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The Himalayan Gold Rush

The untold consequences of Yartsa gunbu in the Tarap valley

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South Asia, Nepal, Dolpa district, Dho Tarap

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Abstract

Despite the fact that it has been used in tradition medicine for centuries, the caterpillar fungus known as yartsa gunbu (Othiocordyceps sinensis), has only become a popular medical supplement in the last fifteen years. Demand in China has driven what has been dubbed 'the Himalayan gold rush', a scramble for the fungus that has utterly transformed the agro-pastoral economies of the remote Himalayan regions where cordyceps is found. In many cases, the locals have prospered economically from the commodification of yartsa gunbu. In one such region of Nepal, the Tarap valley of the Dolpa district, while the villagers have benefitted financially, nearly ten thousand additional Nepalis come to pick the fungus each summer, resulting in detrimental environmental impacts to the sensitive grasslands where the fungus grows. The valley is now littered with trash, its animals and pastures significantly weaker than ten years ago. Thefts, deceit, chaos and violence have now become commonplace during yartsa gunbu season in the Tarap valley. Last year, a dispute between locals and government officials in Dho Tarap resulted in the serious injury of over forty villagers and the death of two. As the price and demand for cordyceps continues to increase, the fungus become increasingly difficult to find and harvest, threatening this burgeoning economy. Yartsa gunbu has caused a cascade of social, environmental, political, and economic shifts in the Tarap valley. This paper is an attempt to understand the full consequences of yartsa gunbu. Forty villagers, two traditional doctors, several teachers and three government officials were interviewed in Dolpo as research. Special attention was given to the details of the clash and to the environmental impact of fungus harvesting. While no absolute conclusion as to the definite long-term impacts of cordyceps can be drawn from this study, one salient point is clear; the Dolpo-pa ancient way of life has undergone rapid change in the last ten years as a direct result of cordyceps, and these shifts are profoundly threatening the culture and society of the Tarap valley.

Acknowledgments

First and foremost, I would like to thank Phurwa Dhondup, my project advisor. His ongoing research into yartsa gunbu sparked my initial interest in the topic. Phurwa's charisma, intelligence and encouragement have helped carry me through this project. His contacts in his home village of Dho Tarap were vast, his friends and family warm and weolcoming. Without Phurwa, our trip to Dolpo would probably not have been possible. I would also like to thank him for putting us in touch with the Crystal Mountain School students that we traveled to Dolpo with. Our journey with them was wonderful, and I will forever remember the time we spent together in Tarap. Lastly, I want to thank Phurwa for his contribution of written materials and photos, particularly his *Ethics in Action* article, which I use extensively the section of this paper that discusses the clash in Tarap last summer.

I would also like to thank Isabelle Onians, my academic director, and Patrick Dowd, one of my program coordinators. Their genuine enthusiasm for all things Himalayan and Tibetan gave the semester weight and meaning. From Tarap, I want to thank Tsering Dorje, Sonam Droma, Tsering Wangmo, Punjock Sewang, and Ebe. They made our journey to and from Tarap fun and pleasant. When we arrived in Dho, they welcomed us into their homes, fed us, offered us tea and chang, and treated us with the utmost hospitality. Their translation work was superb. When I left Dolpo, I felt that I had a new group of friends whom I wouldn't soon forget.

Lastly I wanted to thank Keegan McChesney, the other student who traveled with me to Dolpo. His relentless energy and positive attitude, his ability to laugh and the ease with which he connected with people helped make this project exciting, entertaining and meaningful .

A Note on terms and translations

The terms Othiocordyceps sinensis, yartsa gunbu, cordyceps, bu, fungus, and yartsa are used interchangeably to refer to yartsa gunbu in this paper. When words in the language of Dolpo appear in this paper for the first time without an explanation, they are italicized. Refer to Appendix A for definitions. Also, several scientific terms are defined in Appendix B. In a few places, Wyllie transliterations are given in parentheses.

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Introduction

Traditional Chinese Medicine (TCM) is one of the oldest forms of healing in the world. For over two thousand years, Chinese doctors have been using acupuncture, massage and herbal medicines to treat the ill and wounded[1]. Tibetan medicine is nearly as ancient, tracing its roots to both Ayurvedic and Chinese medicine. Tibetan Medicine was formalized with the writing of four tantras in the 7th century[2]. It is especially important in rural areas of Tibet and in ethnically Tibetan regions of the Himalaya where it is the primary form of day-to-day medical care. Despite the fact western, allopathic medicine has become dominant and mainstream globally, tens of millions of people still rely on TCM, Ayurvedic medicine, Tibetan medicine and other similar methods of traditional healing as a their main form of health care. In the United States alone in 1997, there were over 1 million patients who used to TCM[3].

Healing based on plant and animal products lies at the heart of these forms of medicine. The *Compendium of Materia Medica*, the primary and central text of TCM, was written during the Ming dynasty, in the 16th century, and details over 800 different animals, plants, and minerals used as remedies[4]. One such medicine is Othiocordyceps sinensis, a fungus that is parasitic to a caterpillar, known in Tibetan as yartsa gunbu (*dbyar rtswa dgun 'bu)*, which translates literally to "winter worm, summer grass". It is important to note that cordyceps appears in writing in Tibetan medicine prior to TCM. Zurkhar Namnyi Dorje, a famous 15th century *amchi*, discusses cordyceps and its healing properties in medical treatise written in late 15th century, almost one hundred years before it appears in any TCM texts[5].

While yartsa gunbu has been used as a medicine for over 500 years, its current popularity as a medical supplement is relatively recent. Prior to the early 1990s, its use was not widespread amongst Chinese citizens, and it was not harvested with any intensity or regularity by the people of Tibet, Bhutan or and Nepal as it is today. By 2013, very high quality yartsa gunbu was worth as much as 100,000 US dollars per kilogram. In the last ten years, the price of the fungus has increased by almost 2000 percent in Nepal. Yartsa gunbu is believed to be the most expensive biological commodity in the world, worth more by weight than gold[6].

Cordyceps only grows in the niche high alpine meadows of the Himalaya at elevations of 3000 meters or greater and under very specific soil and precipitation conditions. For many of the people that live in these remote Himalayan regions where cordyceps is found, up until the last five to ten years, the primary (and in most cases single) source of income was farming and animal husbandry. The Chinese demand for yartsa gunbu has utterly transformed the economies of many of these mountainous communities. The global cordyceps trade is now an 11,000,000,000 US dollar industry[7]. In the Nepali regions of Nurbi, Tsum, Mustang, Manang and Dolpo, most citizens pick yartsa gunbu every year, with significant revenues produced. Dolpo is the largest

producer of yartsa gunbu in the country, generating roughly 40 % of Nepal's supply, according to research conducted in 2011[8].

Undoubtedly, this newfound economic prosperity has had a positive impact on certain aspects of the lives of the *Dolpo-pas* who call Dolpo home. However this so-called "Himalayan gold rush" has had myriad consequences on the land and its inhabitants. Every season, almost ten thousand Nepalis from over thirty of Nepal's seventy-five districts flock to the Tarap valley of Dolpo, whose population is just under one thousand. Most locals agree that these outsiders are having an extremely negative environmental impact, threatening the grasslands and pastures that the villagers rely upon for their livelihood. Last summer, a dispute between government officials and the local residents in Tarap resulted in the death of two Dolpo-pas and beating of over forty others. This study is an attempt to understand the full effects of the yartsa gunbu trade and harvest in the Tarap valley. The following pages trace the history and biology of cordyceps, and investigate its the social, economic, political, and environmental impacts in the Tarap valley.

Background on Dolpo

History and life of the Dolpo-pas

Dolpo constitutes the upper valleys of the Dolpa district, the largest and least populated district of Nepal, with an area of 7,889 km^2 and a population of roughly 35,000 (see figure 1). Dolpo is home to some of highest permanent settlements on the planet; ninety percent of the region is 3,500 meters above sea level or higher. Dolpo is made largely of four valleys, Panzang, Nangkhong, Tsarkha and Tarap (see figure 2). Approximately 10,000 people live in Dolpo, though no precise population number is known[9]. Geologically, Dolpo is part of the Tibetan-Tethys sedimentary zone[10]. Dolpo is bounded to north by Tibet and to the south by Dhaulagiri, the sixth highest mountain in the world. This peak largely controls the climate of the region, as Dolpo is in the mountain's rain shadow. Dolpo receives approximately 500 mm of rain a year, enough precipitation to grow a select few crops during the short summer growing season.

