

Merlin Report

Abstract

This report details Stage 4 of the Paksong Orchid Project, and the Writhlington School Expedition to Laos 2011. This expedition was to commission the Paksong Laboratory, which has recently been completed, and to survey the forest areas for conservation threats and potential further developments for the Paksong Orchid Project.

The Paksong orchid project is an international collaboration with the aim of protecting orchids on the Bolaven Plateau through developing a sustainable trade in laboratory raised local species to reduce the pressure of wild collection on wild populations.

Paksong is a small town on the Bolaven Plateau in southern Laos, an area famous for coffee production and dramatic waterfalls. The area also includes areas of forest and wilderness rich in biodiversity including a large number of orchid species. The altitude Paksong is around 1300m asl.

Writhlington school is an 11 to 18 comprehensive school in the south west of England. The school has a notable orchid project, based around a propagation laboratory, and has conservation links in Central America, South Africa and the Himalayas. Writhlington School acted in an advisory role from the formation of the Paksong Orchid Project (POP). My visit was part of the third Writhlington expedition to Laos.

Context

I have been working with the Writhlington Orchid Project for six years, and have experience in micropropagation techniques from managing the Writhlington Microprop Lab for four years. I have also worked in the field to research, and have written a paper on 'Changes in Orchid diversity at different altitudes, and over time, in the Sikkim Himalayas'[2], which I presented at the National Science and Engineering Competition. For this research, I was highly commended in my age category, and won the Society of Biology Prize for the Best research in the Biological Sciences.

The expedition to Laos has given me a unique opportunity to work in a country rich in biodiversity, with much of it still unexplored.[1] Laos is a landlocked country, bordered with Thailand to the west and Vietnam to the east. Paksong, where the project is based at 1300m asl on the Bolaven Plateau[3]. The forest, and the orchids, around Paksong are heavily under threat, making this an ideal location for this conservation effort to be situated.

Paksong Orchid Project

Paksong is a small town in the Southern Lao Province of Champasak. In 2006 Souk Southivong, who lives north of the town, identified the potential for a conservation initiative based on the production of Lao native orchid species with the assistance of horticultural consultant, Eddie Vernon.

The pair contacted Writhlington School in the UK to ask for advice in February 2006. Together, an outline plan was agreed to work towards setting up an orchid propagation laboratory in Paksong.

Since 2006, there have been two Writhlington School visits to Paksong, Souk has visited Writhlington School and the Royal Botanic Garden's Kew Micropropagation Department

to learn techniques and POP was successful in obtaining grant funding from the charity Orchid Conservation International.

In 2008, Souk suffered a serious stabbing at her home in Paksong, which put the project on hold until mid 2010. By summer of 2011, the structure for the Paksong Laboratory was complete and equipment and consumables had been ordered in preparation for commissioning the laboratory during my visit in October.

Writhlington School Expedition 2011

The third Writhlington School Expedition to Laos included four students, their teacher Simon Pugh-Jones and Botanist Dr Lauren Gardiner, who has worked with the school for a number of years. As the most experienced of the the students taking part, my responsibilities were to lead on laboratory work, document the work taking place and to produce an overview of observed threats and challenges as well as contributing to the planning of the future of POP.

Conservation threats

Previous work from POP identified significant conservation threats to both orchid species and their habitats on the Bolaven Plateau. These are summarised below:

Deforestation

Agriculture (mainly coffee) is very prominent in Southern Laos, which puts pressure on the forest. Many coffee farms will extend into forested areas, with large areas often being cleared by burning for growing coffee bushes.

Logging for furniture and fuel is also a threat to the Orchids of Laos.

Collection for horticultural trade

Orchids appear to be universally desirable houseplants across the world. Tourists from Thailand often visit Laos in large coaches and orchid markets near these tourist locations are full of orchids collected from the wild populations in Laos.

Collection for medicine trade

Chinese medicine traders use many orchids for their alternative medicines. *Dendrobium compactum* is in one taxon in high demand by the traders.

Global Warming

Global warming is a phenomenon that can be observed across the planet. Orchids, often grow in a very specific climate envelope. As the temperature of the planet increases, climate envelopes move upwards in altitude, by approximately 180m per 1°C [1]. This particularly threatens orchids in locations where they do not have any opportunity to migrate upwards in altitude over time, such as on the Bolaven Plateau.

My time in Paksong

My group and I arrived in Paksong on Friday 21st October 2011. Over the next seven days, time was spent on a wide range of activities to further the aims of POP:

- Laboratory setup and commissioning
- Preparation of propagation material
- Laboratory training

- Laboratory Production
- Surveying the proposed POP reserve
- Field Observations
- Habitat Monitoring
- Species Identification
- Commercial exploitation and habitat destruction observations
- Species rescue and relocation
- Political support for POP

Laboratory Setup/commissioning

Preparation of prop material (sourcing seed etc)

In order for the laboratory to succeed, a large supply of seed is required. Seed for the Paksong Laboratory was supplied in two ways:

Firstly, seed from plants raised at Writhlington School were imported to Laos. As orchid seed is exempt from CITES, this is an easy and efficient way to bring millions of dried seed from our seed banks at the school to Paksong. These seeds were mainly from Lao orchids being grown at the school as part of our collection.

In addition, seed was collected from wild orchids. Where the land owners permission could be acquired, we collected seed from identifiable orchids in the wild. The main disadvantage with this method is the potential for misidentification, so multiple guide books and local experts were used in order to verify the identity of each plant. Once collected, the majority of these orchids will be sown 'green pod'.

Laboratory training/retraining

When Souk came to the UK, she was trained in both our laboratory procedures, and those used by the Royal Botanic Gardens, Kew. In order to retrain Souk, four laboratory trained students, myself included, from school travelled to Laos. We also took Dr Lauren Gardiner from Kew, to make sure Souk could be reminded of all techniques.

As well as training Souk, the team had to train a second member of the Paksong Orchid Project, Eddie Vernon. Eddie didn't come to the UK in 2008, so needed to be trained from scratch.

