



A Community-Based Conservation Initiative for Wolves in the Ladakh Trans-Himalaya, India

Karma Sonam^{1†}, Rigzen Dorjay^{1,2†}, Munib Khanyari^{1,2,3}, Ajay Bijoor^{1,4}, Sherab Lobzang¹, Manvi Sharma¹, Shruti Suresh¹, Charudutt Mishra^{1,4} and Kulbhushansingh R. Suryawanshi^{1,4,5*}

¹ Nature Conservation Foundation, Mysore, India, ² Department of Biological Sciences, University of Bristol, Bristol, United Kingdom, ³ Interdisciplinary Centre for Conservation Science, University of Oxford, Oxford, United Kingdom, ⁴ Snow Leopard Trust, Seattle, WA, United States, ⁵ Wissenschaftskolleg Zu Berlin, Berlin, Germany

We describe a pilot community-based conservation initiative for wolves *Canis lupus* that involves (i) voluntary deactivation of traditional trapping pits called *Shandong*, (ii) commitment to wildlife conservation by the local community, and (iii) collaborative construction and consecration of a *Stupa* (Buddhist shrine) in the vicinity of the *Shandong* as a symbol of conservation and repentance for past hunting. People and wolves have a complex relationship, in part shaped by predation on livestock, which can have severe impacts on livelihoods in pastoral societies. Consequently, wolf conservation often evokes strong and polarizing reactions. To control wolf populations, livestock herders across the *Trans-Himalayan* and Tibetan regions use different types of traps. *Shandong* is a relatively large, widely used traditional trapping pit with inverted funnel-shaped stone walls, usually built near villages or herder camps. Typically, a live domestic animal is placed in the pit to attract the wolves. Once the wolves jump into the pit, the funnel shaped walls prevent them from escaping, and trapped wolves are usually stoned to death. In an extensive survey covering over 25,000 sq. km, we enumerated 94 *Shandong* in 58 of the 64 surveyed villages in Ladakh between June 2019 and March 2020. Thirty of these had been used to kill wolves within the past 10 years, while 7 had been destroyed. *Shandong* that were not in use were of poorer condition. Since 2017, we have worked with community members, local monks, and the region's religious leaders to support the neutralization of the *Shandong* while preserving their structure, and assisted the communities to build *Stupas* and to consecrate them. Our pilot efforts with three communities appear to generate pride locally, and hold promise for promoting wolf conservation in Ladakh and in large parts of *Trans-Himalayan* and Tibetan regions that share similar cultural settings.

Keywords: trapping pits, predators, livestock, conflict, culture

INTRODUCTION

Humans and wild animals have long-standing, complex and variable relationships (Bhatia et al., 2020). These relationships are often multi-faceted, manifested in dynamic behaviors, attitudes, and emotions that may simultaneously range from negative, neutral, to positive especially in the case of large carnivores (Treves and Naughton-Treves, 1999; Bhatia, 2021). Large carnivores typically

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Duquesne University, United States

*Correspondence:

Kulbhushansingh R. Suryawanshi
kulbhushan@ncf-india.org

†These authors share first authorship

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specialize in feeding on ungulates, and, consequently, livestock represent a potentially suitable prey that have typically high density, predictable distribution, and reduced anti predatory abilities (Zohary et al., 1998; Johansson et al., 2015; Mishra et al., 2016a; Samelius et al., 2021). Retaliatory or preventive killing of large carnivores in response to predation on livestock is a global conservation challenge (Treves, 2009; Van Eeden et al., 2018; Williams et al., 2020).

The *Trans*-Himalayan region, including the Tibetan plateau and its marginal mountains, is a vast rangeland system (>2.6 million km²), which has been home to traditional livestock grazing for several millennia (Mishra et al., 2001, 2002). These rangelands are also home to large carnivores, including snow leopards *Panthera uncia*, wolves *Canis lupus* (Álvares et al., 2019) and Eurasian Lynx *Lynx lynx*. Livestock depredation by large carnivores and their retaliatory or preventive killing is an important livelihood and conservation concern in the region (Mishra, 1997; Berger et al., 2013; Suryawanshi et al., 2013; Aryal et al., 2014; Home et al., 2017; Lyngdoh et al., 2020). People in the region are reported to have a particularly negative attitude toward wolves (Suryawanshi et al., 2013; Bhatia et al., 2020). Compared to other sympatric large predators, wolves can be perceived to be particularly dangerous because of their greater visibility, howling behavior and pack living (Kellert et al., 1996; Eriksson et al., 2015).

