

Spring 2014

Indigenous Management Strategies and Socioeconomic Impacts of *Yartsa Gunbu* (*Ophiocordyceps sinensis*) Harvesting in Nubri and Tsum, Nepal

Geoff Childs

Washington University in St. Louis, gchilds@wustl.edu

Namgyal Choedup

Washington University in St. Louis, namgyal@wustl.edu

Follow this and additional works at: <http://digitalcommons.macalester.edu/himalaya>

Recommended Citation

Childs, Geoff and Choedup, Namgyal (2014) "Indigenous Management Strategies and Socioeconomic Impacts of *Yartsa Gunbu* (*Ophiocordyceps sinensis*) Harvesting in Nubri and Tsum, Nepal," *Himalaya, the Journal of the Association for Nepal and Himalayan Studies*: Vol. 34: No. 1, Article 7.

Available at: <http://digitalcommons.macalester.edu/himalaya/vol34/iss1/7>

This Research Article is brought to you for free and open access by the DigitalCommons@Macalester College at DigitalCommons@Macalester College. It has been accepted for inclusion in Himalaya, the Journal of the Association for Nepal and Himalayan Studies by an authorized administrator of DigitalCommons@Macalester College. For more information, please contact scholarpub@macalester.edu.

Indigenous Management Strategies and Socioeconomic Impacts of *Yartsa Gunbu* (*Ophiocordyceps sinensis*) Harvesting in Nubri and Tsum, Nepal

Acknowledgements

The authors would like to thank Sonam Lama for providing the majority of information on local policies in Tsum, Phurbu Tsewang for filling in some missing information on Nubri, Cynthia Beall and Sienna Craig for allowing us to use survey data from our 2012 research project, Georgina Drew for insightful comments on an earlier draft of the paper, and the two anonymous reviewers whose suggestions greatly improved the final version of the paper.

Indigenous Management Strategies and Socioeconomic Impacts of *Yartsa Gunbu* (*Ophiocordyceps sinensis*) Harvesting in Nubri and Tsum, Nepal

Geoff Childs and
Namgyal Choedup

The harvesting and selling of *yartsa gunbu* (literally 'summer grass, winter worm'; *Ophiocordyceps sinensis*) is contributing to economic and social transformations across the Tibetan Plateau and Himalayan region faster than any development scheme could envision. Meanwhile, the rising demand for the commodity has been linked to violence and environmental degradation, and has generated concerns over resource sustainability. Although good data is emerging on harvesting practices, medical uses, and the booming market for *yartsa gunbu*, especially in Tibetan areas of China, little systematic research has explored village-level management practices and socioeconomic impacts. This paper seeks to partially fill that void through a case study of the *yartsa gunbu* harvest in Nubri and Tsum, contiguous valleys in Nepal inhabited by ethnic Tibetans. Using data from household surveys

and in-depth interviews, the authors describe the process of gathering and selling *yartsa gunbu* within the parameters of management practices that combine religious and secular regulations over natural resources. The authors conclude with a discussion of the indigenous management system in relation to sustainable development.

Keywords: Nepal, Tibetans, caterpillar fungus, *Ophiocordyceps sinensis*, *yartsa gunbu*, natural resource management, sustainable development.

Although *bikas* (development) has been a central component of Nepal's national narrative since the 1960s (Pigg 1992; Des Chene 1996; Onta 1996), some parts of the country, including highland communities populated by ethnic Tibetans, have benefitted very little from state-initiated development projects. In Nubri and Tsum, contiguous valleys in northern Gorkha District that border China's Tibet Autonomous Region (TAR), the state failed to develop basic services like health care facilities and schools beyond a rudimentary level. Despite being bypassed by development, residents of these valleys are now reaping economic rewards that were unthinkable a decade ago. They are doing so by devising strategies to regulate a lucrative resource, *yartsa gunbu* (literally 'summer grass, winter worm'; *Ophiocordyceps sinensis*, also known as 'caterpillar fungus'), in a way that resembles an indigenous form of 'sustainable development'.

Yartsa gunbu is endemic to the grasslands and alpine regions of the Tibetan Plateau and surrounding valleys of the Himalaya (Winkler 2008a). The fungus parasitizes and mummifies the earth-dwelling larva of several Thitarodes ghost moth species to form a fungus-caterpillar complex.¹ The use of *yartsa gunbu* in Tibetan and Chinese medicine has a long history. Today *yartsa gunbu* is widely traded as a powerful tonic in Chinese medicine, is often referred to as 'Himalayan Viagra' in the media,² and has become such an important commodity that scholars nominated it to be China's national fungus (Zhang et al. 2012: 2-3).

With an eight-fold increase in value from ¥4,800 to ¥40,000 per pound (Winkler 2008b: 18) *yartsa gunbu* has become the mainstay of household economies across the Tibetan Plateau and in the highlands of Nepal, India, and Bhutan. It fills an economic void in Tibetan areas of China that state-sponsored development projects, which tend to focus on infrastructure, do not always satisfy. Winkler points out, "Unlike many other natural resources in the region, such as timber, gold and also increasingly hydroelectricity, where the profits are captured by the state sector, fungal income (and other income from wild collected plants) goes directly to rural households" (2005: 77). The *yartsa gunbu* harvest neither interferes with other economic activities nor requires sophisticated technology and capital. "Thus," Winkler argues, "resource access is assured to the people, who are otherwise marginalized by government control of local resources such as timber, by lack of formal education, lack of access to credit, etc." (2005: 77).

In addition to bringing economic benefits, the *yartsa gunbu* harvest can have negative consequences such as the degradation of pasturelands and violence (Devkota

2010: 96; Gruschke 2011: 227; Yeh and Lama 2013: 8). In recent incidents, in June 2014 a clash with police in Dolpo left two dead in a dispute between members of the local community and a National Park Buffer Zone Management Committee over who has the right to collect and keep fees paid by outsiders for access to *yartsa gunbu* grounds (The Record 2014). On 30 May 2013, at least two people died in a fight between Tibetan groups in the area of Rebgong, China (RFA 2013). This event prompted the Dalai Lama to issue a rare plea to Tibetans to shun violence and draw upon traditional values and practices to resolve territorial issues of access.

Despite *yartsa gunbu*'s importance to rural economies and potential links to social discord, environmental degradation, and economic dependency, there is still a lot we do not know about its impact on highland Tibetan communities of Nepal. This paper describes the situation in Nubri and Tsum where *yartsa gunbu* has been collected by local medical practitioners for centuries, but only became a critical part of people's household economies within the last decade. Following a literature review, we use Nubri and Tsum as case studies to illustrate how some communities are dealing with a phenomenon that is transforming people's lives faster than any development scheme could envision.