Laboratory production

At the same time as training Souk and Eddie, we assisted in the first bits of laboratory production. Seed collected from wild orchids were sown in the Paksong lab. It is these seeds that will grow into the first plants to be sold and used for conservation by the Paksong Orchid Project.

As these seeds will take roughly two years in order to mature plants ready to be weened, and up to a further four to mature into full sized flowering plants, we donated some Lao orchids from Writhlington to the Paksong Project. These plants are at various stages and served two purposes. They were used for Laboratory training/retraining in replating

techniques, but also for supplying plant material so the project does not have to wait two years for it's first plants.

Field observations

While in Paksong, I was able to observe orchids in their natural habitat. Tropical forest is quite unique in its extensive biodiversity and something that I thoroughly enjoy studying.



Fig 1 Data logger 1 fixed to tree

recorded at weather stations rather than in the forest where plants are growing. It seems reasonable to assume that forests will tend to have more even temperatures and a more constant humidity than outside of the forest.

In Paksong I used data loggers supplied by Science Scope, a firm of data logging manufacturers now based at Writhlington School, to record climate data over a six day period in the forest above the Paksong laboratory. This area is the proposed site for the Paksong Orchid reserve and contains a number of orchid species (see species list).

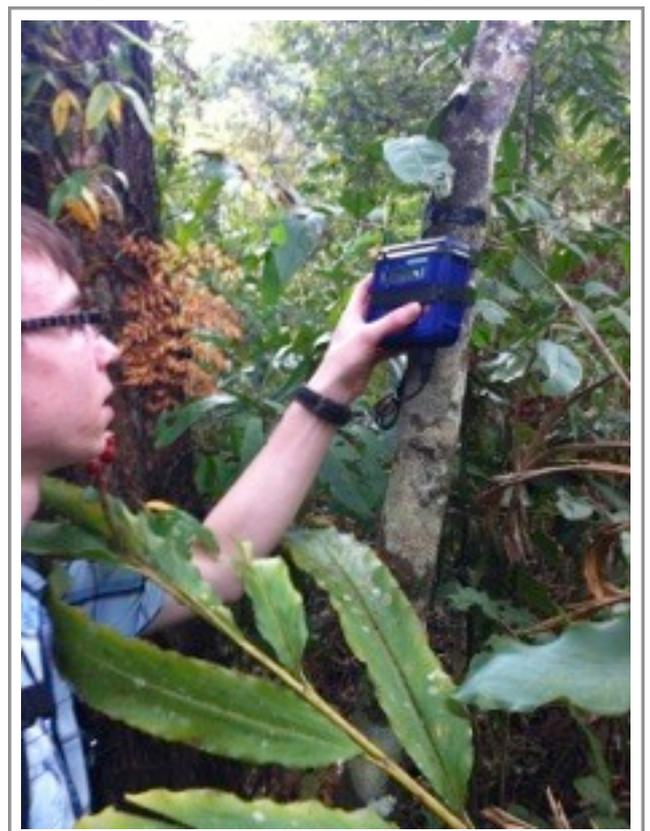
Two data loggers were positioned in the forest on orchid bearing trees. The first data logger was on a tree in the lower part of the forest on a tree with plants of *Pholidota articulata*,

Habitat Climate Data (data loggers)

One opportunity offered by any visit to a natural habitat of horticulturally significant species is the opportunity to collect habitat data that can be used to evaluate the suitability of existing horticultural practice in the UK. In particular we grow a number of the Bolaven Plateau orchid species in the Writhlington School greenhouses and optimum culture of those species can reasonably be assumed to be when greenhouse conditions in the UK replicate the natural habitat conditions in Laos.

Climate data available for orchid habitats can be rather general as it is

Fig 2 - Setting up Data logger 2



Agrostophyllum sp.1 and *Oberonia sp.1*. The second data logger was placed on a tree at the top edge of the forest. This tree contained *Dendrobium heterocarpum*, *Dendrobium chittimae* and

Data loggers were set to record temperature, light level and relative humidity over the period. They were fixed to trees with electrical tape in a vertical position and the humidity sensors were pointed upwards.

Data loggers were recovered from the forest at the end of my time in Paksong and returned to the UK where data was downloaded.

On return to the UK data logger 2 was set up in the Writhlington school greenhouse (section 5) in the same vertical alignment as it had been in Laos and a similar period (five days) of logging was carried out.

Results of Data Logging

Data logger 1 gave limited data as it appears to have suffered from water logging or possible a faulty humidity sensor and therefore the data from logger 2 was used in the comparison with the Writhlington School greenhouse.

Data was downloaded using software supplied by Science Scope and combined to give separate graphs for light level, temperature and humidity as below.

