

DISTRIBUTION OF ASIATIC BLACK BEAR AND ITS INTERACTION WITH HUMANS IN JIGME SINGYE WANGCHUCK NATIONAL PARK, BHUTAN

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We assessed the human-bear interactions and distribution patterns of the Asiatic black bear *Ursus thibetanus* in Jigme Singye Wangchuck National Park (JSWNP) in Bhutan through a questionnaire survey of park residents and by remote camera trapping. Our study revealed 26% (N = 311) of the respondents experiencing one or another form of human-bear interaction. Crop damage accounted for the highest interaction rate at 65%, followed by livestock depredation (25%), between 2012 and 2016. About 10% of the interactions involved human mauling cases in 2006–2016. About 80% of the respondents expressed support for bear conservation influenced mainly by conservation awareness programmes. Observations from 39 camera trap stations across the national park indicated a wide distribution of Asiatic black bears in JSWNP, with a mean site use probability of 0.55 (SE = 0.10, N = 39). With emerging perceived threats such as habitat fragmentation and loss, retaliatory killing, and poaching, it is recommended that the national park management adopt conservation measures that will enable a harmonious coexistence between humans and bears. Habitat enrichment with natural food resources for the bear, equipping communities with conflict preventive measures, and advocating local people on bear conservation are some of the measures that need to be adopted in the national park.

Key words: Himalayan black bear, human-wildlife conflict, Protected Area, species conservation, Ursidae, *Ursus thibetanus*

Introduction

The Asiatic black bear, *Ursus thibetanus* G. Cuvier, 1823, is one of the five bear species found in Asia (Mills & Servheen, 1994). The others include the Himalayan brown bear *Ursus arctos* Linnaeus, 1758, the Malayan sun bear *Helarctos malayanus* (Raffles, 1821), the sloth bear *Mehursus ursinus* (Shaw, 1791), and the giant panda *Ailuropoda melanoleuca* (David, 1869). *Ursus thibetanus* is widely distributed from South-East Iran through Afghanistan and Pakistan, eastward along the lower foothills of the Himalayas in India, Nepal, Bhutan, China, Southern Russian Far East, and North and South Korea (Servheen et al., 1999). Islands in Asia with *U. thibetanus* include Japan (Hazumi, 1994), Taiwan, and possibly the Province of Hainan in China (Trent, 2010). *Ursus thibetanus* can be found in diverse forest habitats and altitudes ranging from sea level to more than 4500 m a.s.l. (Servheen et al., 1999). With the global population of *U. thibetanus* declining due to indiscriminate poaching for trade (Mills & Servheen, 1994), retaliatory killing (Charoo et al., 2011), and habitat degradation and fragmentation (Liu et al., 2011), the species is included in CITES Appendix I (CITES, 2016) and listed as Vulnerable in

the IUCN Red List of Threatened Species (Garshelis & Steinmetz, 2016). However, there are only a few studies on *U. thibetanus*'s ecology, population status and distribution, and the nature of human-bear interactions (Servheen et al., 1999; Sathyakumar, 2001; Garshelis & Steinmetz, 2016).

Ursus thibetanus is found throughout Bhutan (Wangchuk et al., 2004), and the species is listed as a Schedule I species in the Forest and Nature Conservation Act of Bhutan (FNCA) 1995 (RGoB, 1995). Schedule I species, according to the FNCA, are the totally protected species in Bhutan. Such a high degree of protection is expected to counter the perceived threats of bear poaching for bile, habitat encroachment, and retaliatory killing.

On the other hand, conflicts have arisen between people and wildlife across Bhutan in recent times (Sangay & Vernes, 2008) and *U. thibetanus* was reported as one of the conflicting predators (Wang et al., 2006a; Jamtsho & Wangchuk, 2016). Interactions between *U. thibetanus* and humans span a diverse array of geographic and human demographic contexts as bears typically compete directly with humans for space, food, security, and cover (Charoo et al., 2011).

Ursus thibetanus is known to damage agricultural and horticultural crops, apiaries, and fish farms, as well as injuring and killing livestock and humans (Hazzumi, 1994; Chauhan, 2003; Ngoprasert et al., 2011; Fakhar-i-Abbas et al., 2015). There were reports of conflicts between *U. thibetanus* and humans in Jigme Singye Wangchuck in the past (Wang & Macdonald, 2006) but the frequency and severity of conflicts are not known. Moreover, there is no information on the distribution pattern of bear within the national park for making informed conservation decisions either. In this paper, we report the distribution, habitat use, and nature of human-bear interactions in Jigme Singye Wangchuck National Park in central Bhutan.