Overview of Management Practices

Our literature review reveals a patchwork of management practices across the Tibetan Plateau and Himalayan region. Many areas permit outsiders to collect *yartsa gunbu* providing they pay a fee. This is the case in Dolpa, Nepal (Devkota 2010; Knight 2012; Shrestha and Bawa 2013), Kumaon, India (Garbyal et al., 2004), Dongwa Village in Yunnan (Stewart 2014), and some counties in China's TAR where non-residents can purchase permits ranging from ¥300-¥1,500 Yuan (\$40-\$200) (Winkler 2008a). In Domkhok Township, Qinghai, households lease land to outsiders for fees ranging from ¥10,000-¥15,000 (\$1,300-\$2,000) per person. One area is controlled by four households who only permit 80 outsiders to gather each season. By leasing land during the picking season each household receives ¥200,000 (\$26,600) (Sulek 2012). Some places in Qinghai (Gruschke 2008, 2011; Yeh and Lama 2013) and Kumaon (Garbyal et al., 2004) initially permitted collection of *yartsa gunbu* by outsiders, but later imposed restrictions. Exclusionary practices have benefitted Tibetans in one area by opening new opportunities to act as middlemen in the trade (Gruschke 2011: 225). Others areas, such as

Riwoche and Tengchen Counties in the TAR, closed their gathering grounds to outsiders early on (Winkler 2008a).

In Nagchu and Nyingtri Prefectures of the TAR, Winkler (2008b) reports that people from the more densely populated Shigatse Prefecture are permitted to collect *yartsa gunbu*. Other scholars confirmed this while conducting research in Shigatse Prefecture on seasonal labor migration (Goldstein et al. 2008). In 2006, one man reported that he traveled annually to Nagchu with a contractor from a neighboring village. Being well-connected in the nomad region through his work, Nagchu residents permitted the contractor to participate in the *yartsa gunbu* harvest. He assigned four of his workers to the task, for which they were paid their normal construction wage of ¥28 per day (\$3.70). The contractor relinquished half of the harvest to locals and sold the other half on the open market for a net profit of over \$5,000. In contrast, Stewart (2014) reports that road construction crews have overwhelmed local efforts to exclude outsiders in Shusong Village, Yunnan, to the point where their gathering is now unregulated.

In the area surrounding China's Baima Xueshan Nature Reserve in Yunnan Province, Weckerle and colleagues (2010) report that, although it is technically illegal to harvest *yartsa gunbu* in the nature preserve, authorities are unwilling to enforce a restriction on such an important income source for local families. Village committees along with the nature reserve's staff implemented regulations to permit camping only at designated sites where all garbage must be collected and burned, prohibit cutting trees for fuel, and mandate that all holes made by extracting *yartsa gunbu* must be repaired.

Bhutan is the only country to institute a national-level management strategy (Cannon et al. 2009). In 2004 the government relaxed laws on gathering *yartsa gunbu* in order to provide locals with an incentive to police their areas and protect natural resources. The government permitted yak herders who normally graze in an area where *yartsa gunbu* is found to collect during June; only one member per household could participate. In 2008 the limitation on collectors per household was relaxed and more decision-making power delegated to the local level (Cannon et al. 2009: 2272-2273). Bhutan's government legislated that *yartsa gunbu* can only be sold at authorized auctions by authorized collectors. Buyers must be Bhutanese nationals who could sell to international or domestic markets. The government imposes a 4.9% levy on sales to cover the expenses of auctions and to support environmental protection programs (Cannon et al. 2009).

Selling the Product

In Tibetan areas of China the *yartsa gunbu* market is unregulated. Collectors sell to middlemen of their choice who come directly to gathering sites or conduct their business in nearby market towns. Some sell their product before cleaning it, which provides less profit but requires less effort, whereas others increase profits by cleaning and drying the *yartsa gunbu* first (Winkler 2008a). Yeh and Lama (2013: 11) describe how some transactions are conducted in the traditional Tibetan manner of exchanging hand signals, veiled from public view, within each other's long sleeves.³

In primary collection areas of Chamdo and Nagchu Prefectures, TAR, Winkler (2009) estimates that *yartsa gunbu* accounts for 70-90% of household cash incomes. In Domkhok Township, Qinghai, some households are able to earn ¥200,000 (\$26,600) per season by either collecting themselves or leasing access to outside collectors; those who sell their herds and live mainly off *yartsa gunbu* fare just as well as those who continue to keep large yak and sheep herds. Therefore, many nomads are reducing herd sizes or eliminating livestock altogether because herding requires far more annual labor than collecting *yartsa gunbu* (Sulek 2012). A similar process seems to be occurring in Bhutan. Profits ranged from \$38 to \$2,541 with top collectors earning nearly the equivalent of a teacher's annual salary for little over a month's work, prompting some to buy land at lower altitude in anticipation of one day giving up herding altogether (Cannon et al. 2009).

Tibetans in China use *yartsa gunbu* profits to start entrepreneurial activities, such as shops, or as a means to secure bank loans (Winkler 2008b, 2009; Gruschke 2011). Others use the income to invest in cattle and jewelry (Gruschke 2008), cover healthcare expenses, improve the condition of their housing, buy motorcycles and other items such as televisions and DVD players (Winkler 2008a, 2008b; Sulek 2012). In addition, some take the opportunity to gain merit in a culturally appropriate manner by making large donations to monasteries (Winkler 2008a). In Bhutan, collectors use their income to pay school fees or buy items like solar panels and mobile phones (Cannon et al. 2009).

This overview indicates that management practices and economic impacts vary across the region. In areas where *yartsa gunbu* is found, people can realize profits far beyond their income from farming and herding. Tibetans are using the cash to improve their standard of living, and in some cases are reducing dependency on agro-pastoral activities by becoming entrepreneurs. Thus, the *yartsa gunbu* trade is transforming social and economic life in ways that

development initiatives in China and the highlands of surrounding nations have been unable to match. However, Yeh and Lama argue that the trade may act to further marginalize Tibetans in China by “making them highly vulnerable to the whims of Chinese urban consumer demands through a narrowing of livelihood options” (2013: 3). Other scholars express concern over the sustainability of the harvest (Sharma 2004; Cannon et al. 2009; Stewart 2009; Winkler 2009, 2012; Weckerle et al. 2010; Shrestha and Bawa 2013). In contrast, in this article we provide details on the ways that residents of two valleys in Nepal have devised a set of regulations that are equitable and potentially sustainable.

Yartsa Gunbu in Nubri and Tsum

Although it may be true in some parts of Nepal that, “restrictions on harvest have been unsuccessful” (Shrestha and Bawa 2013: 519), evidence from Nubri and Tsum can provide a counterpoint to this general claim. The contiguous valleys of Nubri and Tsum are inhabited by ethnic Tibetans who until recently made their living primarily through farming, herding, and trans-Himalayan trade (see Figure 1). Agricultural land is privately owned, and is acquired through patrilineal inheritance. In exchange for paying taxes to the village administration and local temples, land-owning households have the right to exploit communal resources which include forests and high altitude pastures. The right to use pastures is critical, because that is where *yartsa gunbu* can be found.

