



Celebrating 100 Years of Forestry Research in Madhya Pradesh



INTERNATIONAL CONFERENCE

on

“Wildlife Conservation: Emerging Scenario and Way Forward”

Kanha Tiger Reserve, Mandla (M. P.)

27-29 April, 2023

Proceeding



Organized by



Madhya Pradesh Forest Department, Bhopal

&

State Forest Research Institute, Jabalpur

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Background of the International Wildlife Conference-2023

The state of Madhya Pradesh is also known as the "Heart of India", is located in central India, with a total geographical area of 3,08,252 km². The state is rich in forest with a Recorded Forest Area (RFA) of 94,689 km², of which 61,886 km² falls under the category of Reserved Forests, 31,098 km² is classified as Protected Forest and 1,705 km² is un-classified Forests. This state is also known as the wildlife state of the country with 24 Wildlife Sanctuaries and eleven National Parks and there are ample opportunities for nature lovers, environmentalists, and wildlife enthusiasts to spot wildlife amidst their natural habitat.

Madhya Pradesh has played an important role in India's wildlife conservation programs at a time when many wildlife species are currently on the decline, and it has the distinction of having the largest tiger population in the country. The region has the highest population of leopards within the country and also harbors populations of endangered vultures and the 'endemic' crocodile-gharial. Madhya Pradesh has done a pioneering work in successfully increasing the population of the highly endangered Barasingha and reintroducing the Indian Bison (Gaur). In this way Madhya Pradesh Forest Department has been protecting the natural system and habitat for wildlife for the last several years. Recently, an ambitious project to reintroduce cheetahs to the Kuno-Palpur National Park in Madhya Pradesh has been initiated by the launch of the Trans-Continental Wild Cheetah Rehabilitation Program by the Honorable Prime Minister of India, Shri Narendra Modi.

Madhya Pradesh has a good tradition of scientific management and conservation of wild animals *viz* tigers, leopards, crocodiles, and vultures in the country. In these glorious achievements, the guidance and contribution of the Honorable Chief Minister of the State, Shri Shivraj Singh Chouhan have been very important. On completion of 100 years of forestry research in Madhya Pradesh and according to the manifesto of Honorable Chief Minister, 03-day International Wildlife Conference was organized at Kanha National Park from 27 to 29 April, 2023. The objective of the said conference was to bring together wildlife experts, researchers and forestry experts, NGOs, and wildlife law experts together on a single platform, in which future strategies and policies were decided by discussing the current scenarios on wildlife management, conservation, and rehabilitation. Wildlife expert and Padma Bhushan Dr. H.S. Pawar and internationally renowned wildlife experts from America, Europe, South Africa and Namibia have ensured their participation. The main objective of this conference was to draw conclusions for ensuring progressive all-round development of the country by adopting strategies to merge



economy and ecology together as per the vision of Honorable Prime Minister of India in the Amritkaal of the Nation.

Conference Themes:

1. Wildlife Population Management
2. Wildlife Habitat Ecology
3. Wildlife Policy Issues and Challenges
4. Human - Wildlife Conflict and Mitigation Measures

Conference Date: April 27-29, 2023

About the Organizers:

This conference was jointly organized by the Wildlife Wing of the Madhya Pradesh Forest Department, Bhopal and the State Forest Research Institute, Jabalpur.

Wildlife Wing of Madhya Pradesh Forest Department

The Wildlife Wing of Madhya Pradesh Forest Department is headed by the Principal Chief Conservator of Forests (Wildlife) and Chief Wildlife Warden and it oversees implementation of policies and programs for Wildlife Conservation and Management in the State.

The Madhya Pradesh was the first State to enact the Wildlife (Protection) Act, 1972 on 25th January 1973, but the history of Wildlife Management in the State is even older than the State itself. The formal efforts to conserve the wildlife of this landscape began with the establishment of Kanha Sanctuary in 1933. Later, in the Post-Independence era the State enacted Madhya Pradesh National Parks Act in 1955, and later the Wildlife (Protection) Act superseded the above Act.

As per the provisions of the Wildlife (Protection) Act, 1972, Madhya Pradesh State has notified 11 National Parks and 24 Wildlife Sanctuaries. The State has six Tiger Reserves (combining parts of National Parks and Wildlife Sanctuaries) namely Kanha, Pench, Satpura, Bandhavgarh, Panna and Sanjay.

Out of the 11 Indian Global Priority Sites for Tiger Conservation identified by IUCN, six sites are in the Central Indian Landscape. The Tiger Reserves of Madhya Pradesh and their adjoining Landscapes form major part of these sites.

State Forest Research Institute, Jabalpur

The State Forest Research Institute, Jabalpur (SFRI) came into existence on 27th June, 1963 for the scientific development of forestry sector in the state of Madhya Pradesh following the



recommendations of tenth Silvicultural Conference held at Dehradun in 1961. It was granted autonomy by Madhya Pradesh Forest Department on 29th October, 1994 and was registered on 2nd August, 1995 as a society under M.P. Societies Registration Act 1973.

The institute, during its pre-autonomy stage (1963-1995), won laurels for its commendable accomplishments in developing technologies for the introduction of fast-growing exotic tree species like Eucalyptus and tropical Pines to supply raw material to the paper and pulp industry; eco-restoration of stress sites, such as hard lateritic soils, waterlogged areas and mined out areas of bauxite, coal, iron ore, dolomite, limestone, etc; establishment of a network of seed production areas and seed orchards; developing facilities for soil testing, seed testing and certification; building up of a rich herbarium and development of a botanical garden, including a bamboo setum, preparation of growth and yield tables; conducting species and provenance trials; developing nursery and planting techniques of miscellaneous species; developing non-destructive harvesting techniques of gums, resins and medicinal plants, etc.

Over the years the institute has developed as an educational, training, research and consultancy organization at the state and national level and is carrying out adaptive and applied research programmes.

The Board of the Governors (BOG) of the institute, in its meeting held on 11-01-2022, reorganized the Institute into Forestry and Wildlife Departments to perform the scientific functions. The forestry department of the institute comprises six Divisions viz Biotechnology, Productivity, Conservation, Forest Utilization, Forest Management, and Socio-Economic. The Wildlife Department was reconstituted into four Divisions namely, Animal Ecology, Ecotourism and Conservation Education, Habitat Ecology and Wildlife Management.

The wildlife research in the institute was initiated in the year 2015 with the constitution of Wildlife Branch. The selected research personels of the institute underwent training at the Wildlife Institute of India, Dehra Dun and thereafter ventured upon various research projects related to Wildlife Population Estimation, Habitat Evaluation and Training of field foresters regarding wildlife monitoring and census. The institute played a vital role in All India Tiger Estimation in the state of M.P. The institute was declared as the Nodal Agency for conducting all types of wildlife research in the state by the M.P. Forest Department.

Venue of the conference

The conference venue was amidst the picturesque landscape of globally renowned Kanha Tiger Reserve, located in Mandla district of Madhya Pradesh (Coordinates 22°20'0"N 80°38'0"E). Kanha is nestled in the Maikal range of Satpuras in Madhya Pradesh that forms the central Indian highlands, that proves to be the most inspiring place for the nature lovers. With tropical based



climate, summers at Kanha are so rigorous to be reached up to 43° C but the central highland area of Madhya Pradesh is also uniquely being doused with heavily monsoon pours with the average rainfall of 1800 mm to make the surrounding more scenic and greenish. On the contrary, winters can be found more shivering in the dense jungles of Kanha to drop the mercury level by -2°C. The Kanha Tiger Reserve is reckoned as the perfect habitat for large number of herbivores and carnivores. It is the only location in India where the most endangered antelope variety of Hard ground Barasingha can be found and so called "Jewel of Kanha".

This Tiger Reserve is considered as one of the finest wildlife areas of the world. Spreading across two revenue districts of Mandla and Balaghat, the Kanha National Park was declared as Reserved Forest in 1879 and thereafter as a Wildlife Sanctuary in 1933. Its status was further upgraded to a National Park in 1955 and declared as Tiger Reserve in 1973 along with eight other Tiger Reserves in different parts of India. Presently, it spreads over an area of 1945 km².

Kanha provides lots of hotels and resorts in its vicinity where the visitors can avail accommodation amidst the serene, calm and composed natural ambience of the virgin forest comprising of Sal and other miscellaneous species along with vast stretches of meadows, grasslands and water bodies.

Preparatory phases of the Conference

The project proposal of the conference was submitted to Principal Chief Conservator of Forests, Wildlife, M.P. Forest Department for approval in October, 2022. The project was approved and the fund to organize the conference was released by APCCF (Research, Extension & Lok Vaniki), M.P., Bhopal. Thereafter three committees were constituted to plan and execute various activities of the conference. The Organizing committee was headed by Shri Ramesh Kumar Gupta, PCCF & HoFF, M.P., the Technical committee headed by Shri Amitabh Agnihotri, PCCF & Director, SFRI, Jabalpur and the Logistic committee headed by Shri Pushkar Singh, PCCF & MD MPMFP Federation, Bhopal. A series of meetings were held after constitution of the committees to decide the course of action to be taken to organize the conference.

The functions of the organizing committee were to provide necessary guidelines about each and every aspect of the conference in coordination with the Technical committee and the Logistic committee. The Technical committee was entrusted with the entire works of all the technical issues pertaining to the conference. An internal executive committee was constituted by the Director, SFRI and Chairman of the Technical Committee comprising of Forest Officers, Scientists, and Senior Research Officers to prepare of the brochure of the conference and its wide circulation through correspondence, electronic, print and audio - visual media. The committee formed a team of coordinator, co-coordinator and an associate for all the four themes of the



conference. Correspondence was then made through email and social media with all the prospective participants, institutions, Universities, wildlife experts, wildlife wing of all the States of the country and with renowned international wildlife experts for submission of abstracts for research papers poster presentations.

An overwhelming response was received from within the country as well as from abroad regarding submission of abstracts from the experts, wildlife professionals, ecologists, policy makers, students and other stakeholders. The abstracts received were systematically documented and sent to the coordinators of various themes by the theme associate for review and comments. The accepted abstracts were then categorized into the oral and poster sections. The authors of the selected abstracts and articles were then informed accordingly for registration and their confirmation of participation in the conference (**Annexure 1**).

A detailed minute to minute programme schedule of various sessions was then prepared for the smooth conduct of the entire three days conference activities (**Annexure 2**). The programme schedule contained the names of various executives *i.e.*, the session host, the rapporteurs, chair and co-chair and session associate.

The conference brochure, conference logo, banner, invitations, participants badge, compendium of an odyssey of 100 years of forestry research, and a book of abstracts (**Annexure 5**) were designed and got printed. The conference kit was selected and procured for the participants. A memento was also prepared to commemorate the conference and for honoring the invited eminent wildlife and forestry experts. The artists for cultural function of the conference were selected and invited after consultation with the Sanskrati Sanchanalay, Government of M.P., Bhopal.

The Logistics Committee of the conference was assigned the works pertaining to the arrangements of the conference venue, transport and accommodation of the delegates, facilitation for necessary provisions of technical manpower and equipment during the sessions, arrangement of food and beverages, photography and videography, medical facilities and jungle safari.

Conference activities

The Executive Committee of SFRI, Jabalpur reached the venue of the conference on 26th April, 2023 and assisted the park authorities engaged in arrangements of the conference, in installation of banners at different venues of the sessions, posters and providing the conference kit to the participants.

The conference was inaugurated on 27th April, 2023 in the Conference Hall of the Celebration Van Vilas at Kanha.



Introductory Session

Speaker: Dr. Anish Andheria, President, Wildlife Conservation Trust, Mumbai

Topic: Joining hands for wildlife conservation

Dr. Anish Andheria shared his wildlife experience of Maharashtra with the participants. He opined that if more areas are not developed as wildlife habitat wherever there is over population of wildlife, be it herbivores or carnivores, certainly there will be incidences of Human-Wildlife Conflicts.

He enlightened about the nature of wild stag that always looks for new territories once then is another made in the herd. Therefore, they often come out of the forest and look for new space outside, that results into conflicting situations.

Therefore, when this is the reality then all efforts should be made to explore the possibilities of creating corridor connectivity with adequate measures for their development and maintenance regularly. He also stressed upon community involvement with the corporate for all round development of the area to avoid minimum conflicts between humans and animals. Novel approaches should be adopted for increasing the protected area with relocation of human habitations of the area with proper care of those rehabilitated for a win - win situation.

Speaker: Dr. J. S. Parihar, Former Dy. Director, Space Applications Centre, ISRO, Ahmadabad

Topic: Role of geospatial technology in wildlife conservation.

Dr. Parihar gave an overview about remote sensing and geographical system. He gave an account of the beginning of the remote sensing when people tried to go up in hot air balloons and started taking aerial photographs of areas to take stock of the situation in a better way which could not be possible from the ground.

He elaborated upon the techniques to use the data of remote sensing and geographical information system in habitat management, fire incidences monitoring, management of water bodies and forest degradation. However, he strongly emphasized that all the data collected by means of remote sensing must be verified by ground-truthing, otherwise it will be hypothetical and may not be reliable.



Inaugural Session

Session Host : Dr. Samita Rajora

Theme Rapporteurs : Dr. Ankur Awadhiya & Shri. Adarsh Shrivastava

Session Associate : Shri Anirudhwa Sarkar

S. No.	Title	Author/Presenter
1	Joining hands for Wildlife Conservation	Dr. Anish Andheria, President, Wildlife Conservation Trust (WCT), Mumbai
2	Role of Geospatial Technology in Wildlife Conservation	Dr. J. S. Parihar Dy. Director, Space Applications Centre, ISRO, Ahmedabad

Dr. Kunwar Vijay Shah, Honorable Forest Minister, Government of M.P., Dr. Dhal Singh Bisen, Honorable Member of Parliament Balaghat, Shri J.N. Kansotiya, Additional Chief Secretary Forest, Government of M.P., Shri Ramesh Kumar Gupta, Principal Chief Conservator of Forests and Head of Forest Force, Madhya Pradesh, Shri J. S. Chauhan, Principal Chief Conservator of Forests, Wildlife and Chief Wildlife Warden, Shri Amitabh Agnihotri, PCCF & Director, State Forest Research Institute, Jabalpur and Senior officers of M.P. Forest Department were present during the inaugural session.

Shri S. K. Singh, Field Director, Kanha Tiger Reserve welcomed Dr. Kunwar Vijay Shah, Honorable Forest Minister Government of M.P. and Dr. Dhal Singh Bisen, Honorable Member of Parliament Balaghat with a plant sapling. The Field Director Kanha Tiger Reserve also welcomed Additional Chief Secretary Forest, M.P, Principal Chief Conservator of Forests and Head of Forest Force, M.P, Principal Chief Conservator of Forests and Chief Wildlife Warden and PCCF & Director, State Forest Research Institute, Jabalpur with plant saplings.

Address by Shri Amitabh Agnihotri, PCCF & Director, State Forest Research Institute, Jabalpur

The Director, State Forest Research Institute, Jabalpur, in his speech informed that on this very day Madhya Pradesh has completed 100 years of forestry research. He informed that a century ago, on this date in Madhya Pradesh the Silviculture Division was established. Coincidentally 50 years ago the launch of Project Tiger was done in the Kanha Tiger Reserve, on this day and it also happens to be the golden jubilee occasion The Project Tiger.

Further he said that the State Forest Research Institute, Jabalpur, since its inception has worked as per the expectations of M.P. Forest Department and has successfully completed all the



assignments and research projects allotted by the forest department. He said that the institute has always been active in the direction of discovering new techniques of wildlife conservation and implementing them in field. Similarly, in the field of forestry conservation also the Institute has successfully completed the targets allotted to it.

The techniques developed by the State Forest Research Institute, Jabalpur regarding wildlife population estimation is being successfully used in the management of forest and wildlife. The Director, State Forest Research Institute emphasized upon Holistic look and fresh look regarding forest and wildlife management and suggested to consider the following three points: -

1. How we were doing.
2. How we are doing.
3. How we will be doing?

He believed the forestry professionals need to continuously improve the working method and adopt various advanced techniques while learning from the past experiences. He said the State Forest Research Institute is fully aware to this situation and is always every day to provide standardized solutions to the management problems being faced by the forestry professionals. Emphasis was laid upon the following points: -

1. In order to successfully ensure the protection and promotion of forests and wildlife, it is very important to involve the local community in the entire process, both financially and emotionally.
2. It is necessary to respond effectively from time to time to the challenges and failures that is encountered in the field of wildlife and forest conservation.

After his address the "Life time achievement award" was conferred to senior retired officers of M.P Forest Department Shri. H.S. Panwar and Shri J. J. Dutta.

After receiving the award Shri H. S. Panwar, shared his experiences gained during his tenure as Field Director in Kanha Tiger Reserve. He spoke at length about the works done by him and his emotional attachment towards Kanha National Park.





Plate 1: Glimpses of Inaugural Session

Address by Shri J. S. Chauhan, Principal Chief Conservator of Forests, Wildlife and Chief Wildlife Warden

Shri J. S. Chauhan, Principal Chief Conservator of Forests, Wildlife and Chief Wildlife Warden in his speech narrated about the natural beauty of Madhya Pradesh located in the center of India. He said that Madhya Pradesh is fortunate enough because management of its forest and wildlife areas has been relentlessly done by highly competent and dedicated forest officers and staff at all levels, due to which M.P. has been able to complete the tasks of conservation and



promotion of wildlife in various National Parks and Sanctuaries. The Protected Areas of M.P. is an excellent network which comprises of 11 national parks and 26 Wildlife Sanctuaries in the state. It is also a matter of pride that Kanha in Madhya Pradesh is one of the first five Tiger Reserves initiated in the country.

He further said that while performing various duties in conservation and promotion of wildlife, there is a learning experience every day for all the officers and employees which increases day by day and the refinement in managing forest and wildlife is a continuous process. Shri Chauhan sharing his experiences informed that he had the good fortune of working as Field Director in Kanha for a long time. It was also his good fortune that while working in the field of wildlife, he got a lot of freedom to work, due to which he could successfully implement various schemes of the government for the welfare of wildlife in Kanha National Park.

He said that it was both an honour and privilege to have Dr. M. K. Ranjit Singh the then Collector of Mandla and Padma Bhushan Shri H.S. Panwar, the then Director of Kanha National Park to be amongst the delegates of the conference. He further deliberated upon and said that it is not appropriate to encourage tourism at the cost of conservation in protected areas. While promoting or conducting any tourism related activities in protected areas, it is necessary to take full care of the interest and welfare of the local community. Unless the people of the local community are actively and emotionally involved in the work of wildlife conservation in the protected areas, it will not be possible to implement and achieve the objectives of any conservation program successfully. In this context, it is very important to keep in mind the Man-Animal Conflict. It is necessary to keep rescue squads trained and active in all the protected areas of the state. He added that the work of rescuing and releasing an orphaned tiger was also first started in Kanha National Park.

Address by Shri Ramesh Kumar Gupta, Principal Chief Conservator of Forests and Head of Forest Force, M.P.

The Principal Chief Conservator of Forests and Head of Forest Force, M.P. in his address discussed the problems of the field of wildlife management. He talked about how the relocation of villages from protected areas are difficult in the field of wildlife management. Accepting this big challenge, the Forest Department has relocated several villages spread over an area of about 70 thousand hectares. He emphasized the need for participation of the local community in wildlife management and forest protection. He informed that 30 percent of the total tiger population of India is found outside the protected areas, therefore, it is very important to protect the forests located outside the protected areas for the conservation and promotion of the tiger. He strongly



believed that there is a need to assess as to what has been the achievement in the field of community participation to achieve the goal of conservation of forests and wildlife.

He made the house aware that according to the policy of the state government, one-third of the entrance fee received from the National Parks and Sanctuaries is shared with the concerned eco-development committees. Similarly, there is a provision of giving 20 percent of the income received from tree felling received in the buffer areas of the National Park to the concerned committees. Similarly, there is a provision to give 100 percent income generated from intermediate tree felling to the local community. Hundred percent of the income from ten dupatta collection is given to the local collectors. With the help of these provisions available with the state government, community participation can be used successfully in conservation and promotion of wildlife.

Address by Shri J.N. Kansotiya, Additional Chief Secretary (Forest) Government of M.P.

The Additional Chief Secretary emphasized for inclusive approach towards management of forest and wildlife. It was clarified by him that in the conservation and promotion of wildlife, as long as the local communities who depend on forests for their day-to-day needs are not taken into confidence, it will not be possible to implement any such schemes successfully. He further enlightened that about 28 percent of Madhya Pradesh tribal communities who resides near the forest areas, are below the poverty line and on the contrary, the poverty is lesser in Madhya Pradesh where there is no forest.

This means that preservation of nature and its success was at the cost of the local community. Therefore, it is vital that such tribal communities living near forests whose dependence on forests was disrupted due to the formation of National Parks and Sanctuaries, should be actively involved in the conservation and promotion of forests and wildlife with employment so that they do not feel that their means of livelihood have ended after the creation of National Parks and Sanctuaries.

He suggested that whatever hotels and resorts which are being operated in and around all the National Parks and wildlife Sanctuaries must employ the staff working in them must be taken from the local community.

He expressed that if Ecology, Sociology, Forestry and Economics are taken together as an inclusive approach, only then it can be hoped that wildlife can be conserved and protected.

Address by Dr. Ramakant Panda, renowned cardiologist

Padma Bhushan Dr. Ramakant Panda, a renowned cardiologist has a passion for



conservation of nature and is also a Naturalist and Wildlife Enthusiast. In his speech he said, he has dedicated his entire life in the field of heart care and during his leisure time he has visited several National Parks and Sanctuaries located almost in all the regions of the world, but the diversity of forests and wildlife which is available in India is not found in any other region of the world. He said that in the last four decades there has been a revolution in the field of technology and this advanced technology can be successfully used for the promotion and protection of wildlife. Today, various activities that are going on in National Parks and wildlife Sanctuaries in our country, can be conducted from a remote distance and can be monitored accurately which was not possible earlier.

Address by Padma Bhushan Shri H. S. Panwar, Retired Principal Chief Conservator of Forests

Padma Bhushan Shri H. S. Panwar, retired Principal Chief Conservator of Forests, refreshing his old memories, said that the Project Tiger was first initiated in 1973 in Kanha National Park. The Wildlife Protection Act was enforced in 1972 and the Project Tiger was implemented immediately in 1973 after the general assembly elections in 1969. At that time this phrase or idiom was quite popular "Save Tiger - Save Forest" which indicated that if a tiger has been conserved in a forest area, then the condition of forest was ideal with plenty of herbivores which is the tiger's pre-base. Shri Panwar said that Kanha has been his "Karma Bhoomi" and during his tenure in Kanha it has been his experience that if we ensure the presence of sufficient number of Tigers in the forest areas then it can be rest assured that the ecosystem is secured. He further recalled that in the year 1974-1975 the relocation of the villages located inside Kanha was initiated and by the year 1976 all the 07 villages were relocated outside the National Park.

Address by Dr. Dhal Singh Bisen, Honorable Member of Parliament Balaghat

Dr. Dhal Singh Bisen, Hon'ble Member of Parliament said in his address that 50 years ago the human population was very less and at that time there were abundance of forests. Due to the abundance of forests, wild animals were also available in large numbers. Till the year 1972, due to plenty of wild animals, permission was issued for legal hunting. Now due to the decrease in forest areas, the number of wild animals has also reduced to the level of their extinction. Therefore, the humans have to take several measures to save the wild animals. The villages are now being relocated outside the National Parks and Sanctuaries, which is indeed a great setback to remove any person from his place of birth, but today there is no option left.



The local communities who are being shifted from their birth place are also sacrificing for the conservation and preservation of wildlife. That is why it is necessary to relocate all the displaced local communities to a better place outside and provide all the facilities for their living. There is a need to bring awareness to resolve the Man-Animal Conflict amongst the villagers by the officials of the Forest Department. There is a need to educate the local communities living around the National Park and Sanctuary. The Forest Department has to face the anger of the local communities in case of attack on humans by wildlife leading to loss of life and injury to people, for which they also need to be trained. The forest land is required for development, but development as well as protection of environment must go together. Hence there is a need to strike a balance between the two. We have to save the forest as well as wildlife and also have to do development, therefore there is a need for an inclusive approach. He observed that the forest inside Kanha National Park is good, but the condition of the forest outside the park is not good which needs to be protected and the Forest Department should also pay attention to this.

Address by Shri Abhilash Khandekar, Senior Journalist

Shri Abhilash Khandekar, Senior Journalist, in his address emphasized upon preserving the biodiversity of the earth. He said that India is going to be the most populous country in the future, due to which there will be serious challenges to preserve the economy and environment. The need of land is increasing day by day for the sustenance of such a large population and along with this, the challenge will be to preserve the forests, spread over a large area in order to save the environment. We need land for highway, railway, metro and various dams, for which deforestation needs to be done. He wondered about what arrangements have been made for the local communities living around the forests, which are getting reduced in the day-to-day development works.

He observed that there is no indication of development of the socio-economic status and development being taken for these local communities, while conserving the natural resources and water. He further said that the utility of mountains, rivers and waters has been mentioned in our various mythological documents, Puranas etc. of ancient India. But the problem is that trees and wild animals do not vote. In such a situation who will take care of them in today's present situation, he remarked.

Today M.P. Forest Department has honored its old heroes, who have worked with lot of commitment to save the forests in the past. This sends a message that incidents of encroachment and illegal felling reported in Burhanpur, should not happen again. Water which is vital for human life which cannot be made, cannot be produced, is obtained from the nature and forests only. Open



land should not be left for the construction of houses. Percolation of water under ground is not happening due to which most of the rain water flows away and cannot be absorbed which requires serious thought and attention.

Address by Dr. Kunwar Vijay Shah, Honorable Forest Minister, Government of M.P.

Dr. Kunwar Vijay Shah, Honorable Forest Minister, Government of M.P. in his address, appreciated the efforts made by Shri J.J. Dutta and Shri H.S. Panwar in the protection and conservation of forests for which the forest department has felicitated them for their outstanding contribution. He expressed that these officers served as the foundation stones of the present-day forest on which the trees and wildlife are flourishing.

Mentioning about Padma Bhushan Dr. Ramakant Panda, he informed that Dr. Panda has done about 28,000 heart surgeries till date and said that he is not only an accomplished cardiologist but is also an ardent environmentalist and wildlifer. Speaking about his sympathetically approach towards poor he does heart surgeries for them free of cost once in seven days. He further informed that Dr. Panda is constructing a hotel in Kanha with his own money, whose profit will be distributed among the employees working in the Kanha National Park. In his speech, the Honorable Forest Minister emphasized that along with teak, 50 percent of other species have to be planted to maintain proper balance of the ecosystem. This is because the life of people and animals and birds are dependent only on the minor forest produce of the forest obtained from species other than teak.

Address by Shri Shivraj Singh Chouhan, Honorable Chief Minister, Government of M.P.

Shri Shivraj Singh Chouhan, Honorable Chief Minister, Government of M.P. mentioned in his online address that Project Tiger in Kanha in M.P. have completed 50 years and forestry research in the state have completed 100 years. He informed that till date 203 villages have been relocated for Project Tiger due to which 70 thousand hectares of forest land has been included in forest area. The Chief Minister proudly said that today M.P. is also known as Cheetah, Tiger, Ghariyal and Vulture State. He was of the opinion that if the earth is to be made habitable, then it is very necessary to save forests and wildlife.

He felt that earth is not only for humans, it is for all living beings. God has made the earth habitable with all favorable conditions to suit all the living beings. The principle of "live and let live" applies in this regard. It is not just a matter of welfare of wildlife only. The life of all living beings should be respected. All living beings have an important place in the religious texts as well. Lord Shiva's vehicle Nandi, Lord Vishnu's vehicle Garuda and Mother Narmada's vehicle have been represented as Crocodile and it is clear that trees, rivers and all animals have been given



equal importance in our Indian culture. Trees and mountains are also worshipped. This also shows their importance in human life. If rivers, mountains, trees and forests will all remain, only then humans will be able to survive. The work of conservation of forests and wild animals in M.P. is being looked after by the Forest Department of M.P. The forest area of the state is 10.23 percent of the entire country, in which an increase of 1480 km² has been registered. This is indeed a matter of great pleasure.

There has been an increase of 63 percent in the high-density forest, which has increased from about 4600 km² to 6400 km². Today M.P. In India has, six Tiger Reserves, 11 National Parks and 26 Wildlife Sanctuaries which are successfully fulfilling their goals of preserving forests and wildlife. Efforts have been made to pay special attention to the conservation of forest animals. We have empowered the forest committees and he himself plants three plants per day. With the blessings of Shri Narendra Modi, the Honorable Prime Minister, Cheetah has been reintroduced in the Kuno National Park, Madhya Pradesh. The Tiger has been successfully reintroduced in the Panna Tiger Reserve after its local extermination.

The work of conserving Ghariyal is going on in the Chambal Sanctuary of Morena. Restoration work of gaur or Indianbis on is being done in Bandhavgarh. Ghariyals and vultures are being effectively protected. Successful work has been done on the conservation of State Bird, the Paradise Flycatcher. The M.P Forest Department plants 4.5 crore tree saplings every year. The state government is resolute and determined to improve the standard of living of the forest dwellers.

Address by Shri Mangubhai Patel Honorable Governor of Madhya Pradesh: -

Shri Mangubhai Patel Honorable Governor of Madhya Pradesh in his on-line address expressed that it is a matter of great pleasure that in M.P 100 years of forestry research and 50 years of Project Tiger have been successfully completed. The Honorable Governor emphasized the need for the protection and promotion of wildlife. He said that no wild animal ever unnecessarily attacks any human being. He hoped that the findings and recommendations of this 03-day International Wildlife Conference organized in Kanha will suggest strategies as to how wildlife be conserved and protected in a better way. He recalled how within 15 minutes after a lion was killed in Sasan Gir, the current Prime Minister Shri Modi, who was then the Chief Minister of Gujarat, reached immediately to the site to assess the ground situation. Similar efforts are being made by the present M.P Government for wildlife conservation. Rehabilitation of Python in Satpura Tiger Reserve by the M.P forest department was complimented by the Honorable Governor.



Theme-1: Wildlife Population Management

Theme Coordinator	: Dr. H. S. Pabla
Co-Coordinator	: Mr. Kartikeya Singh Chauhan
Session Host	: Mrs. Rakhi Nanda
Theme Associate	: Dr. Aniruddha Majumdar
Theme Rapporteurs	: Ms. Puja Nagle and Dr. Abhay Sengar
Date	: 28/4/2023
Venue	: Hotel Aranyak, Kanha Tiger Reserve



Plate 2: Core team of Wildlife Population Management

Technical Sessions- Theme Wildlife Population Management

Perhaps for the first time ever, the subject of “Wildlife Population Management” was put up for discussion in a wildlife conference in India. The subject received overwhelming response from within India and abroad. The entries for oral presentations were selected based on their potential for direct application and influence in wildlife management in India. Others were requested to present poster papers. Based on the diversity of entries and the requirements of the conference, the proceedings were divided into five sessions as given below:

Session 1: Need for Managing Wildlife Populations in India.

Session 2: Indian Experiences in Population Management.

Session 3: Population Management in Protected Areas.

Session 4: Managing Wildlife Populations outside Protected Areas.



Session 5: Panel Discussion: Vital Questions and the Way Forward.

Technical presentations on the subject were made on 28th April and the proceedings were shared with the larger audience in a plenary session on 29th April, 2023. Copies of the abstracts received from the authors are enclosed as an Annexure to this report. A summary of the presentations and discussions on each topic is given below;

Entries in each of the sessions were as given below:

Session 1 : Need for managing Wildlife Populations in India

Chair : Dr. H. S. Pabla

Co-Chair : Mr. Kartikeya Singh Chauhan

Sr. No	Title	Author/Presenter
1	Introduction: Need for Managing Wildlife Populations	Dr. H. S. Pabla
2	Wildlife Populations in India: Where They Need Management	Mr. Qamar Qureshi
3	From Bane to Boon: Wildlife Challenges to Wildlife Opportunities	Mr. Mathen Mathew
4	Wildlife Population Management: Its all about the Grass	Mr. Les Carlisle

1. In the opening session, the delegates were welcomed by the session host. The theme coordinator, Dr. H.S Pabla informed the house that over 50 delegates were attending the conference and also briefed about the organisation and structure of proceedings. Dr. Pabla pointed out various reasons for which wildlife populations are actively managed across the world and that these reasons exist in India also. He emphasised that the need for the management of wildlife populations is likely to grow with time in view of the growing human - wildlife conflict and other reasons and that it was high time that India learns the fine art of population management.
2. Prof. Qamar Qureshi of WII gave a bird's eye view of the varied abundance of important species of wildlife in the country and pointed out areas of existing and potential conflict. He also referred to the "empty forest syndrome" pointing out that many forests outside PAs were bereft of any wildlife populations, most probably due to heavy poaching pressure.
3. Mr. Mathen Mathew talked about management of wild ungulates and carnivores, how to address rural and farmer distress, mitigate human-wildlife-conflicts, community involvement – especially indigenous people, make wildlife economy part of the rural community, hunting should be part of wildlife population management, sustainable use of



natural resources, and meat from harvested animals to be used to address protein deficiency.

4. Mr. Les Carlisle mentioned that the principle of wildlife management is essentially “All about The Grass” and establishment of the ecological carrying capacity is the basis for management actions. Animals of any species can be added or removed as needed from the system but the grass and the trees have to grow. “Conservation is complicated,” and it is directly affected by uninformed views and one-size-fits-all solutions suggested through social media channels that create public outcries. The concepts of “Conservation and Preservation” require different management actions and each will have economic, social and conservation implications. The concept of culling and sustainable harvesting from a population was discussed.

Session 2 : Indian Experiences in Population Management

Chair : Dr V.B. Mathur

Co-Chair : Mr. Alok Kumar

Sr. No	Title	Author/Presenter
1	Recovery of Reintroduced population of Gaur (<i>Bos gaurus gaurus</i>) in Bandhavgarh Tiger Reserve: Key learning	Dr. Parag Nigam
2	Recovery from the brink of extinction of the Hard ground sub-species of Barasingha (<i>Rucervus duvaucelli branderi</i>) through intensive, science-based management in Madhya Pradesh	Sh. J. S. Chauhan
3	Management of Spotted Deer (<i>Axis axis</i>) Population in the Protected Areas of Madhya Pradesh	Sh. Rajnish Kumar Singh
4	Management of spill over tiger population in human dominated landscape of central India	Dr. Akhilesh Mishra
5	Expansion of Cheetah Meta-population into India	Mr. Vincent van der merwe
6	Conservation Translocation to recover greater one-horned Rhinoceros (<i>Rhinoceros unicornis</i>) and Eastern Swamp deer (<i>Rucervus duvaucelli ranjitsinhi</i>) in Manas National Park, Assam	Dr. Rathin Barman
4	Using energetic for Wildlife population management: Case study from Manas Tiger Reserve	Dr. Ankur Awadhiya

1. Dr. Parag Nigam gave a detailed presentation on the translocation of Gaur from Kanha to Bandhavgarh, background of the project, habitat suitability predictions, field operations, key learnings in the recovery of reintroduced population of Gaur, study area, monitoring, population status, heard dynamics, recruitment and mortality rates, mean group sizes, network



statistics, home ranges and habitat use, and genetic structure of recovering gaur population. He recommended that the genetic study of the gaur population suggests that it would be ideal to bring some new individuals from a fresh genetic pool to supplement the population and increase the genetic variability. Additionally, efforts to improve and restore the functionality of the corridors connecting source areas like Achanakmar and others may help in movement of individuals that can contribute to the gaur population in BTR. Protection of existing corridors needs to be augmented and anthropogenic pressures reduced.