Material and Methods

Study Area

Jigme Singye Wangchuck National Park (JSWNP) is the third largest national park in Bhutan (Fig. 1) with an area of 1730 km² (JSWNP, 2014a). The national park is linked to Jigme Dorji National Park and Wangchuck Centennial National Park (WCNP) to the north, Phrumsengla National Park to the west, and Phibsoo Wildlife Sanctuary to the south by biological

corridors. Biological corridors are areas set aside to connect protected areas for enabling safe movement of wildlife. There are eight biological corridors in Bhutan, which were first established in 1999 (NCD, 2004). JSWNP also shares a boundary with Royal Manas National Park to the south. With the altitude ranging from 464 m a.s.l. to 4925 m a.s.l., JSWNP has diverse vegetation types with representation from the sub-tropical forest to alpine scrubs. Thirty nine species of mammals including threatened species such as Bengal tiger *Panthera tigris tigris* (Linnaeus, 1758), Leopard *Panthera pardus* (Linnaeus, 1758), Red panda *Ailurus fulgens* (F. Cuvier, 1825), Golden langur *Trachypithecus geei* (Khajuria, 1956), Serrow *Capricornis thar* (Hodgson, 1831), Musk deer *Moschus chrysogaster* (Hodgson, 1839), and Gaur *Bos gaurus* (C. H. Smith, 1827) are found here. The national park is classified into two management zones: a core zone for strict conservation without human interventions, and a multiple-use zone where sustainable harvesting of resources is allowed (JSWNP, 2014b). Close to 5000 people reside in 561 households in the multiple-use zone of the national park, maintaining a close interaction between nature and people.