Tsum is divided into two VDCs (Village Development Committees).⁴ Chhekampar, the upper VDC, is comprised of 11 villages with a population of roughly 1,500. Only residents of Chhekampar have access rights to the pastures where *yartsa gunbu* is found. Nubri consists of four VDCs. The highest, Samagaun, consists of two villages (Sama and Samdo, population 778) which have abundant high altitude pastures and thereby access to the most fertile *yartsa gunbu* areas in the valley. The next highest VDC, Lho (population roughly 1,000), has limited pastures and hence much less *yartsa gunbu*. The two lowest VDCs, Prok and Bihi, have very few pastures where *yartsa gunbu* is found.

The research for this paper was undertaken in 2011 and 2012.⁵ In 2011 we spent five weeks in Nubri studying migration, family management practices, and household economic strategies. In Sama, one of several research villages, we conducted in-depth interviews with 18 householders (nine men and nine women) ranging in age from 31 to 53 (average age of 41.3). Each interview was conducted in Tibetan and included questions about *yartsa gunbu*: who gathered it, how much they earned, how they spent the money, and perceived impacts on the community. We also interviewed two elderly lamas (age 75 and 79) and one young lama (age 36), as well as two village leaders. Some clarifying information was obtained during subsequent visits and phone conversations.

The economic data presented in this paper comes from the 2012 Household Survey of Nubri, Tsum, and Mustang

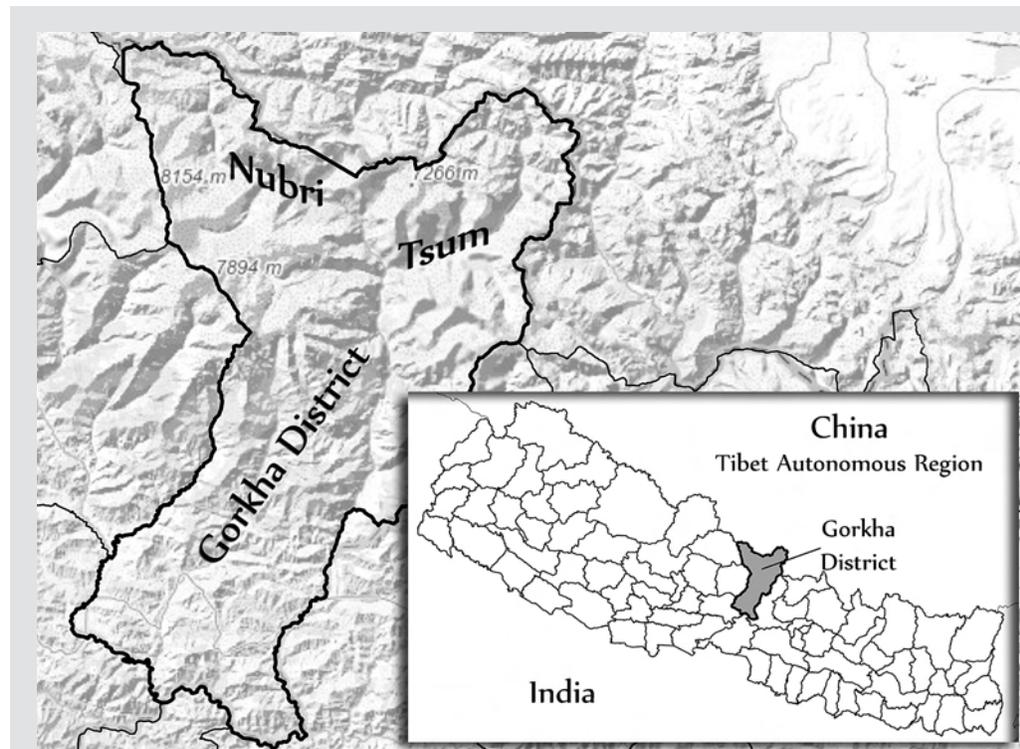


Figure 1. Map showing location of Nubri and Tsum in Nepal.

conducted by Cynthia Beall, Geoff Childs and Sienna Craig. The survey gathered demographic information on every individual in the study area, and economic information on every household including how much money they had made from the previous *yartsa gunbu* harvest. We also spent time in the *yartsa gunbu* camps and thereby gathered first-hand information at the primary harvesting sites.

All residents of Tsum's Chhekampar VDC, which include anyone who was born in a local household regardless of where they currently reside, have the right to gather *yartsa gunbu* on communal grazing grounds located one-day's walking distance from any village. Thus, a man or woman who was born in Chhekampar VDC but now lives in Kathmandu, India, or any other country has the right to return and participate in the harvest. The patrilineal assignment of collection rights is highlighted by the fact that local men's wives who are not born in Tsum can participate, whereas local women's husbands who are not born in Tsum and are not residing in the territory cannot. All other non-residents are prohibited from gathering *yartsa gunbu* on VDC territory. Previously, non-residents from villages below Chhekampar VDC could pay a fee to gather, but locals barred them in 2010 due to concerns over crowding and fighting in the camps and the presence of outsiders during the harvest season when many houses are left empty. Security of personal property outweighed any income gained through the issuance of permits. The only non-residents who can gather are household servants who have lived in Chhekampar VDC continuously for at least one year, and, as mentioned above, non-resident wives of local men.

Other than excluding outsiders, the collection process is not tightly regulated in Tsum. According to data gathered

through interviews and first-hand observation, residents of the uppermost villages travel to the gathering grounds in April and report back when they see evidence that *yartsa gunbu* is emerging. Afterwards, people begin establishing camps in highland pastures that they use for summer grazing. Shelters range from typical herding huts with stone walls covered by woolen tents, to plastic tarps stretched over bamboo poles. In order to share logistics people travel and camp in groups comprised of friends and relatives. Parents recall sons and daughters attending distant boarding schools to help with the harvest. The majority of householders participate—even pregnant women who sometimes give birth at the camps. Only small children, the elderly, monks and nuns, and a few families of hereditary lamas do not collect *yartsa gunbu*.

People from Tsum sell their product to middlemen from Tibet. Most people use their income, which ranged from NRs2,000-NRs300,000 in 2011 (\$24 to \$3,530) to buy food and clothing from markets in TAR, China. As a result, consumption habits have changed; people eat more rice and display their wealth status by serving visitors powdered milk and coffee. Although Tsum's residents do not have a custom of depositing money into savings accounts, some purchase gold and other types of jewelry which are not only status symbols but a way of storing wealth. Locals are also building new homes and renovating old ones, and showing an entrepreneurial spirit by building lodges that cater to foreign tourists.