Wolves are one of the few top and wide-ranging predators across the *trans*-Himalayan region. Hence, they could serve as indicator and umbrella species of this ecosystem (Suryawanshi et al., 2013). They also have various deep-rooted associations with local people as reflected in local folklore (Kusi et al., 2020; Bhatia et al., 2021). Traditionally, the people of the *trans*-Himalayan region have used various means to protect their livestock against wolf attacks (Singh et al., 2013; Bhatia et al., 2021). Amongst the most prominent means of trying to control wolf populations is a traditional trapping pit, locally called the *Shandong* (derived from *Shangku* which is the wolf in vernacular, and *dong* meaning trap). Other means of persecuting wolves have also been traditionally employed in the region, including leg-hold traps, but their current use and spread is unknown (Pers. Comm. RD). *Shandong* are large pits typically built near villages or herder camps, and have inverted funnel-shaped stone walls (Figure 1). People typically bait the trap with a live domestic animal to attract wolves. Once inside the pit, the funnel-shaped walls prevent the wolves from escaping and the trapped wolves are usually stoned to death (Ghoshal et al., 2018). Officially, the persecution of wolves is forbidden under the country's wildlife protection laws (Indian Wildlife Protection Act, 1972; Ramesh, 1999).

Here, we describe in detail a pilot community-based conservation effort that involves voluntary neutralization of the *Shandong* by local communities (reported in brief by Ghoshal et al., 2018). To better understand the extent and use of *Shandong* in Ladakh, we also present the results of a survey of 64 villages covering over 25,000 sq. km. in Leh District of Ladakh. Our work has the potential to promote wolf conservation in Ladakh and other parts of the *Trans*-Himalaya with similar cultural settings. This is particularly relevant as in this region, the Buddhist religion



FIGURE 1 | A *Shandong* or traditional trapping pit for wolves with inverted funnel shaped walls. An agro-pastoralist village is seen in the background. Photo Credit: Rigzen Dorjay.

plays an important role in people's lives and also in wildlife conservation (Li et al., 2014).

MATERIALS AND METHODS

Study Area

The Indian *Trans*-Himalaya lies mostly above 3,500 m, with temperatures ranging from c. 30°C in summer to -30°C in the winter. The region has a limited growing season (May–September) resulting in low primary productivity (Chundawat and Rawat, 1994). The Union Territory of Ladakh is India's largest *Trans*-Himalayan cold-desert region. The large carnivore assemblage includes snow leopards, wolves and Eurasian lynx, and the wild large ungulate assemblage includes Bharal *Pseudois nayaur*, Ibex *Capra sibirica*, Urial *Ovis orientalis*, Tibetan Argali *Ovis ammon* and Tibetan Wild Ass *Equus kiang*. Unlike most other parts of India, these wildlife populations are spread across the landscape and not confined to protected areas. Local communities living in this low-productivity, highly seasonal region have evolved a distinct lifestyle and culture, and have traditionally been pastoralists and agro-pastoralists (Singh et al., 2013). Predominantly, Eastern Ladakh (namely Changthang) is inhabited by transhumant pastoralists, whilst the remaining area is home to agro-pastoral communities (Murali et al., 2020). For this work, we worked with both transhumant pastoralists and agro-pastoral communities. High instances of livestock depredation especially by snow leopards and wolves are reported from large parts of Ladakh (Jackson and Wangchuk, 2004; Namgail et al., 2007).

Since the 1960s, Ladakh has had a strong military presence which has facilitated expansion of road network. The region opened for tourism in 1974, with particularly rapid growth in the past two decades (Dollfus, 2013). Expansion of defence, tourism, and developmental infrastructure, along with implementations of wildlife management and laws, have led to rapid socio-economic and cultural changes in Ladakh (Dollfus, 2013).