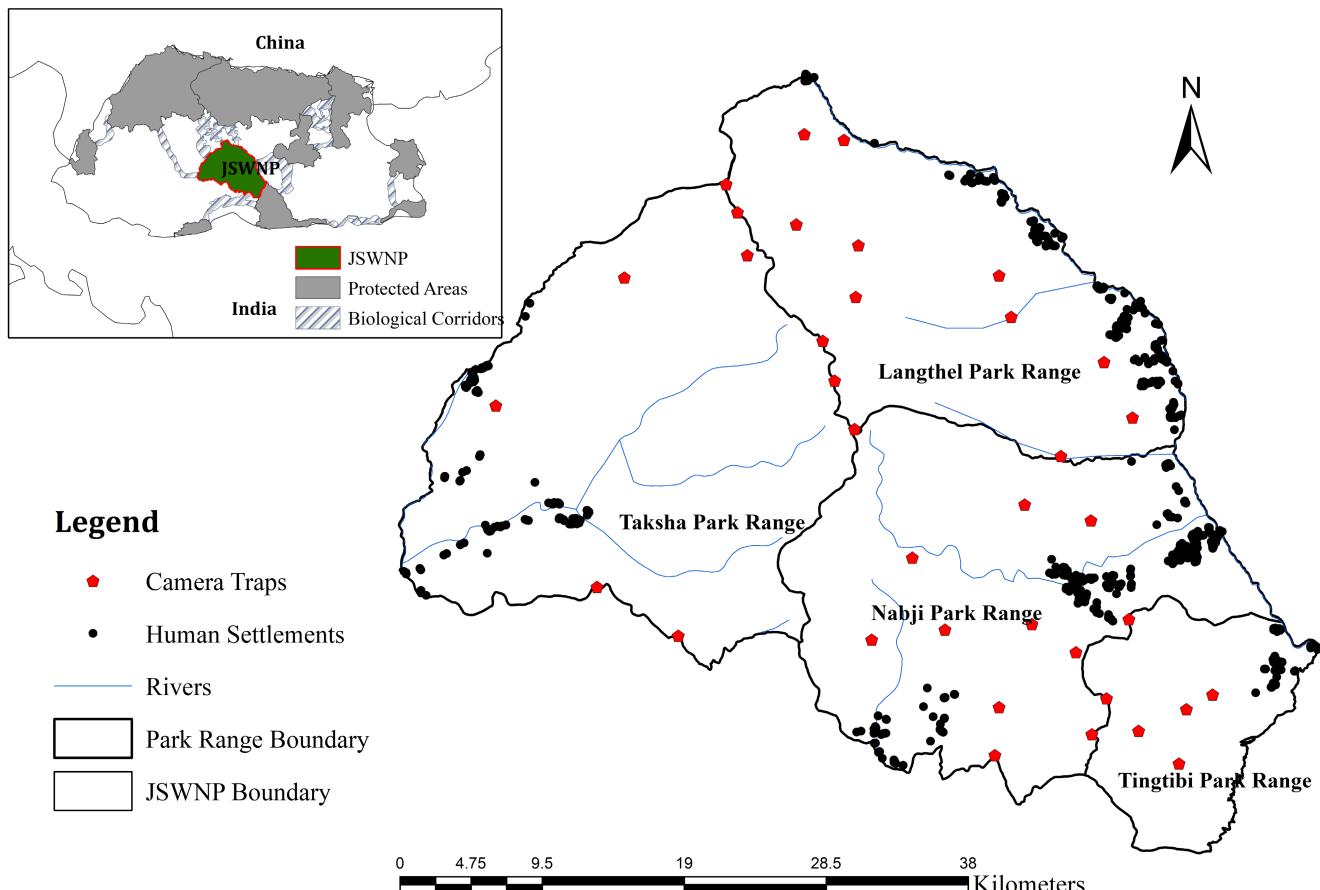


Fig. 1. Map showing the location of camera traps and human settlements in which questionnaire survey was conducted in Jigme Singye Wangchuck National Park. The location of the study area, Jigme Singye Wangchuck National Park in central Bhutan and Bhutan's location in the region is also shown (on the small map).

Field Survey

Questionnaire survey

We conducted a questionnaire survey to understand human-bear interactions and perception of people towards bear conservation. Efforts were made to interview as many households (HHs) as possible. However, we were able to interview only 311 HHs, representing 53% of the total national park residents, who were present at their homes during our door to door survey. The number of respondents varied among different Park Ranges owing to the difference in number of households: Taksha Park Range (72), Nabji Park Range (135), Langthel Park Range (57), and Tingtibi Park Range (47). Park Ranges are smaller administrative jurisdictions within the national park for the ease of managing the national park. We categorised human-bear interactions as (1) crop damage, (2) livestock depredation, or (3) attacks on humans. Information on the former two were sought from the interviewees based on the incidents that occurred in the three years preceding the survey, i.e., 2014 until April 2016, so that respondents can recollect the incidents that occurred to their household. However, in case of attacks on humans, we tried to get information from 2006 to 2016 as the number of such incidents was very low.

Remote camera trapping

We used camera traps to generate data for estimating site use probability of *U. thibetanus* in the Jigme Singye Wangchuck National Park. We laid grids of 2.5×2.5 km throughout the national park, the area of which is slightly bigger than the average home range (3.55 km^2) of bears in general as reported by studies in India (Sunar et al., 2012) where habitats are similar to JSWNP. Camera traps were set up in 39 random grids representing the different habitat types and altitude gradient of the entire national park between July – December 2016. At each station, we installed a Reconyx™ camera trap, 45 cm above the ground and recorded coordinates and altitude for each using Garmin GPS. We placed the camera traps along trails and ridges, near waterholes and salt licks, and in areas with a high density of animals to maximise the probability of detecting wild animals including *U. thibetanus*. We kept a minimum distance of at least two km between each station, to increase the probability of detecting more individuals than repeatedly detecting the same individual. The camera traps were deployed for at least 60 days to increase detection probability.

Data Analysis

Human-bear interactions and people's perceptions

We used descriptive analysis through frequency distribution and multivariate logistic regression to analyse the pattern of human-bear interactions. Preliminary bivariate tests (cross-tabulations and analyses of variance) were carried out and a significance level of $p \leq 0.05$ was used to select the variables to be included in the multivariable model for determining their influence in predicting the response variable. Logistic regression analyses were made using the backward elimination of variables to generate a parsimonious final model. Gender, age, education level, knowledge about bears, human-bear conflict incidents, knowledge of forest rules, and whether they attended an awareness education programme or not were used as predictor variables that influenced peoples' perceptions. The results were reported as estimated coefficients (β), standard error of the coefficient (SE), Wald statistics χ^2 values, and level of statistical significance (p). The associations were considered significant at $p \leq 0.05$. Statistical software R studio (R Core Team, 2018) with relevant packages such as «dplyr» (Wickham et al., 2018), «car» (Fox & Weisberg, 2011), and «lmtest» (Zeileis & Hothorn, 2002) were used for performing the regression analysis.