Traditionally, Tsum's residents were reluctant to gather *yartsa gunbu* on the grounds that doing so constituted the killing of a living being. According to a local saying, "Digging up one worm is equivalent to killing one fully ordained monk."⁶ Nowadays, however, 83% of household



Figure 2. *Yartsa gunbu* collectors' shelter, Tsum.

(Geoff Childs, 2012)



Figure 3. Cleaning *yartsa gunbu* prior to sale, Tsum.

(Geoff Childs, 2012)



Figure 4. Sama Village, Nubri.

(Geoff Childs, 2012)

non-farm income in Tsum comes through the collection and sale of *yartsa gunbu* (see Table 1). A strong economic incentive has prevailed over the aversion to commit what was once considered a harmful action that would provoke negative consequences.⁷

In comparison, *yartsa gunbu* collection is more systematically controlled in Nubri’s Samagaun VDC where management practices involve a combination of village regulations (*yul khrims*) and religious regulations (*chos khrims*). Until now, the local VDC government has taken responsibility for devising and implementing management practices and regulations.⁸ Samagaun’s leaders recognized early on that some regulations could help ensure an equitable and sustainable harvest. Based on the amount of snow cover in the highland pastures and other factors, village leaders set a date for the commencement of the harvest. In the weeks prior to the official starting date every able-bodied resident must physically check in at the community meeting house four times daily (7:00am, 10:00am, 2:00pm, and 6:00pm). The roll call is designed to thwart attempts by any individual to begin collecting earlier than others. Anybody who fails to check in or is caught venturing to the high pastures before the starting date incurs a heavy fine. Village leaders also have the authority to postpone collection when conditions warrant. For example, in 2012 the best areas were still covered by snow in late May so leaders suspending the harvest for a week in order to allow conditions to improve.

Yartsa gunbu is found on a common resource (pastureland) and therefore is treated as a common resource. The right to gather *yartsa gunbu* is held by any bona fide resident of the village, a status defined through participation in a household taxation system (Childs 2005). Each household must register its collectors with the village administration and pay a *yartsa gunbu* tax of NRs100 (\$1.20) for the first household member and NRs4,500 (\$53) for each additional member. The money is spent on common purposes, such as inviting a lama to perform a communal empowerment ritual (*dbang*), repairing the hydroelectric system, or paying litigation costs when disputes arise with other

villages. To guard against outside poachers, the village pays a few men a daily salary to guard the richest harvesting grounds.

Religious regulations (*chos khrims*) are mechanisms designed to prevent people from exploiting resources in sacred areas. For example, Gang Pungyen (Mt. Manaslu, 8,156m) is considered to be the residence of Sama’s protector deity (*yul lha*). Lamas in Sama shield certain tracts of land on the slopes of Gang Pungyen through ‘sealing decrees’ (*shag rgya*) that prohibit people from cutting trees, gathering forest products, or hunting wildlife.⁹ Recently, Sama’s lamas added *yartsa gunbu* collection to the list of prohibited activities in designated sacred areas (see also Winkler 2008b; Boesi and Cardi 2009).

Yartsa gunbu has become such an important contributor to household economies that during harvest season local schools shut down and parents recall to the village children who are living elsewhere. As one man stated,

In our village, all recent developments and rises in income are due to the collection of *yartsa gunbu*. That is why, if there are four members in a household, all four will go. If there are five members, all five will go. Everyone engages in the harvest, regardless of whether they are a lama, layperson, or village leader.

Like in Tsum, the people of Nubri sell their *yartsa gunbu* to middlemen from Tibet who pay in cash; competition among middlemen continually drives the price upwards. Several young residents of Sama facilitate the trade and increase their profits by taking interest-free loans from a middleman, buying *yartsa gunbu* from fellow villagers, and then selling the product back to the money lender. Middlemen use this strategy to capture a greater share of the market.

In 2011 the most successful households made around NRs400,000 (\$4,700) from *yartsa gunbu*. However, fortunes vary because some people are more adept at collecting than others. One woman complained that her son is an

VDC (Valley)	<i>Yartsa Gunbu</i> Income	Total Income (Includes Remittances)	% of Total Income from <i>Yartsa Gunbu</i>
Lho (Nubri)	NRs 12,800 (\$151)	NRs 13,900 (\$164)	92.1%
Chhekampar (Tsum)	NRs 40,900 (\$481)	NRs 49,300 (\$580)	83.0%
Samagaun (Nubri)	NRs 69,400 (\$816)	NRs 90,200 (\$1,061)	76.9%

Table 1. Average Income per Household by Source and Village.

Beall, Childs, and Craig. 2012 Nubri, Tsum, and Mustang Household Survey

incompetent collector and lamented, “What rotten luck! Some individuals can find one or two thousand pieces, but we could manage a mere 375. The money we got only lasted for a month. That’s all.” Nevertheless, even a relatively low tally garners a significant influx of cash considering that, prior to *yartsa gunbu*, the most lucrative income generating activity was ferrying mountain climbers’ loads to Manaslu Base Camp for NRs1,500 (\$18) per trip.

Table 1 demonstrates that *yartsa gunbu* provides the majority of income for the residents of the three VDCs where *yartsa gunbu* is found, but also shows considerable variation.¹⁰ Samagaun has the most abundant highland pastures and therefore profits the most from the harvest.

Instant Income: Pros and Cons

There is no question that *yartsa gunbu* has brought a much needed economic boost to Nubri and Tsum. The valleys were relatively wealthy prior to the 1960s due to their position along trans-Himalayan trade routes (Snellgrove 1989). However, the development of a road system on the Tibetan Plateau combined with frequent border closings eroded trade. By the 1990s the only way people in Nubri could make ends meet was to sell timber across the border to Tibet. People lamented at that time, “We trade or we starve” (Childs 2004). Nowadays, most people we interviewed use at least some of their income to fulfill subsistence needs. One man from Sama explained,

There is no other source of cash income in the village.¹¹ The yearly produce from land is not enough to feed us even when we include dairy products. In the past, people would make do with little income. These days, even with more cash, people still fall short. Nevertheless, in the *yartsa gunbu* era people have plenty to eat and good clothes to wear. They can use the money to buy rice, grain, butter, clothes, shoes, salt, and everything from Tibet.

The income is especially important for poorer families who have little land and cannot produce enough food for the entire year, but can now purchase food from Tibet. For example, a woman living in one of the poorer households in Sama stated that she and her husband made about NRs100,000 (\$1,176) from *yartsa gunbu*. When we asked what she did with the income, she responded,

I feed my family with this money. That’s it. We don’t have much land so we can’t invest it in farming, and it is not enough to buy animals. So we pick *yartsa gunbu* and from that money we run our

household. If we could get lots of money, we could save it for a child’s education but the money is only enough to feed us.