2. Sh. J. S. Chauhan talked on the return of the Barasingha, how Barasingha was on the brink of extinction, its present and past distribution, features of the animal, research findings which were not in favour of the animal, other research findings about the biology of the animal, management interventions in favour of Barasingha like habitat improvement, results of management interventions, last 55 years of population trends, initial efforts of their translocation, reintroduction of Barasingha to Satpura Tiger Reserve, techniques and equipment used, protection from predators, habitat improvement, natural dispersal of Barasingha in Satpura, post release monitoring, number of animals taken from Kanha to Satpura and their population dynamics till date, their recent reintroduction to Bandhavgarh Tiger Reserve.
3. Mr. Rajnish Kumar Singh elucidated management of Spotted Deer (*Axis axis*) population in protected areas of Madhya Pradesh using translocation as a management tool. He gave an overview of wildlife management in Madhya Pradesh, what is the need and approaches of spotted deer population management, challenges involved in translation of spotted deer, methods used and difference between passive capture and mass capture, detailed explanation of passive capture technique and how it is done and total number of chital translocated till date in M.P. He also mentioned how these translocations have resulted in an increase in the chital density in the newly created grassland sites and supporting carnivore recovery. He predicted that Satpura Tiger Reserve, Sanjay Tiger Reserve, Nauradehi Wildlife Sanctuary and Ratapani Wildlife Sanctuary may become more potential habitat after complete village relocation to harbour more tiger population. Also, regular reduction in chital density in high-density areas is likely to reduce the pressure on available habitat.
4. Dr. Akhilesh Mishra gave an overview of number of Tiger Reserves in M.P, the tiger numbers in the state, how occupancy of tigers has increased in the state over a period of time and tiger populations in various Tiger Reserves. He highlighted the facts about how the increase in tiger populations in human use areas and habitats with low wild prey densities were resulting in increase in cattle depredation and human casualties. This is a serious concern for the forest department, he added. Increasing cattle depredation trends by tigers in the state was shared during the presentation. People's intolerance of tigers in human landscape and frequent need



to rescue tigers from the non-protected areas to PAs were stressed by Dr. Mishra. Trends in tiger rescues in the state and the number of human deaths by tigers in Pench Tiger Reserve was discussed. He recommended that in order to manage the spilling over tiger population, that the same priority should be given to the management of wildlife populations outside PAs, as inside. The carrying capacity of tigers in all tiger bearing forests outside PAs should be determined and the population be actively maintained at or below this level. Tigers in excess of the estimated carrying capacity of tiger bearing forests outside PAs should be regularly shifted outside to keep their population at safe levels, without waiting for any human casualties to happen. A massive program of fencing human habitations in forested landscapes should be undertaken to minimize human-tiger conflicts. Most importantly, wildlife should be managed as a renewable natural resource, in accordance with all the international conventions which India is a party to, for the benefit of the people living in forested landscapes.

5. Mr. Vincent van der Merwe mentioned that between 2012 and 2023 the Southern African Cheetah Meta-population expanded from 217 individuals on 41 reserves to 524 individuals on 73 reserves. The Southern African Cheetah Metapopulation constitutes the only growing wild Cheetah population worldwide. This growth was achieved through a combination of (1) hard lessons learnt from 27 years of reintroduction failure (1965 - 1992), (2) predator-proof fencing to prevent cheetah escape from meta-population reserves and consequent human-wildlife conflict, (3) government support for the establishment of privately owned protected areas ($n = 65$), (4) the establishment of a robust wildlife economy supported by highly experienced wildlife veterinarians and game capture companies and, (5) the adoption of managed meta-population strategy with human-mediated relocations to prevent inbreeding, overpopulation and local extinctions on constituent reserves. In the presentation he discussed how India can learn from the initial mistakes made in South Africa, to ensure the successful establishment of a cheetah meta-population in India.
6. Dr. Rathin Barman spoke about translocation of 20 rhinos from CWRC Kaziranga to Manas by WTI, AFD and other partners. Twenty rhinos were translocated under Rhino Vision 2020 (wild to wild) by WWF, AFD and other partners. Forty rhinos were translocated to Manas under two different programmes. The Manas rhino population recovered from zero to 50+. In addition, 17 + 19 Eastern Swamp Deer were translocated to Manas since 2014. The Manas Swamp Deer population recovered from almost zero to 150+. More translocations of rhino and swamp deer are in pipeline.
7. Dr. Ankur Awadhiya presented a case of Manas Tiger Reserve where elephants were found to migrate using the routes that required lowest energy expenditure. He opined that wildlife corridors should be managed on the basis of this principle and the low energy routes should



be made safer and more attractive to animals by planting fruit bearing trees and other measures.

Session 3: Population Management in Protected Areas.

Chair : Dr. U. Prakasham

Co-Chair : Mr. S.S Rajput

Sr. No	Title	Author/Presenter
1	Elephant immune-contraception: Lessons learned	Dr. Dave Cooper
2	Physical and Mass Capture techniques	Mr. Grant Tracy
3	Mass translocation of Pachyderms	Mr. Kester Vickery

1. Dr. Dave Cooper highlighted lessons learnt from free ranging African elephants. The need for elephant population management and the options available for population control such as surgical, hormonal and immuno-contraception. He talked about the attributes of ideal contraceptive agent, whether it is GNRH vaccine or PZP vaccine and the equipment required for carrying out contraception operation and factors leading to success of such programs. He also discussed the avoidance behaviour by elephants and difficulties in capturing family groups. In conclusion, he stressed that the PZP vaccines are efficient, can be remotely delivered, reversible, no short-term deleterious effects, no changes in social behaviour, group integrity, affordable and safe in pregnancy, but cautioned that aversion to helicopters by elephants during the capture operations will hamper any future translocation.
2. Mr. Grant Tracy highlighted the importance of translocations as an important management tool. Different techniques have been developed, tried and tested over the years and factors that are crucial in success of such techniques were discussed. Various capture techniques like mass capture, passive capture, net capture, net gun capture, chemical capture was explained. How various techniques are carried out in field, important considerations, advantages and disadvantages of various techniques, equipment required and other important points were also discussed. He stressed the need for attention to details in transporting and offloading animals and dealing with unique situations.
3. Mr Kester Vickery gave an introduction of his enterprise which has more than 25 years of experience with more than 2,50,000 animals translocated over 40 different species till date. Their services involve wildlife capture and translocations, wildlife veterinary services, specialised capture equipment and logistics. Their impact is present in more than 18 African countries. He further explained why translocations are necessary, pachyderm translocation complexities and requirements, planning and preparation. He shared his experience in translocation of more than 3000 elephants, process of translocation, longest elephant



translocation attempted and more than 2000 rhinos translocated till date. The process and highlights including white rhino translocation from South Africa to Rwanda were shared.

Session 4 : Managing Wildlife Populations outside Protected Areas.

Chair : Dr. K. Sankar

Co-Chair : Dr. Latika S., Nath

Sr. No	Title	Author/Presenter
1	The consequence of recreational hunting to nature conservation	Mr. Jens Ulrik Hog
2	Wildlife Management in Africa	Mr. Charlie Jacoby
3	Community based wildlife management in Namibia	Mr. Uakendisa Muzuma

1. Mr. Jens Ulrik Hog argued that recreational hunting leads to nature conservation, inconvenient but it is true. If it pays it stays, he added. He informed that wildlife is making a comeback in Europe, number of hunters in Europe and across the world have increased over a period of time, and a greater number of trophy hunters are visiting Africa every year to contribute to its economy. He believed that animals are saved from extinction by wildlife ranching. For example, the Rhino species population trends have increased in South Africa due to wildlife ranching and resulted in wildlife economy contribution to the economy in South Africa. He further gave details of statistics of privately-owned hunting areas in South Africa. Mr. Jens was of the opinion that wildlife has to be used and it has to benefit the country's economy. Trophy hunting contributes to conservation and if anything pays, it stays, he opined.
2. Mr. Charlie Jacoby stated that the global public view of wildlife and livestock, as reflected in the media, falls into three main groups. Those who believe in the consumptive use of wildlife/livestock (C group). Those who believe in the non-consumptive use of wildlife/livestock (non-C group). Those who have few or no views about it (no-views group). He pointed out that, however distasteful trophy hunting, traditional medicine and other consumptive uses may be, as presented in the media, and especially to western politicians, they have the advantage of providing wildlife management that is free to the public purse and even earns tourism and tax in dollars. The APAC (African Protected Area Congress) concluded that the non-consumptive model of funding the setting up of a minimum level of protected national parks across Africa will cost US\$200 billion. With this in mind, the non-C group has so far failed to persuade politicians to diverge from what the non-C group claims is public sentiment. It remains likely that politicians will come down in favour of the 'earner'.
3. Mr. Uakendisa Muzuma argued that many protected areas (PAs) in Africa are small to support viable population of large carnivores and mega-herbivores. He informed that many PAs in Namibia are facing budgetary constraint and the community conservation in shared-landscape



plays a critical role by maintaining corridors for wildlife dispersal. Aligning policies and regulations with the current conservation and socio-economic needs is important, he further argued. Sustainable harvesting quota for maintaining wildlife population within the carrying capacity and local livelihood upliftment is critical for success and developing a wildlife conservation management strategy that is inclusive of local people inhabiting communal areas is critical for wildlife management, he added. He informed that the community - based natural resources management program (CBRNM) has achieved remarkable successes via sustainable harvesting through hunting, tourism and meat consumption and has encouraged the co-existence of wildlife and rural communities on communal land in Namibia. The monitoring of wildlife populations, human settlements, and livestock movement, setting area-specific mitigation measures are critical in mitigating conflict in the Namibia context.

With this, the oral presentations came to an end. The poster papers received under this theme are listed below. The audience visited the poster venue as and when possible and interacted with the authors at the venue.

Sl No	Title of the Poster Presentation	Poster presenter
1	30 by 30 and Wildlife Population Management – Best practices from Madhya Pradesh	Mr. Ankur Awadhiya
2	Evolution of new population estimation techniques for male blue bulls based on their unique defecation behaviour	Mr. Mayank M. Verma
3	Mass translocation of captive spotted Deer (<i>Axis axis</i> Erleben) through oral sedation method – Three case studies	Mr. Uday Homkar
4	Propensity to take risky decisions and spatial learning ability in the hatchery reared juveniles of a megafish, Deccan Mahseer (<i>Tor khudree</i>)	Ms. Apoorva Gopinath
5	Mass capture and translocation of Nilgai from croplands to protected areas: A case study.	Mr. Kartikeya Singh & Mr. Rajnish K. Singh
6	Ungulate population and grass forage production in Kanha Tiger Reserve, Madhya Pradesh	Mr. J.S. Parihar <i>et al.</i>
7	Functionality assessment of Ratapani Satpura corridor	Mr. Mayank Makrand Verma & Dr. Uma Ramakrishnan
8	Population dynamics of Tiger & Leopard at Kanha Tiger reserve.	Dr. Ujjwal Kumar <i>et al.</i>
9	Long-term monitoring of ungulates in Kanha Tiger Reserve.	Dr. Neha Awasthi <i>et al.</i>
10	Demography of a keystone species, “The Chital”.	Ms. Shravana Goswami <i>et al.</i>



Session 5: Panel Discussion: Vital Questions and the Way Forward.

The final session was divided into two parts. In the first part, a panel discussion on “Future of Wildlife Conservation in India: Vital Questions” was held and in the second part the group was asked to discuss and debate the potential recommendations for a wildlife population management strategy for India. The panel consisted of eminent Indian and foreign experts, namely:

1. Mr. Les Carlisle
2. Mr. Charlie Jacoby
3. Dr. Y.V Jhala
4. Sh. J.S Chauhan.

The panellists were asked to express their opinions on the following questions:

- Should India aim for conservation of wildlife or just preservation?
- With people and wild animals pushing into each other’s territories, how do we keep people and animals safe from each other?
- Does wildlife have a better future in India as a renewable natural resource or as a holy burden primarily borne by the rural poor?
- For sustainable conservation, should wild animals be allowed to proliferate everywhere or only in designated PAs?
- How can big mammals (e.g., tigers, elephants) help in preserving wilderness that supports biodiversity and mitigates climate change? By annoying people through depredations or by supporting their livelihoods?

As expected, the foreign experts were in favour of active management of wildlife through fences, translocation and hunting. Dr. Jhala was favour of active management but was not supportive of extensive use of fences. Dr. Chauhan was against any notion of hunting and fencing. Interventions from the floor agreed with the need to manage wildlife populations but did not support the use of hunting as a population management measure.



Plate 3: Glimpses of Presentations under the Theme, Wildlife Population Management



Final recommendations on the issue of Population Management of wildlife

Summary of all sessions under this theme have been compiled and recommendations were drafted and discussed amongst the theme participants (Annexure 3). Based on the discussion and suggestion by experts, recommendations under wildlife population management theme are finalized and given below

1. Urgently build human resources and procure equipment and vehicles to manage the translocation of wild animals from problem areas and from high-density areas to low-density habitats.
2. The areas that are prone to crop raiding are around some tiger reserves, not all PAs. The damage by blue bulls and blackbuck is restricted to some areas in some districts where these animals live on the farmlands and village scrubs. Therefore, to know the true extent of crop damage and the species of animals involved in it, a state-wide study should be launched at the earliest. Once that is done, strategies for their management can be evolved easily.
3. Implement measures already known to solve the problem of crop raiding. Some states are successfully using solar power fences in farmlands to effectively control crop raiding. It is necessary right now to promote such a measure by providing villagers with subsidized power fences and training for their maintenance and upkeep. Mobilize sizable funds for implementing HWC management strategies.
4. Commission indigenous research and experiments on the use of contraceptives and sterilization to control the population of monkeys, langurs, and stray dogs, and the population of blue bulls and blackbucks residing around villages and farmlands should be launched zealously.
5. Every four years the government should ensure the estimation of ungulates in the entire state in PAs, territorial forests, revenue forests, and farmlands in villages to find out the areas sensitive to crop raiding and low prey density areas in PAs and corridors and implement mitigation strategies accordingly.
6. Manage tigers in human-dominated areas - As many notified tiger reserves in the country are bereft of tigers or inhabited by an unviable population of tigers there is ample scope for intra and inter-state translocation of tigers. Besides many states still have enough usable tiger habitats, these areas need to be mapped and secured by notifying them as any category of PA acceptable to the local people and translocating adequate prey species from some tiger reserves and farmlands. In M.P. there are total undisturbed huge habitats (645



sq. Km) like the proposed Omkareshwar National Park and areas like Loughur in Balaghat, besides several secure areas that have been recently identified and mapped in Madhya Pradesh using GIS technology.



Plate 4: Panel Discussion - Wildlife Population Management Theme



Plate 5: Group Photograph of Wildlife Population Management Theme



This report summarizes the deliberations of the International Wildlife Conference under the thematic area “Habitat Ecology and Management” held at Kanha National Park on April 28th, 2023. The participants included several eminent wildlife managers, wildlife ecologists, senior forest officers and field biologists. They deliberated on a wide range of issues including conservation and monitoring of wetlands, grassland and riverine habitats, management of invasive alien species, use of modern tools and techniques for monitoring of wildlife habitats. Altogether 13 papers were selected for oral presentations and eight papers were displayed as poster papers. The oral presentations included two keynote addresses, four Invited talks and seven Short presentations. In addition to the oral presentations six panellists were invited to share their thoughts on emerging issues, wise practices and way forward pertaining to wildlife habitat ecology and management.

The deliberations were divided into following Technical Sessions:

- Technical Session 1** : Ecology and Monitoring of Wildlife Habitats
Technical Session2 : Management and Restoration of Wildlife Habitats
Technical Session3 : Panel Discussion: Emerging Issues, Wise Practices and Way Forward in Wildlife Habitat Ecology & Management
Technical Session 4 : Compilation of final recommendations
Technical Session1 : Ecology and Monitoring of Wildlife Habitats
Chair : Prof. Mewa Singh
Co-Chair : Prof. Vinod Kumar

Sr. No.	Title	Author/Presenter
1	Welcome Address & Background	Dr. G.S. Rawat
2	Ecology & Monitoring Wetland ecosystems of India: An Overview	Dr. S.N. Prasad
3	Assessment & Monitoring of Grassland habitat of Kanha Tiger Reserve, Madhya Pradesh using multi- year remote sensing data	Dr. J.S. Parihar
4	Use of novel devices for Monitoring habitat use by wildlife and other ecological parameters - Case study from Madhya Pradesh	Dr. Ankur Awadhiya
5	Wildlife use of the forest connectivities in the Western Terai Arc Landscape	Sh. Nishant Verma
6	Riverine wetlands in the Ganga plains: strategies for conservation and sustainable management	Dr. Rajiv Sinha



7	Advance Geo-informatics based Suitable habitat for Asiatic Caracal in Madhya Pradesh, India: Towards initiating conservation	Dr. J.S. Parihar
8	Spatio-temporal habitat ecology of otters in the Bhavani-Noyyal River basin of western Tamil Nadu.	Sh. Ankit Moun
9	A typology framework to manage and restore dry tropical forests of Central India infested with invasive alien species	Sh. Rajat Rastogi
10	Discussion & Conclusion	Session Chair/ Coordinator

The first technical session began with the welcome address and background by the theme coordinator, Dr. G.S. Rawat. Following this, he handed over the floor to Prof. Mewa Singh and Prof. Vinod Kumar to Chair and Co-chair the session. Altogether, 8 presentations were made in this session. The first speaker, Dr. S.N. Prasad in his keynote address gave an overview on the “Ecology & Monitoring Wetland Ecosystems of India”. He gave an updated information on the inventory of wetlands in India, geospatial tools for mapping the wetlands, Citizen Science approaches to monitoring the wetlands and policy issues in the area of wetland conservation. He emphasized on the use of open-source geospatial tools for monitoring wetland habitats at four hierarchical levels of Panchayat, block, district and state. He also underlined the advantages of creating centralized spatial database the country with well-defined user privileges and with minimal outlay of financial resources.

Second presentation was made by Dr. J.S. Parihar on “Assessment & Monitoring of Grassland Habitat of Kanha Tiger Reserve, Madhya Pradesh “using multi-year (2016-17 to 2021-22) remote sensing data. He discussed the latest techniques of using multispectral, temporal satellite image of 10m spatial resolution for assessment of grass cover during various seasons. He also presented the case study on the use of beat level monitoring of above ground biomass based on 10-day composite (Dekadal) Normalized Difference Vegetation Index (NDVI) images. Further, he discussed the future prospects in the area of monitoring the grassland phenology, leaf area index and seasonal changes in above ground green biomass. He emphasized the need for long - term monitoring of grasslands in Kanha TR using a combination of ground-based studies coupled with RS and GIS tools.

Dr. Ankur Awadhiya made a presentation on “Use of novel devices for Monitoring habitat use by wildlife and other ecological parameters - Case study from Madhya Pradesh” and



highlighted the importance of suitable monitoring tools for wildlife habitat management. He highlighted the need for innovative approaches such as 'off-the-shelf' options and use of customized solutions like Autocam in recording habitat use and behavior of elusive and nocturnal species. He informed the house that Madhya Pradesh Forest Department has developed system for habitat monitoring using the modern tools such as Simply Fire, RS-GIS based fire maps, 3-d models, using neural networks and underlined the need for further advancements.

Next presentation was made by Shri Nishant Verma on "Wildlife use of the forest connectivity's in the Western Terai Arc Landscape". Based on the detailed field work he presented the encounter rates of tiger, leopard, and their prey in various corridors. Further, he suggested various strategies for management of corridors including prevention of causalities along railway tracks using advance alerting systems, etc.

Prof. Rajiv Sinha's pre-recorded presentation was screened. He spoke on the "Riverine wetlands in the Ganga plains: strategies for conservation and sustainable management". Major recommendations by Prof. Sinha were: Accurate wetlands delineation for baseline data generation is an important step towards restoration and rehabilitation of wetlands.

- A detailed basin – scale wetland inventory and a rigorous hydro geomorphic assessment are necessary for prioritization for restoration.
- Connectivity analysis for wetland management must be done to: 1. provide information about the existing water/sediment inflow-outflow pathways. 2. Aid in decision making regarding their management and restoration under proper socio-economic constraints.
- Hydro- dynamics and fragmentation of selected wetlands to understand the casual factors of degradation- natural (seasonal drying) vs anthropogenic (human encroachment).
- An integrated wetland management plan must be based on hydro geomorphic approach.

Next presentation was on "Advance Geo-informatics based suitable habitat for Asiatic Caracal in Madhya Pradesh, India: Towards initiating conservation". The lead author Dr. C. P. Singh could not attend the conference and the second author Dr. J. S. Parihar presented the research paper, focusing on use of artificial intelligence technology for habitat suitability identification and identified North western part of Madhya Pradesh like Morena, Bhind are the suitable habitat for Asiatic caracal, based on AI modelling.

Presentation on "Spatio-temporal habitat ecology of otters in the Bhavani-Noyyal River basin of western Tamil Nadu." Was made by Mr. Ankit Moun. His work was appreciated by the session-chair and other participants. He concluded that the regional environmental changes across



seasons are driving the spatio-temporal habitat usage of Smooth-coated Otter in the Bhavani-Noyyal River basin.

Mr Rajat Rastogi made a presentation on “A typology framework to manage and restore dry tropical forests of Central India infested with invasive alien species”. He gave an overview of efforts made in management of invasive alien species in India and suggested adaptive management approach to deal with areas suffering from multiple invasions and need for site specific standard operational procedures to deal with various invasive species. His presentation generated a considerable discussion among the participants.

Technical Session 2: Management and Restoration of Wildlife Habitats

Chair : Sh. D.V.S. Khati

Co-Chair : Dr. Faiyaz Khudsar

S. No.	Title	Author/Presenter
1	Assessment of habitat suitability for Hard ground Barasingha in Selected Protected Areas of Central India	Dr. K. Nayak
2	Securing wildlife habitats in PAs of Central India	Dr. R.P. Singh
3	Grassland Habitat Development in relocated village sites of Kuno- Palpur Wildlife Sanctuary, Madhya Pradesh.	Sh. R.K. Mishra
4	Grasslands of Wildlife Protected Areas of Central India: Ecological status and response to management interventions	Dr. R. K. Pandey
5	Fire: A versatile tool to manage wildlife habitats	Dr. H.S. Pabla
6	Discussion & Conclusion	Session Chair Coordinator

In this session five oral presentations were made. First presentation was made by Dr. K. Nayak on “Assessment of habitat suitability for Hard ground Barasingha in Selected Protected Areas of Central India”, Based on his detailed assessment of swamp deer habitat in selected protected areas of Central India he compared the habitat suitability for this species. He emphasized on the need for Habitat mapping for habitat management, management of water bodies and swampy areas, and enrichment of grasslands for Barasingha. He also deliberated that different models can be derived for certification of suitability of habitat for Barasingha, based on different parameters.

Two presentations were made on the restoration of village relocation sites. Dr. R.P. Singh



presented the case study on “Securing wildlife habitats in PAs of Central India” and discussed how the process for creating inviolate space for wildlife initiated and reached its target and resulted in successful development of grasslands in Satpura Tiger Reserve. This was followed by presentation by Shri Ravikant Mishra on “Grassland Habitat Development in relocated village sites of Kuno - Palpur Wildlife Sanctuary of Madhya Pradesh”. He discussed the vital role of grass survey for grassland conservation, plantation of native grass species and legume plants, site specific weed eradication and maintenance of planted grasses for next three years. He emphasized on rotational grazing pattern.

Next presentation done by Dr. R. K. Pandey on “Grasslands of Wildlife Protected Areas of Central India: Ecological status and response to management interventions.” He deliberated his work done on Kanha grasslands and enlightened the changes in grassland community structures after 20 years interval and the rate of weed infestation in the grasslands.

Last presentation was made by Dr. H. S. Pabla on “Fire: A versatile tool to manage wildlife habitats”. He gave a global overview on the use of fire as a tool for habitat management and also history of fire management in Indian forests. He observed that since the beginning of organized forestry, with focus only on timber production, nearly 300 years ago, and total fire exclusion became a standard practice in India, with varying levels of success. According to him, total fire exclusion has harmed as many species (even timber species) as it helped, due to their divergent habitat requirements and adaptations. Further, Dr. Pabla recommended long - term studies on the impacts of various types of fire (cool vs. hot, head fire vs. back fire) on vegetation and wildlife habitat. He also suggested that wildlife ecologists and managers need to review and contextualize Dr. Winson Trollope’s recommendations, on the use of fire for management of grasslands in India.

Poster Session- Oral presentation of all the research papers received under the theme could not be possible due to paucity of time. The Poster presentation session was also the part of technical sessions and remained open from 27th- 29th April 2023 during the conference. In this theme total eight posters were presented. Details of the same is given below: -

S.No	Title of the Presentation	Poster presenter
1.	Behavioural study of Bonnet Macaque (<i>Macaca radiata</i>) in metropolitan city of Bengaluru	N. Kushal & U. Anandhi Department of Zoology Bangalore University
2.	Evaluating the potential for reintroducing the endangered wild water buffalo (<i>Bubalus arnee</i>) in Central India.	Bora, J. <i>et al.</i> Wildlife Institute of India.



3.	Restoration of grasslands dominated by <i>Desmostachya bipinnata</i> in Kanha Tiger Reserve, Madhya Pradesh	Deshmukh et al. Kanha Tiger Reserve M.P. Forest Dept.
4.	Status, habitats and conservation prospects of the world's largest goat- Markhor <i>Capra Falconeri cashmeriensis</i> - in the Kashmir Himalaya, India.	Ahmad <i>et al.</i> Wildlife Trust of India, Noida U.P. (Mr. Sameer Khazir was the presenter)
5.	Status of anthropogenic grasslands at village relocation sites in Satpura Tiger Reserve, Central India	Anjana Rajput, Senior Research Officer, State Forest Research Institute, Jabalpur, M. P
6.	Assessment of Wildlife Habitat along Proposed doubling of Railway Line in Sanjay-Dubri Tiger Reserve, Madhya Pradesh	Aniruddha Majumdar, Scientist State Forest Research Institute, Jabalpur, M.P.
7.	Tiger occupancy in Ratapani-Kheoni Landscape: Reasons behind tiger presence in proximity of capital Bhopal, Madhya Pradesh	Mayank Verma & Satyadeep Nag State Forest Research Institute, Jabalpur, M.P.
8.	Critical Study of Resource Sharing Pattern Between Carnivores and Herbivores: Tiger Movement Area of Obedullahganj and Bhopal Forest	Ruhi Haque, ACF Obedullahganj M.P. Forest Dept.

Technical Session 3: Panel Discussion on Emerging Issues, Wise Practices and Way Forward in Wildlife Habitat Ecology & Management

Moderator: Dr. G.S. Rawat

S. No.	Title	Author/Presenter
1	<ul style="list-style-type: none"> Wetland habitats: Scientific data gaps, management issues and way forward Restoration and assessment of grassland habitats Management and control of Invasive Alien 	Sh. B.K.Singh, Dr. S.N. Prasad Prof. B.C. Chowdhary



	<p>Species</p> <ul style="list-style-type: none"> • Use of modern tools and techniques for monitoring of threatened habitats • Judicious use of fire for the management of wildlife habitat • Participatory approaches to habitat management in buffer zones and eco-sensitive zones • Management of bio-corridors 	<p>Dr. Jayant Kulkarni</p> <p>Dr. Khageshwar Nayak</p> <p>Sh. D.V.S. Khati</p>
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Key recommendations by the panelists and other experts –

In the light of recent state of the forest report (FSI 2021) the state governments need to review the changing status of forest cover in and around within the Tiger Reserves and PAs and develop appropriate strategies. In the name of forestry solutions to carbon mitigation the areas under savannah and natural grasslands should not be brought under plantation thereby negatively affecting the wildlife habitats.

For the low rainfall areas such as Madhya Pradesh, the state governments should take up ecological restoration of wetland habitats, Ramsar sites and river valleys in an integrated manner. Schemes such as Narmada rejuvenation under national river conservation programme, community-based ecotourism around wetlands under Prime Minister's **Amrit Dharohar Program**, a statewide new project on wetland i.e., **Save Wetlands and Indigenous aquatic resources of Madhya Pradesh (SWIM)**.

The state governments need to identify and restore the community owned grazing lands / multiple use zones using participatory approaches. Invasive alien species especially aggressive annual weeds will have to be treated aggressively, if possible, using species specific herbicides followed by sowing and forbs in the treated area.

For the management of bio-corridors site specific management plans should be developed jointly by the territorial and wildlife divisions and included in the working plan of respective forest divisions.

In-depth studies would be required on the impact of forest fires on sensitive species such as mouse deer, etc. who depend heavily on fallen logs and snags for raising their young ones. With the looming threat of changing climate many watersheds and micro-catchments are drying fast. Possible impacts of climate change on the flow of water, primary productivity and other habitat features need to be documented in various PAs.





Plate 8: Glimpses of Panel Discussion Session in Wildlife Habitat Ecology & Management

Technical Session 4: Compilation of final recommendations

Technical presentations on the subject were made on 28th April and the draft recommendations were presented by theme coordinator Dr. G. S. Rawat during the plenary session on 29th April, 2023 and suggestions were incorporated. The theme coordinator, Dr. G S Rawat finalized the recommendations of the theme and submitted for open discussion on WhatsApp group after the conference. In the WhatsApp group participants had given their comments on various issues and an open debate was initiated. The points emerged from the debate were incorporated in the final recommendations by the theme coordinator. The final recommendations are given below: -

Ecology and Management of Wetland Habitats

The wetlands are dynamic ecosystems from hydrological, ecological and biodiversity perspectives. Conservation agencies require frequent information and data on the biodiversity elements as well as from a perspective of habitat ecology. Hence, there is a need to initiate biennial monitoring of critical wetland habitats for all stakeholders following participatory approaches.



A hierarchical approach needs to be followed for establishment of baselines on wetlands for various states using appropriate tools including the open-source geospatial techniques such as HTMC, CSS, PHP Post GRE, for further conservation planning and possible policy formulations. Accurate wetland delineation for baseline data generation is an important step toward restoration and rehabilitation of wetlands. Hence, a detailed basin – scale wetland inventory and a rigorous hydro-geomorphic assessment are necessary for prioritization for restoration. Prepare integrated wetland management plans for various regions based on hydro-geomorphic approach.

Ecology and management of grassland habitat with special reference to Hardground Barasingha

Grasslands of Kanha are anthropogenic in origin and liable to change into woodland and forests in the absence of intervention or undergo retrogressive changes if overgrazed. These grasslands also suffer due to infestation by invasive alien species and coarse grasses such as *Desmostachya bipinnata*. This calls for intensive management and regular monitoring. Based on the recent past experience it is recommended that fawning grounds of Barasingha especially tall wet grasslands of Kanha should be managed by dividing the grasslands into 3-4 compartments and adopting 2–3-year rotational grazing by wild herbivores using temporary enclosures.

Parallel activities of weed eradication, sowing of palatable grass seeds and legumes for one or two seasons within compartments is recommended. Systematic documentation and observations on the relative performance of various grasses within the enclosures and various treatments will be required. Kanha has the distinction of having a tradition of long-term research and monitoring. However, baseline data on grassland communities, biomass productivity and seasonal use of various grasses from the past observations have been lost. Therefore, the park management needs to invest into more rigorous ecological assessment of finer grassland strata and impacts of various treatments.

Fire as a tool for habitat management

Several ecosystems such as grasslands, savannahs and deciduous forests have evolved under the regime of periodic fires. Such ecosystems, if brought under a changed regime of complete fire prevention, would result in accumulation of dead plant biomass thereby increasing the fire hazards or change in species composition. Therefore, complete fire prevention in such ecosystems would be neither achievable nor desirable. However, our understanding of its ecological impacts and ability to predict fire occurrence has been limited owing to lack of clear documentation and long-term experimental studies. Based on the deliberations of the session on fire ecology and



management, it was recommended that:

There is an urgent need to document the historical and current trends of fire incidences within PAs especially covering the dry deciduous forests and savannahs, setting up long -term fire experiments and developing standard operational procedures for the management of forest fires and wildlife habitats.

There is a need to initiate experimental studies on the impact of various burning regimes on grasslands and woodlands across different eco-climatic zones of the country in order to understand the ecology of fire in different habitats.

In the meantime, following the age-old wisdom and experience, it is recommended that all accidental and unintended fires must be controlled. Give light cool season burn to savannah type of habitats and woodlands every 3-6 years depending upon the fuel load and rainfall gradient. This will keep devastating fires out and will create habitat for the species which are obligate to grasslands and open habitats.

Contextualize Trollope's recommendations for Indian conditions and develop guidelines for prescribed fires. This would require identification of fire sensitive, fire resistant and fire hardy species and clearer documentation of increasers, decreases and invaders for various habitats.

Securing wildlife habitats through village relocations and eco-restoration

The state of Madhya Pradesh has made tremendous achievements in terms of securing wildlife habitats by successfully relocating the villages outside the protected areas. The process of village relocations has been very transparent based on mutual agreement between the local communities and management authorities. This has been possible due to enabling policies, adequate scientific backing and dedicated officers and frontline staff. Based on this rich experience it is recommended that:

The communities relocated to the new sites would require continued handholding and confidence building so that they become partners in conservation and human-wildlife conflicts are minimized in future. The relocated sites would require adequate financial resources for ecological restoration and development of wildlife habitats. Such sites could be developed for reintroduction / translocation of threatened species as already demonstrated by ongoing process in some of the PAs. The relocated village sites would require continued habitat management and monitoring through action research. Each site should have a clear perspective plan and funding to carry out these activities.



Management of forested corridors and riverine habitats

Recently created over-passes on wildlife corridors in Western Terai Landscape and in other areas of the country have had positive impact on the movement of wildlife across such corridors. It is recommended that regular monitoring of corridor areas especially after construction of overpasses should be done to observe the animal movement in the area. More efforts are needed to maintain these corridors by removing construction material and strict control on non-biodegradable waste and control of encroachment for agriculture and habitation on either side of over passes. The riverine habitats occupied by endangered species such as otters would require regular monitoring of species as well as habitat, control of free ranging dogs, removing the source of pollutants and protection of natural vegetation. Identification and mapping of critical habitats especially holts and feeding areas would be needed to check over fishing, poaching and for further conservation planning.

Use of modern technology / novel devices

Encourage use of modern tools and technology for assessment and monitoring of wildlife habitats, generating water and fire frequency maps, phenology and biomass productivity etc., ICT as well other tools e.g., Artificial Intelligence (AI) technology can be used to identify the habitat suitability, e.g., advanced AI models used for mapping suitable habitat for Asiatic caracal in the North western part of MP like Morena and Bhind. There is a need to revamp capacity building and human resource development in the area of wildlife ecology and ecological restoration in and around PAs.

Management and control of invasive species

In accordance with the National Wildlife Action Plan 2017- 2032, the Government of India has recently formulated a national policy and action plan for the management of invasive alien species in Indian PAs. It deals with identification and prioritization of invasive alien species, prevention and control, surveillance, reporting, and Institutional Mechanism for the Management of Invasive Species. The approval and implementation of the said plan is awaited. In the meantime, the state governments may consider formation of State Level Invasive Species Management Committees (SISMCs) and prepare species specific standard operation plans (SOPs) for prevention, control, and management of alien invasive within natural habitats including PAs, invasion hotspots and vulnerable ecosystems.

Dovetail eco-development activities and green skill development programmes in and



around PAs, following participatory approaches, so that heavily infested sites are managed and restored for sustaining ecosystem services, local livelihoods, and reducing human-wildlife conflicts, and promote regional cooperation for better surveillance and management of invasive alien species and coordinated knowledge-based system in the Indian subcontinent.

Follow a step wise action plan including planning, pre-removal, removal, post removal operations based on species life-history traits and ecosystem characteristics. Process documentation, replication and monitoring by dedicated teams would be essential.