Distribution and habitat use probability

We ran single-season single-species occupancy models developed by MacKenzie et al., (2002) in the programme PRESENCE (Hines, 2006) to understand distribution and habitat use probability of bears in JSWNP. The photographic records of *U. thibetanus* were sorted from each camera trap using the programme ReNamer (Sanderson & Harris, 2013) and its extension tool Occupancy Matrix was used to generate detection histories. The 75-day camera trap effort was collapsed into sampling periods of various durations such as 10 days per occasion (8 occasions), 12 days (6 occasions), and 15 days (5 occasions), each occasion representing a repeat observation. The occasion with the optimum sampling period was selected based on the chi-square goodness-of-fit test for the multivariate global model (MacKenzie & Bailey, 2004) and 15 days proved optimal ($c\hat{h} = 1.01$, $p = 0.40$). Occupancy models can accommodate covariates that influence detection and occupancy probabilities and is modelled as a function of a survey and site-specific covariates (MacKenzie et al., 2006). Based on existing literature on *U. thibetanus* (Sathyakumar,

2001; Charoo et al., 2011; Jamtsho & Wangchuk, 2016), we took into account six site covariates, viz., altitude (m), slope ($^{\circ}$), forest types, land cover (%), distance to river (m), distance to settlement (m), and two survey covariates viz., survey effort (number of days the camera was actively running) and survey area (National Park zones, CZ = core zone, MZ = Multiple-use zone) for model development. All site covariates for JSWNP were derived from the national data of Bhutan, which were processed using QGIS 2.14 (QGIS Development Team, 2018) and ArcGIS 10.3. Forest type data were obtained from land use and the land cover map of Bhutan 2017 (FRMD, 2017), while the forest cover data came from a 30-m resolution global forest change (GFC) cover for the year 2017 (Hansen et al., 2013). The distance to major rivers and human settlements was generated using the Euclidean distance tool in ArcGIS, the vector layers of which were rasterised to generate the distances in metres. All continuous site covariates were z-standardised to zero mean and one standard deviation (Sunarto et al., 2012). A two-step process to estimate the probability of detection (p) and the site use probability (ψ) was followed for building logical model combinations (MacKenzie et al., 2005). Collinearity was checked for all the covariates and no two highly correlated covariates were used together during the modelling. We assessed model support based on Akaike information criterion (AIC) values (Burnham & Anderson, 2004) and all plausible multivariate models within $\Delta\text{AIC} < 2$ were considered to be equally supported by data. The model fit was examined by a goodness-of-fit test with 10 000 bootstrapping. The mean untransformed beta coefficient (β) estimate from the best multivariate model was used to predict the site occupancy of the species. It was also used to measure the degree and direction of the covariate effect on the site-use probability.

Results

Respondent Demography

The respondents' ages ranged between 16 to 84 years with the average age of 47.87 years

($\text{SE} = \pm 1.25$), with approximately 67% being male. About 69% of the respondents had not attended any formal education while the rest attended either non-formal education or some form of formal education. However, about 71% of the respondents attended conservation awareness programmes conducted by the national park officials and about 85% of the respondents were aware of the provisions of forestry act and rules such as the illegality of killing wildlife and others relevant to their livelihoods.

Human-bear interactions and people's perception of bear conservation

The majority (about 86%) of respondents were aware of the presence of *U. thibetanus* in their locality with about 74% of them having direct sighting and the rest reported to have come across bear sign. Most of the bear sightings and sign were reported in the forests near the settlements (within 3 km), which is designated as multiple-use zone by the national park, however about 4% sighted bears in the agricultural fields.

Human-bear interactions are prevalent in the national park with 26% of the respondents reporting some form of interactions with bears, which included depredation of crops (65%), livestock depredation (25%), and attack on humans (10%) (Table 1).

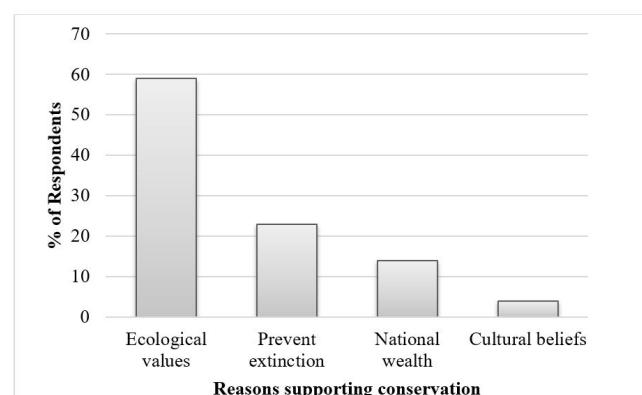
About 80% of the respondents expressed their support for conservation of bears and other species citing reasons such as ecological value, cultural beliefs, and the risk of extinction, and bears as a part of national wealth (Fig. 2). The results from the multivariate regression analysis indicated that people's support for conservation was significantly explained by three variables: awareness education, personal knowledge of basic forest rules, and age of the respondent ($\chi^2 (3, 310) = 169.60, p < 0.05$) (Table 2). On the perception of threats to bears, about 59% of the respondents felt there will be threats of habitat fragmentation due to infrastructure development, possible retaliation by people, and rampant poaching.

