the local IUCN office, the local FAO office and number of Ministry Institutes. Contact with Alex Needham at the British Embassy has also raised the profile of the project with a diffuse range of audiences that would otherwise be missed. There is increasing interest at the National University of Laos for collaboration with the project to increase capacity. Two students have recently started Masters projects in mycology and their participation on training courses will greatly enhance their skill sets and facilitate the completion of their degrees. The Dean of Science has been very supportive of the project and the establishment of the laboratory at the University will ensure a lasting project legacy. The practical in field training both within academic circles and for Ministry field personnel will also ensure that the project outcome will be maintained.

12. Darwin Identity

The Darwin Initiative has been publicised during presentations within the UK at national events including the annual Kew meeting of the British Mycological Society, where the PI gave a talk on fungal conservation and at local KE events (Café Scientifique Aberdeen March 2015, Science show on local Aberdeen radio). The logo was used in presentations.

The project has been covered in a number of online media coverage outlets which mention both Defra and the Darwin initiative:

Deadly or delicacy? Fungi experts go East [Scotland on Sunday]

<http://technews.tmcnet.com/news/2014/05/04/7809903.htm>

<http://www.scotsman.com/news/scotland/top-stories/deadly-or-delicacy-scottish-fungi-experts-go-east-1-3398245>

Articles on the project also appeared in May 2014 in The Scotsman and The Press and Journal. However, reference to the Darwin Initiative was removed over the objection of the reporter and the project PI by the editor prior to publication.

Another article appeared in the Botanics magazine of RBGE in spring 2015 (<http://www.rbge.org.uk/assets/files/Publications/botanics60spring15lores.pdf>), mentioning the Darwin Initiative in the title and the text.

The Darwin Initiative was also publicised during presentations by the PI at Universities in Sweden and Norway during the reporting period. The project was recognised as a distinct entity with Darwin Initiative support.

The Darwin initiative logo and the project are included in the email signature of the PI.

The success of a previous Darwin Initiative project that was carried out in Laos by the UK partner Mark Newman has left a lasting legacy of familiarity with the Initiative. Personnel within the BEI and the National University of Laos are familiar with the Darwin Initiative. The support from Darwin Initiative for the present project has been emphasised during face to face meetings with local members of international organisations in Laos, including IUCN and FAO.

13. Project Expenditure

Table 1 Project expenditure during the reporting period (1 April 2014 – 31 March 2015)

Project spend (indicative) since last annual report	2014/15 Grant (£)	2014/15 Total Darwin Costs (£)	Variance %	Comments (please explain significant variances)
Staff costs (see below)				Due to illness of the PI, one trip planned for June 2014 did not take place. So fewer days were worked on the project.
Consultancy costs				
Overhead Costs				
Travel and subsistence				
Operating Costs				
Capital items (see below)				
Others (see below)				Lab equipment was obtained at a lower cost than estimated in the application
TOTAL	101220.00	86814.51	14	

14. **OPTIONAL: Outstanding achievements of your project during the reporting period (300-400 words maximum). This section may be used for publicity purposes**

I agree for the Darwin Secretariat to publish the content of this section (please leave this line in to indicate your agreement to use any material you provide here)

Annex 1: Report of progress and achievements against Logical Framework for Financial Year 2014-2015

Project summary	Measurable Indicators	Progress and Achievements April 2014 - March 2015	Actions required/planned for next period
<p>Impact</p> <p>To enable Laos PDR to manage its mycological resources and fulfil CBD commitments through increasing awareness of fungi, their conservation, economic sustainability, and ecological importance.</p>		<p>The existence of the project and the numerous meetings at which the importance of fungi has been highlighted have raised the awareness of fungi as an important component of biodiversity in Lao PDR.</p>	<p>Discussions will be initiated with the IUCN and FAO representative in Vientiane to consider how fungi can be included in any planned national initiatives.</p>
<p>Outcome There will be an increased academic and technical capacity in Laos PDR to carry out fundamental mycological research thereby contributing to safeguarding harvesters, consumers and the National fungal capital.</p>	<p>Indicator 1: Knowledge assessments will be made as part of the workshops. Present baseline = no knowledge of fungi. Post workshops the participants should have a good basic theoretical and practical knowledge of traditional and molecular fungal taxonomy, conservation, and ecology. One graduate trained to masters level.</p> <p>Indicator 2: Present baseline = no fungal reference material, little literature or knowledge of ethnomycology - vernacular names and uses. Post project: Representative reference collections made of fungi for sale in markets and of fungi collected during workshops. Each collection associated with a fact sheet and photos in web-accessible database.</p> <p>Indicator 3: Currently only word of mouth reports exist of poisonings due to fungi. Documented cases will be compiled. Increased awareness of potential toxicity being the desired end state.</p> <p>Indicator 4: Currently there is no knowledge of the impact of logging or of harvesting techniques on sustainable utilisation of edible fungi associated</p>	<p>Progress has been achieved in achieving the project outcome with increased technical capacity to support mycological research in Lao PDR with database establishment and the ongoing development of laboratory facilities.</p>	<p>A workshop and a field study will take place in the first two weeks of May. Nine participants from different Institutions will attend and be tutored by all the project International partners.</p> <p>The field study will gather data on both the ecology and harvesting of Matsutake and on fungi collected for income generation at local markets.</p> <p>Collaboration with Prof Newton at Mahosot hospital, Vientiane will further investigate the issue of fungal poisonings in Laos.</p> <p>Two further visits by the PI and Mark Newman will gather data on potential impacts of logging on fungi.</p>

