

# National Mission on Himalayan Studies (NMHS)

## Progress Report

(Period from April, 2017 to March, 2018)

### 1. Project Information

Project ID:	NMHS/LG-2016/009	Sanction Date:	31 <sup>st</sup> March, 2016
Project Title:	<b>Human-Wildlife Conflict Resolution Mechanism in the Indian Himalayan Region: Risk assessment, prediction and management through research and community engagement</b>		
BTG:			
PI and Affiliation (Institution):	<b>Dr. G. S. Rawat, Dean</b> , Wildlife Institute of India Chandrabani, Dehradun, Uttarakhand		
Name & Address of the Co-PI, if any:	<b>Dr. S. Sathyakumar</b> , Scientist-G, Wildlife Institute of India Chandrabani, Dehradun, Uttarakhand		
Structured Abstract detailing the current year progress [250 words limit]	<p>The negative human-wildlife interaction (HWI) or conflict is a major management issue in the Indian Himalayan Region (IHR) where large expanse of human habitations and agricultural lands are either interspersed with fragmented wildlife habitats or located in close proximity to forests leading to frequent livestock depredation, crop damage and attack on humans. Species such as the snow leopard, brown bear, Asiatic black bear, common leopard, wild pig and rhesus macaque are primarily involved in negative HWI. Thus considering the extent and severity of this problem, we have started collecting information on status of human-wildlife conflicts across five states of the IHR. After reviewing extensive literature on all published and available information on conflicts, we have carried out field investigations at specific sites. We prepared conflict hotspot maps based on our field surveys and GIS data for Pauri Garhwal. We camera trapped in an area of 315 sq. km in this district and estimated leopard density to be 4.6 (SE 1.5) per 100 sq.km. Based on our field surveys we have also identified hotspots of conflict for Central Dooars, North West Bengal. We radio-collared 3 common leopards and closely followed their movement pattern in North West Bengal during December 2017-February 2018. The average home range of male leopard was estimated to be 146 sq.km (SE 39) whereas for female it was 71 sq.kms respectively. We have also undertaken surveys in and around Kugti WLS, Chamba Himachal Pradesh for documenting human-wildlife conflicts during August 2017-March 2018.</p>		

Project Partner Name	Affiliations	Role & Responsibilities
Partner 1	Dept. of Wildlife Protection, Jammu & Kashmir	Coordination especially in Kargil & Ladakh regions.
Partner 2	Wildlife Wing, West Bengal Forest Department	Coordination in North Bengal.
Partner 3	Forest Department of Uttarakhand	Coordination in Pauri Garhwal District.

Partner 4	Department of Forest, Environment and Wildlife Management, Government of Sikkim	Coordination in the project sites.
Partner 5	Forest Department of Himachal Pradesh	Coordination in the project sites

## 2. Project Site Details

Project Site	Indian Himalayan Region
IHR States Covered	W.B, H.P., UK & Sikkim
Long. & Lat.	Provided separately
Site Maps	[Attached]
Site Photographs	[Attached]

### 2.1 Project Site Details of Chandrabani, Dehradun:

Project Site	Dehradun, Chandrabani
IHR States Covered	Uttarakhand
Long. & Lat.	Dehradun- 30.3165N 78.0322E
Site Maps	Attached as Annexure 1
Site Photographs	Attached as Annexure 1

### 2.2 Project Site Details of Himachal Pradesh:

Project Site	Chamba, Himachal Pradesh
IHR States Covered	Himachal Pradesh
Long. & Lat.	Chamba- 32.55531N 76.12647E
Site Maps	Attached as Annexure 2
Site Photographs	Attached as Annexure 2

### 2.3 Project Site Details of West Bengal:

Project Site	North Bengal
IHR States covered	West Bengal
Long & Lat	26° 53' to 26°39' Lat & 88° 16' to 89°52'

	Long
Site Maps	Attached as Annexure 3
Site Photographs	Attached as Annexure 3

### 2.5 Project Site Details of Pauri, Uttarakhand:

Project Site	Pauri, Uttarakhand
IHR States Covered	Pauri, Uttarakhand
Long. & Lat.	29° 45' to 30°15' Lat & 78° 24' to 79° 23' Long
Site Maps	Attached as annexure 4
Site Photographs	Attached as annexure 4

