

Darwin Initiative for the Survival of Species

Half Year Report (due 31 October each year)

Project Ref. No.	14-030
Project Title	<i>Going for Gold – Cordyceps Conservation in Bhutan</i>
Country(ies)	Bhutan
UK Organisation	CAB International (CABI Bioscience)
Collaborator(s)	Council for Renewable Natural Resources of Bhutan (CORRB), Ministry of Agriculture, Bhutan
Report date	October 2007
Report No. (HYR 1/2/3/4)	HYR3
Project website	http://194.203.77.76/Cordyceps/

1. Outline progress over the last 6 months (April – September) against the agreed baseline timetable for the project (if your project has started less than 6 months ago, please report on the period since start up).

Good progress has been made in a number of areas. The survey work has continued as planned, building up baseline data that can be used to establish scientifically validated harvest levels in future years. We have also worked with the Nature Conservation Division in Bhutan to set up parallel studies in the Bumdeling Wildlife Sanctuary in the far east of the country, in response to reports that the seasonality of *Cordyceps* differs from that in the western region. This has involved two field expeditions to date, and the installation of a data recorder provided by the project to allow environmental comparison between the two sites. We were rather surprised to find that the ambient soil temperature at the original site at Nam Na did not reach 0°C at all until mid May this year. The cooperation with NCD has been particularly valuable as the study site at Bumdeling is extremely remote, requiring 7-8 days of travel in each direction from Yusipang where the project is based.

Changes to the legal harvest period implemented in 2006 were maintained for 2007, with a small modification to allow later collection in the eastern region which has had a minimal impact on a national scale due to the small number of collectors in that part of the country. We appreciate the value of obtaining objective information on the impact on populations of the collection date change (as expressed by the Year 2 project reviewer). However, this is highly problematic due to lack of baseline information and the range of external factors influencing population sizes. The most direct evidence we have of the appropriateness of current conservation measures is that significant numbers of *Cordyceps* in multiple study sites have been observed after the end of the legal collecting period, suggesting that current harvest is not having a major negative impact on the natural populations.

Work on understanding the biology of the moth which *Cordyceps sinensis* parasitizes has moved forward significantly. We have characterized the species of moth involved. This appears to be undescribed, though there is one possible Chinese candidate species that we are continuing to follow up. The moth species appears to have a very short adult life span (as do other ghost moths) which has proved a major obstacle to work on the entomology in view of the arduous nature of the field work and the difficulties in planning logistical support. However, we were able to collect substantial numbers of moths during the summer of 2007, substantially later in the season than we had originally expected based on our knowledge of seasonality of other ghost moth species in the Himalayas. This will enable us to understand variation within

the species, and will inform future developments in farming research.

Initial experiments on food plant preference were unsuccessful as described in previous reports, and we have therefore initiated a new in-situ pot-based study. The candidate plants will be inoculated with caterpillars once they are fully established and weight gain will be measured over a period next year. We strongly suspect that the *Thitarodes* species is not a specific feeder, and the experiment will provide further support for future farming activities.

We have continued to monitor harvest of *Cordyceps* through the Government auctions. This year the quantity offered for sale was substantially lower than in 2006 at most auction sites. This could be for a number of reasons, including natural population fluctuations and/or increased unauthorized trading in addition to exhaustion of the resource. The quality of *Cordyceps* offered was substantially improved, with little offered in a seriously degraded state as in previous years – doubtless due in part to the education programme provided to the harvesters. We are now happy that the messages on sustainability and quality are reaching their audiences, and as suggested by the Year 2 report reviewer, production of the *Cordyceps* leaflet in Dzongka is now regarded as low priority. We shall of course continue to emphasize the need for sustainability through a range of channels.

We have carried out a substantially more detailed survey of the *Cordyceps* harvest in 2007 through interviews with the collectors, in response to the Year 2 project reviewer's suggestion. As predicted it did prove difficult to gain meaningful information on the *Cordyceps* populations due to an understandable reluctance to divulge detailed information on collection sites or population levels. We do now know that the species is widely distributed within Bhutan, and is probably present in all suitable habitats (typically north-facing *Kobresia*-dominated slopes). We are considering using vegetation survey as a proxy to estimate total population numbers in parallel with information from the markets, but need more data before assessing the potential value of this approach. The results of the harvest survey have not yet been fully processed, and will be reported on in the Year 3 annual report.