Figure 1: map of the Dolpa district in Nepal (Shrestha and Bawa 2013)

The Dolpo-pas main crop is barley, which they use to make *tsampa, thukpa*, and other foods eaten everyday. In addition, they grow a limited amount of mustard, potatoes, millet, radishes and buckwheat in certain areas[11]. The lifeblood of the agro-pastoral economy of Dolpo is the yak and its female counterpart the dhe. Dolpo-pas use these animals for milk, butter, meat, wool, fuel, plowing fields, and carrying loads. Dolpo is renowned for its yak caravans, which carry salt from Tibet to trade for grain in lowland Nepal over some of the highest passes in the world. Goats, sheep, cows and horses are also incredibly important animals. Horses are still the main means of transportation in

Dolpo, as there are no roads or automobiles. There are approximately 80,000 goats and sheep in the entire district of Dolpa[12]. In the Tarap valley alone, there are over 6,000 yaks. Historically, life in Dolpo was governed by the seasons, the animals, and religious tradition. When the seasons begin to shift and the time to plant or harvest is approaching, often a lama is consulted to determine an auspicious date to begin work[13]. Life in Dolpo is incredibly difficult. Until relatively recently, famine was not uncommon, western medical care was virtually absent from the area, and the long, cold, dark winters were spent working as a migrant laborer in lower Dolpo, or, for those who could afford it, in Kathmandu.

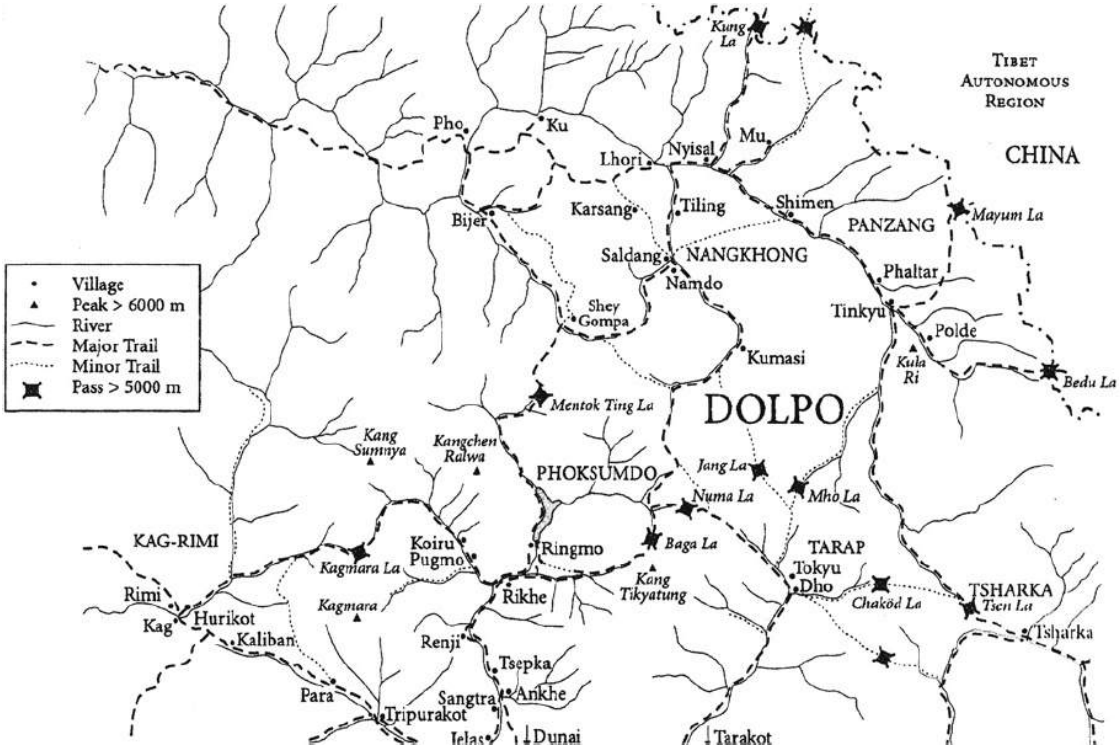

Figure 2: Map of Dolpo (Bauer 2010)

The residents of these four valleys are in every way nearly culturally Tibetan. The Dolpo-pas speak a dialect of Tibetan, practice Tibetan marriage customs, and are commonly Tibetan Buddhists. Dolpo has been known for centuries as a center of religious aestheticism and for its production of esteemed lamas[14]. Dolpo and its people first appear in writing in the 8th century. It is believed that at the time the Tibetan Yarlung dynasty conquered many Tibetan speaking regions, causing a southward migration toward areas like Dolpo and Mustang[15]. Due to the remoteness of the area and the extreme climate, Dolpo has never been a major political power in the Himalaya. Instead it has remained largely independent, occasionally falling under loose fealty to the kingdoms of Lo to the east, and Jumla to the west, which fought for control over the trade routes between Tibet and the lower plains of Nepal. In the 18th century, when Nepal was

unified under the Gorkha tribes and the kingdom of Lo was taken under their reign, Dolpo become even more isolated. In 1959, When the Chinese seized control of Tibet, Beijing placed many restrictions on trade between Tibet and Nepal, altering century-old customs and economic relationships, many of which were vital to the livelihoods and economies of places such as Dolpo. Dolpo-pa nomads and pastoralists were no longer able to bring their herds across the Himalaya to Tibet to graze each year. The following decades were difficult ones for the Dolpo-pas; they had to alter their animal husbandry and trading habits to suite the tense geopolitical climate.

Figure 3: Rivo Rumpa Gompa, Dho Tarap (photo by author)

A brief sketch of the Tarap Valley

In the language of Dolpo, Tarap translates roughly to "excellent auspicious"[16]. Comprised of three main villages called Dho, Tokyu, and Sheepjo, the Tarap valley is one of the most populous in all of Dolpo, with roughly a thousand residents. At an elevation of roughly 4000 meters, the Tarap valley is like much of Dolpo. The animals are plenty, and the people are hard working and devout. Dho Tarap is home to several lamas and a few *gompas*, not to mention many *chötens*. Though still quite mountainous, the landscape of the Tarap valley is unique, as it is some of the softest topography in all of Dolpo. The village of Dho sits at the confluence of two wide and gentle river valleys whose plains are dotted with fields, houses, and animals. These rivers feed into the Tarap Khola, a major river in Dolpo. Because of this riparian environment, Tarap is extremely

fertile, and has historically been relatively wealthy and powerful on the local scale. To access this valley, one must walk for three to four days from the district headquarters of Dunai, in lower Dolpo. Though by no means an easy journey, this path is a rarity in Dolpo, as it climbs no higher than 4000 meters, making it passable for a large portion of the year. To access most of Dolpo's upper valleys, one muss cross multiple passes greater than 5000 meters, many of which are snowed over from September to May[17]. The path between Dunai and Dho Tarap was greatly improved in 1996. Previously the route was somewhat treacherous; it was not uncommon for travellers to fall to their death along the way. Now the path is much safer and more passable (see figure 4). The residents of Dho Tarap are now able to bring yak and mule caravans down to lower Dolpo to trade. Loads were previously exclusively carried by people. The residents of the Tarap valley have benefited economically from the trade that this path has afforded[18].