### 3. Project Activities Chart w.r.t. Timeframe [Gantt or PERT]

PROJECT ACTIVITIES	WORK UNDERTAKEN				OUTPUT
	Year 2017-2018				
	Qtr 1	Qtr 2	Qtr 3	Qtr 4	
<b>Project Activity 1</b> Conflict intensity maps and prediction of vulnerable zones for each Forest/Wildlife Division for the 5 study States	Data compiled from Forest/Wildlife Departments of Uttarakhand, West Bengal and Himachal Pradesh.	Field surveys undertaken in North Bengal, Pauri Garhwal	Conflict Hotspot Map prepared for Pauri Garhwal & central region of North Bengal.	Data collection initiated in Kugti & Tundah WLS, Chamba Himachal Pradesh.	The objective has been partially achieved for Uttarakhand and North Bengal and will most likely be completed in the coming field season. Once we have data on conflict across several sites of Himachal & Sikkim we will prepare spatial maps in a GIS domain.
<b>Project Activity 2</b> Density surface models for four carnivores in the selected sites of the selected study States	It is continuing for common leopard and Asiatic black bear in North Bengal and Uttarakhand. Not yet started for Himachal and Sikkim.				Abundance estimates of focal species will be available for majority (3/4) of study sites within next field season.
<b>Project Activity 3</b> Abundance estimates for selected species for the study area to	First phase of camera trapping completed in selected site of Pauri Garhwal. Initiated recently in North Bengal.				Only partially achieved, will most likely be completed in the next field season. Sites have

determine the population size in different management scenarios.		been identified in Himachal and upper reaches of Northern West Bengal and will be initiated in Sikkim soon.
<b>Project Activity 4</b> Fine scale spatio-temporal data base on species specific ranging and movement pattern of individuals involved in conflict scenarios	Activity of common leopards are being documented through radio-telemetry in North Bengal. Permission for radio-collaring has not been granted in the other study sites.	Partially achieved, more animal needs to be radio-collared in North Bengal. If collaring permits are provided by the other Himalayan states it will provide crucial ecological data on focal species.
<b>Project Activity 5</b> Documentation of general activity, movement patterns of the species in the conflict prone zones	Initiated only in North Bengal. We are trying to estimate minimum home ranges of common leopards through camera trapping in selected sites of Pauri Garhwal, Uttarakhand.	Permissions for collaring problem animals are being awaited from majority of states.
<b>Project Activity 6</b> Species and area specific mitigation plans/ models for negative Human-Carnivore Interactions in the IHR will be prepared	This will be done once all above mentioned objectives are fulfilled. We have initiated reviewing efficacy of wildlife deterrents to reduce conflicts in selected villages of Pauri Garhwal, Uttarakhand.	This will most likely happen in the last field season once all relevant information have been collected, compiled. The mitigation strategies will also need to be rigorously put to field trials which will be time consuming and experimental at times.

#### 4. Financial and Resource Information

*Note:* A separate bank account is expected to be opened for NMHS Project as per the provision of Direct Beneficiary Account (DBA) as laid out by the Govt. of India and also facilitate the audit of accounts. The interest earned out of the NMHS project funds should be reported clearly in the utilization certificate.

Total Grant:	<b>INR 4,44,88,800</b>	Grant Received Date:	1/04/2016
Project Partner(s)	Affiliations/ Institution	Budget Allocated to	Work Done
Partner 1	None	NA	NA
Partner 2	None	NA	NA
Partner 3	None	NA	NA
[Add]			

## 7. Project Beneficiary Groups

Beneficiary Groups [Capacity Building]	Target	Achieved
No. of Beneficiaries with income generation:	We have identified beneficiaries who can be provided with some sort of income in Pauri Garhwal, Uttarakhand. Rest of the states we are still in the process of identifying both beneficiary and sustainable source of income.	This will be partially achieved in the next field season.
No. of stakeholders trained, particularly women:	Women in North Bengal have been made aware about leopard and elephant attack patterns and ways to avoid such fatal confrontation while working in tea-estates. We have also conducted awareness campaigns, training programs for women in Pauri, Uttarakhand. other Himalayan.	30% achieved in North Bengal. 15% achieved in Pauri Garhwal.  Training Programs in Himachal and Sikkim will also be undertaken in the coming field season.
No. of capacity building Workshops/trainings:	4 in total i) Pauri Garhwal (Uttarakhand)-(2) ii) North Bengal (2)	A number of capacity building workshops are planned in the 3rd year with state forest department officials of Himachal & Sikkim regarding conflict mitigation and using sophisticated tools as means of reducing present levels of conflict. Based on the requirements of other interest groups workshop/training programs will be planned.
No. of Awareness & outreach programmes:	4 in total i) Pauri Garhwal (3) ii) North Bengal (1)	We will conduct multiple awareness and outreach programmes for the local communities and other major interest groups in the states of HP & Sikkim this season.
No. of Research/ Manpower developed:	Multiple volunteers (local youth) from Jalpaiguri & Kalimpong districts, Pauri	Youth from local schools and colleges in Pauri, Uttarakhand, Chamba, Himachal, Darjeeling,

