

# Missing pieces in the story of a caterpillar fungus – *Ophiocordyceps sinensis*

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**Abstract:** *Ophiocordyceps sinensis* (syn. *Cordyceps sinensis*) is a peculiar caterpillar fungus. It is not only known for its extraordinary medicinal values, which cover a wide spectrum of illnesses ranging from fatigue to cancer, but also for its fascinating life-story (Yeh & Lama 2013). Unlike many medicinal products, advertisements for “*Cordyceps*” do not solely promote its medicinal value, but also the origin of its production. Retailers often employ snowy mountains, Tibetan script, Tibetan people, blue sky and green meadows to advertise their products. The imagined geography delivers a message to consumers that it is a natural wonder that comes from a Xanadu, a distant, exotic, untouched and unpolluted place. The description of its production site is not meant to deceive the consumers, but it is only one piece of the story. Behind the veil of *Ophiocordyceps* commodification, we see missing pieces from a personal experience during a two-month-long field research in the eastern Tibetan region in summer 2018: Tibetan harvesters, a harsh climate, the declining *Ophiocordyceps* populations, plastic packaging and aluminum cans loitering the meadows. All these are also part of the production story.

**Key words:** conservation, *Cordyceps*, entomopathogenic fungi, ethnomycology, medicinal fungi, Tibet

## INTRODUCTION

The skyrocketing demand for *Ophiocordyceps sinensis* from Chinese urban consumers in the last two decades has created a unique fungal economy in the Himalayas (Winkler 2009). In June 2018 *Ophiocordyceps* of average quality was sold for 50 000 US\$/kg in Shanghai – at the same time the gold price was only 38 000 US\$/kg. This ethnographic fieldwork among communities of *Ophiocordyceps* harvesters during the *Ophiocordyceps* harvesting season in an eastern Tibetan area, China, in 2018 reveals the impacts of the increasing demand of *Ophiocordyceps* on local people and local ecology.

## MISSING PIECES

The *Ophiocordyceps* only grows between 3000 m and 5200 m (Winkler 2010). Here, temperatures regularly drop below freezing on a summer night. Droma, the wife, starts the day at 06.30 h, waking up to make a fire for breakfast and warmth. Phuntsok and I got up when breakfast was ready. After some yak butter tea and Tsampa (roasted barley flour), Droma and Phuntsok carefully placed stones and prickly plants around their plastic tent before leaving to prevent pigs or yaks coming inside while we were away. Harvesters often bring livestock with them when they come to the mountains, which increases the grazing intensity. This has been suggested as one of the factors contributing to the decline

of *Ophiocordyceps* populations (Shrestha & Babu 2013). Near to our tent, on the imagined “pristine” highland meadow, there were piles of waste and beer cans littered across the river banks.

After an hour of hiking, Droma and Phuntsok arrived at the foraging site around 08.30 h, and started their ‘hunting’ until 15.00–16.00 h, when they had to return before sunset. Walking at such a high altitude is not easy, even for some Tibetans who are used to the high-altitude environment. Searching for *Ophiocordyceps* requires patience and concentration. The stromata are usually project 2–3 cm above the soil, and are difficult to distinguish from the surrounding vegetation. Droma and Phuntsok searched on their own, but still within eyesight each other. Droma first walked for a while, then started to crawl on the ground at the places which she thought could be promising. The first three hours were disappointing, so they decided to have a break and eat some lunch. They brought Tsampa snacks, packaged biscuits, and cola. After lunch, the package of biscuits and the cola bottle were left out on the meadow — unfortunately not an uncommon sight in these areas.

Soon after lunch, Droma found the first piece of *Ophiocordyceps*. She used her fingers to remove the soil around the stroma, carefully pulling it entirely out and putting it into a little box. Phuntsok was suddenly motivated by Droma’s finding; he started to actively search at the area around Droma’s first *Ophiocordyceps*. They believe the *Ophiocordyceps* grow together— once



Fig. 1. Advertisement. Translation from Chinese: “Meili Snow Mountain”, “Winter worm summer grass”.



Fig. 2. Advertisement. Translation from Tibetan (upper line): “The pilgrimage place Khawa Karpo”. Translation from Chinese (lower line): “Shangri-La”, “Meili Snow Mountain—Winter worm summer grass”.



Fig. 3. Camp ground: Villagers from neighboring areas are only allowed to set up tents, while the villagers who own these mountains can build houses. Photo: Siran Liang.