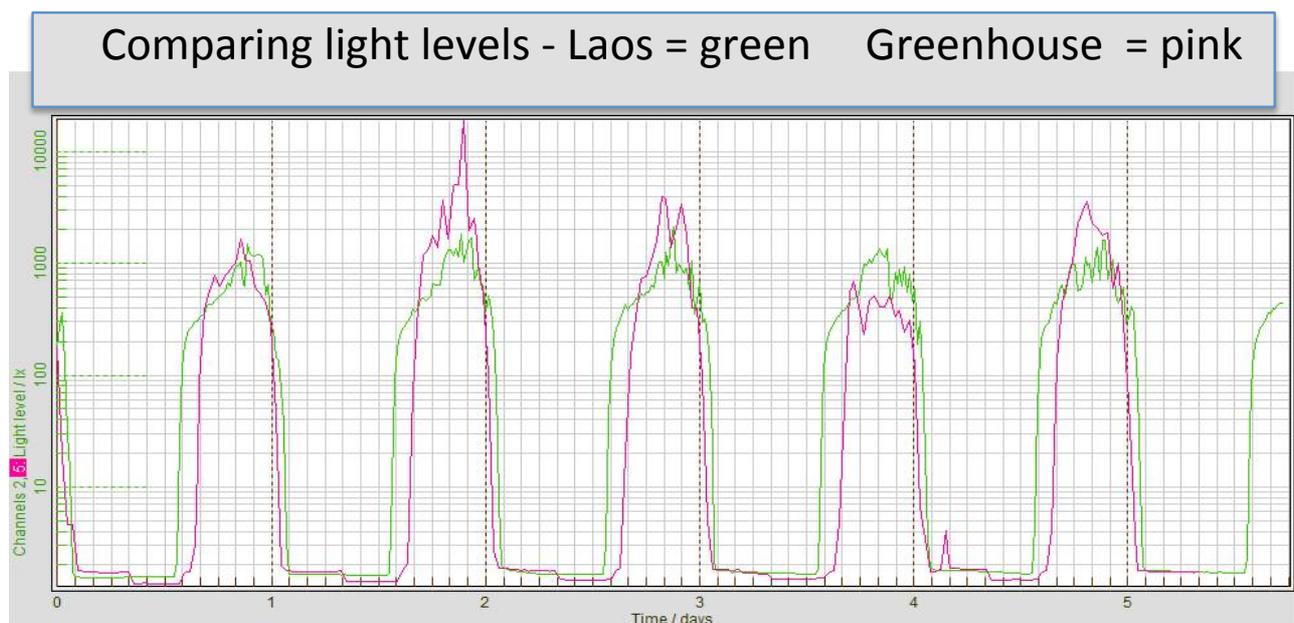


Fig 3 - Data logger graphs comparing light levels in Lao forest and the Writhlington Greenhouses

Light level data shows a very close match between the Lao forest light levels and those in the Writhlington Greenhouse. This was unexpected in November as the solar radiation received in the UK at latitude 51 degrees north is considerably lower than in Paksong at latitude 15 degrees north however the orchids in Paksong are shaded in the forest and auto shading did not deploy in the UK.

Day length is marginally longer in Paksong.

I can conclude that light levels are suitable for the culture of Paksong orchids at this time of year in the greenhouse and artificial lighting to increase light levels or day length do not appear to be needed.

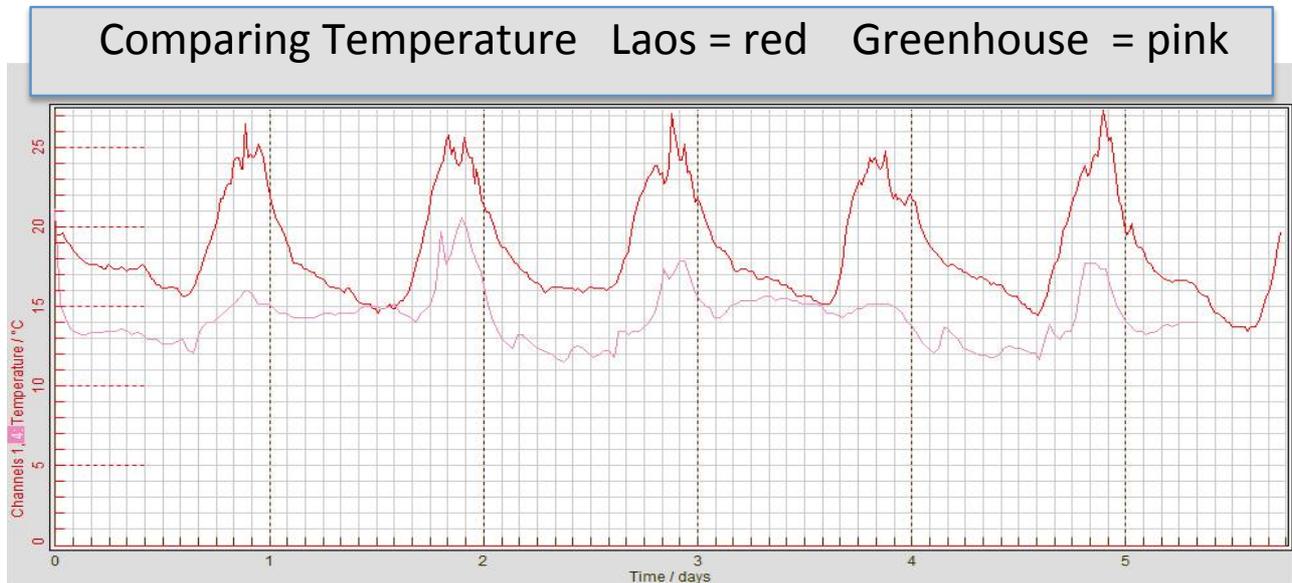


Fig 4 - Data logger graphs comparing temperature in Lao forest and the Writhlington Greenhouses

There are significant differences shown in the corresponding temperature data. The Paksong forest shows a maximum day temperature between 25°C and 27°C and minimum night temperatures between 13°C and 16°C and a mean diurnal range of 11.3°C. The curve shows a rapid morning temperature rise (~2.0°C/hour), approximately six hours at the maximum temperatures before a rapid temperature fall in the evening (~0.2°C/hour) followed by a more gentle fall during the night (~0.3°C/hour).

The greenhouse data shows lower temperatures throughout and a much reduced diurnal range. The maximum day temperatures vary from 15°C to 20°C, minimum night temperatures vary from 12°C to 15°C and the mean diurnal range is 3.6°C.

While minimum temperatures set by the thermostat are only marginally below those recorded in Laos the greenhouse daytime temperatures are well below those in Laos and this also results in a very low mean diurnal range. As a result of this data a daylight thermostat increase is being trialled at the Writhlington greenhouse.