	with forest trees in Laos. Case studies will provide this data.		
Output 1. Mycological training workshops involving international experts training national participants. Establishment of databases.	1a. Measure = Workshops taking place and attract the required participants 1b. Expected change: 10-15 participants trained (previously 0)	The logistics of workshop development coupled with the cancelled visit by the PI in July 2014 delayed the first major workshop until May 2015. However, a suitable group of nine participants has been successfully identified, who originate across different Institutes. The visit by the International project partners in November 2014 successfully processed a large number of fungal collection (ca. 300) and established a database to form the basis of the National reference collection.	
Activity 1.1 Setting up the logistics for the workshops. Recruiting participants for the workshops from BEI and NUoL and other interested parties.	The planning of future workshops will take place throughout this reporting period. This will include a practical laboratory workshop once the molecular lab is functional.		
Activity 1.2, Run three workshops, including field excursions and lab practical sessions.	See box above		
Activity 1.3. Finding suitable servers, hardware and software for initiating and developing of databases	No suitable hardware exists at present either at BEI or the National University. A top of the range Laptop was purchased to store the data and literature accumulated during the project. External backups will safeguard this data.		
Output 2. A functional molecular laboratory supported by training manuals and SOPs for processing and establishing mycological collections from material collected locally and nationally.	2a. Measure = development of a dedicated facility for preparation of fungal DNA. 2b. Training manuals and SOPs - project leader and tutors will correspond monthly to ensure progress on track 2c. Local collections will be checked by project leader (and tutors) 3x per year to ensure satisfactory progress. Expected change: existence of manuals and collections not previously available.	The establishment of the laboratory is an ongoing process. The offer of a location at the National University of Laos and dedicated personnel assistance greatly facilitated the delivery of this output. Collections were checked by International experts during the November visit.	
Activity 2.1. Identifying a secure, suitable location within BEI or NUoL to house the fungal laboratory. Acquiring the suitable consumables and equipment for the lab.	A suitable location for the laboratory was found at the National University of Laos. Installation of equipment will continue in the 2 nd reporting period.		
Activity 2.2. Liaising with other tutors for the development of the necessary manuals for the workshops	Each tutor has developed suitable manuals based on their own areas of expertise.		
Activity 2.3. Preparing manuals for each workshop	Handouts of seminars and protocol manuals have been prepared and will be given to course participants.		