Note: -After finalization of the recommendations, Dr. K. Nayak gave his comments and submitted to the Technical committee of the International Wildlife conference which is given in **Annexure 4**



Theme 3: Wildlife Policy Issues and Challenge

Coordinator : Dr H.S. Singh,
Co-coordinator : R. Sreenivasa Murthy
Theme Associate : Dr. Uday Homkar
Theme Rapporteurs : Mr. A.A. Ansari & Mr. Anupam Sharma
Date : 28/4/23
Venue : Celebration “Van Vilas”



Plate 9. Group photograph of delegates under the Theme: Wildlife Policy Issues and Challenge

PROGRAMME SCHEDULE -Technical Session Details

Session Host : Mrs. Bindu Sharma
Rapporteurs : Mr. A.A. Ansari and Mr. Anupam Sharma

Technical Session 1:

Chair : Dr. V.K. Bahuguna
Co-Chair : R. Shreenivasa Murthy

Wildlife policies and legislations are the integral part of the wildlife conservation. This involves governing land use, protecting habitats, hunting and trapping of animals, reptiles, birds and other fauna and their products etc. Practicing policy helps in achieving the goals that are intended to protect habitats, corridors and species from the danger of extinction. Also, wildlife



protection policies and legislations act from the local level to the international level. In the background of these facts, in the International Wildlife Conference entitled “Wildlife Conservation: Emerging Scenario and Way forward”, a theme - wildlife policy issues and challenges became a part of the conference.

All received abstracts were screened and meritorious abstracts were finalised by the theme co-coordinator and coordinator. Letters of invitation were sent to all selected authors for their presentation during the technical sessions held on 28.04.2023.

Based on the numbers of papers selected for presentation and lead presentations, the technical session was divided into two parts. In this theme, six lead speakers presented their papers. Additionally, eight oral papers were presented by scientists and naturalists for discussion.

In the opening session, delegates were welcomed by the Theme Coordinator, Dr. H.S. Singh. He informed the house about the theme, structure and proceedings of different sessions. About 64 delegates participated in the sessions of this theme at Van Villa Hall of Celebration Resort.

In opening session, the delegates were welcomed by the session host Mrs. Bindu Sharma. She gave a brief introduction of the presenters and their subjects/topics.

Mr. A. A. Ansari and Mr. Anupam Sharma were rapporteurs of the technical sessions. They prepared brief reports of all the presentations and discussions.

In the first technical session, three lead speakers and three oral research papers were presented.

S. No.	Title	Author/Presenter
1	Wild Life and Biodiversity Conservation approach: Current policy environment and the evolving trends	Dr. S.K. Khanduri IFS (Retd.) - Lead Speaker
2	Wildlife conservation in India: Prospects and problems	Dr. A.J.T Johnsingh - Lead Speaker
3	A Note on Tourism in Tiger Reserves of Madhya Pradesh	Dr. Suhas Kumar IFS (Retd.) - Lead Speaker
4	Coastal Regulation Zone Notifications- A legal tool to protect wildlife habitat in Coastal West Bengal.	Subhrajit Goswami
5	Proposed Socio-Legal changes as solution towards effective management of man-wildlife conflicts in Madhya Pradesh.	Anshuman Singh Advocate, High Court
6	Unlocking Protected Areas: A critical analysis of functioning of statutory bodies for wildlife conservation	Tanvi Sharma



Brief reports of the above presentations are given below:

1- **Dr. S. K. Khanduri**, IFS (Retd) talked on “Wildlife & Biodiversity Conservation Approach: Current Policy Environment & Evolving Trends. “He highlighted the following points:

- Wildlife or Forestry policy making cannot be made in Isolation; it should be integrated with other impacting sectors.
- Conservation strategy for areas outside Protected Areas should be made.
- Mechanism for revision of WPA Schedules, based on some objective parameters, should be devised.

Wildlife Census and Population Assessment should be made a regular feature

2- **Dr. A.J.T. Johnsingh** talked about “Wildlife conservation in India: Prospects and problems.” The following are the suggestions given by him:

- Growing and nurturing *Ficus* species
- Promoting ecologically sustainable species
- Free-ranging dogs (particularly Feral dogs) should be controlled.
- Cattle population should be managed, to prevent over-grazing and promote regeneration
- Ban the import of exotic fish
- Species which show vigorous growth in biomass can be grown to provide fuelwood for poor.

3- **Dr. Suhas Kumar**, IFS (Retd) expressed his views on ‘Extant Policies, Law & Management of Tourism in & around PAs & Forest Areas’ with the following suggestions:

- Buffer-Zone tourism should be totally managed by the locals.
- Set aside areas for Ecotourism; link them with local empowerment and livelihood.
- There should be a mechanism or system to monitor the impacts of tourism.
- PAs should declare some *No-Go Zones* wrt tourism.
- Garbage management in PAs

4- **Mr. Shubhrajit Goswami** an Associate Analyst in Legal Initiative for Forest and Environment (LiFE) presented his paper on “Coastal Regulation Zone Notifications” with the following observations:

- Threat to Horse-shoe crabs and Red Crab, due to CRZ violations
- Illegal construction destroying mangroves



- 5- **Mr. Anshuman Singh**, Senior Advocate M.P, Jabalpur High Court expressed his views on “Proposed Socio-Legal Changes as Solution towards Effective Management of Human-Wildlife Conflicts in MP”. The following points were suggested by him:
- Compensation for crop damage due to damage by wildlife should be the responsibility of the Forest Department.
 - Construction in wildlife corridors should be allowed only after approval of NBWL in consultation with NTCA as per section 38O (1)(g) of WPA.
 - Amendments in Forest Rights Act 2006 & Rules 2007 are required:
 - Satellite Data usage to be allowed to reject a wrongful claim over forest land
 - Include provision of **punishment** for public servant who has shown gross negligence or malafide intentions
 - Include “**Review**” provision: FRA land title to be cancelled if found that evidences/documents produced were wrong or insufficient or the claimant was ineligible
 - Include “**Revoke**” provision: In case land title owner is convicted of wildlife crime or any further encroachment
- 6- **Ms. Tanvi Sharma**, an associate analyst, Legal Initiative for Forest and Environment (LIFE) presented her paper on ‘Unlocking Protected Areas: A critical analysis of functioning of statutory bodies for wildlife conservation’.
- The presentation analyzed the trends in wildlife clearances in last five years, approvals (76.7%)/rejections (0.5%), diversions from Tiger Reserves (reducing), linear category of diversions, etc.
 - The presentation focused on the functioning of National Board for Wildlife and its Standing Committee which are statutory bodies formulated under the Wildlife (Protection) Act.



Technical Session 2:

Chair : Dr. Suhas Kumar

Co-Chair : Dr. Kaushik Banerjee

In the second technical session, three lead speakers and oral presentation of four research papers were made.

S. No	Title of the Presentation	Presenter
1	Wildlife Conservation Policy for India	Dr. C.N. Pandey IFS (Retd.) - Lead Speaker
2	75 years of wildlife policy and wildlife conservation issues in independent India, an analysis.	Mr. R. Shreenivasa Murthy, IFS (Retd.)- Lead Speaker
3	Principled Diversion of Forest Lands and Pragmatic Participatory Management of Forest Resources	Mr. Shahbaz Ahmad, IFS (Retd.)- Lead Speaker
4	Human-wildlife conflicts in India- A study of the emerging policy landscape.	Ms. Nimisha Chouhan
5	Human - wildlife conflicts with special reference to wildlife crime and requirement of law related to it.	Ms. Rekha Giri
6	MSTripES - an Adaptive Management Tool for Conservation.	Mr. Ashish Prasad
7	Leonine tale: Ecology, Economics and Politics of Conservation	Dr. Kausik Banerjee

Brief reports of the above presentations are given below:

1. **Dr. C. N. Pandey**, IFS (Retd) presented on “Wildlife Conservation Policy in India with respect to climate change”. Important points of his presentation are:
 - Need of policy with respect to impact of climate change on Protected Area and biodiversity rich areas.
 - Climate change adaptation in wildlife conservation
 - Grassland Mapping and Strategy for Grassland Protection.
 - Site of hospitality areas away from Pas
 - **Mr. R. S. Murthy**, IFS (Retd) talked about “75 years of Wildlife Policy & Conservation Issues in Independent India” with the following remarks: A good Land-Use Policy is a prerequisite for sustainable natural resource management.
 - Historical evolution of policies, legislations and action plans need to be done.
 - Provision of rights in/over area notified under section 18 & 20 of WPA should be rethought.
 - Preventive protection provision should be introduced.



2. **Mr. Shahbaz Ahmad**, IFS (Retd), Ex-Principal Chief Conservator of Forests & Chief Wildlife Warden, M.P delivered his talk on “Principled Diversion of Forest Land & Pragmatic Participatory Management of Forest Resources.” The main points of his presentation are:

- The question of the payment of NPV arises only after the decision to divert a forest land has already been taken i.e., NPV does not help in decision making.
- There is a need for a decision-making tool which may help to decide whether a forest land can be diverted or not. Checklist based tool for examining any proposal for diversion of forest land should contain; Biodiversity, Rehabilitation, Ecological Footprint, Carbon Emission, Carbon Budgeting. No diversion of any forest land or natural ecosystem should be permitted unless the proposal for diversion is able to steer through an approved checklist-based examination. Such a process and the components of the checklist be incorporated as a Proviso in the FCA, 1980.
- Village level JFM Committees are not viable bodies for independent ownership and management of large ecosystems. Forest department and the JFM Committees have to jointly manage the forest with different but compatible roles.
- Community Forest Resources (CFRs) settled as such under the Forest rights act be managed according to the JFM Resolution of the State.

3. **Ms. Nimisha Chauhan**, Ph.D. Scholar from Ashank Desai Centre for Policy Studies, IIT Bombay presented her paper on “**Human-wildlife conflicts In India-A study of the emerging policy landscape**”

- The presentation started with a briefing on current scenario of Human-Wildlife Conflicts, cost of conflicts, and then discussed about Mechanism addressed conflicts (Technical, Translocation, Structural, Cognitive, Compensation)
- Standing Committee of National Board of Wildlife (SC-NBWL) recommended/suggested the following (MoEFCC, 06 January, 2021): Payment of a portion of ex-gratia as interim relief within 24 hours; utilization of *Pradhan Mantri Fasal Bima Yojna* towards compensation against crop damage; and empowering gram panchayats in dealing with the problematic wild animals



4. **Ms. Rekha Giri**, Ph.D. Scholar presented her paper titled “Human wildlife conflict in reference to wildlife crime & requirement of law”. In her presentation, she made the following suggestions:

- Participatory approach: Active involvement of Village volunteers, women & school children.
- Regular workshops with media.
- In-house legal support system.
- Separate courts with specialized judges.
- Training & sensitization of prosecutors & judges.

5. **Mr. Ashish Prasad** from WII, Dehradun presented his paper on “MSTriPES - an Adaptive Management Tool for Conservation.” Highlights of his presentations are:

- MSTriPES (Monitoring System for Tigers- Intensive Protection and Ecological Status) uses GPS, and GPRS to collect information from the field, creates a database using IT-based tools, analyses the information using GIS and statistical tools.
- MSTriPES brings together law enforcement monitoring, ecological status monitoring and human-wildlife conflict in a single platform for evidence-based adaptive management, and better knowledge sharing.
- MSTriPES plays a crucial role in wildlife policy issues and challenges by providing accurate and real-time evidence for the wildlife crimes, illegal activities, human disturbances, ecological status of important species, and habitat parameters. This information is essential for designing and implementing effective conservation policies and measures.

In addition to above presentation during the third session, one more paper was presented by **Sh. Praveen Pardeshi**, IAS (Ret) from Capacity Building Commission on “Policy issues to manage the problem of plenty and endangered species and regions’ on special permission of theme coordinator. Main points of his presentation are:

- Eco-tourism, particularly in Buffer areas, should be entirely managed by the locals (ex. Tadoba)
- Home stays should be promoted (ex. Ladakh/Hemis)
- Lands of villagers living in and around the Protected Areas should be used in a fashion to grow trees so that they earn enough economic benefits from land-use and eco-tourism.



Thus, in total 14 presenters presented their theme/issues/papers in this theme as oral presentation.

Four scientists and naturalists presented their views in the form of poster presentations.

S. No.	Title of the Presentation	Poster presenter
1	Exploring the possibility of spiritual teachings to restore and strengthen the alliance between communities, managers, forests, and wildlife	Dr. Pooja Chourasia
2	Wildlife conservation need of the hour: A Survey	Mrs. Vidya S. Zope
3	Tiger Conservation Prioritization Units (TCPUs) in Ratapani-Kheoni Landscape of Vindhyan range with Special Reference to Ecological Restoration of Wild Land Blocks	Dr. Mayank Makrand Verma
4	The need for sustainable development goal-based strategic approach to tiger conservation in proximity capital Bhopal	Dr. Mayank Makrand Verma

Technical Session 3: Panel Discussion on Emerging Issues and Way Forward-Wildlife Policy Issues and Challenge

Chair : Dr. C. N. Pandey

Co-Chair : Mr Anshuman Singh

Panellists:

Dr. V.K. Bahuguna

Dr. S.K. Khanduri

Dr. Suhas Kumar

Dr. A.J.T. Johnsingh

Mr. R. Shrinivasa Murthy

They along with the group members discussed on different points of policy issues.

Technical Session 4: Compilation of Final Recommendations

Chair : Dr. A. J. T. Johnsingh

Co-Chair : Mr. Anshuman Singh

After completion of all presentations and the panel discussion, compilation of final recommendations of the theme was prepared through group discussion among the group members. The conclusion of the group discussion was presented in open house by Dr. H.S. Singh, the



coordinator of the theme in the form of recommendations of the theme. Based on the discussion held during the presentation, these recommendations were redrafted and again presented to the technical committee of the IWC-2023. After approval of the technical committee, the summary of proceedings and final recommendations were finalised which are given as brief of proceedings and recommendations of Theme-3.

Brief of proceedings

Wildlife Policy Issues and Challenges was one of the four themes of the International Wildlife Conference “Wildlife Conservation: Emerging Scenario and Way forward”. Four technical sessions were organized on 28th April 2023 at Venue-Celebration Van Vilas. In total 63 forest officers, scientists and wildlife experts participated in the sessions. All sessions were held as per the schedule and all speakers, as mentioned in the programme-schedule, made presentations. None of them missed the opportunity to participate actively, although time was a limiting factor. One additional speaker also made a presentation during the third session. Thus, in total 14 speakers presented the contents of their papers/abstracts. There was an active participation of the delegates in the conference to make valuable contribution. Four poster presentations were also made. Considering the presentations by the speakers, suggestions made by the participants and panel discussions during Technical Session-3, final recommendations were compiled and presented by the Coordinator of the Theme 3: Wildlife Policy Issues and Challenge.



Plate 10: Glimpses of Presentations and Discussions on Theme 3: Wildlife Policy Issues and Challenge



Recommendations

1. **Wildlife Conservation Policy:** Although National Forest Policy covers policy issues of wildlife and biodiversity conservation and the National Wildlife Action Plan contains actions required for wildlife conservation, **there is a need of a separate policy document for Wildlife Conservation.**
2. **Need for holistic National Land Use Policy:** Presently India has only a draft land use policy of GoI. If a comprehensive and holistic National Land Use Policy is made, most of the conflicts of unsustainable land use may be put to a rest. **Hence, we need a National Land Use Policy.**
3. **Policy Overall:** The approach towards policy making in other sectors should change from anthropocentric to eco-centric to secure **Environment Justice**. There is a need of institutional mechanism for “**Conservation Centric Development**” such as multi- disciplinary groups to scrutinize development projects.
4. **Crop Damage Compensation:** A dedicated policy on “**Compensation on Crop Damage due to Wild Life**” linked with economic parameters needs to be formulated and promulgated with statutory colour, and with provisions for immediate payment of interim compensation. Its implementation **shall be in the hands of the Forest Department.**
5. **Preservation of Corridors:** To ensure compliances for preserving corridors in implementation of linear infrastructure projects, **Rule 3 of the National Highways Rules, 1957 and Sec. 13 of the Railways Act, 1989 may be amended** to incorporate a provision of identified corridor, **no work shall be undertaken until approval of National Board for Wildlife has been taken.** (Refer to Sec. 38O (g) and Sec. 38V (iii) of the 1972 Act). **Legal status to Corridors and wildlife Connectivity’s should be accorded.**
6. **“No Go Areas”:** Protected Areas and Biodiversity rich areas shall be identified as “No-Go Areas” for purposes of impacting developmental activities, tourism infrastructure and environmentally unsound businesses & industry.
7. **Forest Rights Act (FRA) 2006 – Need of Changes**
 - (i). Whereas the **Forest Rights Act (FRA) 2006** is an attempt to rectify the historic injustices done to the tribals, but its implementation is still fraught with many loopholes like **no cut-off date** application of claims which is leading to continuous encroachment over forest



areas. Therefore, it is strongly recommended that the Government of India should **fix a cut-off date for filing of applications** for vesting of individual rights.

- (ii). FRA, 2006, like in all other legislations, there is a provision of protection to civil servants for anything done in good faith. However, like in Indian Forest Act 1927 (punishment for wrongful seizure), in Wildlife Protection Act (punishment for wrongful arrest), and in Forest Conservation Act 1980 (diversion of forest land for non-forestry purpose), in FRA 2006 there is no such provision of punishment for wrongful allotment of forest land for ineligible claimants or allotment based on false/fraudulent evidence. Therefore, it is recommended that the **FRA 2006 be amended to include a provision for punishment for wrongful allotment** with malafide intentions.
- iii. **Satellite imagery** should be given status of 'primary evidence' in Rule 13(1)(a) of the FRA Rules, 2007 for verifying claims of STs and OFTDs. All other evidences should be treated to be secondary. The Section 11 of the FRA needs to be amended to make the MoEF& CC as the nodal agency for implementation of FRA in place of the Tribal Department.
- iv. The community forest resources settled as such under the Forest Rights Act be managed according to JFM resolution. These **policy decisions are incorporated in the Indian Forest Act 1927 and State JFM resolution.**

8. Critical Wildlife Habitat

- (i) There is need to expedite the notification of 'Core and Critical Wildlife Habitat' as per Section 2(g) of the FRA, 2006. Also, there is need of **harmonising the effect of the Forest Rights Act, 2006.**
- (ii) Part of 'Wildlife Corridors', which are extensively used by some animals such as tiger and elephant for frequent movement /migration, should be identified after scientific study and may be treated like "Critical Wildlife Habitats" in Sec. 2 (b) of FRA. Similarly, Section 4(2) must also include 'Corridors'. In such corridors, biotic pressure and disturbance should be minimised/removed after securing willingness of the local people and payment of proper compensation to them.
- (iii) Also, the principles and approach for resettlement of villages or acquiring patches of private lands within wildlife corridors and biodiversity rich area should be the same as practiced in Critical Habitat within Tiger Reserves.



9. The provision of the life act under **Section 20** has created a lot of hardships for the local people residuary then PA therefore **this Section should be amended to allow sale of private property with a condition that after sale the status of the land use shall remain unchanged.** Already such a provision exists in WPA 1972 Section 36(C). 3 (in case of Community Reserve)
10. **Forest management from Timber Centric to Ecosystem Services Approach and Afforestation to Eco-restoration:** There is an immediate need to shift forestry approaches from timber centric to Ecosystem Services approach and afforestation to eco-restoration approaches while increasing the green cover.
11. **FCA 1980 Checklist:** No diversion of forest land or natural ecosystem can be permitted unless the proposal for diversion is able to steer through an approved checklist-based examination (based on ecological and humanitarian parameters) specially developed for guidance of forest officer. Such a process and the parameters of the checklist be incorporated in the provisions in FCA 1980.
12. **Wildlife conservation beyond Protected Areas:** There is need of enunciating a wildlife conservation strategy outside PA Network.
13. **Local community as key beneficial from ecotourism**
- Creating employment opportunities and capacity building of local communities for eco-tourism and ploughing back of revenue from tourism to local communities. Tourism in the buffer zone should be managed by local people and the earning should go to the EDCs (Eco development committees).
 - Except in case of Protected Areas in proximity of urban centres, notify the surrounds of all Protected areas as Eco-sensitive Zone for conservation development in a radius of at least 3 km from the PA boundary and in case of Tiger Reserves the entire buffer zone. Zonal Master Plan should be placed for operation to address need of people and wildlife. In this zone the government should facilitate a process where in the local people's products and services could be directly utilized by the local hotel industry. This will lead to the economic prosperity of the entire area and benefit all who live in the vicinity of the PAs and TRs.
 - A comprehensive study should be done by the Tiger Reserve management to identify and map critical areas for dispersal and for access to the corridors. Such areas must be marked



as No-Go areas in the buffer zone conservation plan, where hotels and other detrimental activities /industries should not be permitted. Hotels may come up in the buffer zone only in areas marked as non-critical for wildlife.

- iv. The government should fix a moratorium on maximum number of hotels and eateries that may be built in the buffer zones and within 3 km beyond the boundaries of other categories of PAs.
- v. **Regular monitoring** of the direct and negative impacts of tourism is needed. The parameters for such an evaluation should include ecological effects on the habitat, and animal behaviour, as well as secondary effects caused by changes in the lifestyles and cultures of local populations.
- vi. **Representatives from local communities, local NGOs and field personnel** should be a part of eco-tourism advisory boards/committees that monitor and regulate tourism activities in the area. These boards should help develop tourism and conservation plans or strategies.
- vii. Large number of Hotels and Resorts are coming up near Protected Areas with little sharing of profits with the locals who are mainly tribal & poor people. It is therefore necessary to explore possibility of imposing an “**Ecotourism Cess**” or “**Contribution for Benefits of Locals**” on all hotels & resorts near Protected Areas and forest areas. The funds shall be utilized for providing common facilities or for benefits of local people for the surrounding villages.

14. Focused Conservation of Grassland and other Unique Ecosystems: Project, programme and institutional arrangements have been established in Central and State Governments for conservation of some species and ecosystems such as Tiger, Lion, Elephant, Rhino, Wetlands, Mangroves and Coral Reefs, but Conservation of Grasslands which support maximum number of threatened species, and unique ecosystems/biomes, are undermined. Therefore, **diversification of conservation or uniform focus on conservation of all types of habitats and wildlife, especially grasslands is necessary.**

15. Ban on Import and Introduction of Exotic Species: There are many exotic fish species like catfish and tilapia which are very detrimental to native species. Therefore, such **exotic species** should be banned for import after proper scientific studies.



16. **Mandatory Periodical Monitoring Mechanisms:** There is need have a **mandatory periodical monitoring mechanism of policies** related to forest, wildlife and biodiversity national/state strategy/action plans.
17. **Safe Guarding Breeding Sites of Threatened Marine Life:** There are number of species which need protection for their nesting and breeding such as **Sea Turtles, Horse-shoe Crab & Red Crab**, and these should be covered under CRZ Notification. In order to provide full protection to marine biodiversity, Marine Protected Area Network should be strengthened and expanded under Wildlife Protection Act 1972.



Theme 4: Human Wildlife conflicts and mitigation measures

Theme Coordinator	: Dr. Dhananjai Mohan
Co-Coordinator	: Dr. S. Sathyakumar
Theme Associate	: Dr. Mayank Makrand Verma
Theme Rapporteurs	: Mr. Meena Avdesh Kumar, Mr. Kshitij Kumar, Ms. Preeta
Date	: 28/4/2023
Venue	: Khatia Eco center, Kanha Tiger Reserve, India.



Plate 11: Glimpses of meeting on Theme 4-Human - Wildlife conflicts and mitigation measures



Technical Sessions- Theme Human -Wildlife conflicts and mitigation measures

Perhaps for the first time ever, the subject of **Human - Wildlife conflicts and mitigation measures** were put up for discussion in a wildlife conference in India. The subject received overwhelming response from different parts of India. The entries for oral presentations were selected based on their potential for direct application and influence on wildlife management in India. Others were requested to present their works through posters. Based on the diversity of entries and the requirements of the conference, the proceedings were divided into five sessions as given below:

Session 1: Extent of HWC and mitigation measures

Session 2: Human - wildlife Interactions and communities.

Session 3: Panel discussion on Human - wildlife interaction and conflict mitigation measures

Session 4: Compilation of final recommendation.

Session 5: Poster Session

Technical presentations on the subject were made on 28th April and the proceedings were shared with the larger audience in a plenary session on 29th April, 2023 by the theme coordinator. Copies of the abstracts received from the authors are enclosed as annexure to this report. A summary of the presentations and discussions on each topic is given below:

Session 1: Extent of HWC and mitigation measures

Chair - Sh. Shashi Paul

Co-Chair - Mrs Vidya Venkatesh

Sr. No	Title	Author/Presenter
1	Background and Introduction	Dr. Dhananjai Mohan
2	Human - Elephant Conflict and its mitigation in India	Sh. Vinod Yadav
3	Human - wildlife conflict and it's mitigation in Karnataka	Dr. Sanjay Gubbi
4	Human-Wildlife Conflict Management in the Indian Himalayan Region: A review	Dr. S Sathyakumar
5	Monkey Sterilization Himachal Pradesh; Trail Blazer	Sh. Rajeev Kumar
6	Assessment of extent and severity of human-large carnivore conflict in Western Terai Arc Landscape, Uttarakhand	Sh. Nishant Verma
7	Modeling the hotspots of vehicle wildlife collisions in Central India	Dr. Rajashekhar Niyogi



1. Background and Introduction: In opening session, the delegates were welcomed by the session chair, Sh. Shashi Paul. The theme coordinator, Dr. Dhananjai Mohan briefed the house about the number of attendees (n=48) and the organization and structure of the proceedings. In his opening remark, Dr. Mohan pointed out the various reasons for which Human - Wildlife Interactions and Mitigation Measures are actively managed across the world and that these reasons exist in India also. He emphasized that the need for the management of wildlife is likely to grow with time in view of the growing human - wildlife conflict and it is appropriate time now for efficient mitigation measures are developed in the country. Human-wildlife conflict (HWC) is a significant management challenge in conservation. While the number of incidents is generally stable or slightly declining in most states, the overall extent of HWC is increasing. Forest departments and governments now give high priority in addressing this issue. Traditional as well as innovative approaches, along with the use of technology, are being employed to mitigate conflicts. However, the absence of a national database on HWC remains a challenge, and crop losses often go underreported on existing digital platforms in a few states.

2. Title: Human - Elephant Conflict and its mitigation in India

Sh. Vinod Kumar Yadav PCCF (Wildlife), West Bengal (Retd.)

Sh. Vinod K. Yadav gave emphasis to ensure long-term elephant conservation and management, for which the national and regional action plan includes site-specific strategies and the establishment of a corpus fund from CAMPA. The plan prioritizes habitat improvement, including the development of water bodies and soil conservation, conversion of monoculture to mixed forests, and planting trees and bamboo to increase the fodder base. It also focuses on grassland development, securing elephant corridors, and implementing participatory human-elephant conflict management. Ecodevelopment campaigns engage local communities, while capacity building initiatives enhance stakeholder skills. In the short term, strategies include SOPs for handling wild animal straying, an advance warning system with SMS alerts, rapid response teams, watch towers, and various fencing methods for crop protection. Kunki elephant squads are used for non-capturing chases, problem elephants are captured and relocated, rogue elephants are eliminated, and victims of conflicts receive timely compensation.



3. Spatio-temporal distribution of Human-Wildlife Conflict in Karnataka

Dr. Sanjay Gubbi

Holématti Nature Foundation & Nature Conservation Foundation

Dr. Sanjay Gubbi provided an insightful overview of the spatio-temporal distribution of Human-Wildlife Conflict (HEC) in Karnataka. He presented a conflict map and compared the spatial distribution of HEC with the previous decade. His observations clearly demonstrated a significant increase in the distribution of hotspots over time, both in terms of frequency and geographical extent. Dr. Gubbi is a renowned large cat biologist and conservationist hailing from Karnataka. He has been actively involved in conducting extensive leopard monitoring scientific research across protected areas (PAs), reserved forests (RFs), and human-dominated landscapes. His collaboration with the Karnataka Forest Department encompasses a wide range of scientific, conservation, and policy-related initiatives, such as the expansion of protected areas and the implementation of measures to mitigate human-wildlife conflict.

4. Title: Human - Wildlife Conflict Management in the Indian Himalayan Region: A review

5. Dr. S. Sathyakumar

Wildlife Institute of India, Chandrabani, Dehradun 248001, Uttarakhand, India

Dr. S. Sathyakumar stated that in the Indian Himalayan region (IHR), Human-Wildlife Conflict (HWC) is a significant issue. Fragmented wildlife habitats near human settlements and agriculture result in crop/livestock losses and attacks on humans. This review examines efforts to reduce HWC in the IHR for species like rhesus macaque, wild pig, porcupine, common leopard, snow leopard,

Asiatic black bear, Himalayan brown bear, and wolf contribute. Local communities use indigenous protection measures. Forest and wildlife departments have improved compensation and management responses. Research aids understanding of species ecology, behavior, movement patterns, and vulnerable areas for monitoring. Collaborative efforts test wildlife barriers, deterrents, and engage communities. The review presented case studies and outlined a site-specific mitigation strategy.



6. Monkey Sterilization in Himachal Pradesh; A Trail Blazer

Rajeev Kumar, IFS

PCCF Wildlife & CWLW, Himachal Pradesh

Himachal Pradesh has been grappling with a long-standing issue of monkey menace. Efforts to control the problem have primarily been under taken by the Forest Department. Due to habitat loss, monkeys have increasingly come into contact with humans, causing crop damage, horticulture destruction, aggressive behavior, and property damage. This has led to significant economic losses, unemployment, and a negative impact on tourism. To address the conflict between humans and Rhesus macaques, the state's veterinarians pioneered a mass-sterilization programme at the first Monkey Sterilization Centre in Tutikandi, Shimla, in 2007, setting a precedent for surgical population management at large scale.

The monkey sterilization program in Himachal Pradesh has successfully reduced them on key population in rural and urban areas. However, there are concerns about unreported killings during the vermin declaration period. The program has also led to a decrease in monkey size and changes in feeding behavior. The installation of LED mast light towers has increased monkey nuisance at night. Trooped is integration and splinter troupe formation have been observed. Improved monitoring, permanent identification methods, and better evaluation are necessary to address these issues and ensure the program's effectiveness.

7. Assessment of extent and severity of human-large carnivore conflict in

Western Terrier Landscape, Uttarakhand

Verma Nishant¹, Mondal Samrat², Pandav Bivash³ ¹PhD Scholar, Wildlife Science, Wildlife Institute of India (WII), Saurashtra University, Gujarat, India. ^{2&3} Scientists, Wildlife Institute of India (WII), Dehra Dun

The study focused on the Western Terai Arc Landscape, including parts of Dehradun Forest division and Rajaji National Park, characterized by protected areas, forests, scrub land, grassland, and human settlements. Human-wildlife conflict poses a significant threat to wildlife and its habitats due to factors like population growth, land use changes, habitat fragmentation, and livestock grazing. Data was collected on conflict events, analyzing trends and identifying hotspot areas. Leopards were found to be the most active species resulting in human fatalities, with specific age groups affected. Elephants caused the most crop damage, particularly to sugarcane. Recommendations were provided for managing conflict in the studied areas, with risk modeling conducted based on spatial ecology. The Rajaji Tiger Reserve, Lansdowne, and Haridwar forest divisions had the highest human death and injury rates.



7. Title: Modeling the hotspots of vehicle wildlife collisions in central India Rajashekhar Niyogi, Diptesh Sarkar and Robert John
Department of Biological Sciences, Indian Institute of Science Education and Research, Kolkata, Mohanpur 741246, West Bengal

Mr. Rajashekhar Niyogi presented detailed information about vehicle-wildlife collisions (VWC) which cause wildlife mortality, injuries, property damage, and endanger human safety worldwide. In Madhya Pradesh, VWC is the second leading cause of wildlife deaths. Analyzing government records from 2011 to 2020, around 1600 incidents were studied, mapping 80% of the cases. On-ground surveys evaluated mitigation measures and human interventions in ecologically important areas. A Bayesian regression model identified VWC hotspots, with highways near the Panna Tiger Reserve being most vulnerable. Winter months, particularly December, had peak incidents, which is likely due to fog. The study integrates spatial analysis with field survey data to recommend specific measures like speed limits, overpasses, and underpasses. This analytical framework can aid online mapping services, land-use planners, and wildlife managers in mitigating VWC risks and protecting endangered species.

Session 2: Human - wildlife Interactions and communities

Chair : Shri Nitin Kakodkar

Co-Chair : Shri Aseem Shrivastava

Sr. No	Title	Author/Presenter
1	Living with Predators and Pillagers: Managing Human-Wildlife Conflict in India	Dr. H. S. Pabla
2	Human - Leopard conflict and its mitigation in India	Dr. Vidya Athreya
3	A stakeholder-centric approach to leopard management in Tehri, Uttarakhand, India	Dr. Dhananjai Mohan
4	Mumbaikars for Sanjay Gandhi National Park: A citizen science programme for shifting focus of human - leopard conflict from leopards to human safety	Sh. Sunil Limaye
5	Handling human-wildlife conflict through collaboration	Ms. Ramseena P. P
6	A Study on Livelihoods Security and Human-Wildlife Conflicts in the Western Ghats of Maharashtra	Ms. Shruti Majumdar



1. Lead talk: Living with Predators and Pillagers: Managing Human Wildlife Conflict in India Presented by- Dr. H. S. Pabla

Dr. H. S. Pabla mentioned reasons regarding the root cause of Human-wildlife conflict. Human-wildlife conflict (HWC) in India is inevitable due to competition between large mammals and rural communities for space and resources. The conflict has worsened in recent years due to species recovery and population growth. Mitigation measures such as fencing habitats, managing wildlife populations, and early elimination of problem animals can significantly reduce HWC. Economic benefits from wildlife conservation, including tourism and sustainable use, can alleviate the challenges faced by communities. However, current efforts in this regard are insufficient. The author argued that increasing wildlife populations without adequate protection for people violates their fundamental rights. He suggested that prevention and mitigation of HWC should be the core concern of wildlife conservation, aligning with the Constitution and criminal law. While the Wild Life (Protection) Act, 1972 requires revamping, positive interpretation can still yield improvements. The future of conservation lies in a symbiotic relationship between people and wildlife, generating benefits while controlling depredations. Human-wildlife symbiosis is the key to sustainable conservation. The current form of the Wildlife Protection Act (WPA) of 1972 fails to adequately address human-wildlife conflict (HWC) issues. It lacks provisions for preventing or mitigating HWC, does not grant the right to defend oneself against wildlife, and lacks compensation provisions for losses caused by wildlife. The Act states that dangerous animals should be killed only if they cannot be captured without trauma, and captivity is only allowed for animals that cannot be rehabilitated in the wild. The Act designates wild animals as state property, making the state responsible for their actions. Unmanaged HWC is considered a violation of the Indian Constitution (Article 21 and 300A) and a crime committed by the government, officials, and conservation NGOs under the Indian Penal Code. The suggested course of action is to amend the Wildlife Protection Act through an ordinance, mandating the state government to control the danger caused by wild animals to human life and property while ensuring the species' long-term survival. The government also has a legal obligation to provide compensation for losses, deaths, or injuries caused by wild animals.

1. Title: Dealing with leopards in shared spaces in India

Author: Dr. Vidya Athreya, WCS, India

According to Dr. Vidya Athreya in Himachal Pradesh, there has been a decrease in attacks on humans over time. Similarly, Maharashtra has also experienced a decline in human-elephant



conflicts. The situation in Karnataka is not specified. In West Bengal, although there are few human deaths, there are numerous injuries, particularly in tea gardens. Uttarakhand shows indications of decreasing attacks, particularly in Tehri. Elephants are present to some extent in Punjab. In Rajasthan, elephants are present in the state, but attacks mainly occur on the eastern side of the hill range, with no attacks reported on the western side (Bera). To address human-elephant conflicts, it is important to establish immobile borders and implement mobile wildlife management strategies. The involvement of both wildlife experts (biologists and forest department personnel) is crucial. However, it is important to recognize that the problem is a people problem and not just limited to animals. Therefore, efforts should be made to harness the unique cultural ethos of the region, promote empathetic relationships when dealing with damage incidents, and utilize local pride to create peaceful shared spaces. Working closely with local communities for conflict resolution can lead to increased understanding and reduced fear among communities.