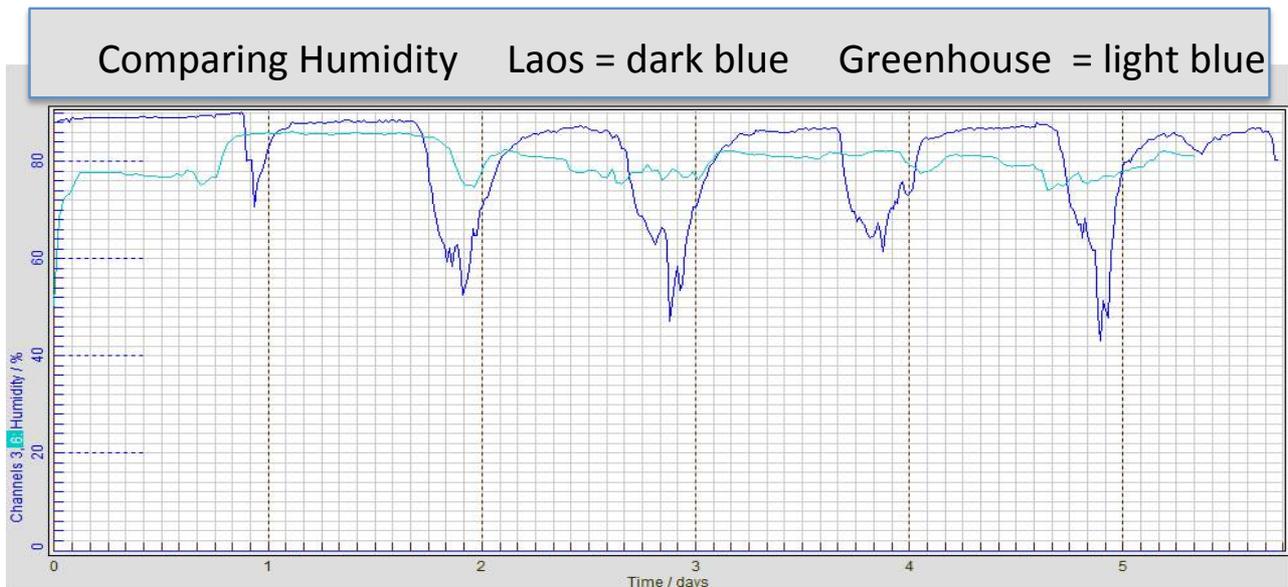


Fig 5 - Data logger graphs humidity temperature in Lao forest and the Writhlington Greenhouses

Humidity results shows broad agreement between the Lao data and greenhouse data. The Lao data shows humidity falling from night time highs between 85% and 89% to day time minimums of 50% to 70% with rising temperatures each day.

Greenhouse humidity remains in the range 74% to 88% throughout. The stability of greenhouse humidity reflects the even temperatures recorded and the trial increase in day time temperatures are expected to reduce day time humidity in line with the Lao values.

The data obtained is limited to a five day period in October and so cannot be used to reliably determine precise growing conditions throughout the year. Nevertheless it provides a useful snapshot of forest conditions in a week without exceptional weather events. Heavy rain occurred twice in the period but the daily pattern recorded was remarkably consistent.

A number of significant similarities with greenhouse conditions at a similar time of year do indicate that greenhouse conditions are broadly suitable for Paksong species but changes are recommended to day time temperatures to provide both suitable absolute temperatures and diurnal variation at a time of year when this is not provided naturally by winter sunlight levels.

Habitat species id

Part of surveying the forests involved making accurate identifications for each species in each different habitat. These data allow analysis of the biodiversity of each habitat, which can give policy makers ideas of the best places to protect.

A species list was generated (see appendix 1)

Commercial exploitation observations

Recorded threats for the orchid species of the Bolaven Plateau (see Conservation Threats) include:

- Deforestation
- Collection for horticultural trade



Fig 6 - Wild collected orchids for sale at Tad Fan

- Collection for medicine trade
- Global warming

During my time in Paksong I observed a number of examples of commercial exploitation and habitat loss indicating considerable current pressure on local orchid populations.

Wild collection

Previous visits to Paksong recorded orchid markets selling wild collected plants to

Thai tourists near the commercialised waterfall sites in the area with the largest market near Tad Fann waterfall. A visit to Tad Fann on the first day in Paksong found that the market was largely closed down with just one remaining stall of wild collected plants. This stall (fig 6) was in a dilapidated state with no obvious effort being made to sell the plants. However the plants were potted and growing. This stall belongs to 'Mrs Sheep' an orchid trader known to the Paksong team.

The plants included a large number *Paphiopedilum* plants, both *Paphiopedilum callosum* and *Paphiopedilum villosum*. All *Paphiopedilum* species are listed as CITES appendix 1 species.



Fig 7 (above) & 8 (right) - Wild collected orchids

Other species present included *Rhyncostylis gigantea*, *Coelogyne lentiginosa*, *Bulbophyllum lepidum* and



Dendrobium chrysotoxum.

The orchid markets at other waterfall sites were

also found to be closed apart from the casual sale of a few *Dendrobium* species at Tad Lot waterfall. It was reported that it is through government action that the markets have been closed which is an encouraging development. Clearly the image of rows of stalls selling unsustainably collected plants in the vicinity of tourist sites that base their appeal on the quality of the natural environment is not a comfortable one.



Fig 9 - Wild collected orchids for sale in Thailand (photo - Eddie Vernon.)

Initial comfort drawn from the closure of the markets was shattered by a visit to the house of the orchid trader (see fig 10). There has clearly been a shift in the trade in wild collected plants rather than an end to this trade.

Under and around the house were collected very large quantities of horticulturally valuable plants. These plants were not being cultivated in any way but were hung on strings by species. The plants had clearly been collected from the wild in the recent past as none of them showed any adaption to being hung upside down.

These plants are destined for illegal export to Thailand (CITES certificates are required for export between CITES signatories) and sale in the highly commercialised street markets there.

Eddie Vernon has photographed these stalls in recent months.

