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RESEARCH ARTICLE

CONFLICTS BETWEEN HUMAN AND WILDLIFE: AN EXAMPLE OF HUMAN AND GOLDEN-TAKIN CONFLICTS IN QINLING MOUNTAINS OF CHINA

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ABSTRACT

Golden takin (*Budorcas taxicolor bedfordi*) is a good example to understand current wildlife management. Golden takin is herbivores, confined to Qinling Mountain areas of China. The aim of this study is to investigate the impact of human-golden takin conflict and poaching of Golden takin in Qinling Mountains; to understand the movement activities of Golden takin in Guangtoushan at Qinling Mountains. Two years summer data were collected between June and August in 2014-2015 and 2015-2016 at Guangtoushan, Qinling Mountains; Moreover, two years winter data between October of 2013-2014 to March of 2014-2015 at Taibai Mountain, and October of 2014-2015 to March of 2015-2016 at Zhouzhi natural reserve using camera traps. The results of the study indicated that, the most serious conflict do happened, 36 events in summer season were recorded, nine (9) cases of human-golden takin conflict were recorded in the year 2000, June recorded the highest rate of conflict (35.71%), with the highest frequency of (30.32%) during the day time around 4:00-6:00 and 6:00-8:00 am in Guangtoushan. 23 skull samples at Qinling Mountains were discovered which found that, the males of Golden takin exhibited the highest death frequency of about 18 individuals compared to 5 for the females. The Camera traps at Taibai Mountains detected 18 species, and 22 species at Zhouzhi natural reserve; Golden takin was the most abundance species representing 62.38% and 52.27% of the captures across the two winter periods at Taibai Mountain and Zhouzhi natural reserve, respectively.

INTRODUCTION

Human-wildlife conflict (HWC) is a protection concern that increasingly endangering some of the most endangered species in the world (Pettigrew, 2012). These conflicts with wild animals may cause damaging of crops, wounding or killing domestic animals and wound or kill people (Ladan, 2014). Humans - wildlife conflict is a serious problem, especially in the case of those people sharing borders with protected areas. In China, humans - wildlife conflicts are thought to be escalate due to increasing continues human population, shrinking and altering wildlife habitats (Justine, 2015). Golden takin (*Budorcas taxicolor bedfordi*) is herbivore animal, confined to Qinling Mountain areas of China, is listed as vulnerable by the International Union for Conservation of Nature (IUCN) (Song, 2008) and its under category I. state protection by the Chinese government. Golden takin is threatened by hunting, habitat destruction, competitors and illness.

It is hunted for its hide and its meat highly expensive (Wang, 1998; Salter, 1997; Nowak, 1999). In Qinling Mountains, the killing is primarily due to the value of meat and market. Golden takin was reported to come down from the mountain, channeling to the villages, attacking people and damage crops, the data provided by the Shaanxi regional forestry department (Qi, 2014). From 1999 to early 2008, Qinling Golden takins had killed 22 and injured 184 people. Introduction of managerial institutions, international and national laws or regulations, the management of hunting will help to promote development of wildlife protection in Qinling Mountain. Therefore, the aim of the present study was to measure the extent of the impact of conflict between Golden takin and human, and explore the threats and conflict conservation of Golden takin in Qinling Mountains of China.

MATERIAL AND METHODS

Study area: This study was conducted in Qinling Mountains of Shaanxi province (32°22'-34°48' N, 105°13'-113°13' E), a special natural geographic system with a total area of 98,040 km² (Fig. 1).

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The Qinling Mountains from the watershed between two rivers of the Yangtze River and the Yellow River, and the boundary of the temperate zone and subtropical zone (7),(Fig. 1). Four major vegetation types are distributed among altitudinal range between 367 m and 3767 m (evergreen broad-leaf forest, coniferous forest, mixed evergreen and deciduous broad-leaf forest, scrubs and meadow) (2). The study area supports different types of wildlife species, including 3 endangered mammals confined to China (Giant Panda, Golden monkey and Golden takin).