2. Title: A stakeholder-centric approach to leopard management in Tehri, Uttarakhand.

3. Authors: Koko Rose, Sanjay Sondhi, Shweta Sivakumar, Dhananjai Mohan, Sunil Limaye and Vidya Athreya

Presented by- Dr. Dhananjai Mohan

Dr. Dhananjai Mohan presented a brief HWC status in Uttarakhand wherein humans and large carnivores like leopards, and tigers coexist. However, negative interactions and injuries caused by leopards have been prevalent. Traditional approaches like translocations, shooting, and ex-gratia payments have not effectively resolved the conflict. The "Living with leopards in Uttarakhand" program (2016-2020) aimed to address this issue through stakeholder capacity building, including consultations, training sessions, media workshops, and awareness programs in schools. The program impacted over 2,000 individuals and is being critically evaluated for its effectiveness and lessons applicable to similar human-wildlife conflict situations.

4. Mumbaikars for Sanjay Gandhi National Park: A citizen

Science Programme for shifting focus of Human - Leopard conflict from Leopards to Human Safety.

Authors: Sunil Limaye, Vikas Gupta, Vidya Athreya, and Vidya Venkatesh

Presented by: Sh. Sunil Limaye

Shri Sunil Limaye highlighted the lessons learnt from mumbaikars for Sanjay Gandhi National Park. Mumbai's leopards gained notoriety for attacking people, including children, due



to the high population density around Sanjay Gandhi National Park. The park, managed by the Forest Department, faces significant human impact. Previous management response involved capturing and relocating leopards, which inadvertently led to more attacks. In 2011, the Forest Department initiated a proactive project to engage with the community, conduct research, and educate stakeholders about safer coexistence. Between 2013 and 2016, there were no leopard attacks on humans, but in 2017, attacks occurred attributed to a captured leopard, which has since been kept in permanent captivity.

5. Title: Handling human-wildlife conflict through collaboration

6. Author: Ramseena P.P

7. Research Scholar, Dept. of Gandhian Thought and Peace Science, Gaandhigram Rural Institute, Dindigul, Tamilnadu

This study aimed to understand and codify the opinions and experiences of communities living in close proximity to wildlife. It emphasized the importance of collaboration between humans and wildlife to mitigate conflicts. Tribal communities, with their traditional practices of coexistence, play a significant role in managing human-wildlife conflict. By exploring collaborative solutions, conflicts can be resolved on common ground, leading to positive interactions between humans and wildlife. The perspective of one interviewee highlights the need for considering the rights of all living beings and promoting coexistence as the solution to the problem.

8. Title: A Study on Livelihoods Security and Human-Wildlife Conflicts in the Western Ghats of Maharashtra

Authors: Mayuresh Bhise, Sailaja Nandigama, Shruti Majumdar, Nikhil Nikam
Department of Humanities and Social Sciences, Birla Institute of Technology and Science, Pilani

Presented by Ms. Shruti Majumdar

Ms. Shruti Majumdar stated that human-wildlife conflicts in India stem from land use changes and human activities, resulting in economic losses, property damage, and harm to both humans and wildlife. The Western Ghats, a biodiversity hotspot, supports livelihoods of diverse communities. This study employed a sustainable livelihoods framework and mixed methods to understand the factors contributing to conflicts, particularly with elephants in agricultural areas near forests. Forest dependent communities face livestock loss, injuries, and economic burdens. The study highlighted the importance of involving local stakeholders in developing effective



strategies to mitigate conflicts, sustain livelihoods, explore alternative methods, adapt to climate change, and minimize damages from human-wildlife conflicts.

With this, the oral presentations came to an end. The poster papers received under this theme are listed below. The participants visited the poster venue as and when possible and interacted with the authors at the venue.

Poster Session -Theme 4- Human - Wildlife conflicts and mitigation measures

Sr. N.	Title of the Poster Presentation	Poster presenter
1	Human - Wildlife Conflicts in Himachal Pradesh: Case Study of Chamba District Vinay Kumar and Pankaj Sekhsaria Centre for Technology Alternatives for Rural Areas, Indian Institute of Technology Bombay, Mumbai, Maharashtra	Vinay Kumar
2	Comparing people's perception towards leopards in two areas with different human-leopard conflict scenario Keyur Naria, Hiren Patel, Narendra Chetule, Chandni Valodkar and Geeta Padate Division of Wildlife Biology, Department of Zoology, Faculty of Science, The Maharaja Sayajirao University of Baroda, Vadodara-390002, Gujarat, India.	Keyur Naria
3	Farmer's perception regarding blue bull damage and management in Punjab Kiran Rani 1 and B K Babbar 2 1. PhD Student, Department of Zoology, PAU, Ludhiana-141004, Punjab, India 2. Zoologist (Rodents), Department of Zoology, PAU, Ludhiana- 141004, Punjab, India	Kiran Rani

Title: Human - Wildlife Conflicts in Himachal Pradesh: Case Study of Chamba District

Authors: Vinay Kumar 1, and Pankaj Sekhsaria 1*

Centre for Technology Alternatives for Rural Areas, Indian Institute of Technology Bombay, Mumbai, Maharashtra

Mr. Vinay Kumar presented a case study of Chamba District in poster. This study in Dalhousie Forest division, Chamba district, Himachal Pradesh, focused on the Gaddi pastoralist community and their human-wildlife conflict. It documented seasonal movement patterns, routes, and challenges faced. Leopards and Himalayan black bears were identified as major problematic species, primarily targeting goats and sheep. Analysis of 21 years of forest



department data showed a seasonal pattern of attacks, with winter having the highest conflict occurrence. Traditional mitigation methods like tin beating, fencing, Gaddi breed dogs, and forest department measures such as compensation and insurance schemes were employed. Compared people's perception towards leopards in two areas with different human-leopard conflict scenario.

Title: Comparing people's perception towards leopards in two areas with different human-leopard conflict scenario

Authors: Keyur Naria*, Hiren Patel, Narendra Chetule, Chandni Valodkar and Geeta Padate

Affiliation: Division of Wildlife Biology, Department of Zoology, Faculty of Science, The Maharaja Sayajirao University of Baroda, Vadodara-390002, Gujarat, India.

This study was aimed to understand people's perception of leopard-livestock depredation and leopard conservation. The degradation and fragmentation of forested habitats have led to increased leopard-human interactions in India. The decline in wild prey availability has forced leopards to target livestock and stray animals outside the forest. Livestock depredation has become a major conservation issue in resource-limited landscapes. The study conducted a questionnaire survey in two talukas (Mandvi and Umarpada) with varying levels of human-leopard interactions. The majority of respondents in Mandvi had negative feelings towards leopards, while respondents in Umarpada had more positive feelings. Most respondents in both talukas were neutral about the importance of leopards for the ecosystem but supported leopard conservation in their area and Gujarat.

Title: Farmer's perception regarding blue bull damage and management in Punjab

Authors: Kiran Rani 1 and B K Babbar 2

- 1. PhD Student, Department of Zoology, PAU, Ludhiana-141004, Punjab, India**
- 2. Zoologist (Rodents), Department of Zoology, PAU, Ludhiana-141004, Punjab, India**

Farmers in Punjab are facing problems due to wild and stray animals, particularly the blue bull or Nilgai. The blue bull's habitat has been reduced due to urbanization and industrialization, leading them to move towards agricultural areas and cause crop damage. Surveys in Mohali and Ludhiana districts identified villages near canals and water holes as hotspots for crop damage. Blue bulls prefer crops like wheat, maize, oats, beans, peas, and vegetables. Farmers have adopted various management methods, including guarding, firecrackers, and reflective ribbons. Farmer awareness campaigns and educational initiatives were conducted to mitigate the issue. It is concluded that targeted management during crucial



crop stages can help reduce blue bull damage and provide cost-effective solutions for farmers.

Session 3: Panel Discussion: Vital Questions and the Way Forward

The final session was divided into two parts. In the first part, a panel discussion on “Human - Wildlife conflicts and mitigation measures” was held and in the second part the group was asked to discuss and debate the potential recommendations for an HWC and mitigation measures strategy for India. The panel consisted of eminent experts, namely:

Sh. Sunil Limaye, Sh. Rajeev Kumar, Shri Nitin Kakodkar and Shri Shashi Paul.

The panelists expressed their opinions on the following issues:

- Extent of HWC and its documentation
- Assessment of population of problem species
- Current strategy to deal with HWC and short comings
- Use of modern tools and techniques in dealing with HWC
- Participatory approaches and stake holder involvement
- Identification of corridors and buffers and management paradigm for such areas
- Policy imperative

Zonation system of HWC areas will help in identifying hotspots of HWC:

The implementation of a zonation system in areas prone to human-wildlife conflict (HWC) is crucial for identifying hotspots where conflicts frequently occur. This systematic approach allows authorities to focus their efforts and resources on areas with the highest occurrence of conflicts, enabling more targeted mitigation measures and conservation strategies.

Need to have Quick Response Teams (QRTs) and Early Warning Systems in place.

Establishing Quick Response Teams (QRTs) and Early Warning Systems is essential for effective HWC management. These teams should be well-trained and equipped to respond promptly to conflict situations, ensuring the safety of both humans and wildlife. Early Warning Systems help in providing timely alerts to local communities, enabling them to take precautionary measures and minimize potential conflicts.

Improving rapport with common people and Community participation:

Engaging with the common people and involving them in decision-making processes fosters a sense of ownership and responsibility towards wildlife conservation. Additionally, collaboration with key stakeholders like the media and police is important for effective communication,



raising awareness, and enforcing wildlife protection laws.

Inter-departmental coordination:

The HWC management requires seamless coordination among various departments and agencies involved, such as forest departments, wildlife authorities, local administration, and law enforcement. Inter-departmental collaboration ensures a holistic approach to addressing HWC, pooling resources, sharing information, and implementing integrated strategies for conflict mitigation.

Bring attitudinal change in people through awareness programs, and Education department can be roped in to bring awareness in schools:

Promoting attitudinal change among people is essential to foster co-existence with wildlife. Conducting awareness programs and educational initiatives, particularly in schools, helps instill a sense of empathy, respect, and understanding towards wildlife and their habitats. Engaging the Education department in these efforts can ensure the inclusion of wildlife conservation in the curriculum, nurturing a conservation-minded generation.

Use of Social Media platforms to connect to common people:

Leveraging social media platforms can be an effective way to engage and connect with the general public. Sharing information, success stories, updates on HWC mitigation measures, and encouraging public participation through these platforms helps to create a wider outreach and mobilize support for wildlife conservation. Social media also facilitates real-time communication and quick dissemination of alerts during HWC incidents.

Multiple Fence approach helpful in dealing with HWC, particularly in Elephant cases:

In mitigating HWC, employing a multiple fence approach, especially in areas with elephant-human conflicts, has proven effective. Combining different types of barriers, such as energized power fencing, elephant-proof trenches (EPT), and vegetative fencing, strategically helps in minimizing crop depredation and reducing the chances of human casualties, providing a more comprehensive deterrent to wildlife movement.

Research is needed for over-abundant Population of conflict species:

For conflict species with over-abundant populations, conducting research is necessary to understand their behavior, movement patterns, and ecological dynamics. Such studies aid in devising appropriate management strategies, including population control measures, habitat enhancement, and implementing adaptive management approaches to address conflicts arising from the overabundance of these species.



Budgetary mechanism should be such that the compensation can be made quickly and in a transparent manner (Incorporating technology for this):

Having an efficient budgetary mechanism is crucial to ensure timely and transparent compensation to victims of HWC. Allocating adequate funds, streamlining the compensation process, and incorporating technology solutions for efficient disbursement help expedite compensation procedures, reduce delays, and build trust among affected communities. Habitat management in a scientific manner should be performed.

Session 4: Session 4: Compilation of final recommendation.

Drafting of Recommendations

Due to the contentious nature of the topic, the group faced challenges in formulating recommendations. To maintain a focused discussion, the theme coordinator presented a set of potential recommendations for deliberation. To ensure acceptability to all participants, the draft recommendations were edited accordingly. Following cross talk, Dr. Dhananjai Mohan led the presentation of the recommendations during the plenary session on 29-04-2023.

In conclusion, the conference has provided an important platform for discussing the issue of Human- Wildlife conflicts and mitigation measures. Given the increasing incidents of human-wildlife conflict, this conference marks a significant step forward. The Madhya Pradesh Forest Department (MPFD) and the State Forest Research Institute (SFRI) deserve commendation for their efforts in organizing this event.

We are currently grappling with the conflicting notions arising from our education and the new realities we face. In order to address this, it is crucial to organize more conferences of this nature. These gatherings will serve to mainstream the debate and assist the conservation community in embracing new ideas and approaches.

To ensure a comprehensive and well-rounded perspective, it was important to involve members from various sectors, including administration, civil society, public representatives from conflict zones, as well as wildlife managers and biologists. By incorporating a diverse range of viewpoints, we can arrive at a balanced understanding and make more informed decisions.

Recommendations regarding Human -Wildlife Interactions and Mitigation Measures in India

Background:

Human wildlife conflict (HWC) has emerged as the biggest management challenge in



wildlife conservation sector. Based on data, in most states number of incidences are static or declining slightly but the extent is increasing. Many areas are now getting subjected to HWC owing primarily to either increasing number of wild animals, or changing behavior of wild animals or fast changing lifestyle of people or changing land-use practices. The priority given to HWC and its mitigation by forest department in particular and Governments in general is much higher now but there is ample scope of improvement in coordination amongst departments, use of appropriate technology and better involvement of diverse stakeholders. Traditional as well as innovative approaches with use of technology are being increasingly followed to mitigate HWC. No national database of HWC exist presently but a few states have a digital platform. However, usually crop losses get under-reported owing to lack of objectivity in assessment and complicated procedures of compensation.

Based on day-long session including presentations of research papers and case studies, talks by experts and panel discussion involving experts, practitioners, managers and researchers, the following recommendations were made to deal with human wildlife conflict.

Governance

- Issues on Human-Wildlife conflict must be completely owned by the respective state Government and not restricted to one department. The committees at the state and district levels as in advisory issued by MoEFCC on 06 Feb 2021 need to be constituted and become actively functional.
- The departments of Police, Revenue and Finance must be involved in HWC mitigation on priority and should extend all possible support to forest departments.
- The Inter-departmental Coordination Committees as suggested in MoEFCC advisory need to co-opt public representatives as well.
- HWC to be classified as a disaster under the Disaster management Act 2005. Necessary orders may be issued by the respective state Government.
- Provision of adequate and unhindered financial resources for HWC mitigation including compensation for loss owing to HWC may be provided by the Governments.
- To deal with Law-and-order situation arising out of HWC incidences, adequate priority must be ensured from administration and police.
- Appropriate orders from the respective Government need to be issued to ensure unhindered cooperation from Veterinary department.
- Considering the nature and extent of HWC, wherever required, landscape-level and inter-state coordination committees may be constituted.



Identification of Hotspots

- Few states have started digital platforms to record incidences of HWC. Such platforms need to be developed in all states and suitably integrated into a national portal.
- App based HWC data collection for incidences needs to be promoted which would help in quick, efficient, and transparent compensation disbursement as well. It can then become a basis for decision support.
- The information so obtained will help in identifying hotspots and in prediction of potential conflict areas to take proactive measures.

Stakeholders' participation in HWC mitigation

- People's participation is a must in managing HWC. To ensure efficient mitigation of HWC, people need to own up the problem along with the Government and both need to be on the same side of the problem.
- Besides local people, other key stake-holders like media, police, peoples' representative need to be involved at every stage of HWC mitigation. School students are also a priority group to be involved.
- Capacity building for all stakeholders needs to be carried out with priority on FD frontline staff and local community.
- Social Media platforms should be used extensively to connect to common people and for awareness generation.

Planning

- Working plan code must have detailed instructions for HWC mitigation. Presently the 2014 code does not give detailed instructions on including prescriptions for HWC mitigation. The problem of HWC is often more serious in territorial divisions and the adjoining human populations.
- TCP Corridors and buffer plans/ ESZ zonal master plans also need to address HWC and its mitigation in detail.

Ground action

- States need to establish and station properly equipped and trained Rapid Response Teams (RRT) based on hotspot mapping and administrative feasibility.
- On priority, the HWC hotspots need to have Village level primary response teams (also called Quick Response Teams).
- As far as possible, early warning systems (EWS) need to be adopted by using appropriate technology.
- Ecologically sustainable linear infrastructure to be developed with adequate mitigation



measures as provided in WII guidelines 'Eco- Friendly Measures to Mitigate Impacts of Linear Infrastructure on Wildlife'.

Adoption of traditional/common management practices

- Judicious use of barriers/repellents to be done in areas facing HWC or having high chances of HWC based on predictive modelling.
- Promotion of appropriate agri-horticulture/ agroforestry around wildlife rich areas that repel wild animal to be promoted.
- Research based management of habitat and water in forest areas/corridors to ensure that it does not aggravate HWC.
- Immunization of local livestock around PAs as mandated by WPA 1972, to be carried out on priority and adequate funds to be provided to veterinary department for the same. Cattle breed improvement and promotion of stall feeding to reduce the chances of cattle kills by wild predators.
- Wildlife compatible forestry practices in buffer and territorial forest areas to be promoted through working/management plans/TCPs for employment generation and ploughing back of revenue for upliftment of local people.

Ex-gratia relief/Compensation

- Uniformity of compensation/ex-gratia relief rates to be ensured across the country. Government of India to decide on such uniform rates.
- Smooth and quick fund flow mechanisms to be promoted in all states through mechanisms like Global budget (MP), Corpus fund (UK) etc.
- Objectivity in assessment of crop damage needs to be evolved.
- Working models for Crop Insurance need to redevelop and possibilities of linking it with Pradhan Mantri Fasal Bima Yojanato be explored.

Miscellaneous

- A repository of case studies (successes and failures) should be created and made available on a public domain.
- Appropriate legal mechanisms for management of over-abundant wildlife populations outside Protected Areas need to be evolved.
- Urgently address issue of stray dogs and stray cattle in wildlife rich areas as it may lead HWC.
- Snakebites is a recent inclusion in HWC compensation schemes in most states. Snakebites account for more deaths than most other species. Need focused attention on it from forest department and state Government.



- A proactive approach instead of reactive approach is the need of the hour with innovative tools and techniques using technology as far as possible.



Plate 12: Panel Discussion on Human - Wildlife conflicts and mitigation measures Theme



Plate 13: Group photograph of participants of Wildlife conflicts and mitigation measures, Theme

Plenary Session

The plenary session was chaired by Dr. Suhas Kumar and co-chaired by Dr. A. J. T. Johnsingh. It began with thematic presentations by the theme coordinators where they presented the recommendations of the themes, followed by discussion with the participants to make amendments to the recommendations to reach the final recommendations. Details of theme-wise recommendations are already given under each technical session.





Plate 14: Glimpses of Presentation by Theme Coordinators during the Plenary Session

Valedictory Session

The Valedictory session included closing remarks and vote of thanks. The Chief Wildlife Warden of Madhya Pradesh, Shri Jasbir Singh Chauhan concluded that while the state of Madhya Pradesh has been at the forefront of active wildlife management with 11 National Parks, six Tiger Reserves, and 24 Sanctuaries. The state supports the highest numbers of tigers and leopards in the country along with wolves, cheetahs, gharials, and vultures. It has proven itself time and again with feats such as successful reintroduction and breeding of tigers into areas that suffered local extinctions, such as Panna Tiger Reserve, Nauradehi Sanctuary, and Sanjay Tiger Reserve, successful rewilding of orphan tiger cubs, successful breeding of vultures, and large-scale reintroduction and translocation of species including gaur (Indian bison), hard ground Barasingha, black buck, and chital for population management. Our wildlife habitat management has led to re-sighting of fishing cat and Eurasian otters in the state. We are planning for reintroduction of wild buffalo from Chhattisgarh, and the population bolstering of Gangetic dolphin is in full sway. However, we need to maintain our edge in wildlife management, looking at their benefits and the loss of biodiversity happening all over the world. To this end, we have identified new protected areas in tiger corridors with no human habitations to create stepping-stone corridors to aid in reducing human-wildlife conflict situations, and conducted this conference to listen to the views of various subject-matter experts to gain insights and directions



for the future. In particular, there is a strong need to inculcate scientific temper and method in wildlife management, and this conference will go a long way to assisting this goal.

The Head of Forest Force, Shri Ramesh Kumar Gupta reminisced about the strong need to have such conferences, and pointed out to the fact that a large scientific gathering such as the current one has happened after a very long period. These conferences need to be made a constant occurrence. He highlighted the role of Madhya Pradesh Forest Department in bringing all stakeholders into its fold. In particular, over 4,300 km² of degraded forests have been fully restored through community action, indicating the fact that the people of the state are not only conservation-oriented, but are also gaining employment and livelihood activities through forest and wildlife management, making it an integral part of their lives. To this end, the State has made schemes for revenue sharing and provisioning of forest produce to the local community. It is only through the active support and cooperation of local communities that forests and wildlife can be protected and restored. In recent times, 26 tourism gates under the “Buffer main Safar” scheme have been generating 2000 permanent employments for the local communities. We aim to reduce the situations of conflict not only by translocating problem animals through the wide support network of veterinarians, but also by providing a mainstreaming opportunity to the forest-fringe dwellers through the process of voluntary relocation. Madhya Pradesh is one of the few states that provide the facility of voluntary relocation not just from core areas, but also from buffer and corridor areas. It has been our experience that the process is extremely beneficial to the forest-fringe dwellers since it brings all the government facilities and opportunities to them, while also removing the chances of crop depredation and bringing produce closer to markets. The process is also beneficial to the government since the costs of relocation, while high in their own way, are much lower than that required to bring all facilities including roads, electricity, etc. to the people, as should be the mandate of every government. At the same time, we are also not shy of taking strong decisions, including the recent de-notification of Karera Wildlife Sanctuary and notification of anew Sanctuary at Karmajhiri, as per local demands. The scientific inputs provided by conferences such as this will go a long way to prioritize our actions in the future.

The Hon’ble Forest Minister, Dr. Kunwar Vijay Shah also impressed upon the necessity to bring both Science and humanity to wildlife management. He urged and motivated the scientific community to consider questions relating to the best ways to increase wildlife populations while reducing conflicts. He brought in examples from his political life, stating that he always prefers to talk to the frontline staff and villagers whenever he is on tour, and he tours a lot to get to know the situations and problems facing the general public. For example, he highlighted the fact that forest-fringe dwellers and frontline staff, while working day in and day



out to conserve and protect the forests and wildlife, seldom get a chance to experience wildlife tourism themselves. Thus, he's contemplating a scheme to celebrate one day every month as a day to celebrate the hard work of these people. On this day, the family members of frontline staff and forest-fringe dwellers will be provided a chance to go on gypsy safaris and to experience wildlife tourism. This will not only bring them closer to the cause of forest and wildlife conservation, but will also bring benefits to the cause of conservation. At the same time, he highlighted the necessity of solving any situations of conflict in the shortest possible time, and impressed upon the need of having a dedicated cadre of wildlife veterinarians. He also upheld the necessity of having research in the fields of employment generation and sharing of usufructs.

The Director SFRI, Mr. Amitabh Agnihotri presented the vote of thanks. He thanked the members who made it all the way to Kanha to present their findings and participated in the discussions. The recommendations of this conference would provide directions to the management of wildlife and their habitats in the days to come. He also thanked the theme coordinators, co-coordinators, rapporteurs, the officers and staff of SFRI, the officials and staff of Jabalpur and Balaghat Circles who played key roles in organization, the team of NIC and Madhyam, the hotel association and the hospitality staff, and the members of print and media for the constant support in organizing and highlighting the conference.

A vote of thanks was made by Shri Abhilash Khandekar, eminent journalist and member of the State Board of Wildlife, on behalf of the participants. He called attention to the best facilities made available to the participants of the workshop and thanked the organizers for the same. Concomitantly, he underscored the fact that general public is suffering due to the loss of biodiversity, and it is high time that all of us come together as a shared front to the cause of conservation of forests and wildlife.





Plate15: Glimpses of Valedictory Session on Day 3 (29-4-2023)

KANHA TIGER RESERVE





Plate 16: Group Photographs with Forest Minister on the concluding day

KANHA TIGER RESERVE



Annexure 1: List of Delegates in IWC 2023 at Kanha Tiger Reserve, Madhya Pradesh

Foreign Delegates

S. No.	Name of the participants	Designation	Country	Organization
1.	Mr. Charlie Jacoby	Broadcaster	United Kingdom	Field sports Channel
2.	Dr. Dave Cooper	Veterinarian	South Africa	Ezemvelo KZN Wildlife
3.	Dr. Andy Fraser	Director Rooiberg Veterinary Services	South Africa	Rooiberg Veterinary Services
4.	Dr. Maria Caiado	Veterinary Surgeon	Portugal	Rooiberg Veterinary Services
5.	Mr. Grant Tracy	Owner	South Africa	Tracy & Du Plessis Game Capture cc
6.	Mr. Jens Ulrik Høgh	Communication Manager	Sweden	Nordic Safari Club
7.	Mr. Kester Vickery	Translocation Expert,	South Africa	Conservation Solution
8.	Mr. Les Carlisle	Director	South Africa	Carlisle Conservation Consulting
9.	Professor Adrian Tordiffe	Associate Professor	South Africa	University of Pretoria
10.	Mr. Selma T Nangolo	Project Manager-HWC	Namibia	Community Conservation Fund of Namibia
11.	Mr. Uakendisa Muzuma	ECOLOGIST	Namibia	Namibian Government, Ministry of Environment, Forestry and Tourism
12.	Mr. Vincent van der Merwe	Manager Cheetah Meta-population	South Africa	The Meta population Initiative

KANHA TIGER RESERVE



Indian Delegates

S. No.	Name of the participants	Designation	Organization
1.	Mr. A.P.S. Sengar	Conservator of Forest	M.P Forest Department
2.	Mr. Abhilash Khandekar	Co-Founder, The Nature Volunteers, Indore	The Nature volunteers (TNV)
3.	Sh. Adarsh Shrivastava	Conservator of forest	M.P Forest Dept
4.	Sh. Alok Kumar	Chief Wildlife Warden, Retd.	M.P Forest Dept.
5.	Mr. Amardeep Rajak	DEO	SFRI
6.	Mr. Amit Kumar Dubey	Chief Conservator of Forests	M.P Forest Dept
7.	Mr. Amit Pandey	Senior Research Officer	State Forest Research Institute Jabalpur
8.	Dr. Amitabh Agnihotri	PCCF	SFRI
9.	Mr. Anil Kumar Shukla	Conservator of Forests	PCCF, Wildlife, Bhopal
10.	Mr. Anil Kumar Singh	CCF, Sagar Circle	Forest
11.	Mr Anirudhwa Sarkar	SRO	SFRI
12.	Mr. Ankit Monn	Ph.D. Scholar	Salim Ali Centre for Ornithology and Natural History
13.	Mr. Ankur Awadhiya	DCF, IT	M.P Forest Dept
14.	Mr. Anshuman Singh	Lawyer	High Court of Madhya Pradesh
15.	Mr. Anupam Sharma	IFS	M.P Forest Dept
16.	Ms. Arti Adhikari	Research assistant	Wildlife institute of India
17.	Sh. Aseem Shrivastava	PCCF	M.P Forest Dept
18.	Mr. Ashish Prasad	Project Manager	Wildlife Institute of India
19.	Mr. Ashok Vyas	PA to Forest Minister	Bhopal
20.	Mr. Atul Kumar Jain	PCCF R&E	MP Forest Deptt
21.	Mr. B. K. Singh	Retd PCCF (HoFF) Karnataka	Karnataka Forest Department
22.	Mr. Bankupalli Nitya	Student	KVASU
23.	Mr. Bhaskar Bhandari	Project Associate II	Wildlife Institute of India
24.	Ms. Bindu Sharma	APCCF	MP Forest Department
25.	Mr. Brijendra Jha	F D Panna tiger reserve	M.P Forest Department
26.	Dr. Chittarnajan Dave	Assistant Professor	State Education Department, Gujarat
27.	Mr. Devaprasad, J.	Field Director Pench MP	MP Forest Department
28.	Dr. Dhananjai Mohan	PCCF	Uttarakhand Forest Department
29.	Mr. Dharam Veer Patel	Account Assistant	SfFRIJabalpur
30.	Sh. Digvijay Singh Khati	Retd. PCCF and CWLW	Uttarakhand Forest Department
31.	Dr. A. A. Ansari	DFO	Nauradehi WLS
32.	Dr. A. B. Shrivastava	Former Director	School of Wildlife Forensic and Health, Jabalpur
33.	Dr. Abhay Kumar Patil	PCCF and MD	MP Forest Development Corporation



34.	Dr. Abhay Sengar	Wildlife Veterinary Officer	Sanjay Tiger Reserve, Sidhi
35.	Dr. Ajit Kumar Shrivastava	Member Secretary Bio Diversity Board of MP and PCCF Protection	Forest Department, M. P
36.	Dr. Amit Mallick	Inspector General of Forest	National Tiger Conservation Authority
37.	Dr. Aniruddha Majumdar	Scientist	State Forest Research Institute, Jabalpur
38.	Dr. Anish Andheria	President	Wildlife Conservation Trust
39.	Dr. Avdesh Kumar Sharma	Senior Research Officer	SFRI Jabalpur
40.	Dr Faiyaz A. Khudsar	Biodiversity Expert	Biodiversity Parks Program, CEMDE, University of Delhi
41.	Dr. G. S. Rawat	Retd. -Dean, WII	Wildlife Institute of India
42.	Dr Gurudutt Sharma	Wildlife Veterinarian, Satpura Tiger Reserve	O/o Field Director, Satpura Tiger Reserve, Narmadapuram
43.	Dr. H.S. Pabla	Former CWLW	M.P. Forest Department
44.	Dr. J. S. Parihar	Former- Dy. Director	Formerly- ISRO
45.	Dr. Jayant Kulkarni	Director	Wildlife Research and Conservation Society
46.	Dr. Karan Sehgal	Wildlife Veterinary Officer	HP Forest Department Wildlife Wing
47.	Dr. Kunwar Vijay Shah	Forest Minister	Govt. of Madhya Pradesh, Bhopal
48.	Dr. Latika Nath	Conservation Ecologist & Photographer	Hidden India
49.	Dr. Mewa Singh	Professor	University of Mysore
50.	Dr. Mohon Ram	DFO, Wildlife Division, Sasan-Gir	Gujrat Forest Department
51.	Dr. Omprakash Dwivedi	Field Biologist	Panna Tiger Reserve
52.	Dr. Parag Nigam	Senior Professor	Wildlife Institute of India
53.	Dr Pooja Chourasia	Independent Researcher	None
54.	Dr. Rajendra Kumar Pandey	Senior Scientist Retd.	SFRI, Jabalpur
55.	Dr. Ramakant Panda	Cardio Surgeon	Mumbai
56.	Dr. Ruhi Haque	ACF	Obedullahganj Forest Division, M.P.
57.	Dr. Sachin Dixit	Senior Research Officer	SFRI
58.	Dr. Samir Kumar Sinha	Joint Director	Wildlife Trust of India
59.	Dr. Sanath Muliya	Assistant Veterinary Officer	NTCA
60.	Dr. Sanjay Gubbi	Senior Scientist and Programme Head	Holematthi Nature Foundation
61.	Dr. Sanjay Kumar Shukla	Member Secretary	Central Zoo Authority, Ministry of Environment, Forest and Climate Change, Govt of India



62.	Dr. Sanjeev Kumar Gupta	Wildlife Veterinary Officer	Panna Tiger Reserve
63.	Dr. Shahbaz Ahmad	PCCF (Retd.)	Retd. IFS officer
64.	Dr. Shailendra Kumar Tiwari	Senior Scientist	State Forest Research Institute Jabalpur
65.	Dr. C. K. Khanduri	PCCF Retd.	Uttarakhand Forest Department
66.	Dr. Suhas Kumar	Former Principal Chief Conservator of Forests	M. P. Forest Department.
67.	Dr. Uttam Kumar Subuddhi	Additional PCCF (Development)	Madhya Pradesh Forest Department,
68.	Dr Vinod B. Mathur	Former Director, Wildlife Institute of India, Dehradun	Wildlife Institute of India
69.	Dr. A.J.T. Johnsingh	Conservation Biologist	WWF India, The Corbett Foundation
70.	Dr. Anjana Rajput	Senior Research Officer	State Forest Research Institute, Jabalpur
71.	Dr. Atul Gupta	Wildlife Veterinary Officer	Van Vihar National Park, Bhopal
72.	Dr. Atul Srivastava	PCCF Working Plan, MP	Madhya Pradesh Forest Department
73.	Dr. Avinash Jain	Scientist- F	TFRI Jabalpur
74.	Dr. C. N. Pandey	Ex Pr. C. C. F & HoFF Gujarat.	IFS (Rtd.)
75.	Dr. Dhalsingh Bisen	Member of Parliament	Loksabha Balaghat
76.	Dr. G S Mishra	Senior Research Officer	SFRI, Jabalpur
77.	Dr. Hamza Nadeem Farooqui	MVSc Scholar	School of Wildlife Forensics and Health
78.	Dr. Jyoti Singh	Senior Research Officer	State Forest Research Institute Jabalpur M.P.
79.	Dr. K. Sankar	Retd. Director	SACON, MoEFCC, Govt of India
80.	Dr. Mayank Makrand Verma	SRA	State Forest Research Institute
81.	Dr. Mohan Ram	IFS	Gujarat Forest Department
82.	Dr. Prachi Mehta	Senior Scientist	Wildlife Research and Conservation Society
83.	Dr. Pratiksha Chaturvedi	Senior Research officer	SFRI Jabalpur
84.	Dr. Rakesh Shukla	Research Officer (Retd.),	Kanha Tiger Reserve
85.	Dr. Rathin Barman	Joint Director	Wildlife Trust of India
86.	Dr. S. Sathyakumar	Scientist-G & Registrar	Wildlife Institute of India
87.	Dr. Shailendra Kumar Singh	Retd. APCCF, Chhattisgarh	Forest Department, Chhattisgarh
88.	Dr. Suhas Kumar	Former PCCF, MP	MPFD
89.	Dr. U. Prakasham	Former CWLW & HoFF,	M.P. Forest Department (Retd.)
90.	Dr. Uday Homkar	Senior Research Officer	State Forest Research Institute, Jabalpur (M.P.)
91.	Dr. V. K. Bahuguna	Chairman	Centre for Resource Management



92.	Dr. Y. V. Jhala	Retd. Dean, WII	Wildlife Institute of India
93.	Dr. Akhilesh Mishra	Veterinary Officer	Pench Tiger Reserve
94.	Dr. Nitin Gupta	Wildlife Veterinary Officer	Bandhavgarh Tiger Reserve, M.P forest Department
95.	Mr. Kartikeya Singh	Founder Director	Wildlife and Forestry Services
96.	Dr. Kausik Banerjee	Scientist, Tiger Cell,	National Tiger Conservation Authority
97.	Dr. Kedar Gore	Director	The Corbett Foundation
98.	Mr. Keyur Naria	Student	The Maharaja Sayajirao University of Baroda
99.	Mr. Kishor Rithe	Director, BNHS	Bombay Natural History Society
100.	Dr. Koko Rose	Deputy Project Director, JICA, Uttarakhand	Forest Department, Uttarakhand
101.	Mr. Kshitij Kumar	DFO	Forest Department M.P
102.	Mr. Kushal N	Research scholar	Bangalore University
103.	Mr. L. Krishnamoorthy	Field Director, Satpura Tiger Reserve	M.P Forest Department
104.	Mr. Lakhanlal Uikey	CCF	M P Forest Department
105.	Mr. Lovit Bharti	Deputy Director, Bandhavgarh Tiger Reserve	MP Forest
106.	Mr. Manoj Kumar Agarwal	APCCF, Ujjain	M. P Forest Department
107.	Mr. Mathen Mathew	Wildlife Consultant	Mathew Consultants
108.	Ms. Meetu Gupta	Founder Director Conservation Core Society	Conservation Core Society
109.	Mr. Dhananjay Jhala	Student	Independent
110.	Mr. Eshaan Rao	Postgraduate	Student
111.	Mr. H S Mohanta	APCCF	M.P Forest Department
112.	Mr. Indrajit Sengupta	President of Saving Tiger Society	Saving Tiger Society
113.	Mr. J N Kansotia	ACS	M.P Forest Department, Bhopal
114.	Mr. Jasbir Singh Chauhan	PCCF Wildlife & CWLW, M. P	MPFD
115.	Mr. Jayanta Kumar Bora	PhD Student	Wildlife Institute of India
116.	Mr. Kamal Arora	Conservator of forest Jabalpur	M.P Forest Department
117.	Mr. Kanhaiya Lal Verma	SrResearch officer	State Forest Research Institute, Jabalpur
118.	Mr. Kedar Gore	Director	The Corbett Foundation, Mumbai
119.	Mr. Nishant Verma	CCF	Forest Department, Uttarakhand
120.	Mr Nitin H Kakodkar	Retd. PCCF Wildlife	Maharashtra Forest Department
121.	Mr. P S Somashekar	Administrative Member	KREAT, Bangalore PCCF Rajasthan Forest Department