Fig. 4. Foraging: Harvesters looking for stromata of *Ophiocordyceps*. Photo: Siran Liang.

you find one, there must be more around. At the end of the day, Droma had found two pieces and Phuntsok one. Three pieces in one day was worse than at the beginning of the harvesting season, and unfortunately it gets worse each year; but still, they were better off than the people who came back empty-handed.

After selling the day's findings to middlemen, Droma went back to the tent to do housework, while Phuntsok headed to a poker room. At 4000 m, cash flows in great volumes for just two months through grocery shops, restaurants, pool tables, poker rooms, chess tables, a jewelry stand, and even a dancehall. That day Phuntsok did not come back for dinner. He spent his evening at the poker room until 02.00 h. The next day, he told us he had lost 60 ¥ (about 9 US\$), equivalent to about two stromata of *Ophiocordyceps*. The same night, Droma went out to the dancehall with her friends. The dance hall was lively, with colorful dresses, laser beams, mainstream Tibetan music, alcohol, soft drinks, cigarettes, and other kinds of activities that blurred the harsh environment outside. It is probably one of the highest altitude dancehalls in the world.

Many Tibetan harvesters were complaining that it was getting harder and harder to find any *Ophiocordyceps*. I was informed by the elderly that decades ago each person could easily find hundreds of pieces a day, and that they used to eat a wok of the fungus for dinner when there was no other option of food. Some of the harvesters blamed the decreasing finds on increasing

numbers of harvesters. Some, however, suggested it was because of climate change. Coincidentally, a recent study underlines the influence of global warming on the decline in *Ophiocordyceps sinensis* (Hopping *et al.* 2018). The locals themselves observed first-hand the effects of climate change: "In the past, the snow could be so heavy that it would hinder us from coming to "*Cordyceps*" mountains, but in the last few years there was not much snow." However, most of my informants attribute the reason of the decreasing production of *Ophiocordyceps* to the mountains' "will". They believe that if the supernatural power wants to bless them, there will be more *Ophiocordyceps*.

I explained the life-cycle of *Ophiocordyceps* to Droma and Phuntsok together with a drawing, which they quickly understood. They started to explain it to their friends, many of whom were eager to learn. They asked me how to make it more sustainable. I told them they could start from not collecting "the ones wearing a hat". Locals call the over-mature stromata with evident sporulation "the ones wearing a hat". I suggested this because these "over-mature" stromata are the main source of the ascospores, and as they usually have much less economic value due to the softness of the larvae (Winkler 2010); middlemen call these "dead *Cordyceps*" or "rubbish *Cordyceps*" and they would pay at most 5 ¥ (0.80 US\$). After listening to my suggestions, one girl responded: "Even if I don't pick it, other people will pick it."

Nyima, a 60 year old shepherd, told me that his daughter-in-law often comes back

home empty-handed. "She can't find even one piece. But she doesn't want to look for other jobs, she also can't do other jobs. As if the money derived from "*Cordyceps*" would be more valuable than the one from other means. She tasted the sweetness of plucking *Cordyceps*. People cannot let go the fact that there is no more "*Cordyceps*"!" His statement implies that although there is a sharp decline of *Cordyceps*, people still have the imagined gold in their minds. The *Ophiocordyceps* has empowered the lives of these people, but it has also restricted their livelihood options.

## CONCLUSIONS

The medicinal attributes of *Ophiocordyceps sinensis* are often promoted together with the exotic origin of production — the mysterious, pure, untouched Tibetan plateau. However, this is not the complete story. This ethnographic investigation reveals first-hand the daily struggle of the Tibetan *Ophiocordyceps* harvesters and the challenges that they face. Overexploitation of *Ophiocordyceps* has not only led to a sharp decline of its population but has also resulted in negative environmental impacts on the remote sites from which it is harvested. Furthermore, although this fungus has empowered the otherwise marginalized Tibetan harvesters in the last few decades and has come to play an indispensable role in their lives, the prospect is that the current unsustainable practice may lead to a devastating impact on local

livelihoods, habitat degradation, and a loss of biodiversity.

Concern over the over-harvesting of this fungus has been expressed in adjacent areas of the Himalayas, and in the case of Bhutan the government was putting in place measures to promote the wise management of this resource (Cannon *et al.* 2009). In view of my findings, it is evident that this matter requires urgent attention throughout the areas in which *Ophiocordyceps sinensis* occurs.

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