Figure 4: The path to Dho Tarap, looking south (photo by author)

Lastly, Tarap is set apart from the rest of Dolpo because of the work of one particular French NGO, *Action Dolpo*. Founded in 1993 by French trekkers, *Action Dolpo* has sought to improve the lives of those living in the Tarap valley. In 1994 they created the Crystal Mountain School (CMS), providing free educating to 140 Dolpo-pa students, ages five through fifteen. The students learn Tibetan, Nepali, English, and standard school subjects. *Action Dolpo* has also established a satellite school (known as the Snow Leopard Residence) in Kathmandu, where students from CMS live together while completing their high school and sometimes college education. Graduates have gone on to become nurses, lab technicians, project managers, and teachers, while some have returned home to continue a traditional way of life or have gone on to continue their studies at a higher level[19]. The school has had an overwhelmingly positive impact on the community. As a result of their linguistic education, young adults can now communicate more effectively with government officials and businessmen in lower Dolpo, improving their means of bargaining, and lessening the financial exploitation of the Dolpo-pas which is all too common. Traditionally, children as young as five work with their parents and siblings, cooking, cleaning, tending to livestock, and cultivating the fields. CMS has altered this labor force. Many families in the valley have sold portions of their livestock because they can no longer manage looking after them. This weakening of the agro-pastoral lifestyle of Dolpo is one potential drawback to the work of *Action Dolpo*. In

addition to education, this NGO has also established a heath post in Tarap, equipped with a birthing facility, basic first aid and dental equipment, and a supply of standard medicines.

There is no grid electricity in the Tarap valley, though most homes now have a small photovoltaic array on their roof, usually providing enough charge to hang a few light bulbs and charge a small number of portable electronics, such as cellphones. Three years ago, a solar powered cell tower was installed on hillside overlooking Dho Tarap. Villagers with phones can now make calls to relatives and friends in the Dolpo, Kathmandu, and elsewhere abroad, if they have the financial means. This connectivity accompanies the rapid modernization much of rural Nepal is currently undergoing, for better or worse.

Yartsa Gunbu

Lifecycle of the caterpillar fungus

Yartsa gunbu, (Ophiocordyceps sinensis) is a parasitic fungus that infects the larvae of the ghost moth (Hepialus humuli)[20]. The cordyceps genus encompasses over thirty species of entomophagous flask fungi endemic to the Himalaya and the Tibetan plateau. Only a handful of cordyceps species are recognized and collected for their medicinal properties, and among these Ophiocordyceps sinensis is by far the most popular and well known. Thirty of the almost forty species of Hepialus larvae can be potentially infected with the cordyceps fungus[21].

Figure 5: Ophiocordyceps sinensis excavated with fruiting body intact (Winkler 2008)

The larvae of the ghost moth spend several years feeding on roots underground before pupating and reaching full maturity as a moth[22]. While this soil-bound larva is still living and feeding, the fungus germinates in its body, ultimately killing it. The fungus infects the caterpillar in late autumn, while it is still underground. The precise method by which the fungus attacks the caterpillar is not currentl1y fully understood[23]. Approximately fifteen to twenty-five days after beginning to grow, the fungus kills the larvae. During the first six to ten days of this growth period

the larvae remain somewhat mobile, often burying themselves an additional 2-5 cm deeper into the soil, which contributes to growth of the fungal fruiting body that subsequently emerges[24]. Before the soil freezes in the early winter, a small stroma grows from the head of the infected caterpillar. The following spring, this stroma develops into a vegetative fruiting body, usually reddish in color and two to six centimeters in length[25]. This fruiting body is often almost twice the length of the caterpillar itself and protrudes from the ground. This stalk is where the word gunbu *(dgun 'bu)*, meaning summer grass originates, as this fungal stroma is erroneously called 'grass' by locals. By the time cordyceps has reached full maturity in late April to mid May, the entire contents of the larvae have been consumed by the fungus and replaced by fungal mycelium, expect for the exoskeleton, which remains as a protective husk [26] . Fully mature cordyceps weigh on average 300 to 500 mg[27].

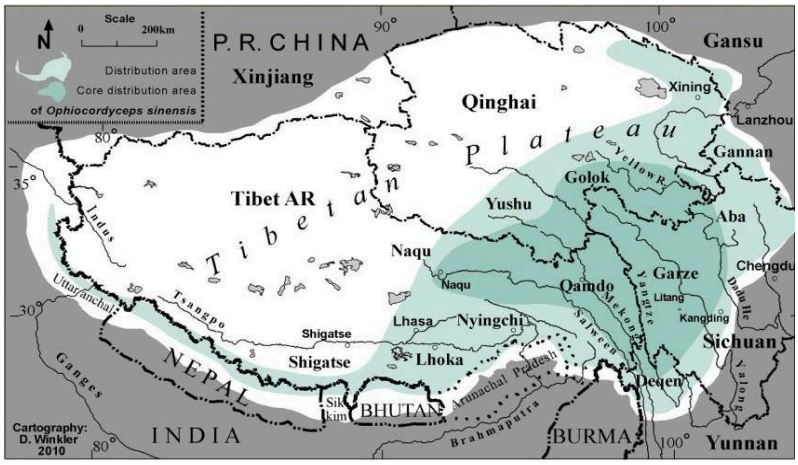

Figure 6: Ophiocordyceps sinensis distribution (Winkler 2008)

Yartsa gunbu is found across the Himalaya in Tibet, Bhutan, and Nepal and a small portion of northern India (see figure 6). It grows only at altitudes of 3000 meters or greater, and is has been documented at elevations as high as 5000 meters. Cordyceps is only found in alpine and subalpine pastures that occur above tree line[28].

Cordyceps harvesting season typically begins in late April or early May, depending on the severity and length of the winter and the region where it is growing. Individuals usually collect the fungus until the pastures have been exhausted and no more can be found. The length of the season varies from two weeks to over a month[29]. Most meadows where yartsa gunbu is found are at least several hundred meters above villages, and often several hours walk away. Many of these alpine meadows are on north-facing slopes. To pick cordyceps, gatherers lie on and their stomachs or hands and knees, or walk very slowly, stooping to scan the ground for the tiny stalk that emerges from soil[30]. The fungus is removed from the earth with a small hoe or knife. One must be careful not to sever or break the fruiting body or the caterpillar, as this will significantly decrease its market value. Several Dolpo-pas interviewed for this study commented that they no longer pick yartsa gunbu because their eyesight is too poor[31]. To the untrained eye, the fungus is easily confused with grass and almost impossible to find altogether.

O. cordyceps reputed medicinal properties

As mentioned in the introduction of this report, traditional Asian medical practitioners have a long history of incorporating plant and animal products into their healing techniques. In the Himalaya alone, there are reportedly over 1700 species of plants that are collected for medical use. Yartsa gunbu was allegedly discovered by Tibetan nomads in the 6th century, when they noted that their yaks seemed to have higher energy levels after grazing on the fungus[32]. Yartsa gunbu first appears in writing in the mid 15th century, in the work of the well-known Tibetan scholar and doctor, Zurkhar Nyamnyi Dorje, who lived from 1439 to 1475. Within his work *Oral Instructions on a Myriad of Medicines,* there is a section roughly four folios long that discusses cordyceps, entitled *An Ocean of Aphrodisiacal Qualities: A Special Work on Yartsa Gunbu*[33]. Dorje describes where to find the fungus, how to harvest it, and how to prepare as an effective aphrodisiac. The chapter opens with eloquent lines of verse, as translated from Tibetan by Jakob Winkler:[34]

In this world sexual desire is
The most marvelous of all earthly pleasures,
The essence of the enjoyment of all the senses…

As to this medicinal substance:
It grows in regions of beautiful mountains
Such as remote grassland mountains.

In the summer it is a blade of grass [growing] on a worm
Similar to the leaf of mountain garlic.
The flower resembles a silken green sedge.
The root resembles cumin seed at the end of autumn.
The taste is sweet and a little astringent.
The post-digestive [taste] is sweet and the quality is oily.
It has a slight warming quality.

It removes prana diseases, cures bile diseases and does not raise the phlegm; a marvelous medicine.
In particular, it especially increases semen.
It is a flawless treasure of an ocean of good qualities.