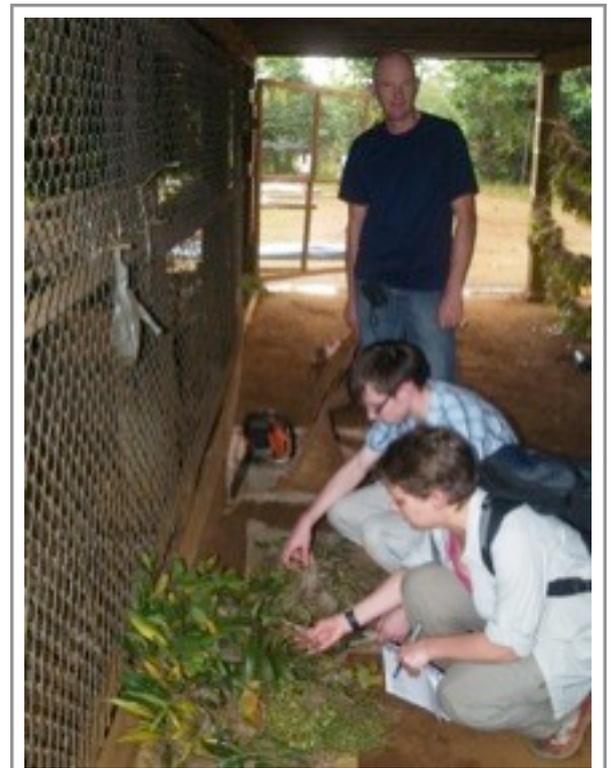


Fig 10 - Wild collected orchids found at the house of a local orchid trader.



Fig 11



Fig 14



Fig 12

Fig 11 (top left) - An area of forest cut down and ready to be cleared by burning

Fig 12 (middle left) - Paksong orchid project team amongst an area of forest cut down and ready to be cleared by burning



Fig 13

Fig 13 (bottom left) - An area of new coffee fields from recently cleared forest.

Fig 14 (top right) - Use of recently cut down forest.

This trade is on a massive scale and must be seen as unsustainable. Evidence at the house also indicated the damaging methods employed by collectors. A recent delivery resting on collecting bags was adjacent to a partly concealed chain saw showing the preferred collection method to be by felling the tree that carried the desired orchid species. The most numerous species hanging on the strings was *Dendrobium chrysotoxum* (550 plants). I feel that it is no coincidence that in our forest explorations I only ever observed young plants of this species as any large or flowering specimens locally are likely to suffer removal and sale to traders.



Fig 15 (left) - Agriculture on the Bolaven Plateau
*Fig 16 (right) - Rachel holding *Dendrobium compactum**

A key target for the Paksong Orchid Project must be to replace the wild collected trade with cheaply produced laboratory raised plants that can be traded both legally and sustainably for the benefit of the people of Paksong and the surrounding area.

Habitat loss

In addition to collection Lao orchid species are suffering from habitat loss.

In the environs of Paksong the destruction of forest is primarily for land conversion to agriculture and in particular an expansion of the growing of Coffee Arabica.