<p>Output 3. Report on poisonous fungi and poisonings collected from markets and medical establishment.</p>	<p>Report will be compiled by project leader, TABI and ABP – progress will be checked 3x per year. Expected change: empirical data on quantification of severity and frequency of this issue, not previously available and critical for addressing this in the future</p>	<p>This output was scheduled for the first reporting period but the lack of central information sources means that data will be collected over the course of the whole project and a report will be produced in the final period. No additional expenditure is required.</p>
<p>Activity 3.1. Contacting medical establishments for cases of confirmed or suspected fungal poisonings. Checking newspapers for poisoning articles. Interviewing traders.</p>		<p>Collaboration has been established with Prof Paul Newton at Mahosot hospital, who has an interest in poisoning cases. The main aim is to identify the causal fungal agent, which is currently unknown. Once this is known it will be possible to raise awareness highlighting the danger.</p>
<p>Activity 3.2. Checking and collating the data</p>		<p>Ongoing.</p>
<p>Activity 3.3. Preparing the final report in conjunction with TABI and ABP</p>		<p>Delayed till final reporting period.</p>
<p>Output 4. Report on the fungi sold at markets, including ecological data.</p>	<p>Report will be compiled by project leader, TABI and ABP – progress will be checked 3x per year. Expected change: There is currently little empirical data on the diversity of fungi sold at markets and no information on their ecology. The report will provide this, enabling future comparative assessments.</p>	<p>Local markets have been identified near the capital Vientiane, which are easily accessible and which have several traders who supply fungi. These markets will be targeted for data collection during the next reporting period.</p>
<p>Activity 4.1. Working with TABI and ABP on gathering data from different markets to establish the diversity and identity of fungi sold. Local Laotian project assistant to participate in this.</p>		<p>This activity is ongoing with ABP. A member of Mrs Bouamanivong at BEI, who will be trained during the May 2015 workshop, will collect data and samples from a nearby market during the next reporting period.</p>
<p>Activity 4.2. This will be done during the May-August season each year with yearly reports prepared</p>		<p>Ongoing data collection</p>
<p>Activity 4.3. The final report will be compiled with TABI and ABP</p>		<p>Planned for final period</p>
<p>Output 5. Data generated from molecular study of fungal communities in logged and unlogged areas, analysed and written up</p>	<p>5a. Report will be compiled by project leader to ensure quality control and timeliness. Progress will be reported regularly to project steering committee. Expected change: There is no data or awareness within Laos on how logging impacts on edible fungi, the report will redress this deficit.</p>	<p>Planned for 2015, see comments above against outcome development</p>

<p>Output 6. Data collected from interviews with local villagers involved in harvesting Matsutake, processed and written up.</p>	<p>6a. Report will be compiled by project leader, TABI and ABP progress will be checked once a year at the end of the fruiting season of Matsutake. Expected change: currently little information available on scale of harvesting, none of harvesting approaches or local knowledge. The study will provide this information to assess if harvesting approaches appear sustainable.</p>	<p>Planned for 2015 & 2016, see comments above against outcome development</p>
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Annex 2 Project's full current logframe

Project summary	Measurable Indicators	Means of verification	Important Assumptions
<p>Goal: Effective contribution in support of the implementation of the objectives of the Convention on Biological Diversity (CBD), the Convention on Trade in Endangered Species (CITES), and the Convention on the Conservation of Migratory Species (CMS), as well as related targets set by countries rich in biodiversity but constrained in resources.</p>			
<p>Outcome: To enable Laos PDR to manage its mycological resources and fulfil CBD commitments through increasing awareness of fungi, their conservation, economic sustainability, and ecological importance.</p>	<p>Knowledge assessments will be made as part of the workshops. Present baseline = no knowledge of fungi. Post workshops the participants should have a good basic theoretical and practical knowledge of traditional and molecular fungal taxonomy, conservation, and ecology. One graduate trained to masters level.</p> <p>Present baseline = no fungal reference material, little literature or knowledge of ethnomycology - vernacular names and uses. Post project: Representative reference collections made of fungi for sale in markets and of fungi collected during workshops. Each collection associated with a fact sheet and photos in web-accessible database.</p> <p>Currently only word of mouth reports exist of poisonings due to fungi. Documented cases will be compiled. Increased awareness of potential toxicity being the desired end state.</p> <p>Currently there is no knowledge of the impact of logging or of harvesting techniques on sustainable utilisation of edible fungi associated with forest trees in Laos. Case studies will</p>	<p>Assessments will take the form of short practical and written exams. Workshop satisfaction surveys will be given out to all participants and analysed. One student with a MSc degree in Biodiversity and Conservation.</p> <p>The project leader and tutors will inspect all reference collections to ensure agreed quality standards, including fact sheets and photos. Project leader and local Project Steering Committee will be responsible for ensuring online access is created and fully functional.</p> <p>Project leader, the local assistant and aid agencies will ensure proper use of standard reporting forms in data acquisition from medical establishments and will also make sure the storage/filing of these records takes place in these establishments. Verification of awareness of both buyers and sellers will be established using market surveys carried out by project leader, local assistant and aid agencies. Project leader will ensure consistency of approach and</p>	<p>There is an assumption that there will be 10-15 participants who will benefit and value participation in the workshops. The level of spoken English may be an issue and a translator may have to be employed. That the international experts who have already agreed to participate will actually be available or will find alternatives.</p> <p>One student must have sufficient English and skills in order to qualify for inclusion on the MSc programme in Edinburgh.</p> <p>That there will be fungal fruit body material to gather and process for inclusion within the National Mycological collection. That conditions can be maintained where dried fungal collections can be kept free from insect attack.</p> <p>That it is possible to obtain information regarding fungal poisoning cases from hospitals and doctors.</p> <p>There is an assumption that accessible suitable logged and unlogged areas can be found in which to do the analyses</p>