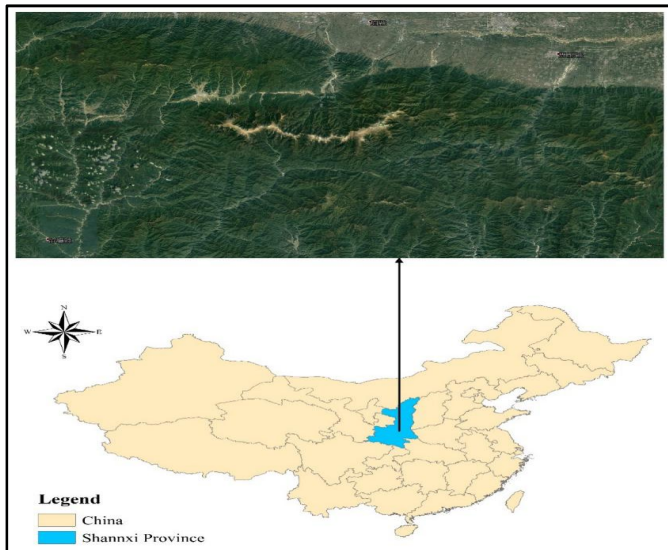


Fig. 1. The geographic location of Qinling Mountains, China

Data collection and analysis

Data acquisition - Internet searches were made on Baidu in two web news (<http://www.sina.com.cn>, <http://news.tom.com>), reported with some photos varied from 2000 -2017. To retrieve data used Chinese keywords like, Língniú shāng rén (Golden takin wound people), which allow us to regain data from different areas in Qinling Mountains of Shaanxi province of China. For each keyword, we searched as we can to get more results, with site addresses and the names of villages that have been reported. Also checked our final database for duplicate reported and focused on the data reported on killed and injured of people to assess human-golden takin conflict. The data recorded the process of Golden takin attacked people, whether is on head, shoulder, back, or anywhere else in their body. Besides; two years summer data were collected in Guangtoushan at the Qinling Mountains Shaanxi province, between June and August in 2014-2015, 2015-2016 respectively, to compare the time of Golden takin attacked to people and the time movement of Golden takin in natural conditions (in Qinling mountains). All photos captured were identified with the camera location, altitude, temperature and date of capture. Repeated captures that clearly shows the same individual that appears over a continuous period of time have been removed (Kawanishi., 1994; O'Brien, 2003). Randomly walked within the Qinling Mountains and Golden takin skulls sample were found and collected dried in different places, and were identified by their morphological differences as males and females to assess the poaching of Golden takin in the Qinling Mountains. Recorded data on the assessment of human-golden takin conflict, daily activity movement of Golden takin, and assessment of poaching of Golden takin in

the Qinling Mountains, were analyzed using Excel database and Origin 8.1.

RESULTS

Census of Golden takin (data published): Golden takin population was estimated in four counts in 1974, 1975, 1981 and 1996, in different areas. Total individuals were 104 in Foping 1974 and 453 in 1996, 225 in Yangxian, 135 in Ningshan, 191 in Taibai, 587 in Zhouzhi, and 72 in Zhashui (Table 1). In 2001 the total estimated of Golden takin was 4418-5720 individuals (13), indicating that the Golden takin number is increasing.

Table 1. Golden takin population estimates during 1974, 1975, 1981 and 1996 in different areas

County	Year	Population
Foping	1974	104
Foping	1996	453
Yangxian	1974	225
Ningshan	1974	135
Taibai	1974	191
Zhouzhi	1974	587
Zhashui	1981	72
Wenchuan	1975	191

Human-golden takin Conflict: The results of human-golden takin conflict showed the villages that recorded most of the events were: Chang'an, Yangxian, Huxian, Fufeng County, Chenggu County, Zhouzhi County, Fengxiang County, Fuping, Zhenan County, Baoji city and Guozhen. The data exhibited Golden takin encountered with people results in killing or injury from the year 2000 - 2017. The rates of human-golden takin conflict were presented in (Fig. 2).