Similar to Tsum, some people use the income to finance house construction or buy jewelry. One man said he uses some of his income to purchase more bovines, and noted that *yartsa gunbu* is partially responsible for the recent increase in herd sizes. A Sama resident also stated, “Parents are taking more responsibility for their children who are in [boarding] school. They take interest in the children’s diet and clothing. They won’t just ignore the children once they had been admitted in school and receive sponsorship.”

The newfound wealth also contributes to religious life. Some people reported using their money to gain merit by sponsoring rituals or embarking on pilgrimages. One man noted that people are becoming more generous and making larger donations to monasteries. We observed that annual religious festivals have become more elaborate as evidenced by the higher quality costumes worn by participants, and the higher value donations of food and material items. Because some of these festivals effectively redistribute food during the lean part of the year (Childs 2005), the benefits of sponsoring communal rituals can filter down to poorer members of the community.

Yartsa gunbu income insulates people from onerous funeral expenses that can lead families into debt. Providing a proper funeral ceremony is culturally appropriate and socially significant in Tibetan societies. Funeral rites assist the deceased person’s consciousness (*rnam shes*) navigate through *bardo*, the intermediary realm between death and rebirth. Failure to provide the full set of rituals can result in the consciousness becoming trapped in *bardo* or rebirth in a hell realm. One man explained that, in the past when a person died, members of the household would scramble to accumulate sufficient funds to sponsor ceremonies that stretch over the course of seven weeks. He recalled incidents where families had to sell livestock, jewelry, and even land to afford a proper funeral ceremony. Nowadays, *yartsa gunbu* income can provide the cash needed to perform last rites.

Many people in Sama expressed worries about negative developments associated with the *yartsa gunbu* trade, including a sharp rise in drinking. Instead of just drinking locally distilled beverages, which are limited in quantity by the amount of grain on hand, cash allows men to purchase cheap, potent liquor from China. The increase in drinking prompted Sama’s residents to form a Women’s Association



Figure 5. *Yartsa gunbu* is the best source of income today in Nubri and Tsum.

(Geoff Childs, 2012)

(Maili Samiti) that immediately took action by instituting a ban on Chinese liquor. According to their president,

The reason [for the prohibition] is that Chinese liquor is very cheap. Therefore, people in the village drink a lot of it. People get drunk and get into fights. After getting drunk on Chinese liquor, men gamble day and night. When their children and wives get sick, nobody is around to take care of them. So we decided to form the association and do something about it. Most people in the village support this ban. Those who drink a lot complain that we have stopped them from getting the cheaper liquor. If you drink too much of the cheap liquor, you know it causes health issues and harm to your body. That is why we have banned the sale of Chinese liquor.

Many people are unused to managing large amounts of money and end up spending their earnings very quickly. Gambling, which used to be confined to a brief period around the Tibetan New Year (January-February), is now common during and after the *yartsa gunbu* harvest. Bets of NRs1,000 (\$12) or more—almost unheard of in the past—are commonplace. As one man put it, “People who are actually poor act as if they are rich. They spend lavishly and want others to see them as rich.”

Furthermore, when we asked a village leader whether *yartsa gunbu* is changing local lives, he responded,

I can say there had been some changes; changes in the way people eat, drink and live. But the change is not proportionate to the economic boom. The changes are not evident in households or in the

village in general. I guess it can be attributed to unwise spending. When the people of Sama travel outside the village, they spend a lot of money. The hoteliers down valley are happy to have guests from Sama because they spend a lot. They don't know how to manage cash.

One man was despondent over his son's recent spending binge. After telling us that his family earned NRs250,000 (\$2,940) from the previous *yartsa gunbu* harvest, he explained, “We put the money in a trunk. My son took that money and spent it all in a couple of days in Kathmandu. I could do nothing. If I question him, he will fight with me. So I didn't say anything.” When we probed whether he thought other people squandered their *yartsa gunbu* income, he continued,

Take me for example. If I could collect 100 worms today, I would spend 500 rupees on drinking. We are not thinking right. Most of us are like that. There are many hotels around here where we get together and drink. But some people can save well. If your wife is smart, then you can save some money. People like me end up with nothing. We only think about the present and live life as it comes.

A young, influential religious leader in Sama is concerned over changing cultural values and financial mismanagement in his village and has organized advising sessions for young men where he counsels them to value traditions and use income in ways that can benefit their families. For example, he recommends they invest in appreciable assets like jewelry, and set aside funds to help children attain a

better education. Only time will tell whether people heed his advice.

The boom in income from *yartsa gunbu* seems to be changing norms of social interaction. As one man commented,

The people of our village are peaceful in general but since the commencement of *yartsa gunbu* trade have become boorish. Earlier, we only had village meetings once or twice a year. Nowadays there are frequent meetings with more arguments between people, more squabbles. People are becoming more selfish.

When we asked whether the sudden change in economic conditions is affecting inter-generational relations, an elderly lama responded,

Things of the past are left behind. This is because of the huge income one can gain from collecting *yartsa gunbu* without doing much hard work. During our parents' time our lineage was highly respected because we are descendants of the religious kings (*chos rgyal*) of Tibet.¹² As we have aged we have continued observing the old values. Modern values are different. We don't attend all the gatherings of the lay people. Their thinking is incompatible with ours (*sems pa mthun mi 'dug*); our experiences and the things we have seen are different. Even if we go to the meetings, neither are [our ways of thinking] compatible nor do they listen to us. Therefore, it is better if we don't go to these gatherings. Modern and traditional thoughts do not match. [Young] people here say, "There is no point talking about traditional thoughts. Leave aside the talk of traditions and let's talk about who's wealthier."

According to this lama, the breakdown of both social and generational hierarchies is due to many people achieving upward mobility through lucrative activities that do not require much work, and by their use of newfound wealth as a sign of status (see also Yeh and Lama 2013: 10-11). He went on to lament that young people nowadays,

[D]on't show any respect, they say we are old people. The little respect I receive is primarily because I am a practitioner of Buddha's teaching and people invite me to perform some religious activities. Other than that, there is no role for us in other [secular] matters. When I talk with people nowadays they all say, 'you and me' (*khyod dang nga*).

Traditional Tibetan social norms are based on the concept of 'order by seniority' (*rgan gzhon go rim*), meaning that younger people should treat their elders with respect through deferential actions (giving them the most comfortable seats, serving them first) and verbal interactions. In Tibetan linguistic convention, honorific speech (*zhe sa*) refers to 'speech whose very words show respect' (Agha 1993: 132). With respect to pronouns, '*khyed*' and '*sku nyid*' are honorific forms of 'you' that should be used when addressing a person of higher age or social status. In contrast, people of lower or equal age and social status are typically addressed using the term '*khyod*.' To address an older lama—a person who occupies the pinnacle of the local social hierarchy—using '*khyod*' represents a linguistic rupture of traditional social norms. The lama interprets this as evidence that the youth are disregarding the traditional age-based social order.