Dorje accurately describes yartsa gunbu and highlights some of the main medicinal uses of cordyceps that are still in practice today. Traditionally, both Tibetan and Chinese doctors prepared cordyceps as a tonic. Usually several specimens are soaked in a small container of alcohol for several months and the product is indigested in small

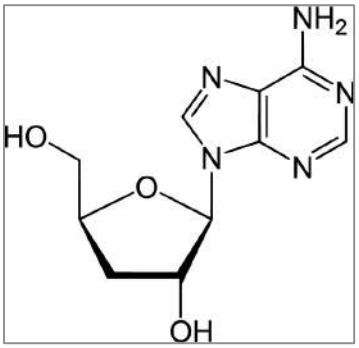

Figure 7: Cordycepin (nih.gov)

amounts. Today, it is also available in pill form, as a powder that has been processed into a capsule. Cordyceps is mainly used to treat fatigue and exhaustion, renal, liver and cardiovascular diseases, muscle and back pain, respiratory and pulmonary problems, and a wide variety of sexual disorders, ranging from erectile dysfunction to premature ejaculation[35]. This aphrodisiacal application is by far what it is most commonly used for today; cordyceps has come to be commonly colloquially known as "Himalayan Viagra". There are nearly two hundred scholarly articles that discuss the reputed myriad medical benefits of cordyceps. The fungus has been toted as having anti-aging, antiviral, antitumor, antioxidant, and immunosuppressant properties. Studies claim that cordyceps reduces tiredness, increases testosterone and libido, and increases the aerobic capacity of endurance athletes[36]. Scientists have claimed that it improves eyesight and is an effective treatment for hepatitis B[37]. One study even goes as far as to claim that cordyceps can provide the user with "eternal youth"[38].

These studies range from completely illegitimate to fairly scientifically sound. Cordycepin is one of the active compounds that have been isolated from cordyceps (see figure 7); several scientists are critical of the methods by which it and other similar compounds are extracted, arguing that some these methods are unsound and consequently the data that studies produce is not valid or interpretable[39]. That being said, much of research into some of the less outlandish claims of the medicinal properties of cordyceps is legitimate, particularly at the cellular level.

There is a large body of research suggesting that cordyceps extracts may increase production of adenosine triphosphate (ATP) within eukaryotic cells. ATP is responsible for storing a cell's energy; it is the body's fuel source on a molecular level. Most of this research was conducted using mice; scientists noted a marked increase in the amount of ATP within the mice's cells. Further research has shown that mice seem to have increased energy and lessened fatigue when given cordyceps' derived compounds in comparison to mice that were not[40]. This reasoning behind this explanation is sound. While some of the reported benefits of cordyceps hold no legitimate scientific underpinning, it is logical that cordyceps has been arguably proven to increase energy and reduce tiredness, as this is one of its oldest and most common uses.

In summation, while a large portion of the scientific research into cordyceps is unsubstantiated and untrustworthy, some of this work holds scientific validity. Furthermore, it is important to note a simple fact; yartsa gunbu simply could never have achieved its present day popularity and widespread use were it a completely ineffective form of medicine.

Yartsa gunbu: past and present

Since even before its first appearance in Zurkhar Nyamnyi Dorje's 15th century medical treatise, yartsa gunbu use has been widespread and common in Ayurvedic, Tibetan, and Traditional Chinese medicines. Prior to its extreme increase in value in the late 21st century, cordyceps was often simple cooked with chicken or duck as a means of releasing its healing properties[41]. Others, particularly the sick and the elderly, would simply drink a small amount of yartsa gunbu tonic each day to maintain their energy levels. Cordyceps has a long history of use as an aphrodisiac in Indian, Chinese, Tibetan and Himalayan cultures[42]. For four centuries, the fungus remained a solely a medicine prescribed by traditional practitioners and doctors. The dramatic increase in the market value of the fungus is a recent phenomenon.

In the late 1970s, as the country emerged into modernity, China began to relax its economic policies, resulting in an increase in trade and harvest of cordyceps[43]. Yartsa gunbu's popularity increased dramatically following the 1993 World Athletic Championships in Stuttgart, Germany, when several female Chinese athletes broke multiple world records in distance running. They attributed their remarkable results to a combination of altitude training, turtle blood and yartsa gunbu supplements[44]. Prior to this point, cordyceps had little market value; in 1970 one kilogram of the fungus was worth less than three US dollars[45]. From this point onward, the demand for yartsa gunbu began grow rapidly. Between 1997 and 2008, the market price increased by ~900% percent in Tibet. Even more impressively, from 2001 to 2011 the price in Nepal increased by ~2300%[46]. Following the 2008 Beijing Olympics, where yartsa gunbu was allegedly used as a performance enhancer once again, the prince continued to skyrocket[47].

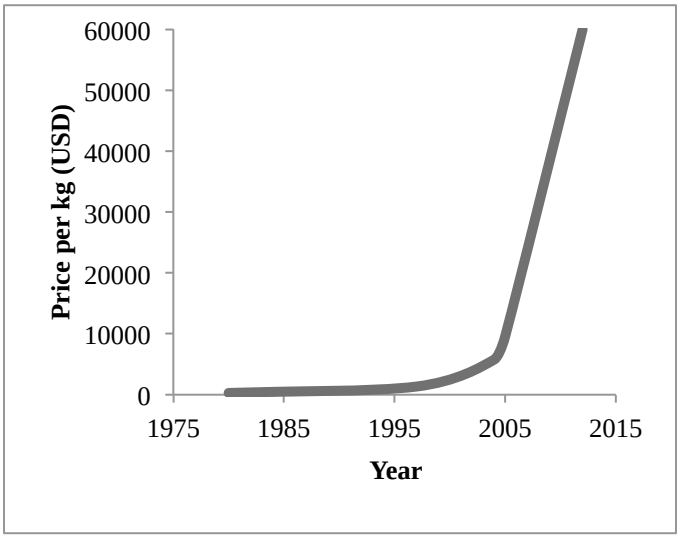

Figure 7: Approximate market value of cordyceps between 1980 and 2012 (data from Shrestha 2013 and others)

In mainland China, the use of cordyceps is seen as a status symbol; individuals will use yartsa gunbu to display their wealth. The country is infatuated with this tiny fungus. In 2014, a yartsa gunbu museum that highlights the history and use of cordyceps was opened to the south of Shanghai. It receives over a thousand visitors a day[48]. Today cordyceps is the world's most expensive biological commodity, worth more by weight than gold[49]. Figure 7 shows the dramatic price increase of the fungus over the last thirty

years.

Demand for cordyceps has utterly transformed the economies of the rural areas in which it was harvested. Most of inhabitants of these mountainous regions primary forms of subsistence are farming and animal husbandry. For the first time, cordyceps has provided them with cash income. A successful season can yield several thousand dollars worth of fungus, a greatly impactful sum of money. In 2008, yartsa gunbu harvest and trade accounted for between 50-80 % of the overall rural income in Tibet in places where the fungus grows[50]. In 2004, the yartsa gunbu industry accounted for approximately 8.5 % of Tibet's GDP[51]. This percentage has undoubtedly increased in the last ten years. The Global yartsa gunbu industry is now valued at approximately 11,000,000,000 US dollars[52]. Nearly 135,000 kilograms of cordyceps are harvested Tibet annually. Nepal is responsible for contributing an additional 2,000 kilograms to the global supply, with almost 50% harvested in Dolpo, where yartsa gunbu accounts for 53.3% of household income [53] [54].

Yartsa Gunbu and the Tarap Valley

Fungal frenzy: economic and social change in Tarap

Yartsa gunbu harvest and trade has brought swift and sweeping changes to the Tarap valley in the last decade. In these recent years, the commodification of cordyceps has created a cash economy which was previously unknown to the Dolpo-as, producing an entirely knew economic climate, and altering the longstanding social one. Every single one of the forty Tarap valley villagers interviewed for this study, whose ages ranged from twenty to eighty-four and averaged forty-two, remembered a time before yartsa gunbu was harvested or sold. Some had only been picking for as few as two years, while others for as long as fifteen. The average amount of years that villagers had been picking for was approximately nine, which coincides chronologically with the increase in global demand.

"When I was a child, one piece of yartsa gunbu was equal to five rupees (approximately 5 cents). It cost nine pieces of yartsa gunbu for one packet of wai wai" (ramen noodles), one villager commented[55]. Today in Tarap, a packet of noodles costs approximately thirty rupees, where as a single piece of yartsa gunbu can be worth as much one thousand. Aside from a select few villagers who were either too old, sick or have poor eyesight, everyone interviewed picked yartsa gunbu. "Yes of course I pick bu," was a common answer to an inquiry. The people of this valley have come to depend on

yartsa gunbu as a means of income, supplementing their agro-pastoral livelihood. Villagers unanimously agree that life is markedly easier because of this added cash flow. The harsh climate and the limited growing capacity of the Tarap valley only provides between four to seven months of food for its inhabitants[56]. Historically, villagers from Tarap would spend the winters working in lower Dolpo, carrying loads, weaving and sowing clothes, tending to animals, and working in the fields. In the springtime, they would return with dal, rice and buckwheat to eat for the rest of the year. This type of arduous indentured labor has been replaced almost entirely by yartsa gunbu. When asked about this shift, a villager replied, "now we bring yak caravans for a short time to lower Dolpo to buy food instead"[57]. In the past, Dolpo-pas would even work as porters as well to earn food.

