Proposed Project Title:

"Assessment of Edge effects on Population structure and regeneration status of most preferred food plants species of Western Hoolock Gibbon: an initiative for empowering the conservation efforts in Namdapha National Park, Arunachal Pradesh, India."

Rationale of the Project :

Namdapha National Park (NNP), in Northeast India is the largest continuous forest patch left in India for the conservation of many species. It is also important for the Western Hoolock Gibbon (Gibbons) which has been suggested to be have quite good population status and the behavior performance in this resource-rich habitat as compared to other areas in India (Das et al., 2006). However, this conclusion has been based on limited data and no extensive studies on gibbons population status, behavioural ecology have been carried out. Further, without knowledge on the population structure and natural regeneration status of the priority food plants for gibbons, it may be wrong to assume that they can sustain gibbon populations in the long term.

Moreover, NNP is facing massive habitat destruction from various anthropogenic threats in and around its buffer and core zone (personal observations, Murali et al., 2011, Dutta et al., 2007). Hence, there is an urgent need to understand the complex relationship between gibbons and their habitats as well as the ongoing edge effects because shifting cultivation practice near edge, cattle grazing, NTFP collection, etc. on the population structure and regeneration status of most preferred food plant species of gibbons in NNP.

Specific objectives of my project:

1. To study the influence of edge effects on the population structure and regeneration status of the most preferred food plant species of WHG in NNP.
2. To document and map the prevailing threats on both the gibbon habitat and their preferred food plant species in NNP.
3. To develop and initiate a long-term, sustainable, community-based conservation management action plan for the survival of gibbons and associated species in NNP.

Methodology:

This work is a part of a long term research study for my doctoral program and I have already collected and analyzed data from several studies that are relevant to the objectives of the present study. The following research has been completed in gibbon-dominated habitats of NNP;

1. Extensive field surveys of populations of gibbons in NNP have been completed. This survey identified variation in population and individual density of gibbons within and among different regions which might be under various forms of anthropogenic threats.

2. Extensive study for period of one year (2012-2013) on seasonal feeding behaviour of two habituated gibbon groups has also been completed. I have listed a total of 40 plant species in the gibbons diet and further, data have been analyzed using the selection ratio formula of Sarkar (2000) to identify the most preferred food plants species of gibbons (e.g. *Alinathus grandis, Chakrusia tubalaris, Neolamarckia cadmba, Melia azedarach, etc.*).

I now want to extend my research to work on the three specific objectives that have been proposed. I am planning to conduct the following major activities using standard methodologies:

Activity 1: To study the influence of edge effects on population structure and regeneration status of most preferred food plant species of WHG in NNP.

Study Design: The population structure and regeneration status of the most preferred food plant species of gibbons in NNP will be investigated. Following a stratified random sampling approach transects of 1-2 km length will be established at a distance of 50m –(2-5 km) from the forest edge to forest interiors within the suitable habitats of gibbons. These transects will also represent the spatial extent of the areas that are under different anthropogenic pressure (e.g. shifting cultivation, encroachment, hunting, NTFP collection) as accounted from my previous ground thruthing work. Within these transects a number of nested quadrats will be laid at each transect, quadrats of 10m × 10m size for the tree, 5m × 5m size for sapling and 1m × 1m for seedling size will be laid randomly at a gap of 50m. The size of the quadrat will be determined using the species-area curve method (following Mueller-Dombois and Ellenberg, 1974).

Data Collection: Within each nested quadrat individual trees having ≥30 cm girth will be treated as adults, 30−10 cm as saplings and ≤10 cm at the base as seedlings. Each individual tree and its respective girth will be recorded at 1.37 m height from the base of an individual tree within the studied quadrat. Moreover, the seedlings and saplings of tree species will be photographed (for further identification) and counted within each quadrats.

Analysis: The collected data will then be used to calculate basal area, density, and importance value index (IVI) according to the formulae of Cottam and Curtis (1956). Finally, based on population size of seedlings, saplings, and adults, the regeneration status of most preferred food plant tree species of WHG will be grouped into five categories namely good, fair, poor, no regeneration and new (Khan et al. 1987; Khumbongmayum et al. 2006). The Regeneration will be considered as 'good regeneration' when seedling > sapling > adults. In cases where the seedlings > or ≤ saplings ≤ adults, it will be termed as 'fair regeneration'. The Regeneration will be 'poor regeneration' if the species survives only in sapling stage and no seedlings are observed. If a species is only found to be present at the adult stage with no seedlings and saplings, it will be termed as 'no regeneration'. A

species will be considered as "new" if the species are found only either in seedling or sapling stage without any adults.