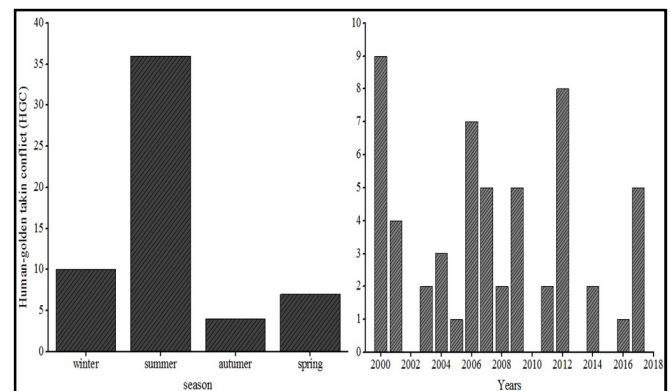


Fig. 2. Human- Golden takin conflict in Shaanxi province, China. A: Season; B: Year

The highest events among all the years were recorded in 2000 (9 events) and 2012 (8 events), while after the establishment of natural forest protection project to protect wildlife, the conflict reduces year by year, and there is no event was recorded during 2002, 2010, 2013 and 2015 (Fig. 2A). For the seasonal attacks of Golden takin to people, the summer recorded the highest damage of (36 events), while the lowest recorded of (4 events) in autumn (Fig. 2B). The fact that Golden takin mating season occurs in summer, during this time the intensity of fighting between males is high, which resulted to killing or injury. According to (Caprinae specialist group, 1996: *Budorcas taxicolor*. in IUCN, 2003), the defeated males will leave the group and move down to mountain then attack

people. The results showed that all the people who attacked were from males of Golden takin. These results showed the conflict between Golden takin and human needs more strategic to management and conservation. Monthly attack Golden takin to people and daily activity are presented in (Fig. 3). June recorded the highest rate of attack of (35.71%), followed by (17.86 %) in May, while no attack was reported in August and September (Fig. 3A). The day time interval of Golden takin attacked to people showed highest activity of (30.32 %) from 4:00-6:00 and 6:00-8:00 am, whereas the lowest activity (3.2%) was recorded from 10:00-12:00 am, 14:00-16:00 pm and 18:00-20:00 pm (Fig. 3B). Golden takin was more active in June and during the early morning of the day, the attacks happened with people during the morning when they are going to school or herbalists going for collecting medicine plants or bamboo shoots.

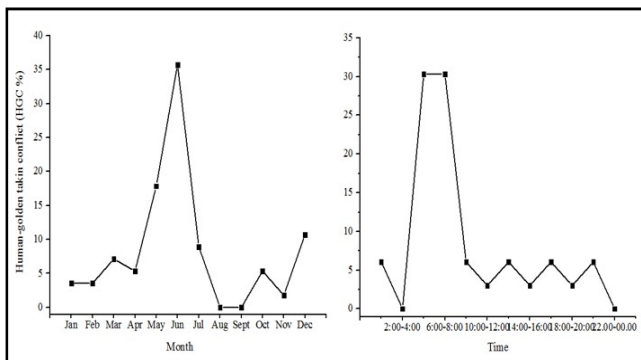


Fig. 3. Monthly Golden takin attack people and daily activity time. A: Months, B: Day activity

Daily movement activity of Golden takin: The daily movement activities of Golden takin in Guangtoushan in summer were presented in (Fig. 4). Golden takin displayed the highest peaks of movement (18.64%), (16.38%) and (15.25%) at periods of 6:00-8:00 am, 18:00-20:00 pm and 16:00-18:00 pm, respectively. These results showed significant relation between Golden takin attacking people and the movement of Golden takin in Guangtoushan in summer, which showed more activity in the morning time.