			(Red)
122.	Mr. Pravindra Gwalvansh	FG	SFRI
123.	Mr. Pushkar Singh	PCCF and MD	MP MFP Federation
124.	Mr. Qamar Qureshi	Scientist –G	Wildlife Institute of India
125.	Mr. R. Sreenivasa Murthy	IFS Ret.d	MP Forest Department
126.	Mr. Rajat Rastogi	Student	Wildlife Institute of India
127.	Mr. Rajendra Prasad Rai	C.C.F. Khandwa Circle, Khandwa (M.P.)	Khandwa CIRCLE Khandwa
128.	Mr. Rajesh Kr. Gupta	Secretary to Chief Minister	Office of Chief Minister Rajasthan
129.	Mr. Rajesh Srivastava	Retd. PCCF and HoFF MP	Forest Department M. P
130.	Mr. Ramesh Kumar Gupta	PCCF & HoFF,MP	Forest Deptt Govt of M. P
131.	Mr. Ramesh Pratap Singh	Retd. APCCCF	M.P Forest Department
132.	Mr. Ramseena P. P	Research Scholar	Gandhigram Rural Institute
133.	Mr. Ritesh Sarothiya	Regional Deputy Director	WCCB, New Delhi
134.	Mr. Ritesh Vishwakarma	Senior Project Associate	Wildlife Institute of India
135.	Mr. Sanjay Thakre	Retd. CCF (MFD), Presently Jt. Advisor NHAI	Jt. Advisor, RO, NAGPUR, NHAI
136.	Mr Satyanand	APCCF(Wildlife)	Forest Department
137.	Mr. Shashi Paul	PCCF, WL, (Retd.)	Odisha Forest Department
138.	Mr V. S. Annigiri	APCCF, IT	M.P Forest Department, Bhopal
139.	Mr. Sameer Khazir	Assistant Manager	Wildlife Trust of India
140.	Mr. Yatin Patel	Wildlife Enthusiast	Independant
141.	Mrs. Anjana S. Thikrey	DCF	Institute of Forest Productivity, Ranchi
142.	Mrs. Aradhana Sahu	CCF, Wildlife Circle, Junagadh	Gujarat Forest Department
143.	Mrs. Jyotsna Gupta	IT Cell Head	SFRI, Jabalpur
144.	Mrs. Padmapriya Balakrishnan	CCF/ DIRECTOR	Van Vihar National Park, Bhopal
145.	Mrs. Sameeta Rajora	APCCF and CEO M.P Ecotourism Development Board	M.P. Forest Department
146.	Ms. Pavitra Ahlawat	Project Assistant	SFRI Jabalpur
147.	Ms. Puja Nagale	DCF	M.P Forest Department, Bhopal
148.	Ms. Sangeeta Kewat	Field Biologist	Sanjay Tiger Reserve, Sidhi, M.P
149.	Ms. Namita Nalamala	Student	University of Bristol
150.	Mr. Narendra Kumar Sanodia	CCF, Indore	M.P Forest Department
151.	Mr. Navdeep Singh	APCCF	Forest department, Haryana
152.	Ms. Nimisha Chauhan	PhD student	IIT, Bombay
153.	Mr. Nishant Kapoor	Filmmaker & MPTFS Volunteer	Bright Tiger Films
154.	Mr. Rajesh Kumar Rai	Conservator of Forest,	Forest Department



		Rewa Circle	
155.	Mr. Rajiv Kumar	Principal Chief Conservator of Forests (HoFF) & CWLW	Forest Department H. P
156.	Mr. Rajiv Kumar Mishra	CCF & FD Bandhavgarh Tiger Reserve	M.P Forest Department
157.	Mr. Rajiv Ranjan	PCCF	Karnataka Forest Department
158.	Mr. Rajnish Kumar Singh	Deputy Director Pench Tiger Reserve	M.P Forest department, GOMP
159.	Mr. Rakesh Kumar Jain	Senior Research Officer	State Forest Research Institute Jabalpur
160.	Mrs. Rakhi Nanda	C.F, Social Forestry Bhopal	Forest Department
161.	Mr. Ravikant Mishra	IFS Retired	M.P. Forest Department
162.	Mr. Ravindra Mani Tripathi	Deputy Director SFRI Jabalpur	SFRI Jabalpur
163.	Ms. Rekha Giri	Lawyer	UPCL
164.	Mr. Sameer Khazir	Assistant Manager	Wildlife Trust of India
165.	Mr. Sanjaya Singh	PCCF (Retd.)	-
166.	Mr. Sanjeev Jha	Conservator of Forest, Chhatarpur	M.P. Forest Department
167.	Mr. Sazid Ali	Forester	SFRI Jabalpur
168.	Mr. Shravana Goswami	PhD student	Wildlife institute of India
169.	Shri Ajay Vaish	Information Publicity Department	Balaghat, M. P
170.	Shri Amit Kumar Singh	DCF & Assistant Director	SFRI Jabalpur
171.	Shri Amit Patoudi	DCF	Office of PCCF Wildlife Bhopal
172.	Shri Anil Shukla	C.F. Wildlife	M.P Forest Department, Bhopal
173.	Shri Anjiky Deshmukh	Field Biologist	Kanha Tiger Reserve
174.	Shri Atul Jindal	PCCF Retd.	U.P Forest Department,
175.	Shri Kishore Rithe	Founder	Satpuda Foundation
176.	Shri N.K. Sanodiya	C.C.F- Indore	M.P Forest Department, Bhopal
177.	Shri S.S. Uddey	C.C.F- Seoni	M.P Forest Department, Bhopal
178.	Shri Sanjay Rayenkhe	DCF & Assistant Director	Kanha Tiger Reserve
179.	Shri Suneel Mishra	APCCF	Chhattisgarh Forest Department
180.	Shri Surendra Kumar Khare	Senior Manager	MPTFS at Office of PCCF Wildlife Bhopal
181.	Shri S K Tiwari	Director	Nai Dunia
182.	Shri Vijay Yadav		Van Vihar National Park Bhopal
183.	Ms. Shruti Majumdar	PhD student	Bits-Pilani, Rajasthan
184.	Mrs. Shyam Sunder Bajaj	Ret. PCCF	Retired IFS
185.	Mr. Siddhesh Sitaram Bhor	Junior Research Biologist	SACON
186.	Sri Rakesh Mohan Dobriyal	Pr. Chief Conservator of	Forest Department



		Forests (HoFF)	
187.	Mr. Srinivas R. Reddy	Chief Wildlife Warden, Tamilnadu	Tamil Nadu Forest Department
188.	Mr. Subharanjan Sen	APCCF Wildlife	M.P. Forest Department
189.	Mr. Subhrajit Goswami	Associate Analyst	Legal Initiative for Forest and Environment
190.	Mr. Sudhanshu Yadav	DFO	M. P. Forest Department.
191.	Mr. Sumit Saha	Field Biologist	Satpura Tiger Reserve
192.	Mr. Sunil Agarwal	PCCF Campa	MP Forest Department
193.	Mr. Sunil Kumar Singh	Field Director	Kanha Tiger Reserve
194.	Mr. Sunil Limaye	Retd. PCCF Wildlife, Maharashtra	Maharashtra Forest Department
195.	Mr. Sunil Mishra	APCCF	Forest Department Chhattisgarh
196.	Mr. Supunya Devavrata Bharadwaj	Producer, Filmmaker	Nudo films, POST it!
197.	Mr. S.S Raghuvanshi	SRO	SFRI Jabalpur
198.	Mr. S.S Rajpoot	Member RETA	RERA
199.	Mr. Suryakant Choubey	Field assistant	SFRI Jabalpur
200.	Mr. Tanuj Suryan	Junior Research Fellow	State Forest Research Institute
201.	Ms. Tanvi Sharma	Associate Analyst	Legal Initiative for Forest and Environment
202.	Mr. Tejas Karmarkar	Field Biologist	Bandhavgarh Forest Department
203.	Dr. Ujjwal Kumar	Scientist Tigercell NTCA	NTCA Tigercell, WII
204.	Mr. Vaibhav Chaturvedi	Co-Founder	Wildlife and Forestry Services
205.	Dr. Vidya Athreya	Director	WCS India
206.	Ms. Vidya Sachin Zope	Research Scholar	Sardar Patel Institute of Technology
207.	Mrs. Vidya Venkatesh	Director	Last Wilderness Foundation
208.	Mr. Vijay B Nandvanshi	Field biologist	Vanvihar National Park
209.	Mr. Vikram Singh Parihar	Chief Conservator of Forest (Retd.)	M.P Forest Department
210.	Mr. Vinay Kumar	Student	IFT, Bombay
211.	Mr. Vinod Kumar	Senior Professor (Retd.)	University of Delhi
212.	Mr Vinod Kumar Yadav	Former Principal Chief Conservator of Forests, Wildlife & CWLW,	West Bengal Forest Department
213.	Mr. Vivek Pagare	Founder Director	Wild track Services



Annexure 2: Programme Schedule

DAY 1: THURSDAY, 27 APRIL, 2023

Venue: Conference Hall, Celebration Van Vilas, Kanha

PROGRAMME SCHEDULE

Time	Activities
05:45-08:45 AM	Jungle Safari
9:30 AM onwards	Registration
12:00- 2:00 PM	INAUGURAL SESSION Session Host- Dr. Samita Rajora Rapporteurs: Dr. Ankur Awadhiya Session Associate – Mr. Anirudhwa Sarkar
2:00- 3:00 PM	Lunch
3:00 -3:30 PM	“Joining hands for Wildlife Conservation” By - Dr. Anish Andheria, President, Wildlife Conservation Trust (WCT) Mumbai
3:30 -4:00 PM	“Role of Geospatial Technology in Wildlife Conservation” By – Dr. J. S. Parihar, Former- Satish Dhawan Distinguished Professor, Outstanding Scientist & Dy. Director, Space Applications Centre, ISRO, Ahmedabad
4:00-4:30 PM	Tea break
4:30- 5:30PM	Conference Briefing & Important Announcements
5:30-7:00 PM	Break
7:00-8:00 PM	Cultural Evening Venue: Celebration Van Vilas, Kanha
8:00-10:00 PM	Ice Breaking Session followed by Dinner Venue: Celebration Van Vilas, Kanha



DAY 2: FRIDAY, 28 APRIL, 2023

THEME-WISE PARALLEL TECHNICAL SESSIONS

PROGRAMME SCHEDULE- SUMMARY

09:00 AM- 05:30 PM	
Theme-wise Parallel Technical sessions for all the four themes	
Theme 1: Wildlife Population Management	Venue: Aranyak Resort Session Host: Ms Rakhi Nanda Theme Coordinator: - Dr. H.S. Pabla Co-coordinator: - Mr. Kartikeya Singh Chauhan Theme Associate: - Dr. Aniruddha Majumdar
Theme 2: Wildlife Habitat Ecology & Management	Venue: Celebration Van Vilas Session Host: Dr Samita Rajora Theme Coordinator: - Dr. G.S. Rawat Co-coordinator: - Dr. Ankur Awadhiya Theme Associate: - Dr. Anjana Rajput
Theme 3: Wildlife Policy Issues and Challenges	Venue: Celebration Van Vilas Session Host: Ms. Bindu Sharma Theme Coordinator: - Dr. H.S. Singh Co-coordinator: - Mr. R. Sreenivasa Murthy Theme Associate: - Dr. Uday Homkar
Theme 4: Human Wildlife Conflicts and Mitigation Measures	Venue: Khatia Ecocenter Session Host: Mr. Pradeep Mishra Theme Coordinator: - Dr. Dhananjay Mohan Co-coordinator: - Dr. S. Sathyakumar Theme Associate: - Dr. Mayank Makrand Verma
05:30-07:00 PM: Break	
07:00 – 08:00 PM	Cultural Evening Venue: Celebration Van Vilas
08:00 – 10:00 PM	Conference Dinner Venue: Celebration Van Vilas

Note: Theme-wise Technical Session details are given separately.



DAY 2: FRIDAY, 28 APRIL, 2023

Venue- Aranyak Resort

Theme 1: Wildlife Population Management

PROGRAMME SCHEDULE-Technical Session Details

Session Host : Ms. Rakhi Nanda

Rapporteurs : Ms. Pooja Nagle & Dr Abhay Sengar

Technical Session 1: Management of Wildlife Populations in India: Why and How		
Chair: Dr. H. S. Pabla Co-Chair: Mr. Kartikeya Singh		
Time	Proceedings	Speakers
9:00-9:30 AM	Introduction: Need for Managing Wildlife Populations in India	Dr. H.S. Pabla
9:30 -10:00 AM	Wildlife Populations in India: Where They Need Management.	Mr. Qamar Qureshi & YV Jhala
10:00-10:20 AM	From Bane to Boon: Wildlife Challenges to Wildlife Opportunities	Mr. Mathew Mathen
10:20 -10:40 AM	Summing up: Role of Population Management in Wildlife Conservation	Dr. David Smith
10:40-11:00 AM	Q&A	
11:00-11:30 AM	Tea Break	
Technical Session 2: Indian Experiences in Population Management		
Chair: Dr. VB Mathur Co-Chair: Mr. Alok Kumar		
11:30-11:40 AM	Recovery of Reintroduced population of Gaur (<i>Bos gaurus gaurus</i>) in Bandhavgarh Tiger Reserve: Key learnings.	Dr. Parag Nigam
11:40-11:50 AM	Management of Barasingha Population in Kanha Tiger Reserve.	Dr. J.S. Chauhan
11:50-12:00 PM	Management of Spotted Deer (<i>Axis axis</i>) Population in the Protected Areas of Madhya Pradesh.	Mr. Rajnish Kumar Singh
12:00-12:10 PM	Management of Lion and Leopard Populations.	Dr. H.S. Singh
12:10-12:20 PM	Management of Spill over Tiger population in a Human Dominated Landscape of Central India.	Dr. Akhilesh Mishra
12:20-12:30 PM	Expansion of the cheetah metapopulation into India	Mr. Vincent C. van der Merwe



12:30-12:40 PM	Conservation translocations to recover greater one-horned rhinoceros (<i>Rhinoceros unicornis</i>) and eastern swamp deer (<i>Rucervus duvaucelii ranjitsinhi</i>) in Manas National Park, Assam	Dr. Rathin Barman
12:40-12:50 PM	Using energetics for wildlife population management: Case study from Manas Tiger Reserve"	Dr. Ankur Awadhiya
12:50-1:00 PM	Q&A	
1:00 -2:00 PM	Lunch	
Technical Session 3: Population Management in Protected Areas		
Chair: Dr. U Prakasham Co-Chair: Mr. S.S. Rajpoot		
2:00-2:15 PM	How to Manage your Success	Mr. Les Carlisle
2:15-2:30 PM	Elephant immunocontraception: Lessons learned.	Dr. Dave Cooper
2:30-2:45 PM	Translocation of Excess Animals: The Ungulates	Mr. Grant Tracy
2:45-3:00 PM	Translocation of Excess Elephants and Rhinos.	Mr. Kester Vickory
Technical Session 4: Managing Wildlife Populations Outside Protected Areas		
(The Reserve/Protected Forests, Herbivores in Croplands, Carnivores around Human Habitations)		
Chair: Dr K Sankar Co-Chair: Dr. Latika Nath		
3:00-3:15 PM	Hunting as a tool for conservation and population management	Mr. Jens Ulrik Høgh
3:15-3:30 PM	Wildlife management in the media	Mr. Charlie Jacoby
3:30-3:45 PM	Community Based Wildlife Management in Namibia.	Mr. Uakendisa Muzuma
3:45-4:00 PM	Q&A	
4:00-4:30 PM	Tea Break	
Technical Session 5: Panel Discussion "Vital Questions and the Way Forward"		
4:30-5:30 PM	Panellists: CWLW MP, ADG WL, Charlie Jacoby, Les Carlisle	

KANHA TIGER RESERVE



Poster Session- Theme 1- Wildlife Population Management

Venue- Conference Hall, Celebration Van Vilas

S. No	Title of the Presentation	Poster presenter
1	30 by 30 and Wildlife Population Management – Best practices from Madhya Pradesh	Dr. Ankur Awadhiya, DCF, Information Technology, Bhopal
2	Evolution of new population estimation techniques for male blue bulls based on their unique defecation behaviour	Dr. Mayank M Verma, SRA, State Forest Research Institute, Jabalpur
3	Mass translocation of captive spotted Deer (<i>Axis axis</i> Erxleben) through oral sedation method – Three case studies	Dr. Uday Homkar, SRO, State Forest Research Institute, Jabalpur
4	Propensity to take risky decisions and spatial learning ability in the hatchery reared juveniles of a megafish Deccan Mahseer (<i>Tor khudree</i>)	Dr. Apoorva Gopinath Project Associate Animal Behaviour and Cognition Programme National Institute of Advanced Studies- Bengaluru
5	Mass capture and translocation of Nilgai from croplands to protected areas: A case study.	Mr. Kartikeya Singh & Mr. Rajnish K Singh
6	Ungulate population and grass forage production in Kanha Tiger Reserve, Madhya Pradesh	Dr. J. S. Parihar Former- Satish Dhawan Distinguished Professor, Outstanding Scientist & Dy. Director, Space Applications Centre, ISRO, Ahmedabad
7	Functionality assessment of Ratapani Satpura corridor	Dr. Mayank Makrand Verma & Dr. Uma Ramakrishnan State Forest Research Institute, Jabalpur
8	Population dynamics of Tiger & Leopard at Kanha Tiger Reserve.	Dr. Ujjwal Kumar, Tiger Cell Kanha Tiger Reserve
9	Long-term monitoring of ungulates in Kanha Tiger Reserve.	Dr. Neha Awasthi, Tiger Cell Kanha Tiger Reserve
10	Demography of a keystone species, “The Chital”.	Ms. Shravana Goswami, Tiger Cell Kanha Tiger Reserve

Poster presentations will remain open from 27th- 29th April 2023



Venue- Celebration Van Vilas

Theme 2: Wildlife Habitat Ecology & Management

PROGRAMME SCHEDULE-Technical Session

Session Host: Dr Samita Rajora

Rapporteurs: Mr. Sudhanshu Yadav & Mr. Rajesh Kanna T.

Technical Session 1: Sub Theme- Ecology and Monitoring of Wildlife Habitats		
Chair: Prof. Mewa Singh Co-Chair: Prof. Vinod Kumar		
Time	Proceedings	Speakers
09.00– 09.10 AM	Welcome Address & Background	Dr. G.S. Rawat
09.10–09.45 AM	Ecology & Monitoring Wetland ecosystems of India: An Overview	Dr. S.N. Prasad Open-Source Geospatial India chapter, International Institute of Information Technology, Hyderabad
09.45–10.00 AM	Assessment & Monitoring of Grassland habitat of Kanha Tiger Reserve, Madhya Pradesh using multi- year remote sensing data	Dr. J.S. Parihar Formerly- Space Applications Centre (ISRO)
10.00–10.15 AM	Riverine wetlands in the Ganga plains: strategies for conservation and sustainable management	Dr. Rajiv Sinha Department of Earth Sciences, Indian Institute of Technology, Kanpur
10.15–10.25 AM	Wildlife use of the forest connectivities in the Western Terai Arc Landscape	Sh. Nishant Verma Wildlife Institute of India Dehradun
10.25–10.35 AM	Use of novel devices for Monitoring habitat use by wildlife and other ecological parameters - Case study from Madhya Pradesh	Dr. Ankur Awadhiya DCF, Information Technology, Bhopal
10.35–10.45 AM	Advance Geoinformatics based Suitable habitat for Asiatic Caracal in Madhya Pradesh, India: Towards initiating conservation	Dr. C.P. Singh Space Applications Center, ISRO, Ahmadabad Gujarat
10.45 –11.00 AM	Tea Break	
11.00–11.10 AM	Spatio-temporal habitat ecology of otters in the Bhavani-Noyyal River basin of western Tamil Nadu.	Sh. Ankit Moun Salim ali Center for Ornithology and Natural History
11.10–11.20 AM	A typology framework to manage and restore dry	Sh. Rajat Rastogi



	tropical forests of Central India infested with invasive alien species	Independent Researcher
11.20–11.35 AM	Discussion & Conclusion	Session Chair/Coordinator
Technical Session 2: Sub Theme Management and Restoration of Wildlife Habitats		
Chair: Dr. D.V.S Khati Co-Chair: Dr. Faiyaz Khudsar		
11.35 –12.05 PM	Assessment of habitat suitability for Hard ground Barasingha in Selected Protected Areas of Central India	Dr. K. Nayak Former Director Kanha Tiger Reserve
12.05–12.20 PM	Securing wildlife habitats in PAs of Central India	Dr. R.P. Singh IFS, (Retd)
12.20 –12.35 PM	Fire: A versatile tool to manage wildlife habitats	Dr. H.S. Pabla Former Chief Wild Life Warden, M.P.
12.35–12.45 PM	Grassland Habitat Development in relocated village sites of Kuno Palpur Wildlife Sanctuary of Madhya Pradesh.	Sh. R.K. Mishra Forest Department, M.P.
12.45–01.00 PM	Grasslands of Wildlife Protected Areas of Central India: Ecological status and response to management interventions	Dr. R. K. Pandey Retd. Senior Scientist & Head of Forest Ecology and Environment Division, SFRI, Jabalpur
01.00 –01.30 PM	Discussion & Conclusion	Session Chair / Coordinator
01.30 –02.30 PM	Lunch Break	
Technical Session 3: Panel Discussion on Emerging Issues, Wise Practices and Way Forward in Wildlife Habitat Ecology & Management		
Moderator: Dr. G.S. Rawat		
2.30 – 3.30 PM	<ul style="list-style-type: none">Wetland habitats: Scientific data gaps, management issues and way forwardRestoration and assessment of grassland habitatsManagement and control of Invasive Alien SpeciesUse of modern tools and techniques for monitoring of threatened habitatsJudicious use of fire for the management of wildlife habitatParticipatory approaches to habitat management in buffer zones and eco-sensitive zonesManagement of bio-corridors	MoEFCC Representative (1) State Chief Wildlife Wardens (2) Dr. J.S. Chauhan Dr. S.N. Prasad Dr. Asad Rahmani Dr. K. Nayak Dr. Jayant Kulkarni International Expert (5-6 minutes each)
3.30 – 4.15 PM	Summary & Conclusion	Dr. G.S. Rawat
4.15 – 4.30 PM	Tea Break	
Technical Session 4: Compilation of final recommendations		



4.30 – 5.30 PM	Compilation of final recommendations by Session Coordinator, Co- Coordinators & Rapporteurs
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Poster Session - Theme 2 -Wildlife Habitat Ecology & Management Venue- Conference Hall, Celebration Van Vilas		
S. No	Title of the Presentation	Poster presenter
1.	Behavioural study of Bonnet Macaque (<i>Macaca radiata</i>) in metropolitan city of Bengaluru	N. Kushal & U. Anandhi Department of Zoology Bangalore University
2.	Evaluating the potential for reintroducing the endangered wild water buffalo (<i>Bubalus arnee</i>) in Central India.	Bora, J. <i>et al.</i> Wildlife Institute of India.
3.	Restoration of grasslands dominated by <i>Desmostachya bipinnata</i> in Kanha Tiger Reserve, Madhya Pradesh	Deshmukh <i>et al.</i> Kanha Tiger Reserve M.P. Forest Dept.
4.	Status, habitats and conservation prospects of the world's largest goat- Markhor <i>Capra falconeri cashmeriensis</i> - in the Kashmir Himalaya, India.	Ahmad <i>et al.</i> Wildlife Trust of India, Noida U.P. (Mr. Sameer Khazir will be the presenter)
5.	Status of anthropogenic grasslands at village relocation sites in Satpura Tiger Reserve, Central India	Anjana Rajput, Senior Research Officer State Forest Research Institute, Jabalpur, M.P
6.	Assessment of Wildlife Habitat along Proposed doubling of Railway Line in Sanjay-Dubri Tiger Reserve, Madhya Pradesh	Aniruddha Majumdar, Scientist 'B', State Forest Research Institute, Jabalpur, M.P.
7.	Tiger occupancy in Ratapani-Kheoni Landscape: Reasons behind tiger presence in proximity of capital Bhopal, Madhya Pradesh	Mayank Verma & Satyadeep Nag State Forest Research Institute, Jabalpur, M.P.
8.	Critical Study of Resource Sharing Pattern	Ruhi Haque, ACF Obedullahganj



Between Carnivores and Herbivores: Tiger Movement Area of Obedullahganj and Bhopal Forest	M.P. Forest Dept.
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Poster presentations will remain open from 27th- 29th April 2023

Venue- Celebration Van Vilas

Theme 3: Wildlife Policy Issues and Challenge

PROGRAMME SCHEDULE-Technical Session Details

Session Host: Ms. Bindu Sharma

Rapporteurs: Mr. A.A. Ansari & Mr. Anupam Sharma

Technical Session 1: Sub Theme- Wildlife Policy Issues and Challenge		
Chair- Dr VK Bahuguna Co-Chair – R. Shreenivasa Murthy		
Time	Proceedings	Speakers
9.00 – 9.05 AM	Opening Remark and introduction of speakers	Dr. H.S. Singh-Theme Coordinator
9.05 – 09.30 AM	Wild Life and Biodiversity Conservation approach: Current policy environment and the evolving trends	Dr. S.K. Khanduri IFS (Retd.)-Lead Speaker
09.30 – 9.55 AM	Wildlife conservation in India: Prospects and problems	Dr. A.J.T Johnsingh
9.55 – 10.20 AM	A Note on Tourism in Tiger Reserves of Madhya Pradesh	Dr. Suhas Kumar IFS (Retd.)
10.20 –10.35 AM	Coastal Regulation Zone Notifications- A legal tool to protect wildlife habitat in Coastal West Bengal.	Mr. Subhrajit Goswami
10.35 –10.50 AM	Proposed Socio-Legal changes as solution towards effective management of man-wildlife conflicts in Madhya Pradesh.	Mr. Anshuman Singh
10.50 –11.05 AM	Unlocking Protected Areas: A critical analysis of functioning of statutory bodies for wildlife conservation	Ms. Tanvi Sharma
11.05 –11.15 AM	Concluding session	Chairman of the Session
11.15 –11.30 AM	Tea break	
Technical Session 2: Sub Theme- Wildlife Policy Issues and Challenge		
Chair- Dr. Suhas Kumar Co-Chair. - Dr. Kaushik Banerjee		
11.30 –11.35 AM	Opening Remark and introduction of speakers	Dr. H.S. Singh
11.35 –12.00 PM	Wildlife Conservation Policy for India	Dr. C.N. Pandey IFS (Retd.)
12.00 –12.25 PM	75 years of wildlife policy and wildlife conservation issues in independent India, an analysis.	Sh. R. Shreenivasa Murthy, IFS (Retd.)



12.25 –12.50 PM	Principled Diversion of Forest Lands and Pragmatic Participatory Management of Forest Resources	Sh.Shahbaz Ahmad, IFS (Retd.)
12.50 –1.05 PM	Human-wildlife conflicts in India- A study of the emerging policy landscape.	Ms. Nimisha Chouhan
1.05 –1.20 PM	Human - wildlife conflicts with special reference to wildlife crime and requirement of law related to it.	Rekha Giri
1.20 –1.35 PM	MSTriPES - an Adaptive Management Tool for Conservation.	Mr. Ashish Prasad
1.35 –1.50 PM	Leonine tale: Ecology, Economics and Politics of Conservation	Mr. Kausik Banerjee
1.50 –2.00 PM	Concluding session	Chairman of the Session
2.00 –3.00PM	Lunch Break	
Technical Session 3: Panel Discussion on Emerging Issues and Way Forward in - Wildlife Policy Issues and Challenge		
Chair- Dr. C.N Pandey Co-Chair-Mr. Anshuman Singh		
3.00 –4.00 PM	Wildlife policy issues and Challenges Vital issues and Way forwards	
4.00 –4.30 PM	Tea Break	
Technical session 4: Compilation of final recommendations		
Chair- Dr. A.J.T Johnsingh Co-Chair-Mr. Anshuman Singh		
4.30 –5.30 PM	Compilation of final recommendations	Coordinator, Coordinators and Rapporteurs

KANHA TIGER RESERVE

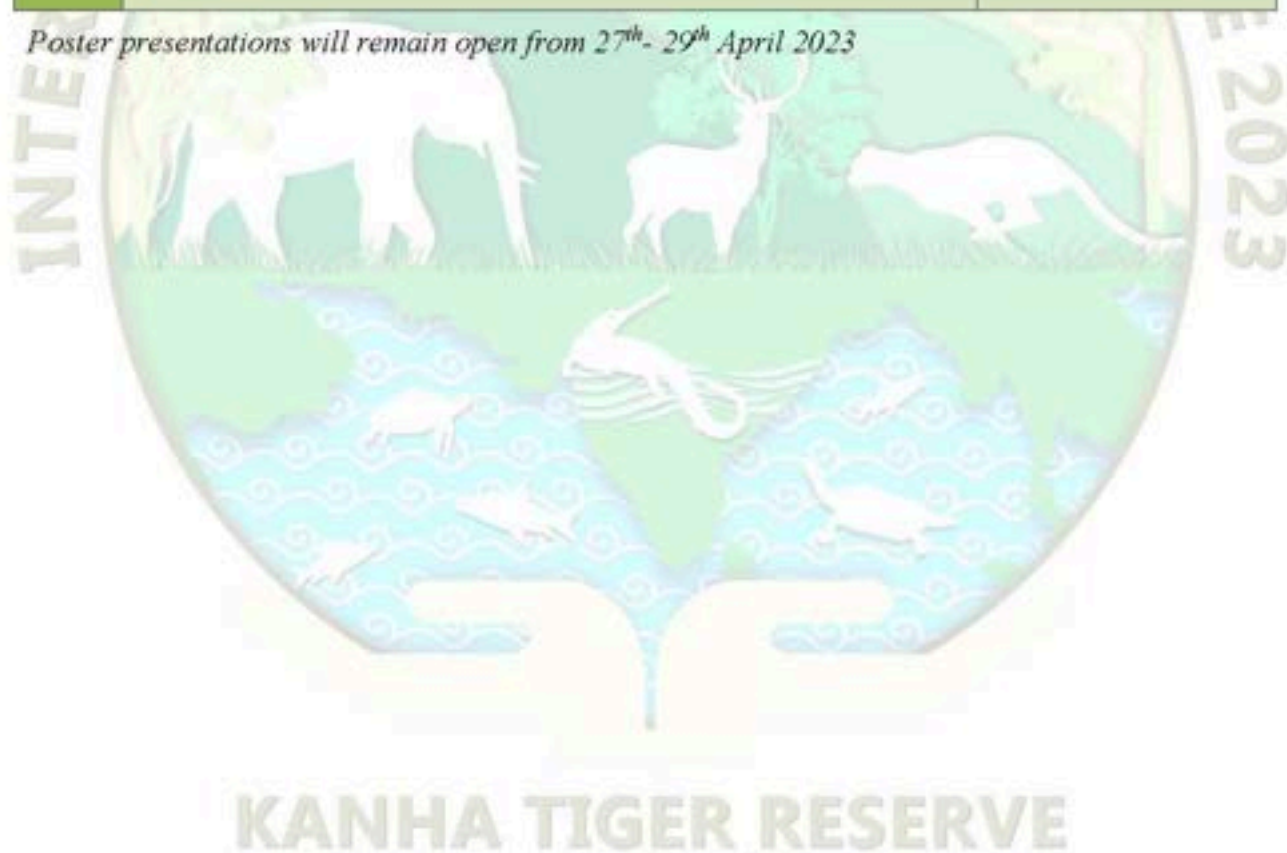


Poster Session -Theme 3- Wildlife Policy Issues and Challenge

Venue- Conference Hall, Celebration Van Vilas

S. No	Title of the Presentation	Poster presenter
1.	Exploring the possibility of spiritual teachings to restore and strengthen the alliance between communities, managers, forests, and wildlife	Ms. Pooja Chourasia
2.	Wildlife conservation need of the hour: A Survey	Mrs. Vidya S. Zope
3.	Tiger Conservation Prioritization Units (TCPUs) in Ratapani-Kheoni Landscape of Vindhyan range with Special Reference to Ecological Restoration of Wild Land Blocks	Dr. Mayank Makrand Verma
4.	The need for sustainable development goal-based strategic approach to tiger conservation in proximity capital Bhopal	Dr. Mayank Makrand Verma

Poster presentations will remain open from 27th - 29th April 2023



Venue- Khatia Ecocenter

Theme 4: Human - Wildlife Interactions and Mitigation Measures

PROGRAMME SCHEDULE-Technical Session Details

Session Host: Mr. Pradeep Mishra

Rapporteurs: Mr. Kshitij Kumar & Mr. Meena Avdeshkumar

Technical Session 1: Session 1: Extent of HWC and mitigation measures		
Chair- Sh Shashi Paul Co-Chair – Shri Vidya Venkatesh		
Time	Proceedings	Speakers
09:00 - 09:15 AM	Background and Introduction	Dr. Dhananjai Mohan
09:15 - 09:35 AM	Human - Elephant conflict and it's mitigation in India	Sh. Vinod Yadav
09:35 -09:55 AM	Human - wildlife conflict and it's mitigation in Karnataka	Dr. Sanjay Gubbi
09:55 -10:15 AM	Human-Wildlife Conflict Management in the Indian Himalayan Region: A review	Dr. S Sathya Kumar
10:15 -10:35 AM	Monkey Sterilization Himachal Pradesh; Trail Blazer	Sh. Rajeev Kumar
10:35 -10:50 AM	Assessment of extent and severity of human-large carnivore conflict in Western Terai Arc Landscape, Uttarakhand	Sh. Nishant Verma
10:50 -11:05 AM	Modeling the hotspots of vehicle wildlife collisions in Central India	Dr. Rajashekhar Niyogi
11:05 -11:25 AM	Discussion & Conclusion	
11:25 -11:40 AM	Tea break	
Technical Session 2: Human wildlife Interactions and communities		
Chair- Sh Nitin Kakodkar Co-Chair Shri Ashim Shrivastav		
11:40 -12:10 PM	Living with Predators and Pillagers: Managing Human-Wildlife Conflict in India	Dr. H. S. Pabla
12: 10 – 12:25 PM	Success stories in Human Wildlife conflict mitigation from SAARC countries	Sh. A. Udhayan/ Dr. Dhananjay Mohan
12:25 -12:45 PM	Human - Leopard conflict and it's mitigation in India	Dr. Vidya Athreya
12:45 -01:00 PM	A stakeholder-centric approach to leopard management in Tehri, Uttarakhand, India	Dr. Koko Rose
01:00 -01:15 PM	Mumbaikars for Sanjay Gandhi National Park: A citizen science programme for shifting focus of human leopard conflict	Sh. Sunil Limaye



	from leopards to human safety	
01:15 -01:30 PM	A Study on Livelihoods Security and Human-Wildlife Conflicts in the Western Ghats of Maharashtra	Ms. Shruti Majumdar
01:30 -01:50 PM	Discussion & Conclusion	
01:50 -02:50 PM	Lunch	
Technical Session 3: Panel discussion on Human - wildlife interaction and conflict mitigation measures - Vital issues and way forward Moderator- Dr. Dhananjai Mohan		
02:50 -04:00 PM	<ul style="list-style-type: none"> • Extent of HWC and its documentation • Assessment of population of problem species • Current strategy to deal with HWC and short comings • Use of modern tools and techniques in dealing with HWC • Participatory approaches and stake holder involvement • Identification of corridors and buffers and management paradigm for such areas • Policy imperatives 	MoEFCC Representative (1) State Chief Wildlife Wardens (1) Sh. Sunil Limaye, Sh. Rajeev Kumar, Dr. Parag Nigam, Sh. Nitin Kakodkar, Sh. Shashi Paul (5minutes each)
04:00 -04:15 PM	Summary and conclusions	Dr. Dhananjai Mohan
04:15 -04:30 PM	Tea break	
04:30 -05:30 PM	Technical Session 4: Compilation of final recommendation	



KANHA TIGER RESERVE



Poster Session -Theme 4 -Human Wildlife Conflicts and Mitigation Measures

Venue- Conference Hall, Celebration Van Vilas

S. No	Title of the Presentation	Poster presenter
1.	Human Wildlife Conflicts in Himachal Pradesh: Case Study of Chamba District	Vinay Kumar and Pankaj Sekhsaria
2.	Comparing people's perception towards leopards in two areas with different human-leopard conflict scenario	Keyur Naria, Hiren Patel, Narendra Chetule, Chandni Valodkar and Geeta Padate
3.	Farmer's perception regarding blue bull damage and management in Punjab	Kiran Rani and B. K. Babbar

Poster presentations will remain open from 27th- 29th April 2023



DAY 3: SATURDAY, 29 APRIL, 2023

Plenary & Valedictory Session

Venue: Conference Hall, Celebration Van Vilas, Kanha

PROGRAMME SCHEDULE

Session Host: Ms Rakhi Nanda

Rapporteurs: Dr. Ankur Awadhiya

Time	Activities
05.45–08.45 AM	Jungle Safari
Plenary Session: Thematic Presentations by all Theme Coordinators	
09:30 –10:30 AM	Theme 1: Wildlife Population Management
10:30 –11:30 AM	Theme 2: Wildlife Habitat Ecology & Management
11:30 –12:00 PM	Tea Break
12:00 –01:00PM	Theme 3: Wildlife Policy Issues and Challenges
01:00–02:00 PM	Theme 4: Human - Wildlife Conflicts and Mitigation Measures
02:00– 03:00 PM	Lunch Break
03:00– 04:00 PM	Poster Visit
04:00– 05:15 PM	Valedictory Session Session Host- Ms. Rakhi Nanda Rapporteurs: Dr. Ankur Awadhiya & Mr. Adarsh Shrivastava Session Associate – Mr. Anirudhwa Sarkar

KANHA TIGER RESERVE



Annexure 3-Discussions on recommendations for theme 1 (Wildlife Population Management)

Drafting of Recommendations

In view of the controversial nature of the subject, the group had considerable difficulty in producing recommendations acceptable to all members. The presentations made in the conference, including the panel discussion, made a clear case for using fences, translocation and hunting as the tools for sustainable conservation of wildlife (Immuno-contraceptives are only in the experimental stages at present). Therefore, in order to ensure that the discussion on the recommendations stays focused, a set of possible recommendations were presented to the house for discussion by the theme coordinator. However, there was an uproar in the house and several members objected to the use of hunting and fencing as population management tools in India. In view of a large number of disparate opinions, the house was given three options by the theme coordinator, namely,

- Edit the draft recommendations suitably to make them acceptable to all;
- Reject this document completely and create a new set of recommendations; or
- Abort the exercise all together if no agreement is possible.