Importance: This activity will provide essential information for the park managers and researchers in formulating conservation and habitat restoration plans and improving the potential habitat for the long term conservation of gibbons.

Activity 2: To document and map the prevailing threats for both the gibbon habitat and their preferred food plant species in NNP.

Methodology: In this activity the spatial location of each transect, quadrat and settlement will be recorded using a GPS. In addition, data on anthropogenic disturbance signs at each nested quadrats such as hunting camps, cutting, lopping, cattle grazing, nearness to human habitation and NTFP collection will be collected.
Analysis: The collected data from both activity 1 & 2 will be incorporated, analyzed to develop a digitized map using various GIS software packages. The maps will depict the spatial regeneration pattern of gibbon food plants along with prevailing threats and the varying intensity of threat factor across the study area.

Importance: These maps will provide a spatial interpretation of threat factors that gibbons and their food plants are facing and can provide critical information on where conservation initiatives at the local level should be conducted. The maps on regeneration and threats will be used to motivate local people for taking up conservation initiatives.

Activity 3: To develop and initiate a long term sustainable, community-based conservation management action plan for the survival of gibbons and associated species in NNP.

Methodology: I will be conduct questionnaire-based interview surveys to understand the socio-economic status of the major tribal groups. Surveys will be conducted with the village priest, the head of hamlet (Gaonbura), village leaders and experienced hunters in the settlements located near or inside the park area (following Rao et al., 2010, Wang et al., 2007). In addition, small scale target-based workshop and education programs will be conducted in collaboration with the local people, stakeholders and the forest personnel.

Importance: This activity will provide me an opportunity to discuss the socio-economic issues that needs to be empowered while formulating any effective conservation action plan. These workshops and programs will also help me to discuss and develop some community-based conservation initiative for the survival of Gibbons and their associated species in NNP in collaboration with the local peoples and forest personnel.

Outcomes of my Project:

As gibbons are conspicuous features of undisturbed forests in this region, and, while they can maintain populations under some forms of disturbance often perform poorly as disturbance increases. Hence, they could be considered an umbrella species for much of the biodiversity dependent on undisturbed (or at least low disturbance) forest. Further, gibbons are recognized as highly effective seed dispersers and thereby contribute significantly to forest regeneration and potentially restoration. My study will contribute to biodiversity conservation in numerous ways: specifically to the conservation of gibbons (by identifying the long viability of their preferred food plants), to the capability of gibbons to facilitate regeneration of the forest in the long term (for which much other biodiversity depends.), and as an umbrella species representing the future of many other forest-dependent species. In this respect my study will identify the main threats to their continued existence and the specific locality of these threats. In turn, this will identify the focus of conservation-based activities, which will benefit biodiversity conservation generally in the park. Overall, the outcomes of this study will also be shared through various means e.g. publication of reports, scientific papers, education materials.

Proposed start and end date of project:

Proposed start date: **01- September - 2014**
Proposed end date: **31- August- 2015.**

Timeline of the project work:

Task description	Start date	End date	Output	Remarks
Studies on the influence of edge effect on population structure and regeneration status of most preferred food plant species in NNP.	September, 2014	February, 2015	Documentation of the regeneration status of population size of seedlings, saplings, and adults, that are most preferred food plant species of gibbon into five categories namely good, fair, poor and no regeneration, new.	This field task will be carried out within this period (winter) of year, because the park area is inaccessible during the monsoon period. (This will be carried out for six months)
Documentation and mapping of the prevailing threats on both the gibbons habitat and their preferred food plant species.	September, 2014	February, 2015	This will help me to map the prevailing threat areas as according to the intensity of encounter of threat factors as well as the mapping of the potential range to	This task will be carried out along with the task 1 (regeneration status study) as both task 1 and 2 together can provide an effective result that can help me in planning the other tasks. (This will be carried out

			carry out the conservation initiative on the basis of the gathered data.	for six months)
Analysis of data and development of education materials for promotion and discussion of the conservation issues related to the gibbon and its habitats food plants in general.	February, 2015	February, 2015	This task will generate the baseline results that will be going to be a key component for initiating conservation programs at a local level. Along with this generation of education materials like; informative maps, posters, presentation material, etc.	This task will be a crucial one for the successful completion of my project aims at a local as well as global level. (This will be carried out for one month)
Workshop, training program and development of community based sustainably feasible conservation action plan.	March, 2015	August, 2015	This task will help me in development and promotion of a long term sustainable community-based conservation management action plan in the NNP.	This task will be carried out at a local level within and in peripheral areas of NNP. Where I along with the local peoples, forest personal and stakeholders will try to formulate a sustainably effective conservation management plan.
Final Report or Thesis writing	July, 2015	August, 2015	This report or thesis will be a source of baseline information for future improvement and management of gibbon habitat and will enable identification of key research options for conservation of species.	This report will submitted to the parent grant source organization as well as in the forest department for future reference.