	provide this data.	analysis of findings. Quality of survey data on logging impacts will be ensured as project leader is directly involved in collecting it. The quality and consistency of household and field surveys of fungi harvesters will be ensured by the project leader overseeing all the work.	
Outputs: 1. Mycological training workshops involving international experts training national participants. Establishment of databases.	1a. Measure = Workshops taking place and attract the required participants 1b. Expected change: 10-15 participants trained (previously 0)	1a. Trained personnel 1b. Usable database 1c. National reference collection	There is a risk that insufficient suitable participants may be found for the workshops and that they can be taught over the three consecutive years. This may be countered by having a number of BEI and NUoL employees as participants.
2. A functional molecular laboratory supported by training manuals and SOPs for processing and establishing mycological collections from material collected locally and nationally.	2a. Measure = development of a dedicated facility for preparation of fungal DNA. 2b. Training manuals and SOPs - project leader and tutors will correspond monthly to ensure progress on track 2c. Local collections will be checked by project leader (and tutors) 3x per year to ensure satisfactory progress. Expected change: existence of manuals and collections not previously available.	2a. Training manuals and protocols for processing fungal material 2b. DNA prepared in the laboratory	That it will be possible to transport and maintain <i>in situ</i> the equipment required for the workshops and new lab. That suitable personnel can be found to maintain the facility
3. Report on poisonous fungi and poisonings collected from markets and medical establishment.	3a. Report will be compiled by project leader, TABI and ABP – progress will be checked 3x per year. Expected change: empirical data on quantification of severity and frequency of this issue, not previously available and critical for	3a. Report on fungal poisoning in Laos	That it is possible to obtain information regarding fungal poisoning cases from hospitals and doctors

	addressing this in the future		
4. Report on the fungi sold at markets, including ecological data.	4a. Report will be compiled by project leader, TABI and ABP – progress will be checked 3x per year. Expected change: There is currently little empirical data on the diversity of fungi sold at markets and no information on their ecology. The report will provide this, enabling future comparative assessments.	4a. Report on the diversity of marketed fungi in Laos	There is a risk that there may be poor fruiting years during the period covered by the project, which could significantly impact on the number of collections and observations that can be made. However, the seasonality experienced in Laos is much more dependable than the vagaries of the temperate zones.
5. Data generated from molecular study of fungal communities in logged and unlogged areas, analysed and written up.	5a. Report will be compiled by project leader to ensure quality control and timeliness. Progress will be reported regularly to project steering committee. Expected change: There is no data or awareness within Laos on how logging impacts on edible fungi, the report will redress this deficit.	5a. Publication on logging impacts.	There is an assumption that suitable study areas can be found.
6. Data collected from interviews with local villagers involved in harvesting Matsutake, processed and written up.	6a. Report will be compiled by project leader, TABI and ABP progress will be checked once a year at the end of the fruiting season of Matsutake. Expected change: currently little information available on scale of harvesting, none of harvesting approaches or local knowledge. The study will provide this information to assess if harvesting approaches appear sustainable.	6a. Publication on Matsutake harvesting	The participation of the villagers in surveying local knowledge and harvesting techniques for Matsutake is critical for the case study.

Activities (each activity is numbered according to the output that it will contribute towards, for example 1.1, 1.2 and 1.3 are contributing to Output 1)

Output 1

Activity 1.1: Setting up the logistics for the workshops. Recruiting participants for the workshops from BEI and NUoL and other interested parties.

Activity 1.2: Run three workshops, including field excursions and lab practical sessions.

Activity 1.3: Finding suitable servers, hardware and software for initiating and developing of databases

Output 2

Activity 2.1: Identifying a secure, suitable location within BEI or NUoL to house the fungal laboratory. Acquiring the suitable consumables and equipment for the lab.

Activity 2.2: Liaising with other tutors for the development of the necessary manuals for the workshops

Activity 2.3: Preparing manuals for each workshop

Output 3

Activity 3.1: Contacting medical establishments for cases of confirmed or suspected fungal poisonings. Checking newspapers for poisoning articles. Interviewing traders.

Activity 3.2: Checking and collating the data

Activity 3.3: Preparing the final report in conjunction with TABI and ABP

Output 4

Activity 4.1: Working with TABI and ABP on gathering data from different markets to establish the diversity and identity of fungi sold. Local Laotian project assistant to participate in this.