	Garhwal and Dehradun township have been trained regarding conducting wildlife surveys and assessing human-animal conflict.	North Bengal & Gangtok, Sikkim will be trained further in the coming field season.
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## 8. Project Progress Summary (as applicable to the project)

Description	Total (Numeric)	Description
<p><i>IHR States Covered</i></p> <p><b>West Bengal</b> The present study site is located within the Darjeeling and Kalimpong districts and the Mal Subdivision (Central Dooars region) of Jalpaiguri District with a human population density of 622 km<sup>2</sup>. The region has several protected areas and a matrix of other land uses.</p> <p><b>Uttarakhand</b> Pauri Garhwal district of Uttarakhand has been selected due to severity of human-wildlife conflict especially with respect to common leopard and black bear. Therefore, this district was chosen as a study site to identify the cause for occurring conflicts. The geographical area of the district is 5444 sq.km and is divided into two divisions namely Pauri and Lansdowne.</p> <p><b>Himachal Pradesh</b> The present study was carried out in the north-west Himalayan region of Chamba district, Himachal Pradesh. The study area selected was two protected area viz., Kugti and Tundah Wildlife Sanctuary. Two villages from Kugti Wildlife Sanctuary (Kugti WLS) were selected for questionnaire survey and 14 sparsely populated villages from Tundah Wildlife Sanctuary were selected for questionnaire survey</p> <p><b>Rhesus Macaque Dehradun</b> We are studying the level of human-</p>	3 states covered during this season (West Bengal, Uttarakhand, Himachal Pradesh)	<p><b>West Bengal</b> In order to predict hotspots, we visited (N=100) sites across central North Bengal and recorded GPS locations where recent attacks on people by leopards and elephants have taken place till date, spatially distributed across the region. We collared 3 common leopards between December 2017-Feb 2018.</p> <p><b>Uttarakhand</b> We visited (N = 50) conflict sites and collected detailed information, compiled other GIS based covariates to prepared conflict hotspot maps. We camera trapped in an area of 315 sq.km to estimate leopard abundance. We also conducted (N = 182) questionnaire surveys to understand perception of local people towards common leopard in Pauri Garhwal.</p> <p><b>Himachal Pradesh</b> Semi-structured questionnaire surveys were carried out encompassing the study area from September 2017 to November 2017. Villages adjoining the study area were selected, and information regarding the status of Human-Wildlife Conflict and perception of people towards wildlife and its conservation were compiled from respective households. Trail transects were laid exclusively for indirect/direct evidence of bears.</p> <p><b>Rhesus Macaque</b> In Chandrabani area we estimated the population of rhesus macaque using line transects with a range between 250 to 450 individuals. As per roost counts the number was much lower (138) and as per grid count number of individuals was</p>

<p>macaque interaction in the vicinity of 2 km radius around Wildlife Institute of India, Dehradun campus.</p> <p><b>Sikkim</b> We have not yet conducted any surveys in Sikkim.</p>		<p>estimated to be 108. We will soon start conducting reproductive control trials using immune-contraception methods. The details are provided in the attached document.</p> <p>Some details of the data collected in the 3 states are provided later</p>
<p><i>Project Site/ Field Stations Developed:</i></p>	<p>.... (attach photos) ... (attach maps)</p>	<p>i) One in Kugti (Himachal Pradesh) ii) Rest already established in previous years in Uttarakhand and North Bengal</p>
<p><i>No. of Patents filed (Description):</i></p>	<p>NA</p>	
<p><i>Article/ Review/ Research Paper/ Publication:</i></p>	<p>None</p>	
<p><i>New Methods/ Modellings Developed (description in 250 words):</i></p>	<p>None</p>	
<p><i>No. of Trainings</i>  <i>(No. of Beneficiaries):</i></p>	<p>Three - 150 personnel from the state forest department officials of W.B and Uttarakhand.</p>	<p>Three training programs were conducted 2 in Pauri and one in North Bengal.</p>
<p><i>Workshop:</i></p>	<p>2</p>	<p>1 each in Pauri Garhwal &amp; North Bengal</p>
<p><i>Demonstration Models (Site):</i></p>	<p>Photos Attached</p>	<p>1. Flaudry demonstration (carnivore repellents) in selected villages of Pauri Garhwal 2. Fox light installation method demonstration undertaken at Conflict hotspot zone in Pauri</p>