Need for the Grant :

I have not been received any individual research grant to purse my doctoral studies, but I am working as a senior research fellow in the Council for Scientific and Industrial Research (CSIR) sponsored project in the Department of Forestry, NERIST, Arunachal Pradesh, India. However, the project is now over since 31st March, 2014 and due to extreme field conditions and remoteness of my study area I was unable to complete the specific

objectives I have detailed in this proposal. If my application for the grant is successful I will be able to complete the research planned for my doctoral program and extend the work to critically important areas that I have identified during my research at NNP.

I have already discussed and developed ideas with local peoples on developing effective conservation management plans for gibbons and their habitats, and your grant would allow me to pursue this objective. Where, to initiate a long term conservation effort I have to build the maximum connectivity with the locals for delivering my research outputs to them towards empowering the conservation efforts for gibbon and their habitat in NNP. This is not possible without sufficient funds, as most of the peoples are residing in remotest part where no modes of transportations are available. Moreover, the cost of living, field expenses and labour cost are too high because of remoteness and less employment opportunity available to the locals. So, the need for seeking grant from you is quite obvious for continuing my research which will generate a lot more outcomes for the long term conservation initiative programs within the park area.

Tentative Proposed Budget in Swiss Franc (CHF): 1 INR= 68.808 CHF (as on 14th April, 2014)

A. Capital equipment cost / one-time cost (Non-Recurring Costs)

Head	Quantity	Unit	Rate	Total (CHF)	Remarks
Equipments					
Digital Camera	1(one)		871.99	871.99	The specified equipments are already available in my Department so, I am not going to include this amount in the total amount requested.
Handy camera	1(one)		654.00	654.00	
Solar Powered battery	2(two)	87.20/unit	174.40	174.40	
Binocular	1(one)		87.20	87.20	
Vernier Caliper	1(one)		72.67	72.67	
GPS	1(0ne)		290.66	290.66	
Field Tent	2(one)	145.33/ unit	290.66	290.66	
Field Accessories (Rucksack, Raincoat, shoes, etc. measuring tape)				145.33	
Total one-time cost: 2,586.92 CHF					

B. <mark>Recurring costs</mark>

Head	Quantity	Unit	Rate	Total (CHF)	Remarks
Honorarium :					
Field assistant	1 (one)	6 months	87.20	436.00	As the study area is situated at a very remote place so, I will appoint a field assistant for providing me help during my field data collection and other technical help
Field Expenses:					
Travels	04 to and fro trips	A total of 04 trips to and fro (75 days per trip)	145.33 per trip	581.33	To reach the field site vehicle will be hired wherever no other mode of transportation is available and to reach the remote areas of the park porters will also be hired.
Accommodation		10 month	43.60/month	436.00	The stay in the field as well as local accommodation has to be managed from this budget head.
Fooding		10 months	174.40/month	1,743.99	This budget head is the most crucial as due to the remoteness of the field site we will have to purchase our own ration in advance for the total period of the field stay.
Capacity Building Awareness Programme:					
Education Material preparation (Poster, Fliers, etc.)				145.33	This budget head will be used for preparation of education materials and other related cost
Meeting and field Education Program		3 (three) programs	87.20/program	261.60	This budget head will be used for organizing field meeting and education program. Wherein this cost will be fully utilized for successful completion of this conservation

					initiative.
Contingency					
(Communication, Printings, Labour Charges)				436.00	This budget head is also very necessary as because it will be used for the publishing of the project work at both local as well as global level. Moreover, sometimes we will need some extra manpower to run our work smoothly. For this Porters will be engaged @ rate 4.36 CHF/per day.

Total recurrent cost: 4040.5 CHF = 278,018.00 INR.

Total amount requested (INR): Only <mark>recurring cost</mark> has been included in the requested amount.

4040.5 CHF = 278,018.00 INR.