Field Surveys

Surveys were carried between June 2019 and March 2020. Our initial intention was to carry out the project across c. 60,000 km² covering both districts within Ladakh namely, Leh and Kargil. This area is comprised of six blocks: Changthang, Kargil, Nubra, Rong, Sham and Zanskar and c.200 villages. These blocks aren't the legal administrative blocks of Ladakh, rather, they are local delimitations. Logistical challenges due to the COVID-19 pandemic necessitated a prioritization of three of the six initial study blocks. The blocks of Changthang, Rong, and Sham were selected based on evidence from literature and knowledge of livestock herders, Wildlife Protection Department Officials, and research scholars who confirmed these blocks to be where wolves predominately occurred and had negative interactions with people (Mallon, 1991; Namgail et al., 2007; Srivathsa et al., 2020). These blocks covered c. 25,000 sq.km in the Leh district of Ladakh.

The surveys involved visiting each of the 64 villages in the study area and interacting with local key informants to map the location of all the *Shandong*. We did not use a pre-set questionnaire, though our main questions pertained to the location of *Shandong* and the last time the community had used one to trap wolves. The conversations revolved around the *Shandong* and human-wolf interactions in the area. Sixty-four key-informants (one from each village), typically community elders involved in past or present livestock rearing and serving as the village head, were interviewed. Before asking for information, oral consent was taken from each key-informant and the conversation was held in *Ladakhi* which is the local Tibetan dialect. As it is illegal to kill wolves, it was possible that key-informants might not share information about the *Shandong*, particularly given the social desirability bias (Grimm, 2010). To address this bias, we spent time building relationships with each key-informant in each survey village. We assured them that our intention was not to persecute or cause difficulty for anyone (Newing et al., 2011). Having local team members who spoke the local language (*Ladakhi*) helped in gaining the trust of the respondents as well. Village locations were obtained from the local district office in Leh (capital of Ladakh). With verbal consent from them, we visited all the *Shandong* around each village, accompanied by the key informants, recorded the GPS location, and categorized each *Shandong* as active or inactive based on the state of the structure and information provided by the key informants. We recorded the time a *Shandong* was last used in either one of the following time periods: over 20 years ago, 10–20 years ago, and within the last 10 years. A significant geo-political conflict (Kargil war) that occurred approximately 20 years before our surveys provided a temporal reference point that all respondents could relate to (Chari, 2009). This provided for relatively comparable time estimates among the respondents. Each *Shandong's* condition was assessed qualitatively using likert-scale type categories (Joshi et al., 2015; **Table 1**). We determined the use of each *Shandong* based on a combination of its condition and key informant information (see **Table 2** for the likert-scale type categories). We also engaged in informal conversation with elders and youth to understand the nature of human-wolf interactions in the area and gauged their willingness on working

TABLE 1 | Shandong condition categories used during the qualitative assessment.

Condition–Likert scale	Qualitative description
Destroyed–1	The structural form that is characteristic of a <i>Shandong</i> (e.g., Figure 1) didn't exist as it was torn down, rendering the structure unusable.
Very bad–2	Large portion of the <i>Shandong</i> was dismantled and/or damaged, although its characteristic shape was discernible. While its use was unlikely, with some repair, it would be usable.
Bad–3	Parts of the <i>Shandong</i> were dismantled and/or damaged, although its characteristic shape was evident. While its use was likely, with some upkeep, its effectiveness and longevity would likely increase.
Good–4	Large portion of the <i>Shandong</i> was intact and likely maintained regularly for its structure and use.
Don't know–5	None of the above descriptions were discernible for the <i>Shandong</i> . This was generally the case when we knew a <i>Shandong</i> existed but couldn't reach it for reasons such as restriction of access due to snow.

Key-informant interviews suggested that *Shandong* in bad and very bad condition and those that were destroyed would not be able to trap wolves effectively.

TABLE 2 | Shandong use categories in the qualitative assessment.

Use–Liker scale	Description
Absent–1	No <i>Shandong</i> existed in the village during the survey.
Don't know–2	<i>Shandong</i> present in the village but insufficient information was available to determine if it was in use or not.
In use–3	<i>Shandong</i> present and were being used to trap wolves.
Not in use–4	<i>Shandong</i> present but were not being used to trap wolves currently.

together to discontinue wolf hunting by neutralizing the existing *Shandong*.

The field surveys were led by two of our team members who are local *Ladakhis* (RD and SL), from the Sham and Rong regions, respectively. Both had been involved in livestock herding in the past. Conversations were all conducted in *Ladakhi*, a local dialect of Tibetan. Throughout the surveys, we respected the sanctity of local traditions, even if some of them were harmful toward wildlife. No gathered information was shared or compromised to prevent any possible persecution or maligning of the local people involved.