Livelihood Options:	None	Not yet explored
Training Manuals:	3	Attached
Processing Units:	NA.... (attach photos)	
Species Collection:	None	
Species identified:	None	
Database/ Images/ GIS Maps:	(Attached)	Provided as separate jpegs

Note: Photos/ maps should be attached in high quality in compatible formats viz., JPEG, .JPG, .PNG, .SHP, etc. along with a suitable figure legend/ caption.

## 9. Project Linkages (with nearby Institutions/ State Agencies)

S. No.	Institute/ Organization	Type of Linkages	Brief Description
1.	Indian Tea Association	Collaboration to reduce human-wildlife conflict in and around tea-estates of North Bengal	We are trying to identify individual tea gardens as role models to reduce human-wildlife conflict (leopard, bear, elephant) through a combination of research, management, awareness and training.
2.	National Institute of Immunology	Collaboration and exchange of technical expertise	We are evaluating efficacy of reproductive control mechanisms such as use of vaccines and contraceptives for rhesus macaque in Dehradun.

## 10. Additional (publication, recommendations, etc.)

Time Period	Publications (Research Papers, Information Material, Policy drafts, Patents, etc.)
Annual [Year 2017-2018]	[None during this period]

## 11. Project Concluding Remark

Kindly update the following Progress Parameters for the Reporting Period:

Project Objectives	Project Output against each objective	Progress made against Monitoring Indicators (specified in Sanction Letter)	Remarks
1. To develop risk assessment tools and processes for identifying negative Human-	We have prepared conflict hotspot maps for Pauri Garhwal (Uttarakhand) and North West Bengal. Data collection has been undertaken in Himachal Pradesh	35% of this has been achieved in the present year.	Considering the vastness of the Indian Himalayan region and limited number of project



Wildlife Interaction (HWI) in the IHR through investigations on HWI and predict potential hotspots of conflict for regular monitoring and development of site specific mitigation efforts	and hotspots will be identified soon.		personnel in the project, it is quite a formidable challenge to adequately sample the entire region. Substantial additional time and man power is required to adequately sample all the 5 states.
2. To understand the biological factors and ranging patterns of selected wildlife species involved in livestock/crop depredation and attacks on people in the IHR	We have collared 3 common leopards in North Bengal. Permissions to radiocollar the leopards and bears are awaited from Uttarakhand and Sikkim.		We will need additional time and research permits apart from the project duration to infer about ecology of such problem animals across all states.
3. To develop and implement adaptive management strategies in some of the identified vulnerable areas through community engagement and use of modern science and technological tools and approaches.	We have initiated use of wildlife repellents in selected villages of Pauri Garhwal through community engagement. In North Bengal we have collaborated with Indian Tea Association staff and workers to develop mitigation strategies. Our approach is a combination of traditional knowledge and sophisticated technological tools to mitigate conflict. We have just started piloting some measures in Himachal Pradesh recently.		Our priority will be to advocate use of tools, techniques which are robust, cost-effective and user friendly for long term use. The tools are being put to extensive field trials before finalization as role models for wide spread use. Meanwhile we are also reviewing other potential equipment to be tested in field soon.

Methodology (in brief):	Attached as separate document
Major Research Achievements:	Attached in separate document
Brief Conclusion - the current year progress – during the reporting period (point-wise):	Attached in separate document
Progress Achieved (%):	Attached in separate document
Remaining work to be done:	

Submitted to:

Nodal Officer, NMHS-PMU  
National Mission on Himalayan Studies (NMHS)  
G.B. Pant National Institute of Himalayan Environment and  
Sustainable Development, Kosi-Katarmal,  
Almora 263643, Uttarakhand  
E-mail: [nmhspmu2016@gmail.com](mailto:nmhspmu2016@gmail.com)

Submitted by:

Project PI (Signature):  
Institution (Seal):  
Dated (dd/mm/yy):

