

## 14-030 First Half year report 2005

### Going for Gold

### First project report, April – September 2005

#### Summary

The project has got off to a solid start. The major initial activity was a five-week field trip to Bhutan to establish experimental protocols and carry out initial research into populations of the caterpillar fungus *Cordyceps sinensis*, the level of harvest and the biology and feeding habits of its insect host. Further survey work has been carried out by our Bhutanese counterparts, and three CORRB staff attended a training course in Thailand on the biology and identification of insect fungi. All major outputs have been achieved, though there are delays.

#### Purpose and Objectives

Harvest of the fungus *Cordyceps sinensis* in fragile natural ecosystems in Bhutan is currently highly lucrative but almost certainly unsustainable. The project will work with local stakeholders to achieve sustainable harvest through regulation of collection and habitat preservation, contributing also to protection of other vulnerable species. Capacity building will enable research into the biology of the fungus and its insect host, and into methods for their cultivation. This will reduce pressure on natural populations while maintaining local livelihoods.

Main activities will include:

- Surveys of current population levels of *C. sinensis* and current harvest, using participatory techniques involving the local population
- Establishment of long-term monitoring/impact studies on the fungus and its natural habitat, complementary to GEF/UNDP-sponsored integrated management plans
- Promulgation of best practice for harvest by local people
- Improvement of regulation, including measures to achieve public support
- Research to elucidate host life cycle and food preference
- Cultivation of food plants for the moth larvae, along with existing experimental medicinal plant gardens
- Establishment of cultures of host larvae and experimental inoculation with *Cordyceps*
- Investigation of IP issues and feasibility study of a Government-regulated trading scheme

#### Narrative

##### *Project initiation*

The first major activity of the project was a five-week survey and planning operation in Bhutan. Two CABI staff (Paul Cannon and Norbert Maczey) and the Bangkok-based consultant Nigel Hywel-Jones spent from 22 May to 24 June in Bhutan. The first week was spent meeting the local project team designated by our partners CORRB, liaising with senior officials of the Ministry of Agriculture, planning the field trip, purchasing supplies, getting used to the altitude – and participating in Bhutan's first ever population census.

The project team from CORRB comprises four people: Dr Lungten Norbu (project leader and administrator), Tshitila (mycology specialist), Kuenzang Dhendup (insect and plant specialist) and Dophu Drukpa (socioeconomist).

### Fieldwork

*Cordyceps sinensis* grows in high montane pastures (between about 4000m and 5000m altitude), in northern parts of Bhutan near the border with Tibet. Many areas of Bhutan are inaccessible, and the study sites in the Jigme Dorji National Park we are using are about three days trek from the nearest road. Most of the time in the field was spent camping (in tents purchased by the project), though in one location we were able to stay in a CORRB building used for processing wild-collected medicinal plants. The remoteness causes unavoidable delays and logistic complications, but we were able to spend over two weeks researching in the *Cordyceps* zone.

*Cordyceps* fruit bodies are harvested by local inhabitants of the National Park, most of whom are yak herders. Activities were divided between survey work for the fungi themselves, investigation of their insect host and initial studies on food plants, and socioeconomic work interviewing the yak herders to tap their knowledge on *Cordyceps* sites and seasonality. Poaching of *Cordyceps* from across the border with Tibet is frequent, and we also attempted to establish the level of poaching and its impact on harvest by legitimate collectors in Bhutan.

*Cordyceps* frequency was found to be highly variable. Most sites previously recognized to be rich in *Cordyceps* were found to be depauperate in 2005, but one site about Lingshi (regrettably particularly inaccessible) was found to have large numbers of fruit bodies. There were numerous concerns expressed by local collectors that Tibetan poachers had extracted many *Cordyceps* before legal collecting in Bhutan began at the beginning of May. However, the season was poorly advanced and we believe that there is likely to be considerable fluctuations in population from year to year with periodic crashes followed by gradual recovery.

The *Cordyceps* site at Nam Na was found to offer the best compromise between *Cordyceps* frequency and accessibility, and a permanent transect was set up to facilitate comparison of populations between years. Much of the initial work on the insect host and its food plant occurred here also.

One of the primary obstacles to farming *Cordyceps* is lack of knowledge of the biology and life-cycle of the insect host. The fungus will grow (very slowly) in pure culture but does not produce its characteristic fruit body, and the major market in China is for the natural product with the caterpillar cadaver attached. The caterpillars feed in the soil layer on plant roots, and can only be collected by digging up sections of habitat. We still have some problems remaining to identify the caterpillars unequivocally, but we were able to make initial assessments of population levels with 4-5 caterpillars of varied instars being gathered from metre quadrats of soil and roots.