After considerable deliberations a group of volunteers, under the leadership of Dr. Y.V. Jhala, came forward to work on the recommendations and produce a draft acceptable to all. They spent a long time trying to incorporate various suggestions and objections into an acceptable document. By the time the redrafting was over, it was quite late and many members had left the conference hall after sharing their views. As a discussion on the final draft was not possible that day, the draft was shared with the members through a WhatsApp group with a request to provide their feedback. It was announced that all views would be considered and presented to the conference organisers for consideration. The draft recommendations were then presented for discussion in the plenary session on the following day. As expected, there was no support to the recommendations in the plenary also. There were strong reactions from the floor primarily opposing the mention of “sustainable use” in the recommendations. As a detailed and reasoned discussion was not possible in this session too, members were requested to send their views on the recommendations by e-mail to SFRL. They were assured that their views would be considered in preparing the final draft as far as possible. The draft recommendations were posted in the larger WhatsApp group which had all participants as members to facilitate access. Rather than sending their responses by e-mail as requested, the members started discussing and analysing the recommendations in the group itself. Very few submissions from individuals by e-mail were received. After sufficient time had elapsed, all the substantive comments from the members were



compiled and reviewed by the theme coordinator to distil a consensus if possible. In all, 21 written responses were received (or extracted from the WhatsApp discussion) and were considered in finalising the recommendations. It goes without saying that most submissions, based largely on emotions rather than science, were against hunting or sustainable use, draft recommendations have been slightly modified on the basis of these submissions but remain largely as presented in the plenary.

In conclusion, it is said that the conference, for the first time, provided a platform to discuss the question of managing wildlife populations, primarily in view of the emerging scenario of the growing human - wildlife conflict. For this bold step, both MPFD and SFRI deserve congratulations. However, the discussions indicated that the Indian conservation community is not yet ready to accept this challenge and needs more time to make up its mind and learn from global experience. In fact, we all are struggling with the conflicting notions of being loyal to our education and the new realities staring at us. Therefore, we should organise more such conferences to mainstream the debate and help the conservation community to be comfortable with new ideas.

However, the theme coordinator, wanted to stress that without managing populations, there can be no wildlife management and there can be no population management without sustainable use. The only alternative to sustainable use is living with rampant poaching and having to declare population after population vermin and mindlessly massacre wildlife.

Thus, the enclosed recommendations are not the result of a consensus but best reflect the presentations made in the conference. The updated recommendations, written submissions/ comments received from the members, including the comments of the theme co-ordinator on each, are attached herewith for further action. In view of the lack of consensus, it is proposed that the Government may consider constituting a committee to review the presentations, recommendations and the comments received from the members to draw conclusions and recommend future course to the government. It is also recommended that the committee should also include members from the administration, civil society, and, public representatives from conflict zones, in addition to wildlife managers and biologists, in order to arrive at a balanced view.

Given below are:

1. Recommendations on Wildlife Population Management.
2. Comments received from members and response received from the theme coordinator on each individual observation are given below.



Recommendations proposed by theme coordinator Wildlife Population Management

India has made tremendous progress in the last 50 years in securing its wildlife and biodiversity heritage in the face of ever-growing pressures on wildlife habitats. While once it looked that animals like tigers, lions and elephants would go extinct, currently populations of these charismatic species are on the increase and India hosts the largest population of these species. In some areas these species have reached their potential carrying capacities leading to increased human-wildlife conflict. This success, a direct consequence of the tolerance of people of India deserves to be celebrated. Conservation managers need to ensure that increase in wildlife populations does not aggravate human-wildlife conflict (HWC) beyond tolerance levels. In a thickly populated country like India, human wildlife co-existence is possible only through the active management of wildlife populations, changing people's perceptions, enhancing community benefits leading to increase in tolerance. A two-pronged strategy needs to be adopted wherein wildlife populations within Protected Areas are prioritised for enhancing biodiversity, ecosystem values and interactions while wildlife populations outside PA's are managed for long-term sustainability in a manner that minimises conflicts. Wildlife populations should be actively regulated in other places so as to ensure minimal conflict and maximum sustained benefits to communities. Based on the presentations of national and international experts and discussions during the session, the participants recommend the following:

1. Protected Areas serve as repositories of biodiversity and source populations for most species. However, viable populations of certain low-density, wide-ranging, species need landscape level management for long-term viability. Therefore, meta-population management with corridor linkages between PA's are essential elements of India's wildlife population management strategies.
2. In order to be able to manage wildlife populations at par with global standards, India must urgently develop capacities to manage translocation and immuno-contraception of wild animals through exposure and training.
3. Population management outside PAs should be done primarily through translocations to low density PA's, fences, and sustainable utilization for local community benefits.
4. In view of the shrinking and degrading of habitats in government forests, restoration of forest should be attempted with CSR support, private and community conservancies outside government forests should be promoted in accordance with section 36C and 36D of the Wild Life (Protection) Act, 1972, by allowing the land owners to benefit from wildlife through tourism and sustainable use.
5. Chief Wild Life Wardens (CWLW) of the states should treat a wildlife population "dangerous", as per section 11 of the Wild Life (Protection) Act 1972, and take steps to



manage it, when it has grown to a level that it is likely to cause harm or injury to nearby people, without waiting for damage to happen.

6. Sustainable use of biodiversity includes sustainable use of wildlife also, as per the Convention on Biological Diversity (CBD) to which India is a party. Therefore, India must develop management systems and legislation to practice sustainable use of biodiversity in all forms.
7. The government should ensure estimation of herbivore populations every four years on the lines of tiger estimation.

Comments received from members on the recommendations and the response of Theme Coordinator on each observation

Mr. Shahbaz Ahmed, PCCF (Retd.), M.P. Forest Department

At point 4 there is a proposal for "Trophy hunting" in the guise of sustainable use. In fact, the concept of trophy hunting emanates from a mindset which takes pleasure in killings and mutilations and considers it a recreation. It is a colonial mindset and according to a recent survey most of the people in Africa, USA and Europe are against trophy hunting. The people involved in the business of trophy hunting know this and so the association of such people known as Safari Club International, South Africa sponsored a study in which they have tried to project that trophy hunting is very beneficial to the local communities. This manipulated finding is far from the truth.

Trophy hunting, in whatever terminology it is engrossed, has no place in a responsible ecosystem or wildlife management. It will be a retrograde step and against the noble ideals for which we have been striving so far.

***Theme Coordinator's Response:** It is true that trophy hunting, also called conservation hunting and recreational hunting, which involves the hunting of a miniscule number of past prime males, is a part of the concept of sustainable use of wildlife prevalent in most countries. On public lands, and outside PAs, recreational hunting is usually done to generate incomes for local communities, where regular photographic tourism is not possible due to poor wildlife densities. Recreational hunting is also a major activity in private wildlife reserves where its financial returns support the conservation of large tracts of wild lands and endangered species. The value of sustainable use, including trophy hunting, to wildlife conservation, can be imagined from the fact that the wild lands under private wildlife reserves in South Africa is more than 3 times the area of public parks (such as national parks) and upto 95% of the populations of many highly endangered species, including the charismatic white rhino, occur only in private wildlife reserves. Many species have recovered from the brink of extinction due to the income generated*



by sustainable use in public and private lands. History of Markhor in Pakistan is often quoted as an illustrative case.

It is also true that, there is a campaign spearheaded by influential animal-rights organizations in Europe and America to ban the import of trophies from Africa. African governments and communities are opposing these bans as they believe that without the financial returns from overseas recreational hunters' wildlife conservation in their countries will become financially unaffordable and people will become poorer.

Wildlife (Protection) Act, 1972, now permits the constitution of private and community conservancies, which are equivalent to private wildlife reserves in other countries, under section 36 C and 36 D. This provision has not made any significant contribution to conservation primarily because nobody ever thought conservancies as income generating assets. This can change if they are allowed to generate revenues from wildlife. If these properties are not contiguous with government forests, they will necessarily have to be fenced to prevent conflict with neighbors. Therefore, their populations will have to be actively managed to keep them within carrying capacity of the habitat. This, along with visual tourism, will also generate incomes that will sustain these conservancies. Without income, the conservancies will become financially unviable and without population management, they will become ecologically unviable. The only way to take advantage of this provision, in the interest of conservation of wildlife, is to allow tourism and population management, along with consumption of meat. For this, appropriate rules will have to be formed. Some changes in the Act will also be required as killing of animals for population management is currently allowed (strangely!) only in PAs (section 29 and 35). It is for us to decide whether to use this provision or to let it sleep forever.

Mr. Anshuman Singh, Advocate

With reference to Point 5 of the recommendations above, please consider that there is a specific legislative intent behind section 11 of the 1972 Act.

With regard to the animals mentioned in Schedule I, only those can be permitted to be hunted which have become dangerous to human life or are disabled or diseased beyond recovery. Schedule II, III or IV animals can be permitted to be hunted if they have become dangerous to human life or property, including standing crops or are disabled or diseased beyond recovery. In either case, this satisfaction as to the animal having become dangerous has to be recorded in writing by the Chief Wildlife Warden. The intent is therefore writ large in the section itself that such satisfaction cannot be recorded and such order cannot be issued unless by material it is established that the animal has become dangerous to human life (or property in case of animals of Sh. II to IV).



It is therefore preposterous to suggest that merely an increase in the population of the animals, such animals can be declared dangerous to human life or property. To say that the increase in the population of the animals would be "likely to cause harm or injury" would be doing violence to not only the letter and spirit of Section-11 but also to the legislative intent behind it.

No interpretation can be permitted which defeats the very purpose and intent behind a legislative instrument or part thereof.

I would therefore request that Point 5 be deleted from the recommendations in its entirety.

***Theme Coordinator's Response:** This member is a senior advocate. Therefore, his advice must be taken seriously. However, a counter argument can be that the law nowhere says that an animal shall be treated as dangerous to human life or property only after it has caused death or destruction. The intent of this section is to prevent deaths and damage to property by wild animals, not only the protection of wild animals against mindless killing. Therefore, taking anticipatory action based on sound science and facts should be within the ambit of the 'satisfaction' of the CWLW. If that were not the case, we did not need a CWLW with 30-35 years of experience to make a judgment. Anybody can order the killing of an animal if it has already started killing people or impoverishing them by destroying their properties.*

Dr. V.K Bahuguna, DG, ICFRE (Retd.)

1. I do not favour killing of any wildlife whatsoever per say. However, like Monkeys by declaring them vermin and killing them as also sterilization though is all right in so far protecting the field crops of farmers is concerned but the better way would be to allow capture of Monkeys for research purposes in the field of medicines by reversing the policy of no capture policy declared on the insistence of Ms. Maneka Gandhi. Monkeys have severely damaged the agricultural crops in Uttarakhand and many other places.

We should have a pragmatic policy for management of such species. Indian people are not yet prepared for Trophy hunting as yet as it is fraught with dangers. After declaration of vermin, we can certainly eliminate such animals depending upon situation to situation.

2. What many people argue for allowing jungle fowl hunting from October onwards for few months/ Sounds good but only in British period, because if we allow it today the political class will always take over and we know the quality. And smugglers will always be lurking around.
3. Therefore, first we should sort out certain dire issues like regeneration and management of natural forest, corridor protection, shift focus on habitat management of a given



landscape, involvement of people in ecotourism etc. as we recommended in this fine workshop.

4. Trophy hunting etc. should wait as if we allow s people will then say why not go for Tiger farming, Deer farming in India are not prepared to take such leap.

We should first consolidate the stability of our varied ecosystem as there is no occasion to live on our laurels of 50 years of Project Tiger as the real conditions in the field are not very sound and population is skewed.

***Theme Coordinator's Comments:** This member is against all killing but supports the use of dangerous animals (vermin) for human benefit. He is against allowing any hunting also because, as he thinks, it will be difficult to control it. His sentiment is representative of the popular beliefs about wildlife and is the foundation of our current conservation paradigm. However, it is important to note that a species is notified as vermin (as he has proposed) when the intent is to exterminate it not to conserve it. On the contrary, we are looking for ways to conserve all biodiversity and sustainable use is a globally accepted strategy to do it. As for the likelihood of any relaxation going out of control, it is important to note that most countries where sustainable use has made conservation socioeconomically viable, including Pakistan and most African nations, are not better governed than India. In most countries, regulated hunting, with benefits to communities, has eliminated rampant poaching by locals and has helped wildlife bounce back even from the brink of extinction.*

Dr. Suhas Kumar, PCCF (Retd.), M.P. Forest Department

“The question is whether any civilization can wage relentless war on life without destroying itself, and without losing the right to be called civilized.” — Rachel Carson

While agreeing with the recommendations stated in para- 1 and 2, I find recommendations- 3 to 6, a disguised attempt to promote trophy hunting which, the group working on this theme, was advocating with all its might throughout the deliberations. Even there was an attempt to get a list of pre-drafted recommendations endorsed by the participants: which fortunately did not materialize. I consider this attempt totally unethical and unprofessional. The group advocating trophy hunting and sustainable utilization is perhaps deliberately trying to present a false scenario that the wildlife population in the country has exploded and humans are their victims. No data support this assumption. The truth is wild animals have always been the victims of the apathy and greed of the human race. It is my personal knowledge, based on my visits to several Sanctuaries, National Parks, and Tiger Reserves in the country, that many PAS including some Tiger Reserves have very low densities of prey and tigers or no tigers at all. I believe that more than 60% of our tigers live off cattle rather than natural prey. The WII conducts all India population estimations of predators and prey species but once they are done with the analysis of the data for tigers and leopards, they just



forget about analysing the prey data in detail for PAs and territorial divisions perhaps because they do not have enough funds to carry out such a massive task. In 2013 the M.P. Wildlife wing had to pay Rs. 32 lakhs to WII to get that data analysed, and the institute took 4 years to complete that analysis. The SFRI, Jabalpur began doing this work after 2016. The reports of both agencies clearly indicate the poor status of the herbivore populations in territorial areas and protected areas of Madhya Pradesh. Therefore, one of the recommendations that this group should make may be- "The government should ensure estimation of herbivore animals in the entire state (in PAs, territorial forests, revenue forests and farmlands in villages) every four years. "The areas that are prone to crop raiding are around some tiger reserves, not all PAs. The damage by blue bulls and blackbuck is restricted to some areas in some districts where these animals live on the farmlands and village scrubs. Therefore, another recommendation should be – "To know the true extent of crop damage and the species of animals involved in it, a state-wide study should be launched at the earliest." Once that is done, strategies for their management can be evolved easily. The irony is despite organizing several hundred workshops all around the country and compiling volumes of recommendations no serious attempts to implement those were made anywhere in the country and meagre funds were made available for implementing those recommendations. It is a pity that we always try to opt for the easiest path – the shortcut- 'kill them all'. The time is ripe to recommend implementing measures already known to solve the problem of crop raiding. Some states are successfully using solar power fences to effectively control crop raiding. The time is to promote such a measure by providing villagers with subsidized power fences and training for their maintenance and upkeep. Indigenous research and experiments on the use of contraceptives and sterilization to control the population of monkeys, langurs, and stray dogs and the population of blue bulls and blackbucks residing around villages and farmlands should be launched zealously instead of recommending an easy and unjustified option of killing hapless animals who are the victims of human being's expansionist and marauding tendencies. Managing tigers living with humans with the kind of situation building up in several areas of the country (more tiger's visible outside than within PAs as human development is making inroads into their habitats), the strategy of capturing and/or killing tigers will not succeed. Every now and then a tiger will be either killed or captured, therefore, there has to be a well thought of protocol to deal with tigers in a human-dominated landscape. One has to understand the issue first -what is making these tigers impatient with humans? I fully understand that an aberrant animal must be eliminated for the good of other congeneric as well as humans, but then how one concludes which animal is totally beyond redemption? Considering the fact that 'NOT' every attack is a sign of aberration, may I suggest applying the same principle of Jurisprudence to wild animals as applied to human beings, too? Establish the offence through undeniable evidence. Every case of attack and human death by wild animals must be investigated thoroughly to establish the identity, and understand the circumstances and behaviour of the



animal as well as of the victim before drawing any conclusions - whether the animal is actually a man-eater or not. In many cases even the identity of the animal is mistaken. Therefore, a thorough investigation is mandatory to avoid losing a large number of innocent tigers. The argument against tigers is that they are dangerous animals because they kill people. I wonder, are they dangerous? I think roads and vehicle drivers are a thousand times more dangerous than the poor tiger. On an average, 155000 people die on roads in India (425 people per day). While the tigers kill around 100 people in a year largely in self-defence when threatened or disturbed. Only a few become man-eaters but that is an aberration, not the rule. We too have serial killers and that does not make all human beings' fiends. Any tiger that has been proven guilty after a thorough investigation must be punished but others who are not guilty should not be made scapegoats. Unfortunately, despite the protocol, there are no sincere investigations as there is always a hurry to declare innocent tigers guilty of murder. After more than 16 years of Project Tiger, India achieved the maximum number of tigers in 1989- the estimated population then was 4334. There was no advocacy to permit trophy hunting, then. After that, the tiger population was on a downslide once again, and by 2005, tigers vanished from Sariska and in 2009 from Panna. The all-India tiger estimation done by WII in 2006 reported just 1411 (1165- 1657) tigers in India. What caused the decline is known to all – unbridled poaching all over the country orchestrated by an organized mafia, severe loss and fragmentation of tiger habitats, and ecologically unsound or indifferent development projects took a toll on the wild habitats and corridors and the growing cities began eating up the forests, thus tigers are a common sight in the cities that have a nearby natal area where tigers still breed (e.g., Chandrapur, Bhopal). In the current times, the number of tigers has gone up in select tiger reserves in some tiger-bearing states, where zealous efforts have been made to control poaching and secure tiger habitats. There is also a focus on protecting tigers and their habitats beyond the tiger reserve boundaries in territorial forests. Madhya Pradesh has created a separate budget head for protecting and managing wildlife beyond protected areas. Systematic relocation of villages from core critical habitats in tiger reserves to create inviolate spaces where tigers can breed, helped tigresses to litter and raise cubs within the secure reserve's boundaries undisturbed. The young and old tigers dispersing from the natal areas soon reach human habitations as the cities and villages have expanded eating into the forests and thus the war begins, the tiger does not vote so no one is on its side. If the absurd idea of killing tigers on first excuse is implemented within six months the government will be forced to set up Tiger Task Force III. This is the time for us to introspect and find out whether we have been making tigers victims of human greed and apathy, mismanagement, and myopic thinking of our race. We torment and pester the animals, rob them of their habitats; pursue them relentlessly without giving these dispersing tigers a chance to settle down in some suitable habitat. Now is the time to do some solid work instead of hiding behind court orders and finding shortcut solutions. As many notified tiger reserves are bereft of tigers or



inhabited by an unviable population of tigers there is ample scope for intra and inter-state relocation of tigers. Besides many states still have enough usable tiger habitats, these areas need to be mapped and secured by notifying them as any category of PA acceptable to the local people and translocating adequate prey species from some tiger reserves and farmlands. In M.P. there are total undisturbed huge habitats (645 km²) like the proposed Omkareshwar National Park and areas like Logur in Balaghat, besides several areas that have been recently identified and mapped using GIS technology. So, there is an adequate habitat where tigers roaming in hostile areas may be rehabilitated. M.P. has also been proactive in making territorial forest officers responsible for wildlife in their respective jurisdictions. From the range officers to the CCFs all are notified wildlife wardens for their respective areas. The state has also created a separate budget head for wildlife management outside protected areas. The state government has made provision for an annual review of all forest circles to assess their contribution to wildlife management. In a proactive state like M.P. vigorously campaigning for killing tigers and other wild animals is totally out of place. As far as the elimination of problem animals (crop-raiders and human eaters) is concerned the law already has provision to deal with it, therefore, adding the words – “Sustainable use” in the Recommendation No. 5 is clearly a veiled attempt to introduce trophy hunting. Section 11 of the Wildlife (Protection) Act ordains upon the CWLW to satisfy himself fully that the animal in question is either a proven danger to human beings/their property (obviously after thorough investigation) or disabled or diseased beyond recovery). Hence, the law is clearly against trigger-happy trophy hunters. Our culture and ethos do not permit unjust hunting, all the scriptures support the killing of animals only for food and not for pleasure. Trophy hunting is unacceptable where an animal is killed just to experience an adrenalin rush. Regarding sustainable use – let it remain a non-consumptive use such as tourism or the organisers must remove the words- ‘Sustainable Use’ from all the recommendations wherever it is mentioned.

Theme Coordinator’s Comments: *In this long and angry essay, written more as an advocate of animal rights and less as a wildlife manager, the member has strongly opposed any kind of sustainable use, particularly trophy hunting. Although most of the text has nothing to do with the subject under discussion, he has made some good points here and there, particularly, the recommendation “The government should ensure estimation of herbivore animals in the entire state (in PAs, territorial forests, revenue forests and farmlands in villages) every four years”. His contention that sustainable use is a disguise for introducing trophy hunting is against the tone and tenor of the discussions in the group which nearly unanimously rejected any notions of trophy hunting and agreed to use the term “sustainable use”. In fact, the group even discarded the word “hunting” and went for “sustainable use” in deference to the popular sentiment regarding wildlife in the country. This shows the cautious approach of the group in coming up with these recommendations. However, recreational or conservation hunting, aimed at*



financially supporting the conservation of wild life and its habitat, is a part of the sustainable use basket and cannot be rejected merely on emotional grounds. The country should make these decisions on merit. His hysterical trivialisation of human suffering due to human wildlife conflict is hugely surprising, to say the least.

Mr. H.S Panwar, Former Director, Wildlife Institute of India & Project Tiger (Retd.)

I admire the wise, thoughtfully analyzed and exhaustive post of Suhas Kumar. I am beholden to the crux of his observation that use of the term, 'sustainable use' in fact is to disguise the intended 'trophy hunting's. This attempt is to be unequivocally condemned and simply purged out of the recommendations of the 'Population Management' Group. I may add some more comments but am posting this right away because of the nightmarish portents of the above attempt.

Theme Coordinator's Comments: The member is my conservation guru. Therefore, I would not like to publicly contradict him. However, I would like to point out that if population management were to be only translocation, and then there was no need for bringing up this subject in the conference. The terms like sustainable use have come to the fore because the organizers wanted us to examine international experience and concepts of conservation. I hope that, over time, the popular opposition to any kind of wildlife utilization will abate and we will be able to make conservation of wildlife more sustainable and painless.

Mr. Sanjay Thakre, CCF (Retd.), Maharashtra Forest Department

I fail to understand, why we try to overlook demands by many states for declaring nilgai and wild boars as Vermin. These species are declared as Vermin in States like Bihar and routinely destroyed (culled) with the help of expert shooters. At present their carcasses are buried by incurring heavy expenses. So, the suggestions of some group members are for utilizing the meat as a source of protein rather than burying. Punjab is already allowing consumption of wild boars killed in such a way. So, if the vermin clause is removed, they can be culled under the prevailing laws. Only a few changes like consumption or trophy hunting of problem species can be made. The anger of farmers and affected people need to be understood.

Theme Coordinator's Comments: I agree with the contention that, if vermin are allowed to be hunted, its meat (and other body parts) should be allowed to be consumed. The law does not prohibit it. However, declaring a species vermin, and stripping it of all legal protection, is crueler than managing its population under a sustainable use regime. Burying and burning thousands of pigs and blue bulls, hunted at public cost, is totally irrational.

Dr. Ranjit Singhji, Principal Secretary (Retd.), Forest, Govt of India

I have sent the first three paras. The second mail is blank. Please ignore.

Am sending herewith the remaining paragraphs with my suggested changes--



Para 3 be amended as follows—

Population management outside PAs be done primarily through translocation to low density PAs, fences and other options beneficial to the local populations including development of local tourism.

In Para 4, the last line may be amended as follows:

"---through tourism and sustainable use commensurate with the optimum carrying capacity of the area in question".

Para 5 may be amended as follows ---" If the Chief Wildlife Wardens (CWLW) of the states come to regard certain wildlife populations as dangerous in accordance with Section 11 of the Wild Life (Protection) Act of 1972, they must take early appropriate steps to manage and control the same".

Para 6 may be amended to read as follows --" Under the provisions of the Convention on Biological Diversity (CBD) to which India is a party, sustainable use of biodiversity should also imply use of wildlife, after ensuring that such usage benefits the local communities and is commensurate with the optimum carrying capacity of the area in question ".

If any clarifications are required in the context of the above suggestions, may kindly call me.

***Theme Coordinator's Comments:** Dr. Ranjit Singh is widely regarded as one of the founders of modern conservation in India and was a key player in the drafting of the wildlife Act in 1972 and many of its later amendments. He has proposed alternative formulations for recommendations number 3 to 6, but without materially changing the intent of these recommendations, except recommendation no. 3 where he has substituted the words "sustainable utilization for local community benefits" with "other options beneficial to the local populations including development of local tourism". He has not objected to the concept of sustainable use in any other recommendation, nor in principle. This is a bit inexplicable because if one supports sustainable use of wildlife as a general policy in conservation, as he obviously does, areas outside PAs will be the prime, perhaps the only, candidates for its implementation as suggested in recommendation no. 3.*

However, Dr. Singh was steadfastly against any kind of hunting or utilization of wildlife in discussions. His usual refrain was that India is very bad at implementing laws and hunting once allowed is likely to go out of control. The fear is valid and, if we opt for sustainable use, stringent controls will have to be put in place. There is evidence that countries much worse governed than us have been able to eliminate rampant poaching by introducing policies of sustainable use. We can do it too.

Dr. A.J.T Johnsingh, Dean (Retd.), Wildlife Institute of India, Dehra Dun



Instead of thoughtless culling of crop raiding wild pigs and nilgai there could be a legal hunting program which can generate money for the community and the community should also be encouraged to consume the meat if they are willing. The carcasses can also be auctioned and the money be given to the farmers where these animals were shot. In some places blackbuck can also come under the category of animals that could be hunted. Hunted animals should never be buried.

Theme Coordinator's Comment: I entirely agree with the member who is a well-known wildlife biologist and teacher. However, blackbuck cannot be hunted (not even captured and translocated), as suggested by him, for reducing crop damage because it is in schedule I of the Act. Therefore, we should consider moving it to schedule II because it is one of the most widespread crop raiders in the country.

Mrs. Upasana Ganguly, Assistant Manager, WTI-India

I agree to the second part of this comment. Especially for animals like elephants which need to move between PAs so a recommendation to restrict them within fences through translocation or fences may not work. And fences in corridor areas will impede their movement. It could be thought of at the interface between human settlements and forests without blocking their movement.

Theme Coordinator's Comment: The full intent of this comment is not clear. It seems she is opposing the use of fences in wildlife management except on interface between forests and human habitation. We agree with the comment and propose that fences should be used only strategically.

Mr. R. Sreenivasa Murthy, APCCF (Retd.), M.P. Forest Department

Recommendation 4. In view of the shrinking and degrading of habitats in government forests, restoration of forest should be attempted with CSR support, private and community conservancies outside government forests should be promoted in accordance with section 36C and 36D of the Wild Life (Protection) Act, 1972, by allowing the land owners to benefit from wildlife through tourism and sustainable use.

What Section 36C (Declaration and management of community reserve...) says:

36A (2) and 36C (2)- The provisions of subsection 2 of section 18, sub-sections (2), (3), and (4) of Section 27, Sections 30, 32, and clauses (b) and (c) of section 33 shall as far as may be, apply in relation to a conservation and community reserves as they apply in relation to a sanctuary.

Section 2- defines hunting which is prohibited under Section 9 and allowed for certain purposes in Section 11 and special purposes in section 12.



Section 36D (3) The committee shall be the competent authority to prepare and implement the management plan for the community reserve and to take steps to ensure the protection of wildlife and its habitat in the reserve.

Section 18. 2 (a) clearly indicates that every person shall so long as he resides in the sanctuary be bound to prevent the commission, in the sanctuary, of an offence against this act

Section 18.4- No person shall tease, destroy, molest any wild animal or litter the grounds of sanctuary.

Thus, the recommendation is ultra vires of the Wildlife protection act which says “allowing the land owners to benefit from wildlife through tourism and sustainable use.” A Land owner of a conservation reserve is Government itself and that of a community reserve is private people. Thus, this recommendation is in violation of the Directives Principles of the Constitution and the WLP Act 1972.

Recommendation 5: Chief Wild Life Wardens (CWLW) of the states should treat a wildlife population “dangerous”, as per section 11 of the Wild Life (Protection) Act 1972, and take steps to manage it, when it has grown to a level that it is likely to cause harm or injury to nearby people, without waiting for damage to happen (text in red added by the theme coordinator).

In this recommendation the dangerous insertion is replacement of wild animal to wildlife populations.

Recommendation 6: Sustainable use of biodiversity includes sustainable use of wild animals also, as per the Convention on Biological Diversity (CBD) to which India is a party. Therefore, India must develop management systems and legislation to practice sustainable use of biodiversity in all forms.

The change in the wording and legislative change had done my oral objections at the conference. Wild animal is defined in section 36 of WLPA 1972 which includes all animals shown in schedules of the act and found wild in nature.

Biological diversity is defined in section 2(b) of Biodiversity Act 2002 as variability among living organisms from all sources and the ecological complexes of which they are part and includes diversity within species or between species and of ecosystems.

Section 59 of BDA 2002 clearly indicates that the provisions of this act shall be in addition to, and not in derogation of, the provisions of any other law, for the time being in force, relating to forests or wildlife.

Thus, trying to equalise biodiversity and wild animals is ultra vires to the provisions of the both the acts and constitution, hence not tenable. Thus recommendations 4, 5 and 6 are ultra vires to



the WPA 1972 and constitutional provisions of wildlife protection. With respect to protection of wild anils in WPA 1972 and sustainable use provisions of BDA 2002 are mutually exclusive.

Theme Coordinator's Comments: *The member contends that the recommendation no 4 and 6 cannot be implemented as the WLPA does not allow sustainable use at present. He is absolutely correct in this. The law will have to be amended suitably in order to implement some parts of the recommendations number 3, 4 and 6. However, his contention that wild animals are not part of biodiversity is obviously flawed.*

Dr. Rakesh Shukla, Research Officer (Retd.), Kanha Tiger Reserve

Due to unavoidable reasons, I was unable to attend the last two days of the workshop. Although I am not fully aware of the proceedings during the presentations, I have been briefed regarding the issues discussed. While I agree on all counts, I cannot help adding again that trophy hunting is not a viable solution and can actually exacerbate the problem it seeks to address.

There may be claims that trophy hunting is supported by scientific research. However, it is important to recognize that there is a proliferation of pseudoscientific research or scientific junk that is often presented as legitimate studies to promote various businesses. Such research is often devoid of scientific rigor and can lead to misleading and inaccurate conclusions. Thus, it is imperative that we exercise caution when evaluating any such findings and their application in India.

In my opinion, trophy hunting as a solution is equivalent to opening a proverbial Pandora's box on the face of the forest department. The department has dedicated significant efforts over the decades to deter and discourage illegal poaching and hunting. Our efforts have succeeded in influencing the public perception that killing a wild animal is morally and legally wrong. Introducing trophy hunting, which is culturally and ethically inappropriate, may tempt people to justify killing animals and ultimately lead to increased poaching.

As an establishment dedicated to nature conservation, we must continue to uphold our achievements and refrain from entertaining such outlandish ideas. The notion of trophy hunting is not a sustainable or responsible solution to the challenges faced by the department.

Theme Coordinator's Comments: *The member, like many others, is dead against trophy hunting. He seems to be confusing trophy hunting with poaching while these are diagonally opposite activities. Sustainable use, not only trophy hunting, eliminates poaching rather than aggravating it. This is the global experience. Perhaps he has not read the recommendations (where there is no mention of trophy hunting) and seems to limit the scope of sustainable use*



only to trophy hunting, which is not correct. Sustainable use is a much larger concept than any one kind of hunting.

Mrs. Bindu Sharma APCCF, M.P. Forest Department

Trophy hunting is against the Indian culture and ethos which is based on non-violence, compassion for all living beings

दौड़ा दौड़ा के मारना हमारी संस्कृति कहीं

Theme Coordinator's Comments: This is the most common argument against the utilization of wildlife. This sentiment ignores the fact that all food on earth comes from killing other organisms (including vegetables and cereals), more Indians eat meat and eggs than are vegetarians, and many of our gods and sages were hunters. A quick recall of Ramayana and Mahabharata can show us our true culture and ethos.