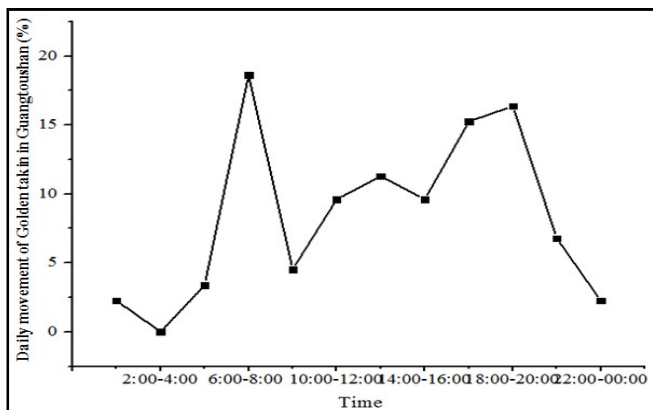


Fig. 4. Daily movement activity of Golden takin in Guangtoushan, Shaanxi province, China

Damages done by Golden takin and people responses: Golden takin were implicated by dwellers around the protected areas three categories of damage are: crops damage, attacks people and their stored agricultural products. Golden takin damage as a result of attacking to people reported in (Fig. 5),

varies from killing, severe wound and a live, of 69, 26 and 15 respectively from 2000-2017. Some villagers were afraid to go outside due to animal attacks. The villagers have the willingness to report the damages caused by Golden takin to the government in order to minimize the conflict.

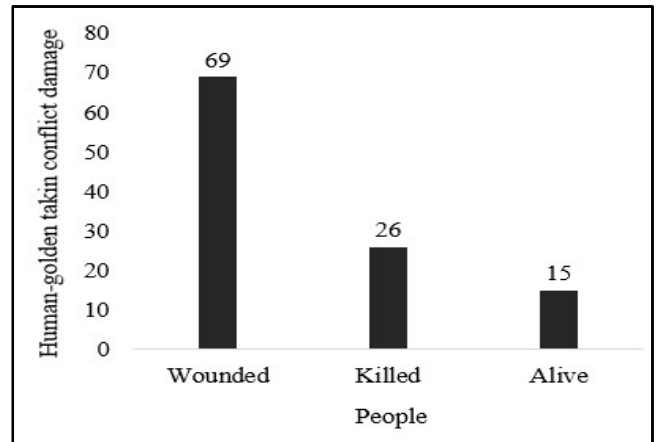


Fig. 5. Golden takin damage to human in Shaanxi province, China

Poaching of Golden takin in Qinling Mountains: Killing of Golden takin can be caused by predators due to natural conditions such as diseases. Analysis of 23 skull samples collected at Qinling Mountains, showed that the males of Golden takin exhibited the highest death frequency of about 18 compared to the females only 5 individuals (Fig. 6). These results suggest that the males of Golden takin are more vulnerable to threats than females.

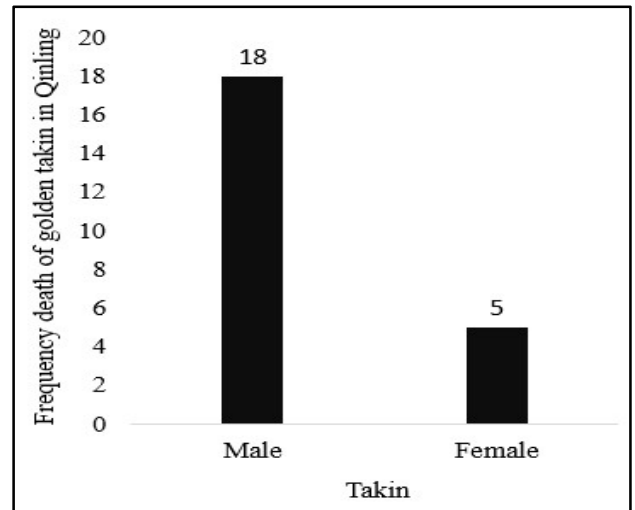


Fig. 6. Frequency death of Golden takin in Qinling Mountains (2014-2016)

DISCUSSION

Human - wildlife conflict is a complex issue and there is no one size fits all solution (Pettigrew, 2012). The conflict between humans and wildlife has become a serious threat to the survival of many of the world's most endangered species. It needs conservation management issue of enormous significance for both affected human communities and endangered species associated with the conflicts (Pettigrew, 2012). Since 2000, human-wildlife conflicts in China mainly happened in Shaanxi, Yunnan, Guangxi, Tibet and Xinjiang autonomous regions (Zhou, 2016).