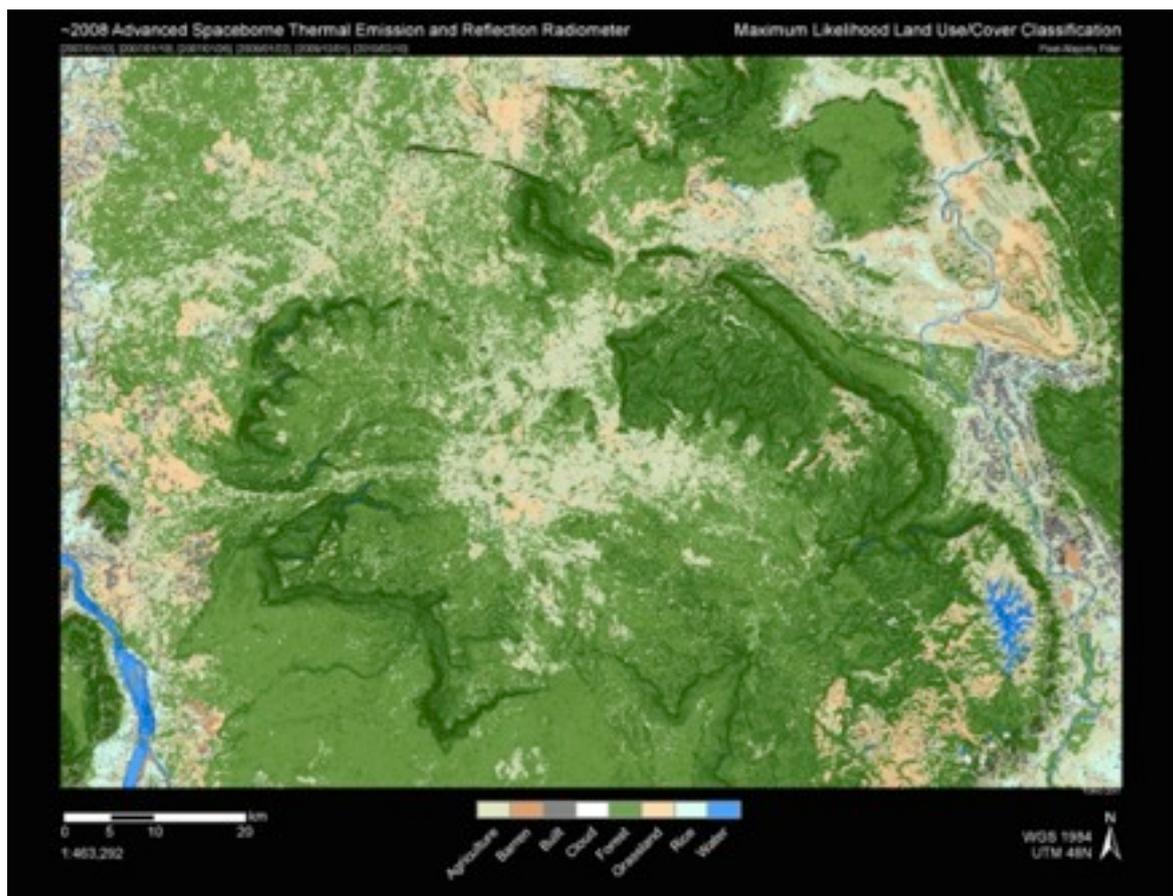
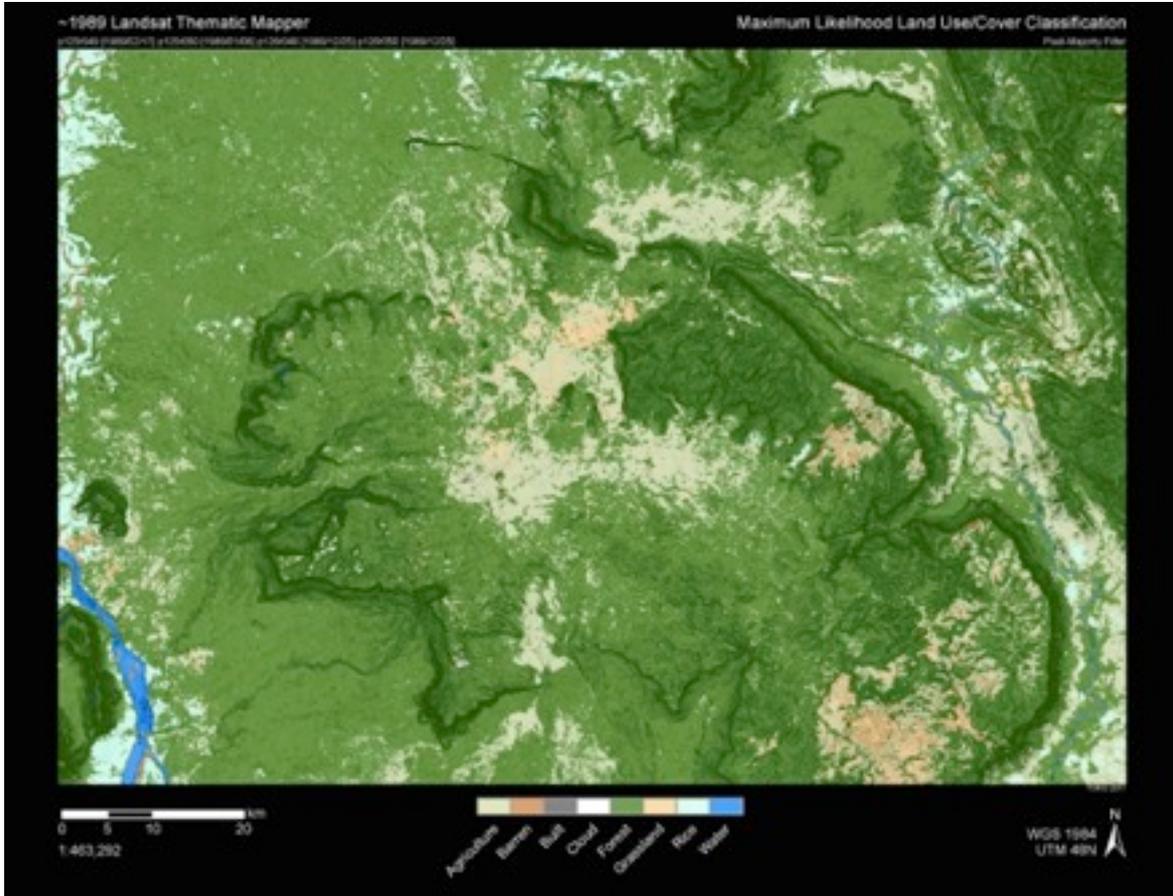


Fig 17 - Land use in southern Laos in 1989 (top map) and 2008 (bottom map)

I observed forest conversion to coffee on a number of occasions. The nature of this conversion can be characterised as follows:

Large scale forest conversion for well financed coffee production (often funded from other countries)

A large area of forest has very recently been cut down to the north east of Paksong in a coffee development that is funded from Japan. Part of the area is still forested, some has been felled but not yet cleared and some has been cleared (by burning and ploughing) There is some extraction of timber as part of the forest clearance.

One of the most disappointing aspects of this approach to agricultural development is that coffee arabica requires shade trees to flourish and rather than make use of the existing native tree species to provide this shade the land is completely cleared and non-native shade trees are planted along with the coffee plants.

Small scale forest conversion alongside informal 'development' particularly along roads.

In a number of explorations into forested areas it was very noticeable that a strip of land either side of the road has largely lost its forest mostly again for coffee production.

In summary there is considerable pressure on the forests of the Bolaven Plateau and this pressure appears to be largely uncontrolled.

The advance of agriculture and the retreat of the native forest is clearly shown by the comparison of the Land use maps for 1989 and 2008 shown below.

While the plateau (outlined by the dark green escarpment forest) has suffered less in this time than the surrounding lowland areas the rate of loss is considerable and I would estimate that the forest will largely have disappeared in fifty years time unless effective controls are implemented.

Other relevant cultural observation

Effective conservation requires cultural support if it is to be effective as it is more about the people than the plants.

During my brief stay in Laos I was able to make brief observations of a number of cultural practices which may or may not support the development of conservation in Paksong.

My first observation was of clear signs of respect and appreciation of wild places and the flora and fauna of Laos. This was most outwardly visible in Luang Prabang with a number of high profile tour centres offering eco-tours, some beautiful old temples (Wats) with gardens and ancient plants. Respect for nature was also reflected in the pages of the in-flight magazines of Lao Airways. Near Paksong there is much made of the natural beauty of the waterfalls of Bolaven Plateau.

On a smaller scale flowers and gardens were commonly observed in Paksong around low status as well as high status dwellings. A connection and appreciation of cultivated flowering plants is in my opinion a good starting point for the support of conservation especially when many of the cultivated flowering plants are Lao natives.

An excellent opportunity to observe political and cultural support was provided by the Paksong' VIPs visit to the newly commissioned orchid propagation laboratory. Visitors included a previous district governor, representatives of the environment department and head of the village police.