Villagers travel to a market on the border between Dolpo and Tibet to sell their yartsa gunbu each season. Here they will stock up on rice, noodles, butter, white flour, oil, and other grocery items. They will also purchase clothes, blankets, and basically any other goods they need or can afford. The price of yartsa gunbu varies depending on the quality of the fungus. Last year the average piece was worth between 400-600 rupees, (4-6 US dollars) with an especially high quality specimen selling for as much as 1000 rupees. On average, the villagers interviewed in this study collected approximately 150 single yartsa gunbu pieces per season, though this number varied considerably[58]. A 2013 study on cordyceps harvesting practices in Dolpo found the average annual yield to be 123 specimens per harvester. If these are sold at average market value, a villager would earn almost 80,000 rupees a season, a considerable amount. Those with who make more money will use it to buy yaks and other animals, and those with a greater sum will travel to Kathmandu. One woman interviewed for this project was even able to build her house with money made from the yartsa gunbu business[59].

For centuries, the economy of Dolpo has centered on animal husbandry, agriculture, and the salt trade. In a few short years, yartsa gunbu has completely overturned this ancient way of life. Several villagers now run hotels and tent camps that cater to the thousands who come from outside the valley to harvest cordyceps each year. They will sell food, tea, soda, and lodging to these outsiders. In this previously cashless economy, rupees are now a common sight. A select few businessman have sprung up in Tarap, selling clothes, shoes, alcohol, candy, food, and various other basic products to people in the valley. These businessmen also will act as middlemen, buying some of the villagers' cordyceps harvest each year and selling it to dealers in Tibet. It is worth noting that the homes of these men who have benefited from the trade of yartsa gunbu are significantly larger and more extravagant than those of most other villagers, resplendent with larger than average solar arrays, televisions, satellite disks, and more worldly food and staples, such as Coca-Cola and Nescafé.

A 2014 study by Geoff Childs and Namgyal Choedup examines the economic impact of cordyceps trade and harvest in the nearby districts of Nubri and Tsum. The

economies of these regions are similar to Tarap: these areas were fairly wealthy prior to the border restrictions China implemented in the 1960's. According to the authors, "there is no question that yartsa gunbu has brought a much needed economic boost to Nubri and Tsum"[60]. The same is true for Tarap, the newfound cash flow that yartsa gunbu has provided has helped decrease famine and improve life in the valley. Villagers can spend the winter in Tarap or even in Kathmandu; they no longer have to break their backs to earn food. When asked about the money that people have made, one villager commented that in Tarap, "because of yartsa gunbu, the standard of living has become high"[61]. Childs and Choedup found similar results in their investigation; cordyceps has improved life in Nubri and Tsum markedly. They learned that in addition to buying food and clothes, people have used money from the fungus to improve their gompas, to pay for funerals, and to educate their children. Yet the authors discovered a downside to this financial prosperity; it wasn't uncommon for individuals to spend all their entire earnings on alcohol and gambling, for instance[62].

During the interviews conducted for this study, the word greed surfaced often. Villagers would comment that this newfound prosperity has brought a sense of competition to the valley that was utterly foreign a decade ago. People see that their neighbors are drinking soda or wearing a wristwatch purchased in Tibet, in turn they feel they too need these superfluous and exotic goods. Fifteen ago, goods important from outside Dolpo were a relative rarity in Tarap. While some households had more animals than others, the ideas of 'poverty' or a wealth gap didn't exist to the degree to which they do today. The increase in Chinese goods, a direct result of cordyceps harvest and trade, has created an artificial sense of wealth and of poverty in the valley. People want the newest product that their friends and neighbors have, regardless of quality of the foods. This influx of cheap Chinese products has also profoundly altered the social climate of Tarap. "When life was only about animal husbandry and farming," a young villager commented, "people used to be more at peace. They didn't have a sense of competition.[63]"

Much of what is purchased from China is mass-produced, nutrient poor, sugary junk food that is markedly less healthy than what the Dolpo-pas used to eat. Nutritional locally produced staples such as *tsampa* and *pu-cha* have begun to be replaced by Chinese goods such as noodles and Nescafé. pu-cha, which was previously prepared with dhe butter, is now made almost entirely with Chinese margarine. None of the villagers are aware that they are drinking an artificial butter substitute high in partially hydrogenated oils. Not only are these foods bad for the Dolpo-pas' health, but they also are wrapped in plastic. Currently there are no waste management practices in place in Tarap; as a result of these goods, the valley is littered with trash (See figure 8).

This heightened sense of competition has also had serious financial consequences. Approximately six to eight years ago, Dolpo-pas from Tarap began borrowing money from businessmen from lower Dolpo, with interest rates as high as 30-50% [64]. These businessmen would also set a fixed price for cordyceps, meaning that following yartsa gunbu season, whomever borrowed money will have to sell their fungus at specific price determined during the winter, regardless of the summer market value. This price is often set artificially low; the businessmen will make a large profit, and the villager is powerless to act. These absurdly high interest rates have caused significant hardship. Individuals will have repaid the principle in full, but will spend years in debt, trying to repay the interest. Money is a relatively new concept to the Dolpo-pas, and they are unfamiliar with the minutia of finance. Many of them have been brutally scammed as a result of these loans. Fortunately they have declined in popularity over the last several years, though several villagers interviewed for this study had already taken out loans for this year's season, and many more admitted to borrowing money in the past. One woman who has interviewed had to sell several of her yaks to repay the loan that she had taken[65].

Figure 8: A packet of Chinese manufactured noodles strewn in the Tarap Khola (photo by author)

The rapid growth of cordyceps trade and harvest has often been equated to a gold rush. While this resource is biological as apposed to geological and therefor somewhat more sustainable, there is an inherent instability to an economy that undergoes such rapid growth, especially one that is dependent on a single resource. The term 'Dutch Disease' was coined in 1977 to describe this very scenario, in reference to the decline of the Netherlands' manufacturing industry upon the discovery of a natural gas deposit[66]. A boom in natural resource extraction causes a shift in labor force from other industries that are in turned weakened, resulting in an overall decline of the local economy, especially after the natural resource has been exhausted. The Tarap valley is experiencing this very phenomenon, with people tending to their fields and animals less, and spending more time picking yartsa. Many villagers who were interviewed explained that they have been tilling and planting their fields prematurely, in anticipation of yartsa gunbu season. Others have sold their animals. One villager from Dho explained it as follows: "before

people picked bu, they had the spring and summer to plow and work and harvest. Now they plow early, harvest early, work really hard, and rush. Life has become so busy[67]". For the Dolpo-pas, the decision to pick cordyceps is an obvious one; their animal husbandry and agricultural practices simply don't yield an equivalent financial reward. Agro-pastoralism lies at the heart of the Dolpo-pa way of life; it is the center of their economy, and has been so for centuries. If the demand for yartsa gunbu or if the fungus itself disappears, the residents of the Tarap valley will find that their main economic sector has been weakened considerably, and that life has become even more difficult. While the summer economy of the Tarap valley is exploding, the winter one remains much the same. As a villager from Tokyu explained, "there is a lack of continuity of trade. In the summer there is a huge amount of trade, but none in the winter[68]". This discontinuity contributes to the economic instability that the Tarap valley is experiencing from yartsa gunbu.

The busyness referenced above was a common topic of conversation when yartsa gunbu was brought up during interviews for this study. The commodification of cordyceps has completely changed the pace of life in Tarap. The Dolpo summer is a short and beautiful one; for a brief three months the fields and hills explode in plants and wild flowers while the villagers tend to their animals and enjoy the warmth of the sun. As one villager succinctly explained, "In the past the summer was really nice. It was as quiet as the winter. Now it is bad[69]". In addition locals picking the fungus, the influx of other Nepalis each summer creates a feeling of extreme tension in the valley, especially given the recent thefts, property destruction, environmental degradation, and violence.