Including Golden takin, there are many other alarming species such as Tiger (*Panthera tigris*), Elephant (*Elephas maximus*), Wild boar (*Sus scrofa*), Brown bear (*Ursus arctos*), Wolf (*Canis lupus*) and Snow leopard (*Panthera uncia*) (Zhou, 2010). In recent years, many accidents of Golden takin living in the Qinling Mountains attacked villagers have occurred in Shanxi Province (Zhu, 2015). The study showed the conflict of Golden takin encountered with people varied from death to injury to alivewith people inhabiting in the vicinity of the mountains, the highest rate of conflict recorded in 2000, then the conflict decreased due to establishment of natural forest protection project of wildlife, there are some years passed with non-conflict, 2002, 2010, 2013 and 2015. Human-wildlife conflicts always cause damages, summer season recorded the highest rate of conflict, which we can be attributed to mating season of Golden takin occurring in summer, or related to its seasonal migration time, people trying to avert the conflict with Golden takin to minimize damages, but Golden takin still causing damage to local people living around the protected areas. The monthly data of Golden takin attacked people and daily movement revealed the highest rate occurring in June (35.71%), and (30.32 %) at periods of 4:00-6:00 am and 6:00-8:00 am, this report is identical with the result of daily movement of Golden takin in Guangtoushan; showed that, the Golden takin was more active in the morning time during summer season. The attacks happened when people are going to their farms, schools, orherbalistsgoing for collecting medicine plants or bamboo shoots.

The result of damages reported that, some people were killed, injured, and alive. Golden takin eating crops and sometimes simply seize the villager's residential properties with unknown ratio of damage. Reference (Fang, 2011) reported attacks by Black bear, 2 people were killed, 72 injured, raided crops, and killed cattle in Sichuan Province, China. Snow leopard was reported to be of less threat to people and livestock life (Justine, 2015). Conflicts between human and brown bears were reported to become increasingly in Sanjiangyuan national natural reserve, the Brown bears destroyed homes and incursion critical food supplies (Pettigrew, 2012). References (MacLennan, 2009) and (Pettigrew, 2012) mentioned that, multiple predator species killed livestock and humans in many areas in Yunnan province. In Mountain areas of Simao, Xishuang Banna natural reserve, herd of 19-24 Asian elephants was damaged a large scale of crops and property (Zhang, 2003). Compared to our result the risk of the wild animals and their conflict with people mostly affected crops and livestock than killing or wounding people. In Nepal wildlife encounters with people killed or wounded to various extents, caused by Elephants, Leopards, Rhinoceros, Bears and Tigers (Krishna, 2016). Golden takin might killed by predators, or due to natural conditions. The result of this study, revealed that the males of Golden takin showed the highest death frequency than females, could be due to the fact that f male Golden takin fight more, and also could be in solitary because of leaving the group. Assessing the human-golden takin conflict will facilitates the understanding of Golden takin conflict and management in China. The conservation of Golden takin and its associated impacts to human remain a big challenge.

CONCLUSION

The conflict between human and wildlife it become serious problem.

Human-golden takin conflict varied from killed, injured and damage people yields. The conflict was related to movement of Golden takin in Qinling Mountains during the seasonal migration time or mating season, and the probability of conflict occurred in morning time. All the Golden takin attacked people were males, the death of males Golden takin was higher than that in females, in Qinling mountains, males Golden takins are more threaten than female. Understanding the human-wildlife conflict and identifying the underlying causes are important component of management and conservation.

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