This group were given a tour of the facilities and shown presentations about the history of the Paksong Orchid Project and the involvement of Writhlington School. They were outwardly very interested in the project, took copious notes on aseptic procedures, asked many questions and suggested many positives that the project offered Paksong. The level of enthusiasm suggests that political and cultural support for the project is probable as it develops.

As part of the visit seed and seedlings in-vitro were imported from Writhlington. The plant health authority in Laos is a relatively new organisation and it appeared that we were the first to attempt to legally import orchid seedlings in-vitro to Laos. Organising the permits and accompanying phytosanitary documentation from DEFRA proved rather complex but in the longer term a functioning plant health authority is likely to both improve the enterprise side of the Paksong project and to restrict illegal wild collection for export.

There are also negative cultural practices that hasten habitat loss and may hamper efforts for conservation.

Firstly, agricultural practice does not appear sympathetic to native species and habitats. The clearance of land prior to coffee planting tends to be total clearance of all trees with bulldozers. Native trees are not left, or even re-planted for shade trees but non-native species are planted with the coffee. These trees are unlikely to support the diversity of native trees.

Secondly there appears to be limited education about the forest and its importance. This contrasts dramatically with the level of education that was apparent in Sikkim on my visit there in 2009. In Sikkim I observed regular road signs about the benefits of the forest and shops had local publications about the forests and its biodiversity. None of these were observed in Laos. It seems that a primary aim for the POP will be to develop an educational programme possible targeted at schools.

Conclusions

Short term outcomes

By the end of my time in Laos a number of outcomes had been achieved.

The Paksong orchid propagation laboratory was complete and operational. Local staff had completed an intensive training programme covering media preparation and aseptic work including a range of seed sowing and re-planting techniques. This had been the main objective for the trip.

A large amount of laboratory work had been completed in the laboratory including the sowing seed of more than twenty five Lao species and re-planting more than fifty jars of protocorms brought with us from Writhlington.

Significant further steps were made in recording the orchid species present in the forests around Paksong. The local species list now contains sixty two confirmed species.

Future plans for the Paksong Orchid Project have been refined and developed during the visit to include a proposed orchid reserve and consideration of eco lodges.

Significant steps have been taken in securing political and community support through the VIP visit.

Finally the visit has changed the lives of those who took part with the British students reshaping future plans as a result.

Medium/Long term future outcomes

Seed sown during the visit will be ready to ween from spring 2013 and from this point on the laboratory will be producing a stream of orchid seedlings.

Laboratory seedlings will be weened in shade houses in Paksong and there are several ideas as to what will happen to the seedlings once weened:

One idea is to work with a local fair trade coffee co-operative. Weened seedlings will be sold to coffee farmers. As previously noted, coffee a major crop in on the Bolaven, and the agriculture around coffee growing is putting many local species of orchid at risk (see Conservation Threats). Coffee farmers can supplement their income from coffee by selling orchids bought from the Paksong Laboratory, grown under their coffee bushes These could either be sold direct to Thai tourists and Chinese medicine traders or bought back for centralised trading.

Precise mechanisms for this enterprise are still to be developed especially as CITES and phytosanitary certification will be required for export.

Export to Europe is also being considered with Writhlington School operating as the importer for lab raised seedlings. This is likely to be most straight forward with seedlings in-vitro but all options are being considered.

Another idea is that these orchids could be used within the educational purposes of POP. They could be reintroduced into the proposed Paksong Eco Resort, behind the Paksong Laboratory or more simply used to develop the educational 'orchid garden'.

Personal outcomes

The experiences that I have gained from this expedition will no doubt stay with me for the rest of my life. I have witnessed first hand the devastating effects of deforestation and how quickly they are decimating areas of forest. At the same time I was able to experience first hand the conservation work being undertaken to combat this. It gives me immense satisfaction to know that I have been involved in something that will help save the planet.

I have wanted to go into a career in research science for a good few years now, but this expedition has reminded me exactly where my heart lies; in conservation and preserving these beautiful patches of forest. I have no set plans as to what I will do for a career, but I have a feeling that wherever I go, horticulture and conservation will be a part of it - which can only be a good thing!

Acknowledgements

Mr Simon Pugh-Jones - for organising the expedition and general help with identification of orchid species.

Dr Lauren Gardiner - for help with collecting scientifically accurate data, as well as write-ups and spellings.

Mr Eddie Vernon & Ms Chansouk Southivong - for being such excellent hosts and putting up with a rather messy expedition team on their living room floor all day for seven days!

Science Scope - For supplying the data loggers used in data collection, and assisting with data processing.

The Merlin Trust - For helping fund my expedition.

References

[1] **Vernon, E. 2007.** Original Project Proposal for Paksong Orchid Project to OCI

[2] **Barnes, L. 2009.** Changes in orchid diversity at different altitudes, and over time, in the Sikkim Himalayas.

[3] **Paksong Tourist Information. 2011.** <http://www.paksong.info> (26/10/11)

Appendix 1 Species List

The following table shows orchid species observed in habitat during the expedition top Laos 2011. The table shows confirmation of observed flowering to confirm identification either in 2011, previous Wrihtlington expeditions in 2006 and 2007 or by photographs sent to Wrihtlington by Eddie Vernon.