The grasses are gone: environmental and social degradation in Tarap

The land has changed. The grasses are finished.
-Dho Tarap villager

As the price of yartsa gunbu continues to increase, so does the amount of people who come from outside of Tarap to harvest the fungus. Last year, reportedly nearly ten thousand Nepalis came to this small valley of one thousand, hailing from over thirty of Nepal's seventy-five districts. Dolpo produces nearly half of Nepal's annual yartsa gunbu yield, and the Tarap valley approximately one third of Dolpo's. Tarap is very much at the center of cordyceps harvesting in Nepal. The fragile alpine environment where the fungus is found is incapable of enduring the impact of these outsiders. Their presence has significantly weakened the grasslands and the herds of Tarap. The chaos that ensues each season has resulted in robberies, vandalism, and multitudes of financial

hardship and deceit. The people of Tarap are beginning to realize that their way of life is increasingly threatened.

Unfortunately, the pastures where cordyceps is most abundant also happen to usually be where the best grasses in Dolpo are found, oftentimes on north facing slopes. Ever since China tightened the border between and Nepal and Tibet in the 1960s, the Dolpo-pas had to turn elsewhere to graze their yaks in the winter. In the harsh and arid mountainous environment of Dolpo, these winter pastures are a precious few. In addition to the heavy foot traffic that these sensitive meadows receive, yartsa pickers bring hundreds of horses and cattle with them each season that graze these grasses heavily. Traditionally, the grasses in these pastures were allowed grow and either cut for hay in the fall or used for grazing in wintertime. A decade ago, herdsman from Tarap would occasionally sell excess hay to other villagers in Dolpo. Now sometimes they are forced to purchase hay for the winter, as their pastures no longer produced enough. Explaining the precise science behind this process, one villager explained, "The yartsa gunbu season, which is during the monsoon, coincides with the time when the grasses start to grow. It hampers with the growing of the grass. We notice now that the grasses don't grow. We don't have good grasses in the winter, and the animals die[70]".

Figure 9: Cordyceps harvesters in Dolpo (Bawa and Shrestha 2013)

Every Dolpo-pa interviewed for this study agreed that their pastures and animals are significantly weaker from the impact of these outsiders. Another villager commented, "There used to be lots of tall grass in the fields were bu is found, now it is all trampled[71]." Another Tarap villager had a similar opinion, "Because of outsiders, the animals don't have enough grass to eat, they are starving[72]". A teacher from the Crystal Mountain School explained ecological ramifications of yartsa gunbu harvesting as follows[73]:

> The environment that used to be here five to six years ago is not there. The land has changed. Before, there used to be long, long grasses and a lot of bushes and now we cannot see them. The grasses are finished. We have to go very far away to cut grasses for our yaks. Due to too many people the grasses are gone. The landscape is finished…. It is very bad for our yaks. Before, even if there was snowfall, our yaks stayed here and they could survive. Now there is no grass for the yaks in winter, so we have to go far away, taking risks in the snow.

The chief concern with respect to yartsa gunbu in Tarap is exactly as stated above. The animals on which these people depend for their very existence are growing increasingly weaker. Every year, yaks, goats, sheep and horses become weak and die. this phenomenon is becoming increasingly common. The most recent winter in Tarap was especially harsh. The following spring; the fields and pastures were littered with the carcasses of animal that did not survive the winter. Of the ones remain, ribcages poke through thinning hair. The animals are starving. Without livestock, the Dolpo-pas of Tarap could not live in the valley. Their way of life hangs in the balance; if the current trend of pasture degradation continues, life in the valley may disappear.

Many villagers also commented about the lack of firewood they have experienced in recent years. When the thousands of outsiders come each year, they dig up the bushes and shrubs that grow in the valley to use as firewood and to construct tents. "These kinds of bushes take decades to grow," explained a villager, "The lack of bushes results in so many ecological imbalances that we have yet to understand[74]". Many villagers spoke of having to go farther and farther afield each year in search of firewood. Furthermore, there are certain areas where the Dolpo-pas of Tarap intentionally do not cut firewood, such as along rivers and next to sacred springs. Cordyceps harvesters completely disregard this practice. As result, nearly all the hillsides and riverbanks in Tarap have been stripped of their bushes in the last five years.

Figure 10: Trash in the Tarap Khola (photo by author)

The banks of the main rivers in Tarap are also filled with an abundance of trash and refuse (See figure 10). Most of the villagers who were interviewed attributed this waste to those who come each year to pick cordyceps. These outsiders camp all along the river for several weeks. When they pack up and leave, they simply discard their waste into the water. The rivers in Tarap are now so polluted that the villagers no longer drink from them. In reality, the locals are responsible for a small portion of the litter as well, though they number significantly less than the outsiders, so their share of the waste is probably proportionally less.

Harvesting cordyceps could be equated to betting or gambling; the possible reward is high, but oftentimes one ends up with a deficit. Traveling to Tarap to pick yartsa gunbu requires a significant financial investment. One must pay for transportation, food, and lodging, all of which is significantly more expensive in Dolpo than other parts

of Nepal, given the lack of roads or automobiles. It is not uncommon for Nepalis who have come to pick cordyceps in Tarap to end the season in debt, having found so little cordyceps that they did not break even on their expenses. Many of the villagers who were interviewed for this study spoke of the rise in thefts that occur in the valley during yartsa gunbu season. One woman commented, "Sometimes they don't even find enough yartsa gunbu to pay for food, so they steal from people. One season they stole a statue from the gompa.[75]". Five years ago, nobody had any sort of lock on the door. now almost all the homes in Tarap have steel padlocks, a result of these recent thefts. Other villagers also explained how outsiders who failed to find enough cordyceps would request to pay for their food at the end of the season, the villagers would agree, and then the outsiders would leave without paying. For centuries, this community has lived in relative undisturbed peace. This kind of theft and deceit is commonplace in the summertime in Tarap now, and it has upended the trust and sense of hospitality that is customary of the Dolpo-pas.

Death and violence, June 2014

Figure 11: Nepali armed police force in Dho Tarap, June 4th 2014 (photo courtesy of Phurwa Dhondup)

Last summer, issues stemming from cordyceps taxes catapulted Tarap into a deadly and violent situation, resulting in the death of two locals and the injury of over forty others at the hands of Nepal's armed police force (APF). In a valley where violence and guns were previously unheard of, villagers continue to live in fear, the memory of this deadly clash all too vivid.

In 2008, people living in Tarap began to collect a small fee from cordyceps harvesters, as a tax for picking on borrowed land. From 2008 to 2011, locals collected 1000 rupees per person. This tax was increased in 2012 to 1500, and again to 3000 in 2013. Villagers interviewed for this study claim that is fee did not even come close to covering cost of the loss of agricultural productivity and firewood that they have experienced because outside harvesters. The Shey Phoksundo Buffer Zone management committee (SPBZMC), a government body which loosely overseas the area, had also been collecting a cordyceps royalty of its own simultaneously. Until 2013 this tax amounted to 1100 rupees for citizens from outside the Dolpa district, 600 for those from within, and 150 from those living within the buffer zone. In 2013 this fee was increased by 300% [76].

In 2014, the SPBZMC made a decision to try and prevent locals from collecting what they deemed as an 'illegal' fee. Furthermore, SPBZMC wanted to allow cordyceps to be harvested on all pasturelands, including those used for winter grazing by local communities. Villagers from Tarap had been trying to prevent yartsa pickers from coming to their primary winter pasture, known as Lang, in an attempt to mitigate the negative impact that yartsa harvesting has had on their grasses. On June 2nd 2014, three government officials representing the SPBZMC came to Dho Tarap along with thirty-five APF personnel. These representatives confiscated 756,000 rupees (roughly 7,5000 US dollars) of tax that the locals had collected and sent thousands of cordyceps harvesters to the Lang winter grassland. The following day, villagers from Tarap sent a petition to the SPBZMC, requesting the fee be returned and Lang made off-limits. This petition was ignored[77].