Studies of food plants were necessarily preliminary, but we found caterpillars associated particularly with two species of *Potentilla*, a *Bistorta* and a dwarf *Rhododendron*. *Kobresia* sedge may also provide food. The intention is to establish the food plants in medicinal plant gardens established by a complementary EU-funded project, allowing food preference experiments to take place. Some of the caterpillars were collected live and carried in containers of soil down to CORRB's experimental base at Yusipang, but the long and rough journey led to a high mortality rate. Subsequent observations suggested that the caterpillars will eat generic foodstuffs such as carrot, which could make cultivation of *Cordyceps* much more practical assuming that the caterpillars can develop normally in these circumstances.

Capture of adult moths was also attempted using kerosene-powered light traps and sweep nets, but though many noctuid moths were caught, no hepialid species were captured. We are unsure as to whether this was because the season was incorrect, or that the moths are genuinely rare following a population crash in recent years.

Subsequent to the initial field work, CORRB staff carried out further surveys to establish the degree of maturity and frequency of *Cordyceps* fruit bodies late in the season, and to carry out further light trapping. Significantly, it was established that there were significant numbers of *Cordyceps* fruit bodies remaining in early August. This suggests either that the fruiting season is longer than we originally

expected, or that the inconspicuous nature of the fruit bodies means that sufficient numbers are missed by collectors to ensure harvest in future years.

#### *MoU and project workshop*

Following the field work, the remaining time in Thimphu was spent agreeing the wording of an MoU between CORRB and CABI to provide a formal framework for the project collaboration (this was eventually signed in September following authorization by the Ministry of Agriculture). In addition, an open project workshop was held, at which senior officials from all relevant Government institutions participated in addition to representatives from other projects, conservation organizations etc. Initial discussions took place on the potential for a colour guidebook to the mountain flowers of Bhutan, and this will be pursued further next year. An initial tranche of funds was provided to allow CORRB to continue survey work: bank transfers between our organizations have only recently become possible following a request by CORRB to the Ministry of Finance in Bhutan.

#### *EU project*

Going for Gold is running concurrently with a larger EU-funded project to develop a sustainable industry for medicinal plants in Bhutan. A small component of this programme was intended to focus on *Cordyceps*, so discussions were held with the local project workers to ensure complementarity. The EU project has a major emphasis on processing and market analysis, and agreement was reached that the *Cordyceps* component would be devoted to analysis of the auction system by which the sale of fruit bodies is regulated by the Royal Government of Bhutan. There are likely to be further synergies between the two programmes, to mutual benefit.

#### *Equipment and budgeting*

The award of the EU project (this had not occurred at submission of the second-stage Darwin application) led to extra pressure on CORRB's camping equipment and other field supplies. In addition to the capital items specified on the Darwin budget therefore, several tents and other pieces of field equipment were purchased. Some of these fall into the grey area between capital items and consumables, but overall the project will remain within budget. We have established the need for extra travel funds over and above those budgeted, and will be discussing modest viring between budget headings in the near future with the Darwin Initiative.

#### *Training*

Training in survey techniques for fungi and insects took place during the initial period of field work. In addition, three Bhutanese project workers (Tshitila, Kenzang Dhendup and Dophu Drukpa) attended a week-long training workshop on the biology and identification of insect fungi at BIOTEC in Thailand, giving them a wider insight into the range of biology and lifestyles of entomogenous fungi, including those from habitats other than montane grassland. It is possible that some survey work for *Cordyceps* will take place in lowland forests of Bhutan as an additional project output, should time and funds permit.

#### *Publicity*

The project has generated a significant amount of public interest. The project workshop in Thimphu was attended by the local press, and an article on *Cordyceps* and its harvest appeared in print and the Internet version of the Bhutanese national newspaper *Kuenzel*. Following a press release by CABI to the English press, a one-page news article on *Cordyceps* and conservation concerns appeared in *New Scientist* and a similar piece in the *Observer*, and BBC Television News also followed up the story. Regrettably,

despite specific requests the Darwin Initiative was not acknowledged as funder in either UK publication, though it did feature in the Bhutanese article.

*The future*

*Cordyceps* research is a highly seasonal activity, and most of the actions planned for year one of the project have now been completed. A website is in an advanced stage of preparation and should go live soon, and we also plan to produce an information leaflet in time for next year's season. An early visit to Bhutan may take place in March next year to provide training and sensitization about *Cordyceps* to National Park staff, who will be in their winter postings in Thimphu at that time. We also plan to hold a short project meeting in Bangkok in the near future (this is more cost-effective than in Bhutan) to review progress and make firm plans for year two of the project.

Paul Cannon, 14 October 2005