Table 1. Number of human-bear interactions in Jigme Singye Wangchuck National Park (2012–2016 except for human mauling (2006–2016))

| Interaction Types | Number of respondents with Human-bear interaction cases in each Park Ranges | | | |
|-----------------------|---|-----------------|-------------------|-------------------|
| | Taksha (N = 72) | Nabji (N = 135) | Langthel (N = 57) | Tingtibi (N = 47) |
| Crop damage | 8 (11.11%) | 19 (14.07%) | 10 (17.54%) | 15 (31.91%) |
| Livestock depredation | 3 (4.17%) | 3 (2.22%) | 14 (24.56%) | 0 (0%) |
| Human mauling | 3 (4.17%) | 1 (0.74%) | 4 (7.01%) | 0 (0%) |

Table 2. Results of the multivariate logistic regression analyses on the respondents' perception on conservation needs for *Ursus thibetanus* in Jigme Singye Wangchuck National Park in 2016

| Variables | Coefficient (β) | SE | Wald χ^2 | z value | p value |
|---|-------------------------|------|---------------|---------|---------|
| (Intercept) | 0.65 | 1.13 | — | 0.57 | 0.566 |
| Awareness education programme attended (Binary) | 2.91 | 0.64 | 20.44 | 4.52 | < 0.001 |
| Age of respondents (Continuous) | -0.06 | 0.02 | 9.56 | -3.09 | < 0.001 |
| Aware of basic forest rules (Binary) | 1.71 | 0.92 | 3.39 | 1.84 | 0.065 |

**Fig. 2.** Proportion of respondents supporting conservation of *Ursus thibetanus* after each respondent choosing one option in Jigme Singye Wangchuck National Park in 2016 (N = 249).

Distribution and habitat use probability

Ursus thibetanus was detected at 20 camera trap locations out of the total 39, producing a naïve occupancy of 0.51. A total of 678 images of bear were obtained from 64 independent events. We detected bears between 1218 m a.s.l. and 4389 m a.s.l. Out of the 20 locations where we detected bears, 11 were inside the core zone, and nine were in the multiple-use zone.

A univariate occupancy model showed the distance to a settlement, altitude, and the distance to a river as most supported covariates on the bear site use probability (ψ), followed by forest cover, land use types, and slope (Table 3). Four multivariate models were found to be strongly supported by our data (models within $\Delta\text{AIC} < 2$) and the model with altitude and distance to river had the highest support (Table 4), yielding a mean predicted proportion of the site use probability of 0.55 (SE = 0.10):

$$\text{probit } (\psi_i) = \beta_0 + \beta_{\text{ELE}} \text{altitude}_i + \beta_{\text{RIV}} \text{distance to river}_i,$$

where β_0 refers to intercept, β_i are the coefficient estimates of the covariates, «» is the site surveyed. The site use probability was relatively higher in the Multiple use zone (0.58 (SE = 0.10)) as compared to the Core Zone (0.53 (SE = 0.09)) (Fig. 3). The estimates of untransformed beta coefficients indicate the altitude had a negative association (-0.962, SE = 0.50) on the bear site use probability and the distance to a river was having a positive association (1.046, SE = 0.58). Models supported by data suggests the distance to a settlement having a negative influence (-0.396, SE = 0.66) on bears' habitat use probability as well.