In May 2013 we learned through interviews and participant observation that elderly community members no longer attend village meetings in Sama. Their reluctance is in response to disrespectful actions by young men who raise their voices and interrupt them, and devalue their traditional knowledge by claiming that time-honored regulations are no longer applicable. It is impossible to determine whether an erosion of the age-based status system would have occurred in the absence of *yartsa gunbu*. What is clear, however, is that Sama's younger generation gained sudden access to a lucrative income source. By doing so they become less dependent on guidance from the elderly, and seem less inclined to adhere to traditional social norms.

Sustainable Development?

The World Conservation Strategy (IUCN et al. 1980) first highlighted the need for 'sustainable development', an approach to simultaneously address poverty, inequality, and environmental concerns (Hopwood et al. 2005). After the Brundtland Report defined sustainable development as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (WCED 1987: 43), the concept has been thoroughly debated, refined, and appropriated by different interest groups to fit various agendas (Hopwood et al. 2005).

Haughton identified five interconnected 'equity principles' that, if "not addressed singly and collectively, then inevitably the ability to move toward sustainable development will be critically undermined" (1999: 235). The first, inter-generational equity, encapsulates the Brundtland Report's definition of sustainable development



Figure 6. Horsemen between Sama and Samdo, Nubri.

(Geoff Childs, 2012)

cited above. The second, intra-generational equity, refers to socioeconomic equity within a society at a given time. The third, geographic equity, “requires that local policies should be geared to resolving global as well as environmental problems,” whereas the fourth, procedural equity, advocates for regulatory transparency in which all individuals are treated fairly. Finally, inter-species equity is a call for maintaining biodiversity by treating the survival of all species on an equal basis with humans (Houghton 1999: 235–237). Although we do not have sufficient data to fully address all of these principles, we have enough to comment on inter-generational equity, intra-generational equity, and procedural equity.

Does the current rate of harvest of *yartsa gunbu* compromise the ability of the future generation to meet its own needs (inter-generational equity)? As Winkler points out, “Any resource of such immense value, and key relevance to rural livelihoods as *the* main cash source, runs the risk of being over-exploited” (2009: 306). Rising commercial demand has spurred a sharp increase of collecting and, consequently, concerns over the sustainability of the *yartsa gunbu* harvest (Sharma 2004; Cannon et al. 2009; Winkler 2009, 2012; Weckerle et al. 2010; Shrestha and Bawa 2013). Although insufficient data exists to track long-term trends with certainty (Winkler 2009), one study in Dolpa, Nepal, indicates a recent decline in the volume of *yartsa gunbu* gathered and a local perception that current collection practices are unsustainable (Shrestha and Bawa 2012). Importantly, Dolpa allows outsiders access to collection grounds. As

a result, roughly 50,000 people ventured to highland pastures in 2010 in search of *yartsa gunbu* (Shrestha and Bawa 2012: 518). This mirrors a trend in other open-access areas where increasing competition reduces per capita yields (Winkler 2009). Although Winkler (2009) initially expressed guarded optimism that *yartsa gunbu* is resilient in the face of increased collection, he recently noted that competition has generated a worst case scenario in places where people extend the picking season beyond the time when *yartsa gunbu* reaches its peak value. Not only do they extract an inferior product with lesser market value, they reduce the number of spores that can be released to infect next year’s crop (Winkler 2012: 38–39).

Several scholars argue that community-based management practices can be effective mechanisms to ensure sustainability (Cannon et al. 2009; Stewart 2009; Weckerle et al. 2010; Shrestha and Bawa 2013). The absence of strong government presence has allowed the residents of Nubri and Tsum the autonomy to combine novel and traditional regulations that can potentially moderate collection intensity and ensure long-term sustainability of *yartsa gunbu*. Religious decrees prohibit collecting in certain sacred areas thereby ensuring that part of the landscape will remain undisturbed. Furthermore, regulations limit the number of collectors by excluding outsiders. In the case of Samagaun VDC, if we eliminate those locals who are unlikely to participate in the harvest (monks and nuns, the disabled, children under five, adults 55 and older, people who live elsewhere) and assume that parents can recall all children residing in boarding schools in Kathmandu, only

400 of 780 VDC residents (51% of the population) would gather *yartsa gunbu*. In comparison, in Majphal, Dolpa District, where access is open to outsiders, Shrestha and Bawa (2013) counted 2,600 collectors—nearly double the VDC’s population.

Is everyone treated in a fair and transparent manner under the rules and regulations governing *yartsa gunbu* (procedural equity)? Policies in Samagaun VDC are decided through public meetings in which issues are debated then resolved by consensus. Everyone from the wealthiest to the poorest household must adhere to the same starting date for gathering *yartsa gunbu*, a policy that is designed to facilitate equal access to the collection grounds. The daily roll call is done in public so everyone knows who is present in the village, and who is absent. Every household is beholden to the same level of taxation, and the use of revenue is decided by committee to fulfill agendas that benefit the entire community. Although some individuals no doubt try to bend or circumvent the rules, the *yartsa gunbu* regulation system is designed and administered in a manner that is meant to be transparent and equitable.

Can the *yartsa gunbu* harvest reduce the gap between rich and poor (intra-generational equity)? Traditionally, wealth status was determined by a combination of ‘external wealth’ (*byi’i nor*; arable land and domesticated animals) and ‘internal wealth’ (*nang gi nor*; jewelry, sacred objects, and other valuable household items). Poor families possessed scant external and internal wealth, and stood little chance to acquire more. However, in the *yartsa gunbu* economy a poor family with a sufficient labor force can obtain substantial cash income. Thus, several people we interviewed commented that *yartsa gunbu* income makes life easier for everyone, including the poor. As a senior lama explained,

People are doing very well by collecting and selling *yartsa gunbu*. With this huge income, they can buy livestock, household goods and improve their lives. If this new business of *yartsa gunbu* had not happened, people would have to work hard like they used to do in the past by farming, carrying

loads, and collecting wood. In the past wealthy people did not have to work hard physically while the poorer people had to go everywhere down the valley and up the mountains and work very hard to earn a living. These days, everyone has attained wealth and there is a leveling [of economic differences].

Although intra-generational equity appears possible under Sama’s harvesting regulations, the variation in income yields among participating households (NRs4,000–540,000) shows that outcomes are not uniform. Table 2 displays a positive relationship between the number of household residents and *yartsa gunbu* income. The same relationship also holds true between household size and traditional signifiers of wealth: land and cattle. Because households that are already relatively wealthy tend to have larger labor forces, the *yartsa gunbu* harvest may be simultaneously improving everyone’s standard of living and increasing wealth inequity within the villages. This is a topic that merits further research.