Data Analysis

We used the Pearson's Chi-squared test of independence to test if the usage of *Shandong* was linked to their condition. We expected *Shandong* in good conditions to be in use, unless other social, economic or ecological factors prevented or rendered their use unnecessary. Additionally, we tested if the *Shandong* in use (i.e., those used in the previous 10 years) were clustered in space. To do so, we calculated the nearest neighbor distance for each *Shandong*

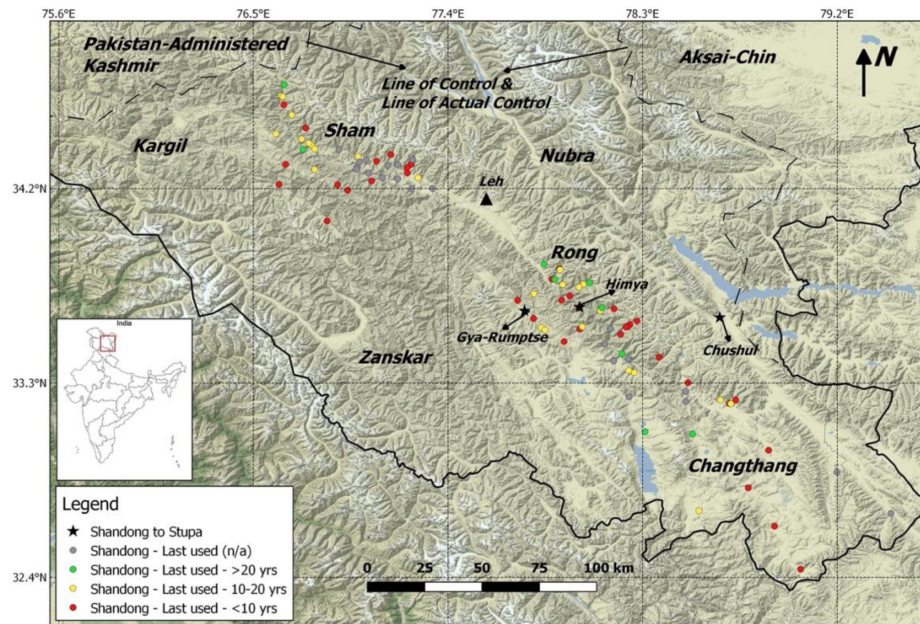


FIGURE 2 | Map showing *Shandong* locations and use. Locations depicted by stars are where *Shandong* have been neutralized. The colors correspond to the time the *Shandong* was last used. Green = Last used >20 years ago, Yellow = Last used 10–20 years ago, Red = Last used <10 years ago and Gray = Last used not known. The Line of Control and Line of Actual Control indicate the present military control line along international borders.

pair and compared this distance for recently used and not in use *Shandong*. We expected spatial clustering of *Shandong* that were in use as we expected neighboring communities to share similar wolf abundance and retaliatory practices.

RESULTS

Status of *Shandong* in Ladakh

We recorded 94 *Shandong* spread across the three surveyed blocks in Ladakh–Rong ($n = 32$), Sham ($n = 39$), and Changthang ($n = 23$) in 58 of the 64 surveyed communities (Figure 2). The highest number of *Shandong* in a village was five. According to the information from our key informants, some *Shandong* may have been used to trap and kill 10–20 wolves over the previous 20 years. Thirty-seven *Shandong* were reported to have been used within the past decade (years 2010–2020), of which fifteen were currently active (Figure 3). Thirty-four *Shandong* had not been used in the past decade and were not being actively maintained, many of which were in a poor condition (Figure 3). For the remaining 23 *Shandong* we couldn’t determine the last time they were used (Figure 2). *Shandong* that were not in active use were poorer in their condition (Pearson’s Chi-squared test of independence: X-squared = 55.604, $df = 6$, p -value = 0.02).