The prices obtained in 2007 were higher than ever before, with one small batch sold at an equivalent price of US\$12500/kg. These almost astronomical figures underline the challenge of achieving sustainability of harvest, and the potential for distortion of existing yak-dominated economies in high-montane Bhutan.

Initial attempts at introducing a pilot community-based management scheme for *Cordyceps* were unsuccessful as recorded earlier (primarily loose community cohesion and distrust of Government mediators) and we have been investigating alternative strategies for promoting shared management responsibilities. A major obstacle is continued unauthorized cross-border harvest and trade, and we predict that sustainability can only be achieved in the long term on a regional basis. We have been liaising with a US research project along similar lines that has recently been established in Yunnan, and we are exploring the potential for a regional workshop to exchange information.

Disappointing progress on development of *Cordyceps* farming led to a request in April 2007 to modify the project objectives by reduction of expectations in this area, though we are continuing to gather information that will be useful to achieving this objective in the future. We proposed as an alternative objective the preparation of an identification manual for montane flowers of Bhutan, as a byproduct of digital images gathered during the survey work. The project reviewer questioned the wisdom of extending the project objectives, and suggested that we carried out further surveys for other *Cordyceps* species as an alternative. We have taken this suggestion on board, and while we are still planning to provide the Bhutanese Government with substantial numbers of illustrations to act as the basis for a book in the future, we carried out an initial survey for other insect-associated fungi this summer in Bumdeling. We found about a dozen species, all of which were previously unrecorded for Bhutan. A further survey is taking place as this report is being written in the south of the country, with additional external support from an EU-funded medicinal plants project. Bhutanese scientists are being trained in survey and

identification techniques, and we anticipate that the survey work will be submitted as a research paper. We made a request to the Darwin Initiative to modify the project objectives as described in the Year 2 Annual Report, but did not receive a response. As we have now adjusted our proposal for modification to coincide with views of the Year 2 report reviewer, we assume that this modified objective is acceptable to the Darwin Initiative.

We are currently in the final stages of preparing for two two-day workshops to be held in the central and western regions of Bhutan next month. These will put the *Cordyceps*/ghost moth system in perspective with knowledge of fungus and insect diversity and ecology in general, providing the participants with improved understanding of the role of these important organism groups in ecosystem function. We will also use the opportunity to discuss further options for sustainable management of *Cordyceps sinensis*. The workshop delegates will primarily be field biologists from the National Park system, who have only basic knowledge of the groups concerned. Matching funding has been obtained to support the workshops, from the EU and also the Thai Government institution BIOTEC.

2. Give details of any notable problems or unexpected developments that the project has encountered over the last 6 months. Explain what impact these could have on the project and whether the changes will affect the budget and timetable of project activities.

No further unexpected or unwelcome developments have occurred in the last six months, and the project is progressing as planned.

Have any of these issues been discussed with the Darwin Secretariat and if so, have changes been made to the original agreement?

Some further modest virement between the consumables and travel budgets may be needed, but we have recently applied for a small travel grant to support project work and we will not make a formal request until the outcome is known.

Discussed with the DI Secretariat: no, in..... (month/yr)

Changes to the project schedule/workplan: no, in.....(month/yr)

3. Are there any other issues you wish to raise relating to the project or to Darwin's management, monitoring, or financial procedures?

No

If you were asked to provide a response to this year's annual report review with your next half year report, please attach your response to this document.

Please note: Any planned modifications to your project schedule/workplan or budget should not be discussed in this report but raised with the Darwin Secretariat directly.

Please send your **completed form by 31 October each year per email** to Stefanie Halfmann, Darwin Initiative M&E Programme, stefanie.halfmann@ed.ac.uk . The report should be between 1-2 pages maximum. **Please state your project reference number in the header of your email message.**