Genus	Species	Flowering	souks garden	pakong felled trees	100 year old rose	Horse shoe waterfall	POP reserve	plateau drive	Luang Prabang
Adenoncos	sp.1 tree over Mekong								1
Aerides	houletiana	Eddie photo				1			
Agrostophyllum	sp.1 short wide leaves	2011				1	1		
Agrostophyllum	sp.2 long thin leaves						1		
Anthogonium	gracile	2011			1				
Appendiculata	pendula				1				
Bulbophyllum	didymotropsis	2007			1				
Bulbophyllum	lemnisiatodes	2007				1			
Bulbophyllum	lilacinum	2011					1		
Bulbophyllum	long spike	2011						1	
Bulbophyllum	penicilium	2007			1				
Bulbophyllum	reptans	2011		1			1		
Bulbophyllum	sp 1 small like Trias			1					
Bulbophyllum	sp.2 long bulb stragglng			1			1		
Bulbophyllum	tortuosum	Eddie photo		1					
Chiloschista	usneoides	2007				1			
Cleisostoma	birmanicum	2007			1				
Cleisostoma	sp.1 terete leaves all on one side of stem								1
Cleisostoma	teretifolium	2007		1					
Coelogyne	assamica	2011			1				
Coelogyne	fusescens	2007			1				
Coelogyne	lentiginosa	2011				1			
Coelogyne	trinervis	2011		1		1			
Coelogyne	viscosa				1				
Cymbidium	bicolor	2011					1		1
Dendrobium	aciculare			1					
Dendrobium	aphyllum								1
Dendrobium	cariniferum	2007		1	1		1		
Dendrobium	chittimae	Eddie photo					1		

Dendrobium	chrysotoxum	2007		1					1
Dendrobium	compctum	2011	1	1				1	
Dendrobium	crepidatum					1			
Dendrobium	jenkinsii								
Dendrobium	pachyglossum			1			1		
Dendrobium	pulchellum	2011							1
Dendrobium	sp.1 pink single flowers	2007			1				
Dendrobium	thyrsoflorum						1		
Dendrobium	heterocarpum	Eddie photo		1			1		
Eria	discolor	2011		1		1	1		
Eria	lasiopetala	2007			1				
Eria	paniculata	2007		1	1		1		
Eria	pannea	2007		1					
Eria	sp.1 possibly bipunctuata								1
Eria	tomentosa	2007					1		
Eulophia	spectabilis	2007					1		
Habenaria	rhodocheila	2011			1	1			
Liparis	paradoxa	2011			1				
Malaxis	sp.1					1			
Oberonia	sp.1 tiny fat	2011	1	1			1		
Oberonia	sp.2 thin leaves			1			1		
Ottochilus	fuscus				1		1		
Pholidota	articulata	2007		1	1	1	1	1	
Pholidota	convaleriae	2007		1	1		1		
Pholidota	imbricata				1	1	1		
Pholidota	recurva	Eddie photo		1	1		1		
Polystachya	concreta					1	1		
Porpax	sp.1 (tiny little orchid)			1					
Robiquetia	pachyphylla	2007					1		
Rynchosstylis	gigantea					1			
Spathoglottis	affinis	2011			1				
Thrixspernum	centrepda	2007		1			1		
Vanda	denisoniana	2006							1
Vanda	flabellata							1	
Vandopsis	lissochiloides		1			1	1		
		Totals	3	22	20	15	26	4	8

The records show identification of 64 orchid species from a total of 98 records. Of the 64 species 41 species have been recorded in flower. The greatest number of species were recorded in the proposed POP reserve (26 species) demonstrating the importance of this area in terms of its orchid diversity. Further sampling is likely to identify considerably more species than those recorded especially since a number of Dendrobium, Bulbophyllum and Coelogyne species in the area look similar when not in flower.

Luke Barnes – Merlin Laos Visit 20/10/2011 – 31/10/2011

Accounts summary

The following table shows all spending during the trip (the currencies used are US Dollars, Lao Kip, Thai Bart and UK Sterling)

date	item	\$	Kip	Bart	£
20/10/2011	Rhubarb Heathrow				9.2
20/10/2011	Boots				1.4
21/10/2011	Mango tree			215	
21/10/2011	Mango tree			83	
21/10/2011	Blue Lagoon	11.45			
21/10/2011	Airport transfer	12			
21/10/2011	Drinks	2			
21/10/2011	Temple offerings	2			
21/10/2011	Temple entry	3			
22/10/2011	Breakfast		12000		
22/10/2011	Taxi	12			
22/10/2011	Airport purchase	2			
22/10/2011	Tadd Fan	4			
22/10/2011	Hotel 1 night	17			
23/10/2011	Breakfast (market) drinks		5000		
23/10/2011	Breakfast market food		8000		
23/10/2011	Lunch Paksong		32000		
24/10/2011	Breakfast (market)		6300		
24/10/2011	Lunch – waterfall		31000		
24/10/2011	Won coffee		23000		
24/10/2011	First aid rescue				22.74
25/10/2011	Won coffee		12000		
25/10/2011	market breakfast		5000		
25/10/2011	sinouk coffee		52000		
25/10/2011	Dinner		51000		
26/10/2011	breakfast		20000		
26/10/2011	lunch		22000		
26/10/2011	lunch		50000		
26/10/2011	Parking/entry fees		33000		
26/10/2011	Evening meal		17000		
26/10/2011	Market food		31000		
28/10/2011	Breakfast		16000		
28/10/2011	Drinks pakse		11000		
28/10/2011	taxi		150000		
28/10/2011	street food dinner		80000		
29/10/2011	Breakfast		31000		
29/10/2011	lunch		52000		

29/10/2011	hotel	34			
29/10/2011	lunch on 25th Oct		44000		
29/10/2011	temples		21000		
30/10/2011	Dinner		75000		
30/10/2011	Evening meal and show		220000		
30/10/2011	Taxi	15			
30/10/2011	Breakfast (market) drinks		31000		
30/10/2011	Mango Tree			310	
30/10/2011	Drinks			96	
21/10/2011	Visa	32			
	Totals	146.45	1141300	704	33.34
	Totals in dollar	146.45	152.17	25.14	
	Total £				244.95

* Exchange rates \$1 = 7500K = 28 Bart = £0.60

Travel costs:

Flights (Key travel) Heathrow – Bangkok – Luang Prabang – Pakse.	1 373.23
Bus travel to/from Heathrow	21.10
Total	£1 394.33

Other Costs

DEFRA inspection and certificate	£32
Medical costs - Innoculations	£46
Malarone tablets	£38
Total	£116

Spending summary

Moneys on expedition food/ accommodation	244.95
Travel	1394.33
Other	116.00
Total	£1755.28

This amount was covered by my Merlin Grant £1 100 and then my contribution of £655.28

Accounts prepared by Luke Barnes 10th Feb 2012