Distribution Pattern of *Shandong*

We found that *Shandong* that had been in use recently had a significantly lower nearest neighbor distance when compared to the nearest neighbor distance of a randomly selected pairs of *Shandong*. *Shandong* that were in use before the last decade

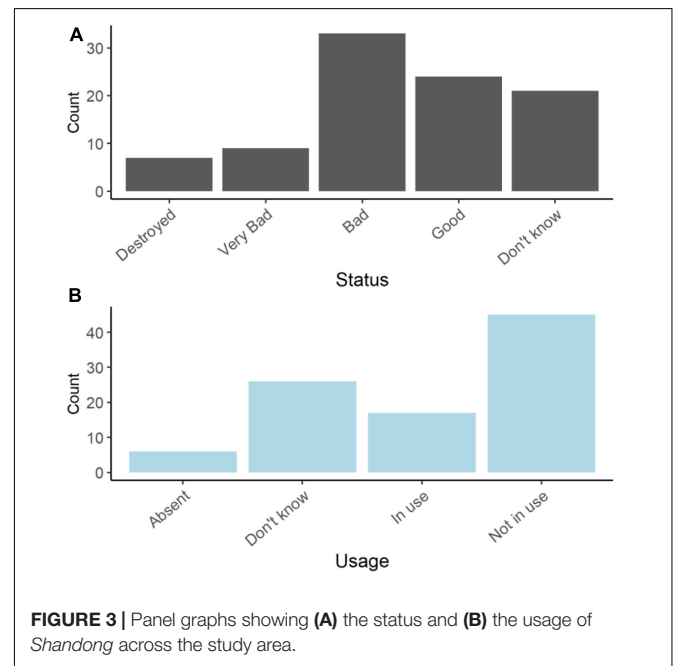


FIGURE 3 | Panel graphs showing (A) the status and (B) the usage of *Shandong* across the study area.

did not show signs of clustering relative to the recently used ones (Figure 4).

Conservation Initiative

In 2017, we (CM and KS) initiated discussions with the local community members and their political representatives from the pastoral village of Chushul about the possibility of neutralizing

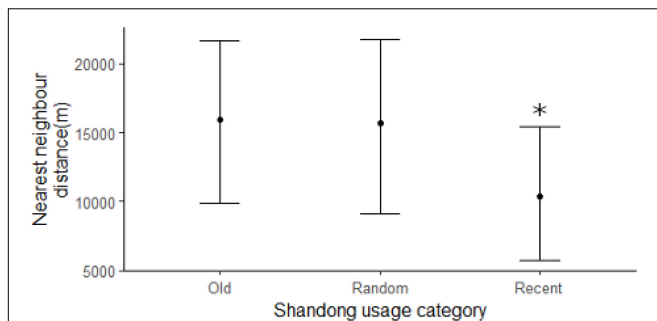


FIGURE 4 | *Shandong* that were used in recent times (<10 years ago) were clustered in space as shown by the significantly lower nearest neighbor distance. Error bars show 95% bootstrapped confidence intervals. * indicates statistically significant difference in the bars.

their *Shandong* while preserving and maintaining them as part of the cultural heritage. We also initiated discussions about the initiative with influential religious leader and scholar His Eminence Bakula Rangdol Nyima Rinpoche and sought his views and advice on the possibility of symbolically building a *Stupa* (a Buddhist religious symbol) at the *Shandong* site. A *Stupa* is a mound-like or hemispherical structure which contains relics like idols, religious text, or the remains of Buddhist monks/nuns. They may be used as a place of meditation (Sharma, 2013). The shape of a *Stupa* supposedly represents the Buddha and there is belief that a *Stupa* may represent the five purified elements according to Buddhism: (i) the base, often a square, represents the earth, (ii) the hemispherical dome/vase represents water, (iii) the conical spire represents fire, (iv) the upper parasol represents air, and (v) the dissolving point represents wisdom. Buddhists across Ladakh circumambulate the *Stupas* as an important ritual and devotional practice (Dorjey, 2016). In certain areas of Ladakh, *Stupas* also play an economic role in the community by attracting tourists.