In conclusion, people across the Tibetan Plateau and Himalayan region are grappling with issues associated with *yartsa gunbu*: how to effectively manage a common resource, how to ensure equitable access, and how to deal with the sudden influx of income. They are confronting these issues using a combination of traditional regulations and novel ideas. The results are mixed. On the negative side, some areas have witnessed the degradation of pastures, turf wars and violence, discordant social relationships, and heavy drinking. On the positive side, *yartsa gunbu* provides an opportunity for people to improve their standard of living, start business ventures, enhance religious life, provide better education for children, and mitigate the economic burden associated with deaths in the family. Household-level improvements are being accomplished independent of state-sponsored development initiatives, and in the case of Nubri and Tsum management practices that were devised independent of state interference may prove to be sustainable over the long-run.

Household Residents	Number of Households	Yartsa Gunbu Income	Land in Local Units	Bovines
1-2	41	NRs 61,390	19.7 'bre	5.6
3-5	76	NRs 81,266	42.2 'bre	12.3
6+	16	NRs 152,656	58.2 'bre	20.6
Total	133	NRs 83,727	37.0 'bre	11.1

Table 2. Household Residents by Income and Economic Assets, Samagaun VDC.

Beall, Childs, and Craig, 2012 Nubri, Tsum, and Mustang Household Survey

Geoff Childs (Ph.D. in Anthropology and Tibetan Studies, Indiana University) is an Associate Professor of Anthropology and Environmental Studies at Washington University in St. Louis who specializes in studying the interconnections between demographic processes, global connections, economic changes, and family transformations in the highlands of Nepal and the Tibet Autonomous Region, China.

Namgyal Choedup (Ph.D. Candidate, Department of Anthropology, Washington University in St. Louis) is in the process of dissertation writing after completing 18 months of fieldwork among Tibetan exile communities in India. His research interests are diaspora/transnational studies, national narratives and collective memory, development studies, demographic change, contemporary Tibetan societies, contemporary China and India. In addition, he has worked as a researcher with the Environment and Development Desk of the Tibetan exile administration.

The authors would like to thank Sonam Lama for providing the majority of information on local policies in Tsum, Phurbu Tsewang for filling in some missing information on Nubri, Cynthia Beall and Sienna Craig for allowing the use of survey data from the 2012 research project, Georgina Drew for insightful comments on an earlier draft of the paper, and the two anonymous reviewers whose suggestions greatly improved the final version of the paper.

Endnotes

1. On the life cycle, geographical range, and history of collection of *yartsa gunbu* see Winkler (2008a, 2009), and Zhang et al. (2012).
2. See Winkler (2012) for a critical review of press reports. *Yartsa gunbu* has been viewed as a sexual stimulant in Tibetan and Chinese medicine for centuries. Zurkhar Nyamnyi Dorje, a 15th-century doctor and scholar, composed a text describing the benefits of *yartsa gunbu* in which he wrote, "It bestows inconceivable advantages. Thus, it increases the Seven Bodily Constituents. Among these, particularly it serves best for the purpose of libido, increasing offspring and improving vitality." (Winkler 2008b: 32-36 contains the Tibetan text and its translation).
3. Tibetans from Qinghai report that bartering through the exchange of hand signals is an old practice, employed while haggling over animal skin prices with non-Tibetan traders, which may be related to the fact that sometimes sellers and buyers do not speak a common language. Furthermore, since most transactions take place in the open along roadsides, exchanging hand signals within sleeves ensures that other people do not know the prices which may be

advantageous to the buyer (personal communications, July 2013).

4. Village Development Committees (VDC; Gāun Bikās Samiti in Nepali) are sub-district political divisions designed to link local communities and the state with the goal of improving the delivery of services. Control over local resources can fall under the purview of the VDC government, or can be usurped by larger organizations such as National Parks and Conservation Area Projects.

5. The 2011 research was supported by a Washington University Faculty Research Grant. The 2012 project, Genes and the Fertility of Tibetan Women at High Altitude in Nepal, was funded by the National Science Foundation (Grant No. BCS-1153911, PI Cynthia Beall, co-PIs Geoff Childs and Sienna Craig).

6. 'bu gcig 'bru na dge slong gcig bsad pa 'dra bo yin/

7. See Yeh and Lama (2013: 6-7) for an insightful discussion of Tibetan moral perspectives on the *yartsa gunbu* harvest and environmental degradation. See also Winkler (2008b: 29).

8. *Yartsa gunbu* collection grounds are managed by different entities throughout Nepal. In some districts, like Manang, the Conservation Area Management Committee is tasked with collecting fees, whereas in other areas permission to harvest is granted by the Department of Forestry, a National Park, a Buffer Zone User Group, or a Community Forest User Group (Devkota 2010: 95-96).

9. Prohibiting hunting and other disturbances around sacred mountains has a long history in the Tibetan world. One practice is territorial 'sealing' (*rgya dom pa*) that has two different but parallel traditions under the heading *ri rgya lung rgya* ('sealing the hills and valleys'). The first is 'monastic codes of rights and regulations', and the second is public decrees or laws by a ruler (Huber 2004: 133). Huber also describes local forms of sealing territory called *ri khrims* or *ri rgya* ('laws on hills' or 'sealing of hills') which are performed for two related reasons: to protect economically valuable resources such as game animals, timber, and medicinal plants, and to restrict activities that potentially disturb local deities.

10. The data presented in Table 1 do not constitute a complete economic picture. The residents of Lho have immense forest resources and regularly travel to Tibet to exchange timber for grain, wool, and other essential items. Residents of Samagaun, who have far less forest resources, use income from *yartsa gunbu* to buy grain and wool. Therefore, the economic disparity between the VDCs is not as large as Table 1 suggests.

11. In fact there are a few other sources of cash income, including portering and occasional wage labor, so we presume he means no other that can compare in scale.