The next day, a group of villagers were holding a meeting about yartsa gunbu in their customary location in Dho Tarap. They decided to submit a request once more to the SPBZMC representatives, so they went directly to the government outpost in the village and peacefully asked the money to be returned, and for Lang to be protected. A group of young men attempted to enter the building. Suddenly the APF attacked them with batons. Several villagers threw stones at the police, who fled the scene. A few minutes later, without warning or provocation, the APF attacked once more with batons and fired live rounds into the crowds of unarmed Dolpo-pas who frantically fled in fear of their lives. A middle-aged lama and artist who witnessed the violence gave his personal account[78]:

> I tried to run away over a bridge, but the police were shooting, and the police were chasing me. The pointed their gun at me, I thought they would shoot, so I jumped off the bridge.

Figure 12: Police vandalism, June 2014 (photo courtesy of Phurwa Dhondup)

"They played me like a football, but with martial boots and batons", testified a sixteen-year-old Dolpo-pa boy who was brutally beaten. "They let us sit in a sort of Lotus position, and jogged and jumped on our legs, as if we were trampolines. One of them shone the light and kicked me right in the face," described a twenty-four teacher from Dho Tarap. Another twenty-five year old villager was forcibly pulled out of a grain storehouse, beaten with batons, let go, and recaptured as he tried to run away. He saw his brother being shot, and witnessed APF force a hot rifle barrel down his friend's throat. According to witnesses, the police shouted to villagers "we will kill you all", " this is Nepal, this is not your country", and uttered ethnic slurs.[79]

Following this chaos, the police went door to door at almost every house in the valley, vandalizing grain boxes, homes, doors, and capturing anyone they suspected of participating in the protest (see figure 12). The villagers hid in one another's homes for over twenty-four hours while these raids were conducted. Some fled the village entirely while others hid in outbuildings, tents, and pastures. The valley was paralyzed with fear; even those who had had nothing to do with the violence were afraid, for the police were capturing and incarcerating people indiscriminately. One woman described the police bursting into her home, where several young men were hiding, and beating and kicking her husband repeatedly, despite the fact that he hadn't left his home in several days due to being sick with gastritis, and regardless that had had nothing to do with the violence. "All the children were

Figure 13: Tsering Phurwa, photo taken at Tarap clinic at 4:12 PM local time, June 4, prior to his death (photo courtesy of Phurwa Dhondup)

crying," she commented. The police preceded to roundup every young boy staying in her home[80]. In total, the police were responsible for the death of two Dolpo-pas, the detention of twelve, and the injury of over forty others (See figures 13 and 14) [81].

Figure 13: Bruises from police violence, June 2014 (Photo courtesy of Phurwa Dhondup)

The APF attempted to conceal the death of Tsering Phurwa, who was murdered by the police on June 4th. Following his death, the police visited his wife, telling her that unless she testified that her husband had died through "falling off a cliff while collecting timber," the twelve Dolpo-pas who were detained by the police would be taken to the district headquarters of Dunai and accused of killing her husband, and that she would not received the one million rupee death compensation that the police had promised her.

The impact of this brutal violence continues to haunt Tarap. The villagers interviewed for this study spoke of the horrific events in chilling detail, many commenting how they had never experienced anything remotely similar to the events of June 4th. A gun had never been fired in this peaceful valley. "I didn't sleep after the clash," a woman commented. "Even when I started to sleep, I had nightmares of the violence." one farmer described in pantomime the gunshots, ensuing chaos, running for cover, and crying afterward[82].

For an isolated society that had never experienced violence of such magnitude, the chaos of June 4th has had deep impacts. Villagers live in constant fear of the APF, and many are worried that another clash will occur. In many ways, suppression of Dolpo-pas represents a common ideological frame of thought among mainstream Nepali society. A prevailing mindset is that mountain dwelling, ethnically Tibetan and Himalayan people are backward, barbaric, and defenseless. Some villagers from Tarap believe that the APF personnel were ordered from their supervisors to beat the locals. One teacher from the valley explained the reasoning behind this theory as follows[83]:

> It's an example of neocolonialism. People from the hills and the central districts of Nepal are coming to the so-called remote areas to the so-called savages, and they say we need to teach these people who has all the power, who is in charge.

Regardless of orders or motivation, the police violence that occurred in Tarap was extreme, unwarranted, and a flagrant human rights violation. The Nepali government at the SPBZMC were somewhat taken aback by considerable media attention that this

violence received. Perhaps because of this spotlight, the SPBZMC has had several successful meetings this past year with representatives from Tarap. While no official decision has been reached, locals are hopeful that harvesting will be off-limits in Lang, and that they will be allowed to collect a small service charge in conjunction with the SPBZMC. The SPBZMC is open to this idea, as it is nearly impossible for their officers to collect the fee alone in an area as large as Tarap. They are attempting to reach an agreement where locals would collect the tax and give a portion of it to the government[84]. Given these positive meetings and the embarrassment the Nepali government received following violence, villagers are hopeful that no more violence will occur, though still they continue to live with a substantial amount of fear and psychological trauma.

Crime and violence related to yartsa gunbu has become all to common in Nepal in the last several years. A lack of regulation and oversight combined with the financial incentive has resulted in increase in illegal smuggling of cordyceps, and vandalism and thefts, as discussed previously. In 2009, six men from Manang murdered seven outsiders from the Gorkha region who had come to Manang to harvest yartsa gunbu. In 2011, these men were found guilty of their crimes and given life sentences in prison[85].

A brief comparison of cordyceps management strategies

In almost all the regions on Nepal, India, Bhutan and Tibet where yartsa gunbu is collected, locals prevent outsiders others from harvesting the fungus. Even in extremely rural Tibet, locals prevent outside access. Bhutan has implicated a management strategy on the national level, allowing on only one member per household to harvest cordyceps, and taxing the sale 4.9 %. While Nepali legalized yartsa gunbu harvest and trade in 2001, much of the trade is done illegally. In 2001, for instance, a mere 3.1 kg of cordyceps was traded legally in the entire country[86]. Currently Nepal does not officially restrict the number of people who can pick yartsa gunbu or the total amount that can be harvested annually. However, many regions have developed their own small-scale management strategies. For instance, In the Samaguan VDC of Nubri, village leaders establish a date each year to start collecting the fungus. When this date approaches, every able bodied villager is required to meet for roll-call four times a day in an attempt to prevent people from beginning to pick before the official season has begun[87]. In Mustang and Manang, only locals are allowed to pick the fungus. Even in the Sahara and Kani VDCs of Dolpa, outsiders are restricted. While a limit on the amount of people who come from outside Tarap to harvest cordyceps would boost the local economy and lessen the environmental impact considerably, such a scenario is simply unrealistic. The Tarap valley is just too large to be governed in such a manner. The inhabitants of the valley would not be able to police the vast hills that surround their villages. Furthermore, the potential income from cordyceps harvest in Tarap is simply too great for the Nepali government to place any restrictions. As the fungus begins to disappear and the and its sustainability becomes a

pressing issue perhaps the government will consider a more conservative taxation and management strategy.

The future and suitability of yartsa gunbu

Given its extreme popularity and the degree to which it is harvested, it not surprising that scientists have begun to witness a decline in annual yield of cordyceps. A 2013 study in Dolpo by Uttam Shrestha and Kamaljit Bawa where 203 harvesters were interviewed found that fungus is declined in the region. 95 % of the harvesters that they interviewed believed that the cordyceps was becoming harder to find in the pastures, and 67% believed that the current manner in and the rate by which the yartsa gunbu is harvested unsustainable . 70% of harvesters thought that it was markedly more difficult to locate the fungus in pastures. Everyone interviewed in this paper's study agreed that the fungus is definitely more difficult to find with each passing season. Bawa and Shrestha's study also found that Yartsa gunbu pickers are an increasing amount of days in the pasture, while the amount of fungus they are finding is decreasing. Furthermore, while the price and demand for cordyceps has continued to rise, since 2011, Nepal's total yield has declined (see figure 14). Bawa and Shrestha conclude that fungus is likely declining. They propose that the Dolpo-pas would benefit from developing a local management strategy to prevent this lucrative commodity from disappearing altogether[88].