The Chushul community was enthusiastic about the possibility of neutralizing the *Shandong*, committing to conservation, and under the Rinpoche's guidance, collectively building a *Stupa*. We had started interacting with the Chushul community in the year 2017 as part of our work on assisting livestock herders to produce relatively sustainable "snow leopard friendly" cashmere. This involves assisting them to adopt wildlife friendly herding management and other practices. In June 2018, the Chushul community neutralized all the four *Shandong* in their area and built a *Stupa* next to one, as a commitment toward conservation and in repentance of past hunting. These *Shandong* had been active in the past. The neutralizing of the *Shandong* is done by removing a few stones from the structure, which creates a passage for any trapped animal to escape, while preserving the traditional architectural structure. This can be labor and time intensive task and various community members including the herders, youth groups, women and local monks usually take part in it. The structure is maintained to respect the tradition and cultural heritage of the communities. The *Stupa* helps integrate Buddhist principles of compassion toward all living beings. Thus, this effort strengthens the links between culture, livelihoods and

conservation. While we supported the cost of building the *Stupa* including identifying and appointing experienced masons, the community members voluntarily contributed funds as well relics to be placed inside the *Stupa*. This *Stupa* was publicly consecrated in June 2018 by Rangdol Nyima Rinpoche. In the meantime, one of us (KS) had similar discussions with the community of Rumpitse in the Gya-Miru region within the Changthang block of Ladakh, with whom we have had a conservation partnership since 2006. This community agreed to neutralize their *Shandongs* and built a *Stupa* in the year 2019. Before proceeding with on-ground activities, we (AB, CM, KS, RD, KRS) sought advice from another religious leader who is revered by this community, His Eminence Drukpa Thuksey Rinpoche of Hemis Monastery. He supported our efforts and performed the consecration of the *Stupa* in September 2019.

We had video recorded the process of *Stupa* building and consecration in both the Chushul and Rumpitse communities, and these were converted into an awareness film by contracting a Ladakhi filmmaker. The film has been made publicly available¹ and is being used to spread awareness among other communities (Figure 5). In the year 2021, we (KS, CM) completed negotiations with the community of Himya for neutralizing their two *Shandongs* and build a *Stupa*. This *Stupa* was consecrated in September, 2021 by His Eminence Drukpa Thuksey Rinpoche.

Our informal interactions with people in all three communities has revealed considerable pride and a sense of gratification amongst community members for having been involved in this initiative, and we believe that this has made sustainable impact in terms of renewed support for wolf conservation. Anecdotal evidence suggests that no wolves have been killed in the region since the conversions of the *Shandong*. Nevertheless, we acknowledge that to robustly test the efficacy of this conservation initiative, data on metrics such as reduction in wolf hunting cases and perceptions and attitude of people toward wolves would be needed.

Approach to the Conservation Initiative

In our *Shandong* to *Stupa* conservation initiative, we followed the PARTNERS (Presence, Aptness, Respect, Transparency, Negotiation, Empathy, Responsiveness, and Strategic Support) Principles approach for community-based conservation (see Mishra et al., 2017 for detailed definition of each principle).

In all three partner communities that have neutralized their *Shandong*, we built long-term relationships with multiple visits and interactions (following the principles of **Presence**, **Respect**, **Transparency**, and **Empathy**) before the actual conservation interventions were initiated. Amongst other learnings, this helped us understand that the intention behind killing wolves was purely to protect their livestock (**Respect**, **Empathy**). We did not entertain or pursue any wish to penalize community members involved in hunting wolves, nor did we seek to destroy the *Shandong* which represent an important part of the cultural heritage (**Aptness**, **Respect**, **Transparency**). This background and understanding helped us to conceptualize the idea of neutralizing the *Shandong* and constructing a *Stupa* (**Aptness**).

¹https://www.youtube.com/watch?v=bLW_5C6nOIE&t=415s



FIGURE 5 | A neutralized *Shandong* with a newly constructed *Stupa* adjacent to it. Photo Credit: Rigzen Dorjay.

Throughout the process, we disclosed our goals, purpose and intentions to the communities (**Transparency**). Even after multiple discussions, there would often be periods when community members were not available. It was important for us to accommodate their availability and timelines (**Responsiveness**), but also expect accountability as well as to be accountable ourselves for activities listed in formal agreements (**Negotiation**). Lastly, a community although a collective, is often a heterogeneous mix of individual aspirations, thought processes, and opinions (Klein et al., 2007; Xu et al., 2009; Mishra et al., 2017). This is why we worked with different groups within the community including but not limited to the women's alliance, the herders and local monks, but also engaged with regional religious authorities and government representatives at both the conceptualization and execution levels of the intervention (**Strategic support**).

We also realize that neutralizing *Shandong* by itself doesn't address the issue of livestock predation and the negative human-wolf interactions. In each of the three communities that neutralized their *Shandong* (as indeed in the tens of our other partner communities), we have also assisted with multiple other initiatives such as livestock insurance and predator-proofing of corrals.