Mr. A. A. Ansari, DFO, Nauradehi Wildlife Sanctuary

It is my personal opinion that scientific hunting must be backed by scientific data about the population of a particular species, habitat of that species and recent trends in its population. But one thing is very clear and wide that countries like India change in land use patterns so fast that we cannot connect with the habitat of a particular species. Both existing forest/PA and agriculture are under intense NTFP collection and farming respectively. So now we not spare a single mahua flower or other fruits for Wildlife. It affects both Wildlife food availability as well as habitat enrichment in the form of regeneration. Existing habitats outside PA if any is so fragmented that many species are already struggling to breed. If we allow the so-called scientific hunting of any species, then most of FRA area which are bordering forest compartment may finish that species in one go. One observation I can incorporate here that one Blackbuck Sanctuary in M.P, Bagdara, wherein at the beginning of first decade of this century there were thousands of Blackbucks but in the span of 10-15 years this number shrank to a few hundred individuals due to fast land use change and change in crop pattern. So, a species which is already struggling to find its viable habitat if we allow scientific hunting may cause a sudden population crash. It will be more scientific if we first assess and provide viable habitat to the target species then observe the crop raid pattern. More crop raiding does not reflect more population amid rapid habitat loss.

Theme Coordinator's Comments: The member says that any proposal for hunting should be backed by scientific data and he is generally against hunting. He also contends that crop raiding by wild animals is more due to land use changes rather than increase in wildlife populations.

While generally agreeing with his contentions, I think we cannot ignore the fact that all over the world, sustainable use of wildlife has helped improve the status of wildlife, particularly of



endangered species. There may be other factors also at play (e.g., better law enforcement) but the stakes of the local people, and of the land owners, due to the jobs and incomes generated by wildlife, has been the key factor. Only sustainable utilization and tourism create these products.

Dr. S.K Khanduri, PCCF (Retd.), Uttarakhand Forest Department

Several points are coming neatly on how to go about if population management has to involve removal.

Understanding of spatial and temporal density analysis of populations would be one. After all, for us habitat is constant (or a shrinking factor only) and only population is variable, which could be regulated.

A tight regulatory system for any such measure could be a way like approval of the management plans containing these proposals, from NBWL or a similarly high level well learned oversight system. Framework for proposals can also be designed before bringing it in practice.

No harvesting from PAs of course and introduction of good protocols would be needed for population assessment in non-PA forests - meaning a new thrust on the mandates there.

Trophy as of now must be a total no but use of proxy provisions like s 11 or 62 must be avoided.

At the same time space must be available to the managers for this purpose if and when needed.

Law needs this space.

This is one of the best outcomes of this conference that debate has started which was intended with the use of s 62.

However, policies and laws must be driven by logic and need, and not by sentiments and skepticism.

I am elated to see the debate in this group and thank all who are sharing their wisdom.

***Theme Coordinator's Comments:** Although he is instinctively against trophy hunting, like most of us, he wants that "space should be available to the managers for this purpose". The conclusion is obvious. He is also against "harvesting" from PAs but is happy to see a debate starting on the subject of population management in wildlife conservation.*

Dr. Samir K. Sinha, Jt. Director, WTI-India

Intensification of developmental activities is leading towards land-use changes of various dimensions affecting long-ranging species, species with wide distribution, and range-restricted and endemic species alike. Thus, it is important to look into wildlife population management in totality – not only in terms of human-wildlife conflict, but also in terms of changes in ecosystems.

Human-wildlife conflict is primarily an outcome of an enhanced interaction between humans and wildlife that might be driven by and aggravated due to shrinkage of habitats (not



only forest area!) sometimes resulting into the perceived inflated density of animals; change in land-cover and land use pattern; and above all the pivotal role the human behaviour (such as low tolerance), practices (changing crop pattern that lures wild animals, increasing irrigated land area, poor waste management attracting all kinds of animals - not restricted to carnivore mammals but also reptilians, herbivores, etc.), and many a time adopting wrong, unscientific and irrational methods of dealing with the human-wildlife conflict.

As a conservation practitioner, I strongly believe that conservation problems are mainly due to four human behavioural aspects- attitude, knowledge, skill, and behaviour. These aspects apply to all human beings – be it a villager, a tribal, a conservationist, a policy maker, or a forest or wildlife manager. So, the problem due to the increase (sometimes perceived) of wildlife population must not be handled without detailed site-specific situation analysis identifying the key drivers of the above mentioned human behavioural aspects.

A blunder that we (as a manager, conservationists, scientists, or other influential groups of stakeholders) often commit is prescribing and adopting measures that are based on short-term observations, and replicating interventions that are effective only for a specific situation and prone to fail in other situations.

Nonetheless, we should also acknowledge that our practices in the ecosystem have also changed the behaviour of wild animals. It is largely known that human behaviour also affects wildlife behaviour. Cognitive capabilities and past experiences of wild animals with a human may affect their ability to exploit human-dominated environments and respond appropriately to human behaviour. Interaction of human beings with animals also affect species behaviour, such as the likelihood of loss of fear due to regular human interactions (be it chasing an elephant or feeding a macaque; may be tourism as well).

Apart from the loss of forest cover, we, as human beings, are driving the loss of habitats (grasslands, deserts, wetlands, natural open areas, fallow land, etc.), having implications on many species - which are heading to local extinction, or fragmented populations ultimately leading towards local extermination.

Keeping in view the above situations in mind, I summarize my personal viewpoints below. I am not repeating the points put forward by Dr. Suhas Kumar, Mr. R. Shreenivasa Murthy and Mr. Shahbaz Ahmad.

- i. Hunting/culling and use of wildlife populations in conflict affected areas must be a 'no-no', because we do not know much about its implications on the ecosystem and human health. Hunting and consumption of wild animals will make human population more prone to suffer from zoonotic diseases (in the entire discussion at the conference, we



forgot to discuss wildlife health, human health, and ecosystem health – the One Health Approach).

- ii. There are sufficient legal provisions in India to deal with ‘problem’ animals. The need is to ensure that the ‘problem’ animals are identified based on criteria already set for few taxa. Additional criteria must be developed to cover more conflict species.
- iii. Removal of species declared as ‘Vermin’ under the Wildlife (Protection) Act must be done as per a systematically designed plan and not killing the target species randomly and mindlessly. We still have very little knowledge about the implications of such efforts on the ecosystem and species population itself.
- iv. We must focus on reviving and recovering species, especially the ecosystem engineers including giving a chance of survival to predators and meso-predators in human-dominated landscapes through conservation translocations and other effective methods. Such measures must not only be restricted to Threatened species but other species as well, based on overall ecosystem requirements in human-dominated areas.

A nationwide joint project by government, NGOs, and universities to map habitats (not forests!) and key faunal assemblages of human and ecosystem interests in such habitats should be undertaken. It will help identify and rehabilitate the degraded habitats, focussing more on the restoration of ecosystems rather than species-centric approaches.

Theme Coordinator’s Comments: He is against any kind of hunting or utilisation, even in conflict areas but has not given any cogent reason accepted the lack of data. This is a widespread sentiment in the country and needs to be carefully altered with the help of logic and science. I think this debate is a good beginning.

Mr. Kedar Gore, Director, The Corbett Foundation

India has made tremendous progress in the last 50 years in securing its wildlife and biodiversity heritage in the face of ever-growing pressures on wildlife habitats. While once it looked that animals like tigers, lions and elephants would go extinct, currently populations of these charismatic species are on the increase and India hosts the largest population of these species. In some areas these species have reached their potential carrying capacities leading to increased human-wildlife conflict. This success, a direct consequence of the tolerance of people of India deserves to be celebrated. Conservation managers need to ensure that increase in wildlife populations do not aggravate human-wildlife conflict (HWC) beyond tolerance levels.

In a thickly populated country like India, human wildlife co-existence is possible only through the active management of wildlife populations, changing people’s perceptions, enhancing community benefits leading to increase in tolerance. A two-pronged strategy needs to be adopted



wherein wildlife populations within Protected Areas are prioritised for enhancing biodiversity, ecosystem values and interactions while wildlife populations outside PA's are managed for long-term sustainability in a manner that minimises conflicts. Wildlife populations should be actively regulated in other places so as to ensure minimal conflict and maximum sustained benefits to communities. Based on the presentations of national and international experts and discussions during the session the participants recommend the following:

1. Protected Areas serve as repositories of biodiversity and source populations for most species. However, viable populations of certain low-density, wide-ranging, species need landscape level management for long-term viability. Therefore, meta-population management with corridor linkages between PA's are essential elements of India's wildlife population management strategies.
2. In order to be able to manage wildlife populations at par with global standards, India must urgently develop capacities to manage translocation and immuno-contraception of wild animals through exposure and training.
3. Population management outside PAs should be done primarily through translocations to low density PA's, fences, and sustainable utilization for local community benefits.
4. In view of the shrinking and degrading of habitats in government forests, restoration of forest should be attempted with CSR support, private and community conservancies outside government forests should be promoted in accordance with section 36C and 36D of the Wild Life (Protection) Act, 1972, by allowing the land owners to benefit from wildlife through tourism and sustainable use.
5. Chief Wild Life Wardens (CWLW) of the states should treat a wildlife population "dangerous", as per section 11 of the Wild Life (Protection) Act 1972, and take steps to manage it, when it has grown to a level that it is **likely to cause harm or injury** to nearby people, without waiting for damage to happen (text in red added by the theme coordinator).
6. Sustainable use of biodiversity includes sustainable use of wild animals also, as per the Convention on Biological Diversity (CBD) to which India is a party. Therefore, India must develop management systems and legislation to practice sustainable use of biodiversity in all forms.

Theme Coordinator's Comments: On the one hand, the member is completely against hunting or sustainable use, while on the other he says that "We need to debate whether this is tolerance or helplessness of people sharing space with wildlife, as they do not have a choice" and "This has already gone beyond the perceived tolerance levels.". This confusion is typical of us all. Our



generation of wildlife managers, scientists and conservationists have grown up believing (as educated) that hunting or utilisation has no place in conservation. We are totally insensitive to the fact that this kind of conservation causes tremendous pain to the poor people. And this pain is growing. We, the conservation community can afford this insensitivity because we (and our families) are safe from this pain. Obviously, wildlife conservation needs to become less painful and more affordable to be sustained. That is what the recommendations encapsulate.

Dr. K. Nayak, CCF (Retd.), M.P. Forest Department

1. Words like sustainable utilization and sustainable use should be removed.
2. Creation of quality habitat for species specific is essential for long term survival. This will address the conflicts of wild animals and humans.
3. For crop damage, compensation should be proposed through insurance.
4. Compensation should be proposed treating crop damage as calamity and should be included in land revenue code.

Coordinator's Comments: All these solutions need to be available for sustainable conservation. They are not mutually exclusive.

Mr. S.S Rajput, PCCF (Retd.), M.P. Forest Department

I have expressed my strong opposition to the population management recommendations during the session on the same day. There are several ways of managing "problem animals" which I had mentioned that time - and hunting/ sustainable harvesting is not one of them.

What I gather from that lecture on hunting it's all about private forest and private companies running it as a business without any moral responsibility of environment, ecology and wildlife...here there is no scenario of large private forest and private company, therefore it is illogical to talk in Indian context.

Theme Coordinator's Comments: The two presentations on hunting, one from a representative of the Government Namibia and another by a recreational hunter provided convincing data that wildlife has prospered globally under sustainable utilization regimes. Our conditions may not be exactly the same but the principles have universal application. There is no harm in learning from others who have done things differently and perhaps better.

Dr. Latika Nath, Naturalist and Nat-Geo Explorer

Absolutely agree - I had stated in the session as well that man eating or problematic mega mammals need to be removed. Keeping them in cages for the rest of their life is not an option to consider. This is essential solitary confinement for them. Who carries out the removal can we discussed - but the removal will ensure that public opinion remains positive.



Theme Coordinator's Comments: The context of this comment is not clear. It appears she prefers killing problem animals rather than putting them in cages for life. Nobody can disagree with that.

Based on the above discussion, theme coordinators proposed a revised recommendations as follows

1. Protected Areas serve as repositories of biodiversity and source populations for most species. However, viable populations of certain low-density, wide-ranging, species need landscape-level management for long-term viability. Therefore, meta-population management with corridor linkages between PA's is an essential element of India's wildlife population management strategies
2. In order to be able to manage wildlife populations at par with global standards, India must urgently develop capacities to manage translocation and immuno-contraception of wild animals through exposure and training.
3. Population management outside PAs should be done primarily through translocations to low-density protected areas (PAs), fences, and sustainable utilization for local community benefit.
4. In view of the shrinking and degrading of habitats in government forests, restoration of forests should be attempted with CSR support, and private and community conservancies outside government forests should be promoted in accordance with sections 36C and 36D of the Wildlife (Protection) Act, 1972, by allowing the land owners to benefit from wildlife through tourism and sustainable use.
5. Chief Wildlife Wardens (CWLW) of the states should treat a wildlife population "dangerous", as per section 11 of the Wildlife (Protection) Act 1972, and take steps to manage it, when it has grown to a level that it is likely to cause harm or injury to nearby people, without waiting for the damage to happen.
6. Sustainable use of biodiversity includes the sustainable use of wildlife also, as per the Convention on Biological Diversity (CBD) to which India is a party. Therefore, India must develop management systems and legislation to practice sustainable use of biodiversity in all forms.
7. Government should ensure the estimation of herbivore populations every four years on the lines of tiger estimation.



A large number of participants reacted vehemently against the use of the word “sustainable utilization” of any scheduled wildlife species as the law of the land does not allow any utilization of species listed in the schedules of the Wildlife (Protection) Act 1972. The participants were also against the invocation of the Biological diversity convention, 1994, and the Biological Diversity Act 2002 which provides for sustainable use of species. They objected on the ground that, the Biological Diversity Act, 2002 cannot be invoked in derogation of the provisions of other Act/s already in force (please see section 59 of the BD Act, 2002). The Wildlife (Protection) Act, 1972 clearly lays down the conditions under which a scheduled wild animal can be killed or captured. There is no mention of the term- “sustainable use” in any of those sections. One participant explained the provisions of the Act as follows:

“There are only two provisions which deal with hunting of wild animals – Sections 11 and 12 of the 1972 Act. For the discussion here, Section 11 is relevant. There is specific legislative intent behind Section 11 and that is only those animals can be permitted to be hunted which have become dangerous to human life or property or are disabled or diseased beyond recovery.

“This satisfaction has to be recorded in writing by the Chief Wildlife Warden. The intent is therefore writ large in the Section itself that no such satisfaction be issued unless by material it is established that the animal has become dangerous to human life (or property).

“It is, therefore, preposterous to suggest that merely an increase in the population of the wild animals can form the foundation to declare it dangerous to human life or property”

The dominant members of the group advocating trophy hunting and sustainable utilization present false scenario that the wildlife population in the country has exploded and humans are their victims. No data support this assumption. The truth is wild animals have always been the victims of the apathy

In the current times, the number of tigers has gone up only in select tiger reserves in some tiger-bearing states, where zealous efforts have been made to control poaching and secure tiger habitats. There is also a focus on protecting tigers and their habitats beyond the tiger reserve boundaries in territorial forests. Madhya Pradesh has created a separate budget head for protecting and managing wildlife beyond protected areas. Systematic relocation of villages from core critical habitats in tiger reserves to create inviolate spaces where tigers can breed, helped tigresses to litter and raise cubs within the secure reserve’s boundaries undisturbed. The young and old tigers dispersing from the natal areas soon reach human habitations as the cities and villages have expanded eating into the forests and thus the conflict escalates the tiger does not vote so no one is on its side. These tigers need a helping hand not a bullet in their heads.



The fact is, in the country, many PAS including some tiger reserves have very low densities of prey and tigers or no tigers at all.

The use of the term 'fences' in recommendation 3 was also debated and a large number of participants in the plenary were against fencing protected areas as it goes against the basic principle of in-situ conservation and management of meta-population in a landscape.

To be fair to the drafters of recommendations for the population management group their recommendations were put to online voting but only 60 participants against a total of 234 responded making the exercise infructuous.

The organizers and participants of the IWC have painfully noted that there is a video in circulation on YouTube, participated by some members of the population management group that advocates killing tigers moving out of their natal areas in search of new habitats and getting in conflict with people. The video-maker in his knavery believes that all the dispersing tigers are man-eaters and must be killed. This wantonly misguiding video is unequivocally condemned as it is spreading this falsehood among trophy hunters who enjoy killing innocent animals.

The organizers condemn such blatant and unethical measures to promote one's view. In light of the content of the video in circulation the group's recommendations- no.3 to 6, are a disguised attempt to promote trophy hunting which is totally illegal under Indian laws and against the spirit of the directive principles of State policy of the Indian constitution. This group was advocating trophy hunting with all its might throughout the deliberations and then there was an attempt to get a list of pre-drafted recommendations endorsed by the participants: which was summarily rejected by the participants.

In the light of the above facts and some useful recommendations given by the participants of other groups the organizers are obliged to adopt the following resolutions and give a set of recommendations that conforms to the law of the land the constitution o and the cultural values of the country.

RESOLUTION

Now therefore the International Wildlife Conference–Kanha hereby resolves as follows:

- 1. Recommendations No. 3, No 4, No. 5 No. 6 of the Wildlife Population Management Groups are hereby expunged.*
- 2. These expunged recommendations No. 3, No 4, No. 5 No. 6 of the Wildlife Population Management Group shall be excluded from the Proceedings and Recommendations of the International Wildlife Conference – Kanha.*
- 3. Recommendation No. 1 is not a recommendation but a statement of biological fact hence ignored, recommendations 2and7 are accepted with some modifications.*



Annexure 4: Comments by Dr Khageshwar Nayek on theme 2 (Wildlife Habitat Ecology)

To,

The Technical committee,
International Wildlife conference,
State Forest Research Institute,
Jabalpur, Madhya Pradesh.

Sub: Comments on recommendations by coordinator, co-coordinator of theme – 2 (Habitat ecology and management)

Sir,

I have gone through the recommendations of theme-2. However, I do not agree with some of the recommendations in spite of detail discussion in the conference and discussion through WhatsApp from 27-04-2023 to 08-05-2023. A lot of interventions and suggestions came from the esteemed delegates but most of the suggestions are ignored during finalization the recommendations. The recommendations are more or less same as they were presented in the plenary session. If it is so, we should not have extended our discussions through WhatsApp till 08-05-2023. During discussions at Kanha Tiger Reserve, we could not have in depth and through discussion due to paucity of time. However, we got sufficient time to express our experience and thoughts. But WhatsApp discussions were not included in the final recommendations though the esteemed delegates gave sufficient time and energy for effective deliberation. I would like to reiterate some of the points before technical committee to deliberate upon before finalizing the recommendations for incorporation in the proceedings of the conference.

- 1) We have so many problems to address in wildlife management. But most of the recommendations are general in nature. We should have focused and pin pointed recommendations to solve the problems.
- 2) We have been using cool burning for more than 40 years and adverse results of cool burning have been shared by so many delegates. Still then we stick to the recommendation 3.4. Again, I propose to delete it.
- 3) Contextualize Trollope's recommendations are not useful for Indian conditions in terms history of grassland, nature of grassland, extent of grassland, height of grass species, grazing pressure by herbivore. We can develop our own fire regime after conducting efficient experiment. Therefore, I propose to delete recommendation 3.5.
- 4) In Madhya Pradesh we have corridor management plans that were prepared with joint participation of territorial wing and wildlife wing. However, efficient implementation is not



possible for so many reasons. We have to develop a system for efficient implementation. Again, I propose to create a corridor division under the territorial circle. Again, there is tremendous scope for improvement of corridor management plan. Here I would like to add the comments of PCCF (HoFF), M.P. He opined that treatments proposed in corridor management plans are superficial in nature. Presently we have a number of books and literatures. Using these literatures, we can make site specific scientific corridor management plan. Before that we have an efficient system for execution.

- 5) Tiger Conservation Plans are being prepared as per the guidelines of WII Dehradun. These plans are theme based and prescriptions are general in nature. They are not site specific. To make it site specific, we should make habitat mapping before prescribing treatments as per the requirement of site. We should recommend entrusting WII Dehradun to prepare guidelines for preparation site specific plan on basis of habitat mapping.
- 6) We should learn lessons from Kanha management for linking meadows by corridor along roads. They did it by widening the fire lines by removing bushes. Field director gave the statistics that that they got 100 fawns in Kanha and Sarai ranges in a year. Therefore, we should recommend linking the grasslands with efficient corridor.
- 7) Shri H. S. Panwar, while he was director, Kanha National Park observed that compaction was one of the reasons for degradation along with grazing pressure. In our recommendation, we have not addressed this problem.
- 8) We have not recommended anything to address the *Aristida*, *Demostachya* and *Imperata* etc.
- 9) Shortage of food for barasingha has not been addressed. I would like to bring to your kind notice that barasingha were fed adopting stall feeding transporting dry grasses from Bhaisanghat range to Sarai range (Ronda meadow) in 2015, 2016, and 2017. It is a matter of great concern.

Dr. Khageswar Nayak, IFS (Retd.)
Former Field Director
Kanha Tiger Reserve &
Pench Tiger Reserve

KANHA TIGER RESERVE





INTERNATIONAL CONFERENCE

on

“Wildlife Conservation: Emerging Scenario and Way Forward”

Kanha Tiger Reserve, Mandla (M. P.)

27-29 April, 2023

BOOK OF ABSTRACTS



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**International Wildlife Conference-2023 "Wildlife Conservation: Emerging Scenario
and Way Forward"**

27-29 April, 2023

Advisors

Mr. R.K. Gupta, Dr Jasbir Singh Chauhan,
Mr Amitabh Agnihotri & Mr Ravindra Mani Tripathi

Theme 1 : Wildlife Population Management

Theme Coordinator : Dr. H.S. Pabla
Co-coordinators : Mr Ripu Daman Singh, Mr. Kartikeya Singh Chauhan
Theme Associate : Dr. Aniruddha Majumdar

Theme 2 : Wildlife Habitat Ecology & Management

Theme Coordinator : Dr. G.S. Rawat
Co-coordinators : Dr Khageshwar Nayak, Dr. Ankur Awadhiya
Theme Associate : Dr. Anjana Rajput

Theme 3 : Wildlife Policy Issues and Challenges

Theme Coordinator : Dr. H.S. Singh
Co-coordinators : Mr. R. Sreenivasa Murthy, Rajnish Kumar Singh
Theme Associate : Dr. Uday Homkar

Theme 4 : Human Wildlife Conflicts and Mitigation Measures

Theme Coordinator : Dr. Dhananjay Mohan
Co-coordinators : Dr. S. Sathyakumar, Mr Anupam Sharma
Theme Associate : Dr. Mayank Makrand Verma

Composing & Designing: Pratap Rao Vagh

FOREWORD

The state Madhya Pradesh also popularly called as the "**Heart of India**" is known all over the world not only for its rich faunal and floral diversity but also for the endeavours that have been made to preserve it on a sustained basis. The recent introduction of cheetah in the state has added yet feather in the cap of conservation success of the state and an important step forward.

The tropical forests of Madhya Pradesh harbours very high abundance of wild animals in Central India. According to the previous estimation during 2018, highest numbers of tiger i.e. mean population 526 (441-621) and leopard 3,421 (3,271-3,571) are found in Madhya Pradesh. The state also has rich aquatic diversity and the abundance of Gharial is highest in the country.

It is the second largest state, with an area of 3,08,252 km² constituting 9.38% geographical area of the country. The recorded forest area of the state is 94,689 km² which is 30.71 % of its geographical area. In terms of forest canopy density classes, the state has 6,665 sq km under very dense forest, 34,209 sq km under moderately dense forest and 36,619 sq km under open forest and 5,457 sq km under scrubland. As per India State Forest Report 2021 the Recorded Forest Area (RFA) in the State is 94,689 sq km of which 61,886 sq km is Reserved Forests, 31,098sq km is Protected Forests and 1,705 sq km is unclassified Forests. Eleven National Parks and 24 Wildlife Sanctuaries constitute the Protected Area network of the State. There are 6 Tiger Reserves in the State covering total area of 10,174.26 sq km.

Managing wildlife in human dominated landscape is a daunting task for wildlife managers and policy makers. The human activities for their own living and benefits have affected the wildlife considerably across the world. This has resulted in extinction of many wild animals & plants and biodiversity loss.

Over the years the human activities increased and development happened on a large scale which has affected the wildlife and the ecosystems adversely. This has also resulted in habitat fragmentation, deforestation, which in turn has added to climate change. The exploitation of wildlife for trade and other benefits, illegal hunting has also been detrimental to the survival of our wild populations

The wildlife protection and conservation is therefore is a herculean task, especially in the developing countries where coexistence of "**Ecology and Economy**" is much needed and this objective cannot be achieved until and unless all functionaries of the governments, scientists and local communities residing in and around the protected areas, non-profit and non-governmental organizations, law enforcement agencies and the policy makers work in tandem towards this goal.

In order to share their thoughts and evolve actionable strategies in the backdrop of the emerging scenario Madhya Pradesh Forest Department is organising an International Conference on **Wildlife Conservation: Emerging scenario & Way Forward** at Kanha Tiger Reserve from 27-29 April 2023 to bring all stakeholder on the same platform, for wildlife conservation under the following vital themes;

- 1) Wildlife population management,
- 2) Wildlife habitat Ecology,
- 3) Wildlife policy issues and challenges and
- 4) Human wildlife interactions and mitigation measures.

It gives me immense pleasure to inform that response to this conference has been overwhelming from all the stakeholders reflected in a large number of abstracts of papers and posters for presentation.

Edited abstracts received so far have been compiled in this "**Book of Abstracts**". I thank all the theme coordinators, co-coordinators and theme assistants for their hard work, valuable contribution and active participation to review and revise such huge number of abstracts.

Due to the limitation of time, it was impossible to accommodate all the contributions in oral presentation in sessions slated to be held during the conference. However, the remaining contributions, which are equally valuable and important, may be presented as posters. In total 45 abstracts were considered for oral presentation and 28 abstracts were considered for poster presentations under various themes. Theme wise abstracts of paper and posters are published in this "**Book of Abstracts**" for reading and references of academicians, scientists, policy makers and wildlife managers.

I am sure this effort will go a long way to the cause of wildlife conservation and consequent benefits for the posterity.

Amitabh Agnihotri
Director-SFRI

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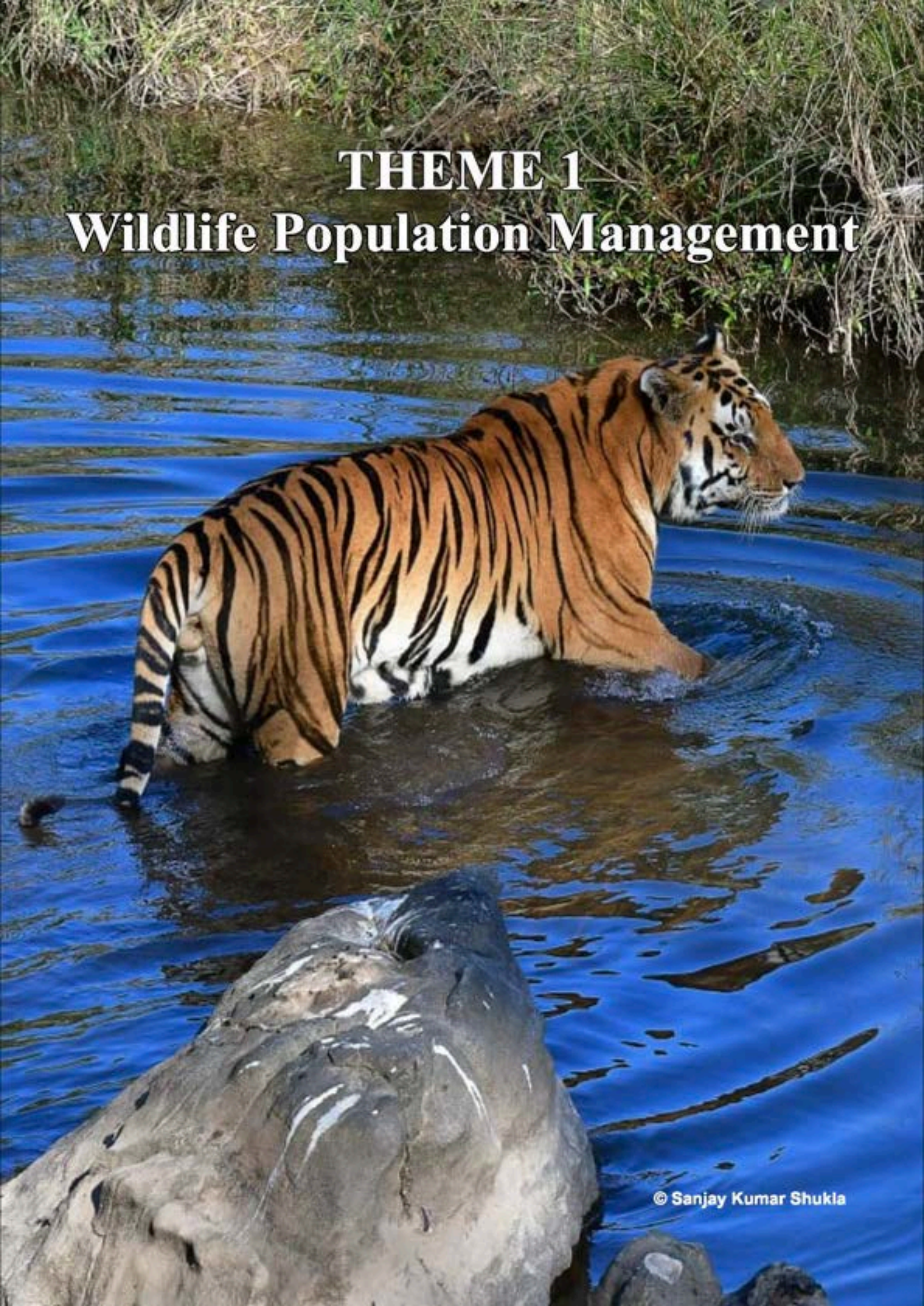
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THEME 1

Wildlife Population Management



THEME 1
(Wildlife Population Management)
ORAL PRESENTATIONS

Conserving Wildlife Populations in India: Where They Need Management

Qamar Qureshi and Y. V. Jhala

Wildlife Institute of India, Chandrabani, Dehradun- 248001, India.

Email-qnq@wii.gov.in

Abstract

Anthropogenic activities, or human activities, have had a significant impact on the wildlife population in India. Historically, these activities were aimed at sustaining empires and human populations, which led to the destruction of natural habitats and a decline in medium and large-bodied animal populations. By the time India gained independence in 1947, the forest cover had been reduced to around 30%, which was fragmented, with most of the tropical and temperate regions being replanted. However, after the enactment of the Wildlife Protection Act in 1972, the paradigm of wildlife conservation changed in India. Scientific inputs and changes in forest management practices, driven by political and public concerns about nature conservation, were introduced. Currently, India faces two major challenges in wildlife conservation. Some species, such as the Great Indian Bustard, Sangai, and Vultures, are declining due to human-induced changes in habitat and human population. On the other hand, Tigers and Elephants are increasing due to cultural tolerance and protective interventions by the state. Some species, such as Leopard, Nilgai, Wildpig, and Rhesus macaque, are increasing due to their behavioural adaptation and cultural protection.

Conservation efforts use various policy and management tools to protect wildlife populations. One approach is to develop protected areas, where human activities are limited to conserve species and their habitats. Another approach is to restore, rewild, or reintroduce umbrella or charismatic species, such as the Tiger, One-horned Rhinoceros, Barasingha, and Cheetah, to support the conservation of other species. Controlling invasive species is also a way to protect native species and habitats, as well as reduce impact on human societies, sometimes through the use of lethal methods or humane techniques such as trapping and relocating. Law enforcement is used to protect many species that are hunted for their value. Green technology is another approach that is adopted to reduce the impact of human activities on wildlife populations. The conservation of wildlife in India is complex due to the need for balancing developmental needs and biodiversity preservation. India's cultural and biological diversity requires careful management and planning for species and habitat survival. Despite the progress made in conservation science, there is still a significant gap between scientific knowledge and its practical implementation in the field. To address this, conservation professionals and researchers must collaborate to ensure the development of practical and relevant knowledge. Research should be contextualized within a comprehensive conservation planning model that considers social, cultural, and economic factors.

However, there is a shortage of organized systems for adopting scientific practices, a decrease in the number of managers enrolling in wildlife conservation programs, and insufficient funding for long-term problem-solving research, which is crucial for the creation of effective conservation strategies. Therefore, there is a need for a joint effort to establish a philosophy, policy, and practices that align the developmental needs of society with wildlife conservation.

Key words: population management, policy, monitoring, re-wilding

From bane to boon: Wildlife challenges to wildlife opportunities

Mathen Mathew

Mathew Consultants, Hyderabad

Email- wleco.rm@gmail.com

Abstract

The increased protection given to wildlife has increased their numbers greatly. Therefore, wild animal population management is essential. There are many causes for the increase – overabundance – as well as for plummeting wild animal numbers, which is human induced to a greater or lesser extent. Wild animal populations must be maintained and managed to slightly sub-optimal to optimal levels depending on the carrying capacity of a given location and ecosystem, but should never exceed it. Adaptive management techniques should be applied to positively increase threatened wild animals while reducing overabundant species which are generally non-desirable, and are indicated by degraded habitat and environment, to manageable levels. They usually contribute to the degradation of the landscape.

Wildlife is a renewable resource and should be treated as such. Economic benefits can be derived from selective harvesting of animals leading to betterment of landscapes and ecosystems, increase biological diversity and improve ecosystem goods and services, while providing intangible cultural, religious, recreational and aesthetic benefits. Wildlife management will positively address farmer distress, improve livelihood streams and provide for newer ones. It will also reduce existential human wildlife conflicts (HWC). It will, therefore, foster better human wild animal coexistence.

A “what works where and why” should be applied. This focused approach will answer many of the questions as well as find practical, cost effective and remunerative solutions. It will address increased wild animal populations, while improving interactions with people living close to wild animals, including having a positive impact on HWC reduction.

Certain wild animals which are now overabundant and are non-desirable in the numbers we have, are known vectors of communicable diseases to both humans and domestic livestock. There are others, especially carnivores that are existential threats to people, their livestock and their livelihoods as evidenced by media reports.

Crop raiding animals should be harvested, the meat used for consumption locally, especially since India suffers from anywhere between 71% and 75% protein malnutrition and interestingly, above 90 percent are unaware of the daily requirement of protein Shoba Suri (2017). Carnivores harvested will yield huge funds, which, when ploughed back into the area will have a positive effect thereby mitigation through financial intervention. Today, both herbivores and carnivores are destroyed without accruing any benefit whatsoever. These animals so destroyed should be used for hunting, the revenue and meat generated should be shared while the hunters will get to keep a portion of the meat as well as whatever trophy accrues from the harvest.

The above proposed model will enrich the habitats, improve biodiversity and augment niche animal populations while improving habitats for endangered wildlife. It will also empower indigenous people and local communities (IPLC) and stakeholders, address HWC, align with the Convention on Biological Diversity's Kunming – Montreal Biodiversity Framework (K-M BF), especially the Goals A, B and C. It will also address targets 1, 4 & 5 (Reducing threats to biodiversity) and targets 9 & 12 (Meeting people's needs through sustainable use and benefit-sharing) out of the recommended 23 action-oriented global targets for urgent action over the decade to 2030.