Activity 4.2: This will be done during the May-August season each year with yearly reports prepared

Activity 4.3: The final report will be compiled with TABI and ABP

Output 5

Activity 5.1: Suitable logged and unlogged sites will be identified in collaboration with TABI and ABP. The impact on the above ground tree vegetation will be assessed. Root samples will be taken and dried for shipping to JHI.

Activity 5.2: Samples will be extracted and processed for high throughput sequencing. Data will be analysis and community analyses carried out.

Activity 5.3: A report will be prepared and a scientific paper produced for publication.

Output 6

Activity 6.1: Suitable areas producing Matsutake will be identified in collaboration with TABI and ABP. Observations will be made of harvesting techniques and interviews will be carried out with the harvesters.

Activity 6.2: Data will be collated from different areas to identify potential differences in knowledge and harvesting approaches

Activity 6.3: A final report will be prepared in conjunction with TABI and ABP

Annex 3 Standard Measures

Table 1 Project Standard Output Measures

Code No.	Description	Gender of people (if relevant)	Nationality of people (if relevant)	Year 1 Total	Year 2 Total	Year 3 Total	Total to date	Total planned during the project
Established codes								
2	No. of people to attain Masters qualification		Laotian	0			0	1
4C	No. of postgraduate students to receive training		Laotian	0	2		0	2
4D	Number of training weeks provided		Laotian	0	2		0	4
6A	No. of people to receive training		Laotian	1	8	8	1	17, Training course will be given on fungal identification
6B	No of training week provided		Laotian	1	2	2	1	5
7	Number of training materials to be produced for use by host country			0	3		0	5, will include posters to raise awareness of potentially toxic fungi. Translations of Mycological terms.
12A	Number of computer based databases to be established and handed over to the host country			1			1	2
13A	Number of species reference collections to be established			300			300	600
14B	Number of conferences/seminars/workshops attended at which findings from Darwin project work will be presented/ disseminated.			1			1	3
20	Estimated value of assets to be handed over to host country			Ca. 57K			Ca. 57K	60K In addition 10 teaching microscopes have been donated – value

								undetermined
21	No. of permanent Facilities			2			2	2, A molecular laboratory (in progress) and a National Mycological collection
23	Value of resources raised from other sources for project work							Ca. 110000 This includes overhead shortfall from James Hutton Institute, In-kind time from tutors, and Aid money allocation from ABP.

Table 2 Publications

Title	Type (e.g. journals, manual, CDs)	Detail (authors, year)	Gender of Lead Author	Nationality of Lead Author	Publishers (name, city)	Available from (e.g. website link or publisher)
The Fungi of Lao PDR	Journal	Mark Newman, Botanicus, 60: 2014, p. 7.	Male	UK	RBGE, Edinburgh	http://www.rbge.org.uk/assets/files/Publications/botanicus60spring15lores.pdf

Annex 4 Onwards – supplementary material (optional but encouraged as evidence of project achievement)

This may include outputs of the project, but need not necessarily include all project documentation. For example, the abstract of a conference would be adequate, as would be a summary of a thesis rather than the full document. If we feel that reviewing the full document would be useful, we will contact you again to ask for it to be submitted.

It is important, however, that you include enough evidence of project achievement to allow reassurance that the project is continuing to work towards its objectives. Evidence can be provided in many formats (photos, copies of presentations/press releases/press cuttings, publications, minutes of meetings, reports, questionnaires, reports etc.) and you should ensure you include some of these materials to support the annual report text.

Annex 4A: Report produced by Ole Pederson using approaches discussed with the PI. Project participation was scheduled but cancelled at the last moment due to ill health.

Annex 4B: Example of a protocol for collecting and identifying fungal collections.

Checklist for submission

	Check
Is the report less than 10MB? If so, please email to Darwin-Projects@ltsi.co.uk putting the project number in the Subject line.	
Is your report more than 10MB? If so, please discuss with Darwin-Projects@ltsi.co.uk about the best way to deliver the report, putting the project number in the Subject line.	
Have you included means of verification? You need not submit every project document, but the main outputs and a selection of the others would strengthen the report.	
Do you have hard copies of material you want to submit with the report? If so, please make this clear in the covering email and ensure all material is marked with the project number.	
Have you involved your partners in preparation of the report and named the main contributors	
Have you completed the Project Expenditure table fully?	
Do not include claim forms or other communications with this report.	