Table 3. Univariate site use probability models for six site covariates and the null model for *Ursus thibetanus* in Jigme Singye Wangchuck National Park in 2016

| Model | AIC | ΔAIC | AIC wt | Model Likelihood | K | -2 Log Likelihood |
|--------------------|--------|--------------------|--------|------------------|---|-------------------|
| ψ (SET), p(.) | 222.29 | 0 | 0.32 | 1 | 2 | 218.29 |
| ψ (ALT), p(.) | 222.84 | 0.55 | 0.24 | 0.75 | 2 | 218.84 |
| ψ (RIV), p(.) | 223.22 | 0.93 | 0.20 | 0.63 | 2 | 219.22 |
| ψ (GFC), p(.) | 224.22 | 1.93 | 0.12 | 0.38 | 2 | 220.22 |
| ψ (LU), p(.) | 226.10 | 3.81 | 0.05 | 0.15 | 2 | 222.10 |
| ψ (SLO), p(.) | 226.68 | 4.39 | 0.04 | 0.11 | 2 | 222.68 |
| ψ (.), p(.) | 227.26 | 4.97 | 0.03 | 0.08 | 2 | 223.26 |

Note: Covariates used are ALT = Altitude, SLO = Slope, LU = Land use types, GFC = Forest Cover, SET = Distance to settlement, and RIV = Distance to river; AIC = Akaike Information Criterion corrected for small sample size; ΔAIC = Relative difference between AIC of subsequent models compared to the top model; AIC Wt = AIC weight; K, number of parameters, Detection probability was kept constant p(.)

Table 4. Multivariate model selection results for *Ursus thibetanus* site use probability in Jigme Singye Wangchuck National Park in 2016

| Model | AIC | ΔAIC | AIC wt | Model Likelihood | K | -2 Log Likelihood |
|--------------------------------|--------|--------------------|--------|------------------|---|-------------------|
| ψ (ALT + RIV), p(.) | 220.22 | 0 | 0.40 | 1 | 3 | 214.22 |
| ψ (SET + RIV), p(.) | 221.05 | 0.83 | 0.27 | 0.66 | 3 | 215.05 |
| ψ (ALT + SET + RIV), p(.) | 221.86 | 1.64 | 0.18 | 0.44 | 4 | 213.86 |
| ψ (ALT + SLO + RIV), p(.) | 222.17 | 1.95 | 0.15 | 0.38 | 4 | 214.17 |

Note: Covariates used are ALT = Altitude, SLO = Slope, SET = Distance to settlement, and RIV = Distance to river; AIC = Akaike Information Criterion corrected for small sample size; ΔAIC = Relative difference between AIC of subsequent models compared to the top model; AIC Wt = AIC weight; K, number of parameters, Detection probability was kept constant p(.)