12. See Childs (2004) on the history of the prestigious Ngadag lineage in Sama.

References

- Agha, Asif. 1993. Grammatical and Indexical Convention in Honorific Discourses. *Journal of Linguistic Anthropology* 3 (2): 131-163.
- Boesi, Alessandro and Francesca Cardi. 2009. Cordyceps sinensis Medicinal Fungus: Traditional Use among Tibetan People, Harvesting Techniques, and Modern Uses. *Herbal Gram* 83: 52-61.
- Cannon, Paul F., Nigel L. Hywel-Jones, Norbert Maczey, Lungten Norbu, Tshitila, Tashi Samdup, and Phurba Lhendup. 2009. Steps towards Sustainable Harvest of Ophiocordyceps sinensis in Bhutan. *Biodiversity Conservation* 18: 2263-2281.
- Childs, Geoff. 2004. *Tibetan Diary: From Birth to Death and Beyond in a Himalayan Valley of Nepal*. Berkeley: University of California Press.
- . 2005. How to Fund a Ritual: Notes on the Social Usage of the Kanjur (bKa' -'gyur) in a Tibetan Village. *Tibet Journal* 30 (2): 41-48.
- Des Chene, Mary. 1996. In the Name of Bikās. *Studies in Nepali History and Society* 1 (2): 259-270.
- Devkota, Shiva. 2010. Ophiocordyceps sinensis (Yarsagumba) from Nepal Himalaya: Status, Threats and Management Strategies. In *Cordyceps Resources and Environment*, edited by Zhang Ping Hao-wei, 91-108. Grassland Supervision Center by the Ministry of Agriculture, People's Republic of China.
- Garbyal, S. S., K. K. Aggarwal and C. R. Babu. 2004. Impact of Cordyceps sinensis in the Rural Economy of Interior Villages of Darchula Sub-division of Kumaon Himalayas and Its Implications in the Society. *Indian Journal of Traditional Knowledge* 3 (2): 182-186.
- Goldstein, Melvyn C., Geoff Childs, and Puchung Wangdui. 2008. "Going for Income": A Longitudinal Analysis of Change in Farming Tibet, 1997-98 to 2006-07. *Asian Survey* 48 (3): 514-534.
- Gruschke, Andreas. 2008. Nomads without Pastures? Globalization, Regionalization, and Livelihood Security of Nomads and Former Nomads in Northern Khams. *Journal of the International Association of Tibetan Studies* 4: 1-29.
- . 2011. Nomads and their Market Relations in Eastern Tibet's Yushu Region: The Impact of Caterpillar Fungus. In *Economic Spaces of Pastoral Production and Commodity Systems: Markets and Livelihoods*, edited by J. Gertel and R. LeHeron, 211-229. Farnham: Ashgate.
- Haughton, Graham. 1999. Environmental Justice and the Sustainable City. *Journal of Planning Education and Research* 18: 233-243.
- Hopwood, Bill, Mary Mellor and Geoff O'Brien. 2005. Sustainable Development: Mapping Different Approaches. *Sustainable Development* 13: 38-52.
- Huber, Toni. 2004. Territorial Control by "Sealing" (rgya sdom-pa): A Religio-Political Practice in Tibet. *Zentralasiatische Studien* 33: 127-152.
- IUCN, UNEP, WWF. 1980. *World Conservation Strategy: Living Resource Conservation for Sustainable Development*. IUCN: Gland, Switzerland.
- Onta, Pratyoush. 1996. Ambivalence Denied: The Making of Rastriya Itihas in Panchayat Era Textbooks. *Contributions to Nepalese Studies* 23 (1): 213-254.
- Pigg, Stacy Leigh. 1992. Investing Social Categories through Place: Social Representations and Development in Nepal. *Comparative Studies in Society and History* 34 (3): 491-513.
- RFA. 2013. Dalai Lama Seeks Halt to Fighting over Prized Caterpillar Fungus. Radio Free Asia Tibetan Service, June 7, 2013. <http://www.rfa.org/english/news/tibet/fungus-06072013220245.html> (accessed on 25/06/2013).
- Sharma, Subrat. 2004. Trade of Cordyceps sinensis from High Altitudes of the Indian Himalaya: Conservation and Biotechnological Priorities. *Current Science* 86 (12): 1614-1619.
- Shrestha, Uttam Babu and Kamaljit S. Bawa. 2013. Trade, Harvest, and Conservation of Caterpillar Fungus (Ophiocordyceps sinensis). *Biological Conservation* 159: 514-520.
- Snellgrove, David L. 1989 [1958]. *Himalayan Pilgrimage*. Boston: Shambhala.

- Stewart, Michelle Olsgard. 2009. Exploring the Rush for 'Himalayan Gold': Tibetan *Yartsa Gunbu* Harvesting in Northwest Yunnan and Considerations for Management. In *Contemporary Visions in Tibetan Studies: Proceedings of the First International Seminar of Young Tibetologists*, edited by B. Dotson, 69-91. Chicago: Serindia.
- . 2014. Constructing and Deconstructing the Commons: Caterpillar Fungus Governance in Developing Yunnan. In *Mapping Shangrila: Nature, Personhood, and Polity in the Sino-Tibetan Borderlands*, edited by Emily T. Yeh and Chris Coggins. Seattle: University of Washington Press.
- Sulek, Emilia Roza. 2012. Disappearing Sheep: The Unexpected Consequences of the Emergence of Caterpillar Fungus Economy in Golok, Qinghai, China. In *Development Transitions: Land, Labor and Social Policy in Tibet*, edited by K. Bauer et al., 1-34. Kathmandu: ANHS and Himal Books.
- The Record. 2014. Police Brutality on Dolpo's "Black Day" Under Investigation. The Record, 10 June 2014. <www.recordnepal.com/wire/police-brutality-dolpo-s-black-day-under-investigation> (accessed on 12 June 2014).
- Weckerle, Caroline S., Yongping Yang, Franz K. Huber and Qiaohong Li. 2010. People, Money, and Protected Areas: the Collection of the Caterpillar Mushroom *Ophiocordyceps sinensis* in the Baima Xueshan Nature Reserve, Southwest China. *Biodiversity Conservation* 19: 2685-2698.
- Winkler, Daniel. 2005. *Yartsa Gunbu* - *Cordyceps sinensis*. Economy, Ecology and Ethno-mycology of a Fungus Endemic to the Tibetan Plateau. In *Wildlife and Plants in Traditional and Modern Tibet: Conceptions, Exploitation and Conservation*, edited by A. Boesi and F. Cardi, 69-85. Milan: Società italiana di scienze naturali e Museo civico di storia naturale di Milano.
- . 2008a. *Yartsa Gunbu* (*Cordyceps sinensis*) and the Fungal Commodification of Tibet's Rural Economy. *Economic Botany* 62 (3): 291-305.
- . 2008b. The Mushrooming Fungi Market in Tibet Exemplified by *Cordyceps sinensis* and *Tricholoma matsutake*. *Journal of the International Association of Tibetan Studies* 4: 1-47.
- . 2009. Caterpillar Fungus (*Ophiocordyceps sinensis*) Production and Sustainability on the Tibetan Plateau and in the Himalayas. *Asian Medicine* 5 (2): 291-316.
- . 2012. 2011- The Year Cordiceps Mushroomed in the Media Landscape But Did Not Thrive in Tibet. *Fungi* 5 (3): 34-40.
- World Commission on Environment and Development (WCED). 1987. *Our Common Future*. Oxford University Press: Oxford.
- Yeh, Emily T. and Kunga T. Lama. 2013. Following the Caterpillar Fungus: Nature, Commodity Chains, and the Place of Tibet in China's Uneven Geographies. *Social and Cultural Geography* 14 (3): 1-23.
- Zhang, Yongjie, Erwei Li, Chengshu Wang, Yuling Li and Xingzhong Li. 2012. *Ophiocordyceps sinensis*, the Flagship Fungus of China: Terminology, Life Strategy and Ecology. *Mycology* 3 (1): 2-10.