DISCUSSION

Shandong Abundance and Use

Our surveys documented a relatively high abundance of *Shandong* across the survey region, with 90% of the surveyed communities having one to five *Shandong*. Although some of them were no longer used or had been destroyed, many of the *Shandong* were well maintained and in occasional use. This is understandable as livestock herding is an important source of livelihood and integral part of the *Ladakhi* culture and lifestyle, and livestock losses to predators are difficult for people to absorb or tolerate due to economic and emotional

setbacks (Namgail et al., 2007; Bhatia et al., 2020; Maheshwari and Sathyakumar, 2020). In parts of Ladakh, wolves reportedly account for disproportionately higher proportion of livestock losses than other sympatric predators such as snow leopard and lynx (Namgail et al., 2007).

Interestingly, we found that there was spatial clustering of *Shandong* currently in use, that could be indicative of conflict hotspots. Such hotspots can account for disproportionate persecution of wolves which requires immediate conservation attention. These hotspots appear to be in the Central Rong and Eastern Sham regions of Ladakh (**Figure 2**). We hope to engage in a similar manner as we did in Chushul, Gya-Miru region (including Rumpitse) and Himya in these two regions as well (see sections "Conservation Initiative" and "Approach to the Conservation Initiative"). Nevertheless, further investigations are required into factors like declining wolf populations, presence of livestock compensation programs and decreasing livestock numbers (as seen in some parts of Ladakh).

Our interactions with key informants revealed that use and status of *Shandong* were impacted in part by factors beyond human-wolf interactions. Expansion of defence, tourism, and development infrastructure has led to rapid socio-economic and cultural changes in Ladakh (Dollfus, 2013; Sharma, 2019). We found places where *Shandong* had been dismantled and left unattended due to the availability of alternate livelihood sources like employment in the tourism sector, other than livestock. Additionally, a few *Shandong* were destroyed and hence rendered unusable due to flash floods. We also found two instances where *Shandong* had presumably been used against dogs. Wild felids like snow leopards are presumably able to get out of these structures should they fall in, and we didn't find any instance when they had been trapped in *Shandong*. There is little evidence to suggest that other methods are being employed to kill wolves (some of the last documented cases of wolf pups being killed at dens are nearly two decades old). Most respondents suggested that availability of guns and snares has seen a decline across many parts of Ladakh (Pers. Comm. RD).

Conservation Initiative

The cost of living with large carnivores, is often borne disproportionately by the communities co-habiting spaces with these predators (Salafsky and Wollenberg, 2000; Treves and Karanth, 2003). Exclusionary and top-down conservation approaches have tended to further alienate local peoples, turning potential conservation allies into adversaries (Lele et al., 2010). Conservation efforts have historically been perceived to be discriminatory against local people (Mishra et al., 2017). Respectful engagement of local communities as partners is critical in achieving long-term conservation outcomes (Holmes, 2007; Lejano et al., 2007; Bennett et al., 2017; Mishra et al., 2017).

Our conservation initiative is founded on and strengthens the links between culture, ecology, and conservation. However, this effort must not be viewed in isolation. Neutralization of *Shandong* by itself could have potentially negative outcomes by facilitating more livestock predation by wolves. This is why it is critical to combine the neutralizing of *Shandong* with other multi-pronged strategies that mitigate negative human-wolf interactions and facilitate human-wolf coexistence (Pretty and Smith, 2004). As mentioned earlier, with all the three partner communities involved in this pilot phase, we have assisted with multi-pronged efforts including livestock insurance (Mishra et al., 2003, 2016b), setting up village reserves (Mishra et al., 2016c), predator proofing of corrals, and other livelihood and conflict management initiatives. With such a multi-pronged approach, this initiative of neutralizing *Shandong* and gaining the communities' conservation commitment has the potential to be replicated and significantly improve the status of wolves in Ladakh and other parts of the Tibetan Plateau that share a similar culture.

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DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

AUTHOR CONTRIBUTIONS

KRS, AB, and CM conceived the idea of the project. KS led the on-ground conservation interventions, while RD led the on-ground field surveys. MK and SL helped in data collection. MK, MS, and SS conducted the analysis. All authors contributed to the writing of the manuscript.

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