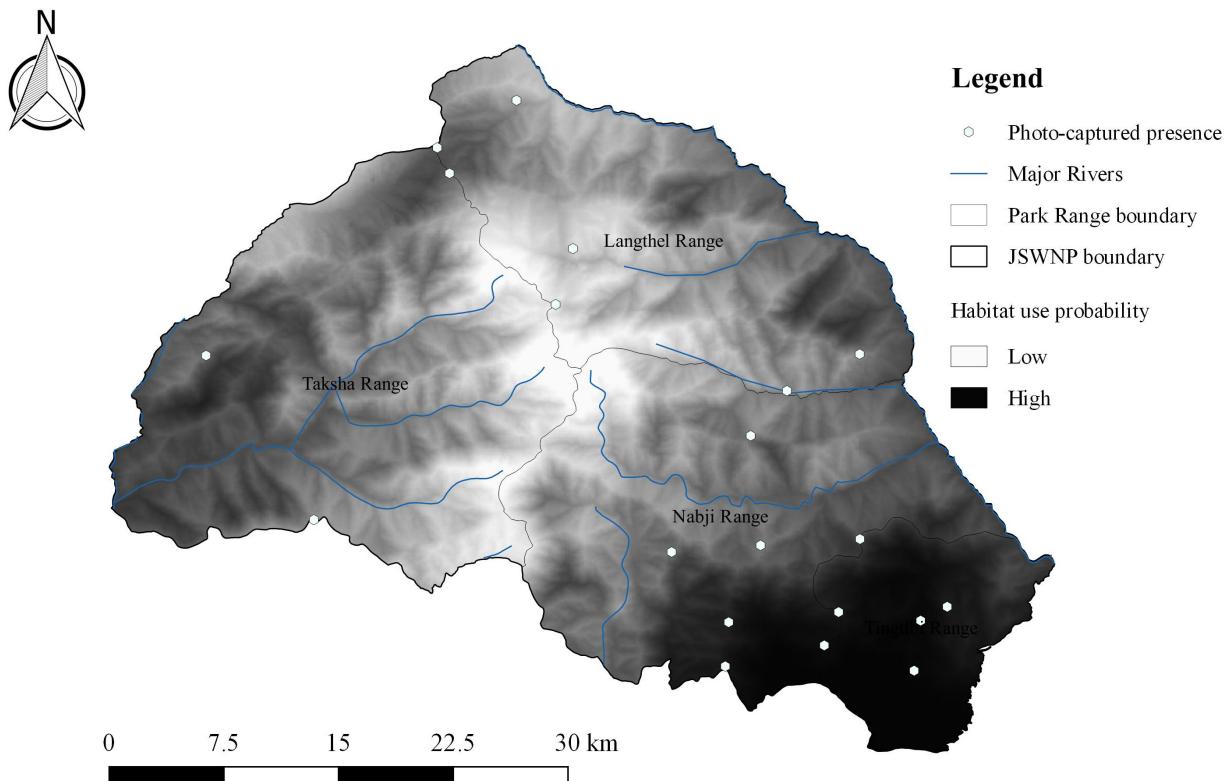


Fig. 3. Estimated proportion of area used by *Ursus thibetanus* in Jigme Singye Wangchuck National Park in 2016 as ascertained from occupancy modelling framework.

For the detection model, neither the survey area (Core zone and Multiple-use zone) nor camera trap effort had a significant influence on detection probability (p). Therefore, in the multivariate combinations, covariates influencing detection probability (p) was kept as null $\psi(\text{covariate})$, $p(.)$.

Discussion

The *U. thibetanus* is a common species in JSWNP with the species being recorded from the sub-tropical forests to the alpine zone clearly indicating that this species is a habitat generalist (Escobar et al., 2015; Garshelis & Steinmetz, 2016). However only four camera stations above 4000 m a.s.l. captured a bear, with the highest altitude being at 4389 m a.s.l. We had 11 camera stations out of 39 above 4000 m a.s.l. The occupancy modelling also indicated a negative association between altitude and site use probability with the proportion of area used by bears at lower altitude being bigger than that of higher altitude. Sathyakumar (2001) also reported that bears generally do not move above 4500 m a.s.l. because of less food availability in the alpine scrub vegetation.

In JSWNP, *U. thibetanus* was reported as a conflicting species in earlier studies (Wang & Macdonald, 2006; Wang et al., 2006a). However, bears accounted for just 8% of the total livestock kills (Wang

& Macdonald, 2006) and 7% of the total crop damage (Wang et al., 2006a) in 2000. With only 26% of the respondents reporting some form of interactions with a bear, our study results align with the findings of Wang & Macdonald (2006) and Wang et al. (2006a). Thus, we can possibly conclude that the intensity of conflict caused by bears in JSWNP is not as serious as perceived by the communities.

Amongst the reported interactions, crop damage was found to be most common followed by livestock depredation and mauling of humans, similar to findings from Jamtsho & Wangchuk (2016) in WCNP and by Charoo et al. (2011) from Dachigam National Park, Kashmir, India. Incidents of crop damage can be attributed to the availability food crops like maize in the communities, which is reported to be a preferred food by bears (Fakhar-i-Abbas et al., 2015; Ali et al., 2017). Bears are opportunistic omnivores and consume more plant than animal matter (Joshi et al., 1997). Yet, *Ursus thibetanus* often depredate livestocks in the cattle sheds and during winters in the region (Chauhan, 2003; Yadav et al., 2009; Charoo et al., 2011). However, livestock depredation in JSWNP is not as high as that of crop damage incidents. Though no investigation was done, the loss of livestock to bears in JSWNP can be largely related to husbandry practices such as free grazing in the forests as this is the most common meth-

od of herding practice in JSWNP. Sethy & Chauhan (2011) from India and Jamtsho & Wangchuk (2016) from WCNP also reported similar causes leading to livestock attacks by bears.

Most of the human-bear conflict areas were found to be either in the multiple-use zone or within a three-kilometre buffer from settlements, which was consistent with the results from our occupancy modelling. Our modelling results suggest that bears commonly use areas in the multiple-use zone which was corroborated by 86% of the respondents reporting the presence of bears in the forests near the villages. Similar observations were also reported from India by Sathyakumar (2001) and Charoo et al. (2011) wherein they reported bears preferring to stay near the human settlements, possibly attracted to croplands and domesticated food resources. In the WCNP in Bhutan, Jamtsho & Wangchuk (2016) reported that people sighted more bears during the season of crop production. It is established that fragmented habitats with adjacent human habitations and croplands or orchards increase the close interactions between human and bears (Bargali et al., 2005). However, unlike in India where human settlements expand towards forest fringes (Charoo et al., 2011), people in Bhutan complain of expanding forests bringing wildlife next to their door (Wang et al., 2006b). A preliminary report on land cover change analysis in JSWNP from 1995 to 2015 also showed an increase in forest cover by 4% (Letro, 2016).