Please fill the NMHS Progress Report pro forma as applicable with respect to time and other requirements and return via post/ e-mail. In case of any query, please contact at: [nmhspmu2016@gmail.com](mailto:nmhspmu2016@gmail.com)

Methodology :	<ul style="list-style-type: none"><li>• Conflict hotspot map prepared in ArcGIS based on conflict locations and open source data in a binary logistic regression framework in R.</li><li>• Spatially explicit mark recapture based approach used to estimate abundance of common leopard in selected site of Pauri Garhwal.</li><li>• Common leopards radio-collared with Vectronics GPS collars to record data at every 4-hour interval.</li><li>• Semi-structured questionnaire surveys conducted across Pauri &amp; North Bengal to assess peoples' perception towards wildlife and in mitigating conflicts.</li><li>• Field demonstration of wildlife repellents, outreach programs, informal meetings with village community representatives of Pauri Garhwal, North Bengal and Chamba region, Himachal Pradesh.</li><li>• Rapid grid survey conducted to understand the characteristics of grid in Dehradun, Chandrabani study site.</li><li>• Pilot surveys to assess the status of garbage dumps in the study area.</li><li>• Vegetation sampling to understand resource utilization of macaques in forest, rural, urban and agricultural areas.</li><li>• Scan and focal sampling carried out to understand the activity budget and movement patterns of particular troop.</li><li>• Abundance estimation of Rhesus macaques through combination of line transects, roost count and grid count.</li></ul>
Major Research Achievements:	<ul style="list-style-type: none"><li>• Conflict hotspot zone map prepared</li><li>• Collared 3 common leopards</li><li>• Informal formation of Village Response Teams</li><li>• Camera trapping exercise completed for a block of 315 sq.km in Pauri Garhwal</li><li>• Occupancy based sign surveys conducted to assess relative abundance of common leopard and black bear in Pauri Garhwal</li><li>• Camera Trapping exercise initiated in Mahandanda WLS, North Bengal to estimate abundance of common</li></ul>

	<p>leopard and wild prey.</p> <ul style="list-style-type: none"> <li>• Mapping of land use land cover change over time for Chandrabani area (1972 to 2015)</li> <li>• Documentation of resource utilization and activity pattern of Rhesus macaques in study area.</li> <li>• Abundance estimation of Rhesus macaques in study area</li> </ul>
<p>Brief Conclusion - the current progress</p> <p>– for the reporting period ONLY (pointwise):</p>	<ul style="list-style-type: none"> <li>• Generated conflict hotspot map for Pauri Garhwal and North Bengal</li> <li>• Camera trapping completed in 315 km sq. area in Pauri Garhwal.</li> <li>• Camera trapping initiated in 240 sq.km area in North Bengal.</li> <li>• Occupancy based sign surveys conducted in Pauri Garhwal to assess relative abundance of leopards and black bears.</li> <li>• Semi-structured questionnaire surveys carried out across selected sites in North Bengal, Himachal and Pauri region.</li> <li>• Collared three common leopards in North Bengal to understand activity and resource utilization patterns</li> </ul>
<p>Progress Achieved (%):</p>	<ul style="list-style-type: none"> <li>• <b>45% achieved.</b></li> <li>• More time and manpower needs to be allotted for completion of the objectives in another 4-5 years' time with additional funding support.</li> </ul>
<p>Remaining work to be done:</p>	<ul style="list-style-type: none"> <li>• Population estimation of leopards and prey in North Bengal and other sites in Pauri Garhwal.</li> <li>• To document home range, activity pattern and habitat use of bears, leopards in selected conflict prone sites of Uttarakhand, Himachal and Sikkim.</li> <li>• Prepare extensive spatial database of conflicts for the 5 study sites.</li> <li>• Formation of Rapid response team / Conflict teams in Uttarakhand.</li> <li>• Awareness programs in Himachal, Uttarakhand, North Bengal and Sikkim.</li> <li>• Efficacy of wildlife repellents along with traditional tools, practices to reduce intensity of conflicts in selected sites of IHR.</li> <li>• Application of reproductive control methods in rhesus macaque in Dehradun.</li> <li>• Document home ranges, resource utilization pattern of rhesus macaques in Dehradun through radio-telemetry.</li> <li>• Home range estimation, habitat use and ranging pattern of macaques in Dehradun, Chandrabani region.</li> <li>• Macaque identification software development, vegetation survey, monitoring seasonal accumulation of garbage.</li> <li>• Software development for individual macaque identification</li> </ul>