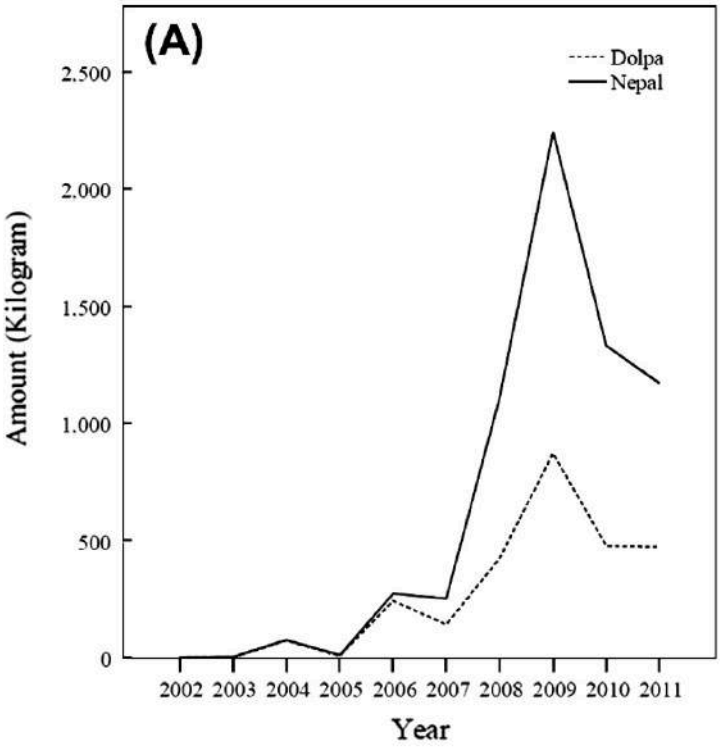

Figure 14: total Yartsa gunbu trade in Nepal from 2003 to 2011 (Bawa and Shrestha)

As discussed in previous sections of this paper, yartsa gunbu harvest has had serious environmental, social and economic impacts in the Tarap valley. The pastures and animals are significantly weaker, and the villagers are depending less on agro-pastoralism for their livelihood, instead turning to income generated by the fungus. If they current decline in cordyceps continues, the Dolpo-pas of the Tarap valley face serious hardship in

the coming years. Without yartsa gunbu money and with weaker grasslands and smaller and less healthy herds, they will find that their way of life is once again incredibly difficult, perhaps even more so than before the commodification of cordyceps.

Conclusion

Yartsa gunbu's rise in popularly has caused swift social, political, environmental, and economic changes in the Tarap valley within the last decade. As a result of overharvesting and environmental degradation, the agro-pastoral way of life that the Dolpo-pas depend on is threatened. The violence of June 2014 shook the valley to its core; many villagers now live in fear. While they have benefited economically from the fungus, the environmental impact is simply to great and its effects too far-reaching too quantify. As cordyceps disappears and the conditions of the animals and pasturelands continue to worsen, these people's ancient way of life will continue to be at risk of disappearing. Perhaps the meetings between villagers and the Shey Phoksundo Buffer Zone management committee this spring will result in an agreement to protect certain sensitive winter pastures, delaying the complete destruction of all grasslands in Tarap. Regardless, the Dolpo-pas of this valley, though a strong and resilient people, face significant difficulties in the ensuing decades. Yartsa gunbu has accelerated the modernization of the valley. The last decade has resulted in almost unimaginable change; it is impossible to say what the next one will bring. One can only hope that the Dolpo-pas of Tarap will weather the storm.

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Methods

The vast majority of the forty-nine interviews conducted in this study where done so through a translator, either in Nepali or the Tibetan dialect that is spoken in Dolpo. Those who spoke English well enough answered the questions directly. A standard list of questions was used, though more often then not follow up questions were asked, and oftentimes the conversation would take its own organic turns (See Appendix C). To protect the identity of interviewees, no actual names were used in this paper. Sadly, our research was cut short because of the devastating 7.8 magnitude earthquake that struck Nepal on April 25, 2015. While Dolpo was not affected by the destruction, it became necessary to terminate our research period prematurely. I had intended in interviewed more villagers in Tarap, and traveling to Lang. Furthermore, I was planning on conducting interviews at the office of the Shey Phoksundo Buffer Zone management committee in Dunai, and interviewing several scientists, government officials, amchis, and Dolpo-pas in Kathmandu. None of this was possible. In total we spent about two weeks in Dolpo and ten of those days in Tarap.

Appendix A: Glossary of Dolpo terms

Amchi: A traditional Tibetan doctor.

Chöten: Also known as a stupa. A mound or circular or square structure that often contains Buddhist relics.

Dolpo-pa: How the ethnically Tibetan people who live in Dolpo refer to themselves.

Gompa: A Buddhist monastery.

Pu-cha: Traditional Himalayan butter tea, usually prepared with black tea, Dhe butter, sugar, and a small amount of salt.

Thukpa: A brothy soup made with barley flour, yak cheese, salt, and dried meat. Thukpa is a staple of the Dolpo-pa diet.

Tsampa: Roasted barley flour that is sometimes served with a small amount of yak cheese and salt, and usually tea. It is also known as *Pak*. Calorically dense and supposedly very notorious, tsampa is a mainstay of Tibetan and Himalayan diets. In Dolpo it was usually consumed as a snack and not a full meal.

Appendix B: Glossary of scientific terms

Entomophagous: Refers to insects commonly eaten by humans.

Flask fungi: Funguses within the Basidiomycota family that produce simple, straight fruiting bodies.

Stroma: A mass of fungal tissue that is responsible for producing spores.

ATP: Adenosine triphosphate, the nucleotide responsible for energy storage and transfer within cells.

Eukaryotic: organisms with specific biological cellular characterizes that distinguish them from bacteria, archaeae, or prokaryotes.

Appendix C: Sample interview questions

1. What is your name?
2. How old are you?
3. What is your occupation?
4. Where do you live?
5. Where are you from originally?
6. Do you pick yartsa gunbu?
7. How long have you picked for?
8. How much yartsa gunbu do you usually get in a season?
9. What to do use the money for?
10. Have you ever taken out a loan for yartsa gunbu?
11. What changes have you have witnessed in the time since you've begun picking?
12. What is your opinion on outsiders who come to harvest?
13. Can you describe the details of the clash last season?
14. How did it make you feel?
15. Are you worried that another one will occur?
16. If you were in charge of the buffer zone committee and the village, what changes would you make?
17. Do you think yartsa gunbu is a good thing or a bad thing for Tarap?

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Traditional Chinese medicine (TCM) originated in ancient China, and has evolved over thousands of years. TCM practitioners use herbal, medicines, various mind, such as body practices, acupuncture, tai chi,to treat or prevent health problems In the, United States,people use TCM primarily as a complementary health, approach. This fact sheet provides a general overview of TCM, and and suggests sources for additional information. *Traditional Chinese Medicine: An Introduction*.

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Suggestions for Further Research

As mentioned in this report, the diet of the Dolpo-pas has shifted significantly in the last decade as a result of the availability of Chinese goods. A study that examined changes in nutrition, eating habits and social practices related to would be fascinating. Many Dolpo-pas discussed rumors of a road that was in the processes of being built from Tibet into Dolpo. The roads from both the north and south in the Upper Mustang have caused sweeping changes in the region. A comparative study between Mustang and Dolpo that investigates the impact of roads would be fascinating. In terms of yartsa gunbu, it goes without saying that this research would have yielded much more concrete results had it taken place during actual yartsa gunbu season. On a more personal note, I would be honored to return to Dolpo during the summertime to conduct follow up cordyceps research.

Figure 15: The author in Dolpo, April 2015

For SIT students, I would offer a few points of simple advice. Firstly, approach travel in Dolpo (and all of south Asia for the most part) with an open mind, patience, and with an attitude of levity, knowing full well that your travel plans will inevitably change. We were fortunate enough to have the privilege of traveling with a group of Dolpo-as to Tarap all the way from Kathmandu. Not only did this help reduce the price of food, transportation and lodging alone the way, (often we slept and ate for free), it added to the authenticity and enjoyment to the entire experience. I can say with confidence that some of the closet friends I made during my entire semester were during my twenty days in Dolpo. I would strongly recommend that you try and do the same if at all possible.