That over 80% of the respondents expressed support for conservation of the bear may be an indication of people's willingness to live alongside bears at the current nature and intensity of conflicts, this may also be credited to the rigorous conservation awareness programmes initiated by the national park management. Liu et al. (2011) reported that education programmes can help increase local people's tolerance towards wildlife. We make this statement as a conservation awareness programme for the communities in an annual event in JSWNP and no cases of poaching were recorded by the national park management in the last 10 years. However, we caution that the nature of the bears' habitat choice and encroaching forest in the settlements might heighten human-bear conflicts in the future, questioning the survival of bears and safety of people's livelihoods. We put this on record as over 50% of the respondents expressed perceived threats that may emerge in the future.

Conclusions

While the conservation situation of *U. thibetanus* looks promising in JSWNP with reference to human-bear interaction, conservation threats cannot be denied

with various developmental works happening within the vicinity of the national park. Human-bear conflicts may intensify in the future due to human encroachment into the bear's habitat or vice versa (Sangay & Vernes, 2008), resulting in communities losing their tolerance to wildlife, which might incite retaliation. Therefore, it is vital that effective crop protection measures such as electric fencing are put in place, and livestock guarding and herd management alternatives are explored to reduce a loss to people. Habitat fragmentation and loss due to development is impacting every species in the biosphere (Escobar et al., 2015) and such anthropogenic disturbances will not spare habitat generalist species such as *U. thibetanus*. Conversely, expanding forests in JSWNP reinforces the need for a detailed assessment of the feeding habits of bears, as the lack of adequate food resources in the wilderness drives bear closer to settlements where palatable food resources are easily available, which could lead to human-bear conflict incidences. Subsequently, habitat enrichment with natural food resources where required, equipping communities with conflict preventive measures, and advocating local people on bear conservation should be carried out. Furthermore, to ensure human-bear coexistence and to achieve conservation success, the national park management should work towards preventing the three perceived threats: habitat fragmentation, possible retaliation, and poaching. With JSWNP forming an indispensable conservation landscape in central Bhutan and providing a linkage to other protected areas through biological corridors, the conservation success in JSWNP will have greater implications for bear conservation in Bhutan.

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РАСПРОСТРАНЕНИЕ ГИМАЛАЙСКОГО МЕДВЕДЯ И ЕГО ВЗАИМОДЕЙСТВИЕ С ЛЮДЬМИ В НАЦИОНАЛЬНОМ ПАРКЕ «ДЖИГМЕ-СИНГАЙ-ВАНГЧУК» (БУТАН)

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В данной работе нами оценены особенности распространения гималайского медведя (*Ursus thibetanus*), а также взаимодействия между ним и человеком в национальном парке «Джигме-Сингай-Вангчук» (НПДСВ) в Бутане. Были использованы опросные сведения жителей национального парка и данные, полученные с помощью фотоловушек. Наше исследование выявило, что 26% (N = 311) респондентов испытывают по меньшей мере одну из форм взаимодействия человека и медведя. В период 2012–2016 гг., наносимый урожаю ущерб составил самый высокий уровень взаимодействия на уровне 65%, меньшую долю составило хищничество медведем скота (25%). Около 10% взаимодействий было связано с травмированием человека в период 2006–2016 гг. Около 80% респондентов выразили поддержку сохранению *Ursus thibetanus*, что было вызвано, главным образом, программами по повышению осведомленности населения. Данные, полученные с использованием 39 фотоловушек на всей территории НПДСВ, показали широкое распространение особей в национальном парке со средней вероятностью использования участка 0.55 (SE = 0.10, N = 39). В связи с возникающими предполагаемыми угрозами, такими как фрагментация и утрата мест обитания, ответные убийства и браконьерство, рекомендуется, чтобы руководство национального парка приняло меры по сохранению вида, которые обеспечат гармоничное существование человека и медведей. Увеличение природных пищевых ресурсов гималайского медведя на территории исследования, оснащение местных поселений человека мерами по предотвращению конфликтов с медведем и защита местного населения в вопросах сохранения медведей являются некоторыми из мер, которые необходимо принять в национальном парке «Джигме-Сингай-Вангчук».

Ключевые слова: Ursidae, *Ursus thibetanus*, гималайский черный медведь, конфликт между человеком и дикой природой, ООПТ, сохранение видов