Key words: Biodiversity, wildlife-economy, wildlife-management, human-wildlife-conflict

Recovery of Reintroduced population of Gaur (*Bos gaurus gaurus*) in Bandhavgarh Tiger Reserve: Key learnings

Parag Nigam, Ritesh Vishwakarma, Jasbeer Singh Chauhan, Rajiv Mishra, Bilal Habib and Nitin Gupta

*Wildlife Institute of India, Chandrabani, Dehradun-248002 (Uttarakhand) & Madhya Pradesh Forest Department, Bhopal-462023 (Madhya Pradesh).
Email- nigamp@wii.gov.in*

Abstract

The gaur, a large bovine species, was once common in the Indian subcontinent but now faces significant threats, including habitat loss and poaching. As a result, reintroduction efforts have been undertaken in Bandhavgarh Tiger Reserve (BTR) to overcome the local extinction and to conserve the species. This study aims to assess the current status of the reintroduced gaur population in BTR and its range extension, as well as to identify future challenges to conservation.

A total of $n=50$ individuals (14 male and 36 female) were reintroduced to BTR, in two tranches, in 2011 and 2012. The immobilised animals (with Etorphine Hydrochloride and other supporting drugs) were captured and kept for observation in a holding boma built at the capture site in Kanha Tiger Reserve. For soft release of animals in BTR, a 100-hectare enclosure with suitable vegetation, cover, and water was chosen and enclosed with a powered fence. The herd was finally released into the wild after one month in the boma. This founder population was regularly monitored using satellite telemetry, camera traps, line transects and behavioural observation methods over the decade (2011 to 2022). The gaur population in BTR has steadily increased from $n=50$ to $n=168$ individuals in 2022. Currently, the population of 168 individuals, was observed to have formed seven different herds, having mixed age and sex class individuals, covering over 470 km² area of the reserve and exploring new areas around the park. The herds and rover bulls were also observed to move unidirectionally (towards north, north-eastern) outside the park boundary in the beginning, showed efficacy of the fenced area built on southern part of the park for initial confinement of the reintroduced animals.

The study showed that gaur populations typically have a pyramid shape, with a broad base indicating a large number of young individuals and a narrowing towards the top, representing fewer older individuals. The present gaur population ($n=168$) comprises mostly adult females ($n=37$) followed by calf ($n=43$), sub-adult females ($n=22$), yearling and juvenile ($n=30$), sub-adult males ($n=15$) and adult males ($n=21$). The estimated overall gaur sex ratio, adult female: adult male was 1:0.6, and adult female: calf ratio was 1:0.8. In Bandhavgarh, the adult male: adult female ratio is higher than that of Kanha, Mudumalai and Nagarhole, but closely similar to those of Pench, Parambikulam and Tadoba. The adult female:calf ratio is higher than that of Pench, Mudumalai, Parambikulam, Kanha and Nagarhole. The current study shows that the population has a large percentage of breeding females. The estimates from many regions of India are very comparable to Bandhavgarh's overall population structure and dynamics. The demographic structure of the population is dominated by adult females, indicating the successful reproduction and survival of the calves.

The results of the decade long study showed that the reintroduction of gaur in the Bandhavgarh Tiger Reserve has succeeded, and the population shows signs of natural growth and

range expansion. However, the study identifies several challenges that could threaten the future of the gaur population in BTR. As the growing population expands its range outside the park, it may become more vulnerable to the diseases from livestock. Habitat fragmentation and degradation due to infrastructure development and recolonization of wild elephants shall also pose significant risks to the recovering population of gaur. The study recommends implementing management strategies to mitigate these threats, such as increasing corridor connectivity and monitoring habitat fragmentation and large-scale monitoring of the mega herbivore species. Additionally, efforts should be made to increase public awareness and community engagement to reduce disease spread from livestock and promote conservation.

In conclusion, this study provides insights into the current status of the reintroduced gaur population in BTR and highlights the need for continued conservation efforts to ensure the species's long-term survival. The findings of this study can help guide conservation efforts in the reserve. Habitat restoration and management, community engagement, and regular monitoring and disease control measures are suggested as potential solutions to these challenges. . To achieve the natural population dynamic and prevent inbreeding in the introduced population, periodic supplementations are also recommended for future management.

Key words: *Bos gaurus gaurus*, reintroduction, population, species conservation

Recovery from the brink of extinction of the Hard ground sub-species of the Barasingha (*Rucervus duvaucelii branderi*) through intensive science based management in Madhya Pradesh

Jasbeer Singh Chauhan, Subharanjan Sen, L. Krishnamoorthy, SK Singh

Madhya Pradesh Forest Department

Email- chauhanjs87@gmail.com

Abstract

The Hard ground sub-species of the Swamp Deer locally known as Barasingha (*Rucervus duvaucelii branderi*) which is the state animal of Madhya Pradesh was threatened with imminent extinction in the sixties. The numbers were less than 70 individuals. Active and intensive management interventions backed by experience and science over the last 5 decades have seen their numbers increase steadily to over 1200 at present. Initially the single population was confined to a small area in Kanha National Park, around forest villages Sonf, Raunda and Central Kanha meadow. Now there are established meta populations spread all over Kanha Tiger Reserve as well as a geographically separate re-introduced population in Satpura Tiger Reserve. Following scientific studies of the Barasingha, most notably by Dr. Claude Martin, management interventions including strict protection, village relocations to make additional habitat available to the deer, in-situ predator proof breeding enclosure, eventual scientific approach to tiger and other co-predator management, fire management, habitat management etc were implemented. Efforts were made to set up meta populations in suitable sites within Kanha Tiger Reserve. The initial efforts for range expansion and establishing separate geographically isolated populations could not succeed owing to lack of technical know how about the capture and translocation techniques of herbivores. Subsequently in 2015 a separate meta population was successfully established in Satpura Tiger Reserve by adopting mass capture and safe transportation of Swamp deer. The endangered Barasingha is now well on the way to recovery in the protected areas of Madhya Pradesh.

Key words: Swamp deer, Kanha and Satpura Tiger Reserves, Meta population

Management of Spotted Deer (*Axis axis*) Population in the Protected Areas of Madhya Pradesh

Rajnish Kumar Singh, Akhilesh Mishra and Bhaskar Bhandari

Pench Tiger Reserve, Madhya Pradesh

Email - rajnishk.forest@gmail.com

Abstract

Madhya Pradesh has the largest forest area notified as protected area (PA) under the Wild Life (Protection) Act, 1972. Tiger, the national animal of India, is the focus of wildlife management in MP and in many other states. Spotted deer (*Axis axis*) is the principal prey of tiger and other carnivores in India and the density of carnivores depends largely on the density of spotted deer (also called chital) in their habitat. The density of spotted deer varies from PA to PA and there is a large variation even within PAs. One of the factors that determines the chital density in a PA is the proportion of grasslands in the habitat as chital is largely a grazer species. Accordingly, the State has been focussing on enhancing the proportion of grasslands in PAs by relocating villages situated in the PAs. The process of relocating villages from the PAs of the state started in the seventies and has been completed in many key PAs of the state. However, a large number of villages has been relocated only in the last few years, and the prey population in these areas has not yet grown to satisfactory levels for sustaining the growing populations of tigers and other carnivores.

In order to expedite the growth of prey base in the habitat released by the relocation of villages, the state has adopted a proactive approach of translocating chital from PAs with large and growing chital populations to those with large areas of low density. Under this programme several thousand animals have been translocated from Pench, Bandhavgarh, Van Vihar, Narsinghgarh WLS etc. to newly vacated village sites in Satpura Tiger Reserve, Sanjay Tiger Reserve, Ralamandal WLS and Gandhi Sagar WLS and so on. Similarly, Kanha Tiger Reserve has translocated a large number of spotted deer from its high density areas to newly vacated village sites within the PA also, although the park has been trying to encourage natural dispersal through corridors of suitable habitat.

Pench Tiger Reserve, which has been free from any human occupation for over three decades, has been in the forefront of this active wildlife management approach adopted by the state. The reserve has one of the highest chital densities in the country (65.75 animals/sq km) and has been designated as the principal supplier of chital to the PAs that need augmentation. The reserve has already supplied 2871 animals to several PAs, namely, Nauradehi Wildlife Sanctuary, Kuno National Park, and Kheoni Wildlife Sanctuary since 2019 and has built excellent capacity to capture and transport the animals without any significant mortality. As any further increase in chital density in Pench TR is likely to adversely affect the habitat, and may also increase crop raiding in the surrounds, translocation of chital to other parks of the state is likely to continue in the future.

As a part of this programme, five permanent capture bomas have been created in the high chital density areas of the park. The animals are passively driven into the boma after they have become comfortable with its presence for some time, and are loaded into trucks through a loading chute on the other end. No drugs are used during capture or translocation. The transportation distance varies from 200 to approximately 500 km. No mortality due to capture myopathy or trauma has been observed so far.

Keywords: Chital Translocation, Pench Tiger Reserve, Wildlife management.

Management of Spillover Tiger population in a Human Dominated Landscapes

Akhilesh Mishra and Bhaskar Bhandari

Pench Tiger Reserve, M.P.

Email- akm241968@gmail.com

Abstract

India is home to over 70% of the global tiger population and nearly one third of these live in the Central Indian forests. Tiger population in the country has been growing consistently since 2005 and has crossed 3000 after declining to nearly 1000 animals in 2005. In the beginning, most of this growth was in tiger reserves and a few other protected areas (PAs) of the country. But the tigers gradually started occupying the forests beyond the boundaries of PAs as the numbers inside PAs grew. It is now estimated that over 35% of the tiger occupied area in the country is outside PAs and is growing. Many of the tiger reserves (TRs), particularly those in Central India, have almost reached saturation levels and tigers are increasingly spilling into human dominated forests and other lands in the country. Along with tigers, the populations of leopards and prey species has also increased significantly and is spilling beyond the boundaries of not only PAs, but also other forests. This is resulting in the aggravation of human wildlife conflict in the form of human deaths and injuries, livestock losses and crop losses. Tigers and leopards are increasingly being seen in the outskirts of cities like Bhopal, Mumbai and Nagpur etc. With further rise in tiger population, and associated predator and prey species, expected in the near future, more and more animals are likely to spill over beyond the PAs and human-wildlife conflict (HWC) is likely to reach a tipping point in not too distant a future. Although HWC is very widespread in the country, it is particularly acute around the PAs. Cases of villagers burning forest department property and attacking the field staff in the wake of human casualties have recently been seen in Pench, Bandhavgarh and Sanjay tiger reserves of MP. Nearly 90 people have been killed by tigers and leopards around the Tadoba Andhari Tiger Reserve of Maharashtra in 2022. It is obvious that future of wildlife in the country is likely to be imperiled if HWC continues to grow with any growth in wildlife populations, particularly of tigers and other big cats.

Therefore, it is time that wildlife managers start actively managing the population of tigers and other predators outside PAs. We suggest the following steps in this regard:

- Same priority should be given to the management of wildlife populations outside PAs as inside.
- The safe carrying capacity of tigers in all tiger bearing forests outside PAs should be determined and the population be actively maintained below this level.
- Tigers and leopards in excess of the estimated safe carrying capacity of tiger bearing forests outside PAs should be regularly hunted or otherwise removed, without waiting for any human casualties to trigger such management.
- Any tiger or leopard taking up residence dangerously close to human habitation, or indulging in regular cattle lifting near human habitation, should be removed without waiting for any human casualties.
- A massive programme of fencing human habitations in forested landscapes should be undertaken to minimise HWC.
- Wildlife should be managed as a renewable natural resource, in accordance with all the international conventions which India is a party to, for the benefit of the people living in forested landscapes.

Keywords: tiger reserves, human wildlife conflict, rescue, population management

Expansion of the cheetah metapopulation into India

Vincent C. van der Merwe and Yadvendradev Jhala

*Cheetah Metapopulation Project, The Metapopulation Initiative, South Africa and Wildlife
Institute of India, Dehradun, India
Email- vincemetapop@outlook.com*

Abstract

Cheetah (*Acinonyx jubatus*) numbers have decreased across their distribution range at 2.26% per annum over the past century. Cheetahs persist in 30 subpopulations, with seventeen comprising less than 30 individuals. With limited natural dispersal between them, these populations are not viable in the long-term. The Southern African cheetah metapopulation is increasing at a finite growth rate of 8.8% per annum. This is largely due to the adoption of a managed metapopulation approach, with human-mediated gene flow co-ordinated between 72 participating reserves and 32 reintroductions co-ordinated over the past decade, increasing both numbers and range. Reintroductions / Conservation translocations of large carnivores have increasingly been recognised as a strategy to conserve threatened species and restore ecosystem functions. The cheetah is the only large carnivore that has been extirpated in India, mainly by over-harvest of cheetahs and their prey coupled with loss of habitat. India now has the economic ability and safe habitats with prey, to restore its lost natural heritage, for ethical as well as ecological reasons, and presents avenues for expanding the managed metapopulation approach. We acknowledge the limitations of this approach: it is expensive; 6% of relocated cheetahs die in transit; and natural landscape processes are not always at play. The hands-off approach adopted elsewhere places a strong emphasis on natural gene flow through the establishment of corridors between conservation areas, promoting natural recolonisation. Here we present an alternative conservation strategy, the intensively managed metapopulation, where source populations are established amongst human-free protected areas. Dispersal between sources is managed through human mediation. Such strategies, though less desired compared to naturally connected populations, are likely the only practical solution to having viable large carnivore populations in many densely populated and developing countries. We discuss the environmental, social, and economic benefits associated with Cheetah reintroduction in South Africa, and how these benefits can be realised in India. We document reintroduction failures in Africa and how this can be avoided in India. We provide a rationale for cheetah reintroduction into India and discuss strategies for creating source populations and simulating gene flow.

Key words: metapopulation, reintroduction, ecotourism

Conservation translocations recover greater one-horned rhinoceros (*Rhinoceros unicornis*) and eastern swamp deer (*Rucervus duvaucelii ranjitsinhi*) in Manas National Park, Assam

Rathin Barman, Nazrul Islam, Aftab Ahmed, Bhaskar Choudhury, Samshul Ali, Sanatan Deka, Daoharu Baro, Samir Kumar Sinha, Rahul Kaul, Vivek Menon
Wildlife Trust of India, F-13, Sector-8, NCR, Noida-201301, India
Email- rathin@wti.org.in

Abstract

Manas National Park, Assam is well known for its rare, endemic, and threatened wildlife in the transboundary eastern Himalayas. It is one of the eight protected areas in India holding the population of greater one-horned rhinoceros and one of the two distribution sites of the eastern swamp deer. Populations of more than a hundred rhinos and a healthy population of eastern swamp deer were severely depleted during the mid-80s to the 1990s socio-political turmoil in the region. The rhino population was extirpated due to poaching in the civil unrest. Recovery of these two species was undertaken by the Wildlife Trust of India (WTI) in association with Assam Forest Department and the Bodoland Territorial Council – an autonomous council for the Bodoland Territorial Region established under the 6th Schedule of the constitution of India.

The species recovery program adopted conservation translocation to achieve the goal of repopulating rhino and reinforcing the remnant eastern swamp deer population in the Manas National Park. The orphaned rhino calves captured in floods and rehabilitated at the Centre for Wildlife Conservation and Rehabilitation were translocated to Manas and acclimatized in an in-situ 5 ha enclosure before being released in the natural habitat following the soft release protocol. From 2006 to 2021, 20 rhinos (male: female = 2:3) were translocated in seven batches.

The remnant swamp deer population in Manas was supplemented with swamp deer captured in Kaziranga National Park; 36 captured individuals were translocated to Manas National Park in two batches between 2014 and 2017. The translocated individuals were acclimatized in a 12 ha in-situ enclosure before releasing in the habitat.

Of the 20 translocated rhinos, 60% of individuals survived in the wild, and the remaining died due to various causes except poaching. Four surviving rehabilitated females reproduced 12 calves, all surviving in the wild. The rehabilitated rhinos and their progenies constitute about 45% of the 47 rhinos in Manas. The annual eastern swamp deer population estimation conducted by the Forest Department recorded gradual increment in the deer population, reaching to 121 individuals in March 2021. Conservation translocation efforts have re-established rhinos in a historical site. The eastern swamp deer translocation increased the population and genetic viability of the population in its small distribution ranges. The conservation effort also played a crucial role in removing Manas from the list of World Heritage Sites 'in danger.'

Keywords: Greater one-horned rhino, eastern swamp Deer, translocation, Manas, Kaziranga.

Using energetics for wildlife population management: Case study from Manas Tiger Reserve

Ankur Awadhiya

*DCF Information Technology, Madhya Pradesh Forest Department,
Satpura Bhawan, Bhopal 462004
Email- mp572@ifs.nic.in*

Abstract

Degradation of habitats and loss of corridor connectivity due to deforestation and encroachment is pushing several species towards non-prime habitats, migration routes, and locations, often leading them to human-dominated landscapes and increasing situations of conflict. Under these circumstances, a knowledge of the propensity of an animal to move to a particular location can make considerable effect on proper management of the species by permitting the concentration of resources: men, materials, and machines to locations where they may have the greatest impact. Energetics analysis of the movement paths of animals can help predict and simulate the routes they will take. In this paper, we explore elephant movement paths in the Manas Trans-boundary Conservation area through the lens of energetics. We explore the possibility of high elevation forests being utilised as an alternative route by elephants using computation of energy requirements vis-a-vis the extant corridor routes. It was found that the alternative pathways are as much as five times more energy intensive than the existing routes, with per kilometre energy requirements being around 2.5 times the current per kilometre requirements, proving their unsuitability for the migration of elephants. This indicates that restoration of corridor connectivity is urgently required to avoid situations of conflict or population decimation of elephants, with management implications for other species and locations as well. In particular, these data may be utilised to identify and predict areas of elephant movement in the landscape and take suitable steps to avoid situations of conflict. Plantation of suitable energy-dense edible species in low energetics areas can be used to confine elephants to such areas, and also to nudge their movement in the landscape to specific areas as per requirements.

Keywords: Manas, Manas Trans-boundary conservation area, Movement ecology, Energetics, Corridor connectivity

Wildlife Population Management: "Its all about the grass"

Les Carlisle

Founder Director, Carlisle Conservation Consulting, South Africa

Email-les.carlisle.94@gmail.com

Abstract

The principle of wildlife management is essentially, "Its all about The Grass" and establishment of the ecological carrying capacity is the basis for management actions. Animals of any species can be added or removed as needed from the system but the grass and the trees have to grow. "Conservation is complicated," and it is directly affected by uninformed views and one-size-fits-all solutions suggested through social media channels that create public outcries.

The concepts of "Conservation and Preservation" require different management actions and each will have economic, social and conservation implications.

The concept of culling and sustainable harvesting from a population is discussed.

Keywords: Conservation, population management, economy

Elephant immune contraception - Lessons learnt.

D V Cooper

*Director – African Wildlife Vets.
Email: info@africanwildlifevets.org*

Abstract

Research in the Kruger National Park in the late 1990's demonstrated that the use of Porcine Zona Pellucida (PZP) vaccine in elephant cows was safe, effective and could be administered reasonably efficiently without the need of immobilization. Furthermore, it was later demonstrated to be reversible at least in the short to medium term (3 - 5 Years). Since 2000 several small elephant populations have been contracepted with PZP and in the medium term no noticeable behavioral or social side effects have been documented.

Contraception of the first elephant herd (n = 200) in KZN began in 2007 with an initial 70 breeding females inoculated with PZP vaccine with a booster administered 6 weeks later. The vaccine was delivered remotely from a helicopter on an annual basis. The results and method used to effectively deliver the vaccine to the selected herds are described. Although there appears to be no visible form of social disturbance, avoidance behavior to any form of helicopter activity has become increasingly evident and has proven to be a hinderance when attempting to translocate family groups as another and possibly more preferable means of reducing population size. Behavioral consequences of immunocontraception in the long term needs to be more thoroughly investigated before recommending it as a single option towards managing elephant populations in Africa.

Key words: Kruger National Park, vaccine, Africa, Porcine Zona Pellucida

Physical and Mass Capture Techniques

Grant Tracy

School Eshowe South Africa

[Email-grant@tdgamecapture.co.za](mailto:grant@tdgamecapture.co.za)

Abstract

An overview of capture methods in the African Context shall be given. The discussion will be centred around the 5 most used capture methods on this continent. This will centre capture methods in relation to terrain.

Key words: Wildlife Capture, translocations, Africa

Mass translocation of Pachyderm

Kester Vickory

Conservation Solutions

Email- Kester@conservationsolutions.co.za

Abstract

Conservation Solutions is a specialist wildlife translocation organisation based in South Africa providing logistical, technical and veterinary expertise to private and government conservation organisations across the globe. Their focus is on wildlife population management, rewilding and alleviation of human – elephant conflict.

More specifically, Conservation Solutions has developed unique systems and techniques that allow for the effective, efficient and economical translocation of pachyderms at scale over long distances. Conservation Solutions founder, Kester Vickory will present on the development of the equipment, systems and techniques that allow for the safe and efficient translocation of elephants and rhinos.

Key words: Wildlife Capture, translocations, re-wilding, human elephant conflict, South Africa

The consequences of Recreational hunting to nature conservation

Jens Ulrik Høgh
Nordic Safari Club
Email- juh@arsenalet.com.

Abstract

As Western countries have developed into the societies, they are today, most types of hunting have become a thing of the past. No one in the West hunts for subsistence anymore. Commercial hunting practices like market hunting for meat - or other animal products to sell - are almost legally regulated out of existence. What's left is primarily recreational hunting – passion-driven hunters who, first and foremost, choose that lifestyle simply because they enjoy it. The legal framework regulating recreational hunting is exceptionally tight. The hunting community has driven legislative steps toward sustainable utilization in recognition that sustainability is the only way to ensure the future of recreational hunting.

The consequences of this move towards recreational hunting might surprise people unfamiliar with hunting. Almost every hunted species in Europe and North America thrives. Many wildlife populations have grown bigger than ever during the last 200-300 years. Enormous areas of habitat enjoy protection as hunting areas. And the system of consumptive sustainable utilization has been adopted with colossal success (from a nature conservation point of view) in other regions of the world over the last 50 years or so. This is the main reason for the abundance of wildlife in Southern Africa and the recovery of central Asian populations of mountain sheep and goats like Urals and Markhors.

Recreational hunting has even proved to be an effective tool for managing wildlife in areas with overabundant problem species, controlling dangerous animals, and fighting the spread of invasive animal species. This presentation aims to brief the audience about the historical development and the facts, figures, and challenges of modern recreational hunting.

Key words: Sustainable utilization, wildlife abundance, population management

Wildlife Management in the Media

Charlie Jacoby

Field sports Channel

Email- charlie@fieldsportschannel.tv

Abstract

The global public view of wildlife and livestock, as reflected in the media, falls into three main groups:

- Those who believe in the consumptive use of wildlife/livestock (C group)
- Those who believe in the non-consumptive use of wildlife/livestock (non-C group)
- Those who have few or no views about it (no-views group)

What are the numbers attached to these three groups? Research should be done to find out. It seems likely that most telling are the votes on the relatively harmless sport of 'trail hunting' (following a laid trail with riders on horses and a pack of hounds in the English countryside, allied to the now restricted pursuit of foxhunting) by a 5.4 million-strong membership organisation called the National Trust, which owns large tracts of land in the UK suitable for trail hunting. In at least two votes, around 1% of the membership voted vehemently in favour of banning trail hunting on National Trust land (non-C group), 1% voted equally furiously in favour of keeping it (C group) and 98% abstained (no-views group).

There are regional variations to the three groups and to the elements within them. For example, Europe has almost no lethal human/animal conflicts. Therefore, the danger some wildlife poses to human life is seldom a consideration in either European media or politics. Contrast this with India, where it is a significant consideration.

APAC came to the conclusion that the non-consumptive model of funding the setting up of a minimum level of protected national parks across Africa will cost R16.4 trillion (US\$200 billion). With this in mind, the non-C group has so far failed to persuade politicians to diverge from what the non-C group claims is public sentiment. It remains likely that politicians will come down in favour of the 'earner'.

Key words: Media coverage, wildlife, trail hunting

Community Based Wildlife Management in Namibia

Uakendisa Muzuma

Ministry of Environment, Forestry and Tourism, Namibia

Email- uakendisa.muzuma@mef.gov.na

Abstracts

Protected areas (PAs) are essential for conserving large carnivores, with their large-ranging behaviour to meet their basic ecological needs. However, large carnivores occur outside PAs and have shared landscapes with humans for millennia. The Namibian government officially introduced the community-based natural resources program (CBNRM) in 1996. It aims to devolve wildlife conservation practices and benefit local people inhabiting communal areas. The program has achieved remarkable successes via sustainable harvesting through hunting, tourism and meat consumption and has encouraged the coexistence of wildlife and rural communities on communal land. Residents learn to coexist and benefit from nature through practice and collaboration with various stakeholders. However, because the program is built upon human-wildlife coexistence, human-lion (*Panthera leo*) conflict (HLC) is present. This has been a pressing challenge, particularly regarding people's coexistence with dangerous animals such as lions and Elephants. Although the CBNRM program has achieved initial success, understanding how humans, livestock, and wildlife use the shared landscape is critical. The monitoring of wildlife populations, human settlements, and livestock movement, setting sustainable harvesting quotas and providing area-specific mitigation measures are critical in mitigating conflict in the Namibia context. Muzuma will discuss the approaches taken by the Namibian government to mitigate human-wildlife conflict, and how to improve the livelihoods and conservation of wildlife in the shared landscape.

Keywords: spatial ecology, human-wildlife coexistence, *Panthera leo*, CBNRM, Human-lion Conflict.

THEME 1
(Wildlife Population Management)
POSTER PRESENTATIONS

30 by 30 and Wildlife Population Management - Best practices from Madhya Pradesh

Ankur Awadhiya

*DCF Information Technology, Madhya Pradesh Forest Department,
Satpura Bhawan, Bhopal 462004
Email- mp572@ifs.nic.in*

Abstract

The geological epoch of Anthropocene has brought with itself the sixth mass extinction of species, necessitating urgent conservation and management of wildlife populations across various ecosystems. To this end, the 30 by 30 initiative has been included as a target of the Kunming-Montreal Global Biodiversity Framework at the recently conducted COP-15 meeting of the Convention on Biological Diversity. This initiative aims to designate 30% of all terrestrial, inland water, coastal, and marine areas as protected areas, and manage them, and the wildlife populations within, for their biodiversity and ecosystem functions and services. India being a signatory to the initiative, we now have exciting opportunities and novel perspectives to manage our wildlife populations. Care needs to be taken to identify such locales, and manage wildlife populations in a way that maximise biodiversity and ecosystem benefits with minimum prospects of conflicts. The state of Madhya Pradesh has taken pioneering steps in this direction, evolving a novel methodology for the identification and delineation of areas, and management of the wildlife populations within. Utilising high-resolution satellite imagery, we have been able to identify 11 reserved forest areas in wildlife corridors with high biodiversity intactness indices that are devoid of any human habitation, mining, or agriculture. Notification of these areas under Section 26A(1)(b) of the Wildlife Protection Act 1972 is under progress. Managing such areas for wildlife and biodiversity not only helps meet the target figure of 30%, but also helps create stepping stone corridors and conserve biodiversity — that too in a manner that does not result in any situations of conflict. In this paper, we explore these using case studies, and discuss policy implications for other states in their wildlife population management approaches.

Keywords: Wildlife Population Management, 30 by 30, Case study, Best practices, Madhya Pradesh, Policy implications

Evolution of New Population Estimation Techniques for Male Blue Bulls Based on their Unique Defecation Behaviour

Mayank Makrand Verma

State Forest Research Institute, Jabalpur (M.P.)

Email- mayanksfri@gmail.com

Abstract

Crop raiding by blue bulls (*Boselaphus tragocamelus*) is an acute problem faced by farmers in Madhya Pradesh and several other states of India. Culling of its surplus populations is often a non-option in the face of religious sensitivities associated with this species in India, 'Capture and translocation' seems to be the only viable option available with wildlife managers. However, it also requires prior knowledge of its population density and location of herd/ individuals. Although several population estimation techniques for wild ungulates are already in vogue, none of these is suited for blue bulls as these have been developed in the context of deer species. An attempt was, therefore, made to develop suitable techniques for the population estimation of this species on the basis of its unique defecation behaviour of repeated defecation at the same locations, called 'lavatory sites' and thereby making huge dung heaps, ostensibly for territorial marking. The investigation was carried out in Van Vihar National Park, Bhopal and it involved several steps, including study of gender specific variation in its defecation behaviour, evolution of a new 'seen, tag and chase' method of complete counting and observation of defecation rate of a captive male blue bull kept in an enclosure, prior to finally evolving a new 'road transect daily defecation rate method', based on mean daily defecation rate for the population estimation of free ranging adult male blue bulls. In this method, mean daily defecation rate in open was determined after observing defecation at all the active dung heaps for eight days. It was compared with the mean daily defecation rate of a captive adult male blue bull, taken as standard daily defecation rate. From this comparison, it was deduced that adult male blue bulls, besides defecating at lavatory sites, defecate elsewhere also in scattered manner. It prompted us to bring in the concept of 'scatter factor'. These new techniques developed during the present investigation can facilitate identification of suitable capture sites for male blue bulls. Since gender ratio of this species at most of the places is heavily biased in favour of females, removal of certain male population from problem areas is bound to further widen the gender imbalance, leading to desired decrease in overall population of blue bulls within few generations.

Keywords: *Boselaphus tragocamelus*, crop raiding, 'seen, tag and chase' method, lavatory sites

Mass translocation of Captive Spotted deer (*Axis axis* Erxleben) through Oral Sedation Method – three case studies

Uday Homkar, Ravindra Mani Tripathi and Amitabh Agnihotri

State Forest Research Institute, Jabalpur

E mail- homkar_uday@rediffmail.com

Abstract

Translocation of spotted deer by oral sedation method has been widely adopted. The oral sedation method adopted by them was modified by using Diazepam (valium) tablets. Captive spotted deer were successfully translocated between 2003 and 2008 in Madhya Pradesh and Chhattisgarh states. This type of work was carried out at various sites in different time period as follows:

1. Total 36 animals were shifted in three stages from State Forest Research Institute Jabalpur to Central Ordnance Depot Campus Jabalpur located at a distance of 12 kms.
2. Five animals were shifted from Vikram Vatika Ujjain to Ralamandal Sanctuary, Indore, located at a distance of 70 kms.
3. 157 animals were shifted in one attempt from Kanan Pendari Zoo, Bilaspur to Achanakmar Sanctuary, located at a distance of 62 kms.

Animals were translocated in vehicles using all safety measures under supervision of qualified veterinarians.

It was observed that evening time was good for providing medicated food for sedation, because at that time disturbance level was low. Two to 2.5 gm doses of medicine found to be sufficient for ideal sedation of one spotted deer. Capturing of sedated animals before sunrise and immediate translocation gave better results. This technique was found suitable for translocation of captive spotted deer with some precautions.

Keywords: Translocation, Tranquilization, Diazepam, Sedation, Medicated Food and Concentrated food.

Propensity to take risky decisions and spatial learning ability in the hatchery reared juveniles of a megafish Deccan Mahseer (*Tor khudree*)

Apoorva Gopinath, Suraj Poojary, Adidev Ajithkumar and V. V. Binoy
*Animal Behaviour and Cognition Programme, National Institute of Advanced Studies, Indian
Institute of Science Campus, Bengaluru, India – 560012*
Email- vvbinoy@nias.res.in

Abstract

Restocking depleting populations of a keystone species using individuals produced in captive conditions is a method widely practiced to ensure the health of natural habitats and degenerating ecosystems. Millions of juveniles of the charismatic megafish mahseer - popularly known as the 'tiger of the river' - produced through artificial breeding practices and reared in the homogeneous conditions of the hatcheries are being released into various natural water bodies in India every year to replenish their declining population. However, studies conducted on different megafish species revealed that the alternate trajectories taken by the development of behaviour and cognitive abilities in the young ones reared in the artificial habitats diminish their chance of survival when released into the natural water bodies.

The present study explored the individual variation in personality traits, namely, boldness (propensity to take risky decisions in a novel environment), exploratory behaviour, and spatial learning ability, in the hatchery-reared juveniles of a megafish Deccan Mahseer (*Tor khudree*). Our results reveal that these vital behavioural traits exhibit variation at the individual level and the presence of a conspecific as well as its personality has an impact on the spatial learning ability of the subject fish. This implies the need for considering the personality traits of members of the group in addition to that of the subject fish while designing restocking and reintroduction programmes. Personality traits and spatial learning abilities are major determinants of behavioural flexibility and, consequently, adaptation to the novel environment of the natural water bodies post-release. Therefore, the need for understanding the development of these vital behaviour traits in juvenile fish growing in natural and artificial aquatic habitats will be discussed in the context of designing a 'life skill training protocol' for improving the success rate of restocking Deccan Mahseer in the rivers of South and Central India.

Keywords: Restocking, Reintroduction, Spatial Learning, Collective Behaviour, Personality, Deccan Mahseer

Mass capture and translocation of Nilgai from croplands to protected areas: A case study

Kartikeya Singh and Rajnish Kumar Singh

Madhya Pradesh Forest Department

Email- kartikeyachauhan@gmail.com

Abstract

The problem of ungulates like Nilgai, Black Buck and Wild boar has reached epic proportions in croplands owing to factors well known. In addition to culling, scientists and managers have been recommending translocation and contraception to address this problem. However, in order to do any of these, animals need to be captured first. In 2016 MP forest department carried out a pilot project to develop and standardize the technique of mass capture and translocation of Nilgai from croplands to protected areas.

We used mass capture technique practiced in Africa to successfully capture and move 27 Nilgai from village Era in Mandsaur district to Gandhi Sagar Wildlife Sanctuary.

This case study elucidates the technique used, capture & translocation process, challenges faced and way forward.

Keywords: Bluebull, Gandhisagar, population management

Ungulate population and herbaceous forage production from grasslands in Kanha Tiger Reserve, Madhya Pradesh

Jasbir Singh Chauhan, Jai Singh Parihar, Sunil Kumar Singh, Dharmendra Singh and Sheshakumar Goroshi

*Madhya Pradesh Forest Department, Space Applications Centre (ISRO), Haryana Space Applications Centre, Node Gurugram and India Meteorological Department
Email- jsparihar@yahoo.com*

Abstract

Rapid increase in animal population in wildlife protected areas has been observed in many places. Developing a sound management planning to sustain the changing population would require information on population dynamics as well as habitat condition. Kanha Tiger Reserve (KTR) is known for not only nurturing a large tiger population, but also as the only abode of hard ground barasingha, till a few years back. There are several other ungulates with sizeable population sustaining the growing tiger population. Human settlements were evacuated from KTR, and this additional land has been devoted to development of grassland habitat. Attempts have also been made to facilitate dispersal of spotted deer from high to low population density area through corridors as well as physical transfer. In view of changing population size and spatial distribution, it is important to regularly assess forage production vis-à-vis ungulate population and forage requirement spatially.

This study is based on the use of remote sensing satellite images to map the herbaceous cover to assess yearly Above Ground Biomass (AGB) production. Normalised Difference Vegetation Index (NDVI) images generated from multispectral images of 10m spatial resolution acquired in the months of October 2020 and March 2021 were used as representing Kharif and Rabi seasons. A tree-cover mask generated from same satellite image was used to mask the tree covered areas. Above ground grass biomass estimate is based on the field sampling of grasses in October and March months from 48 plots of 1m x 1m in Ajanpur and Sukdi beats of Bhaisanghat forest range of KTR. Above ground herbaceous biomass has been treated as available forage to ungulates. Forest range level ungulate population of 2010 to 2020 was used to assess the trend and 2020 population for deriving forage requirement by converting animal number to biomass using the average animal weight as reported in literature. This in turn was used to compute forage requirement using the standard ratio of animal body weight and forage needed.

Forage production from herbaceous cover in 2020-21 to forage requirement by ungulates in KTR was 4.06:1. At forest range level low to high available:required ratio was 0.80:1 (Kisli), 1.39:1 (Kanha), 2.69:1 (Mukki), 4.59:1 (Sarhi), 7.92:1 (Supkhar) and highest of 12.12:1 (Bhaisanghat). Rising trend in population of spotted deer, gaur and barasingha; decline in sambar, barking deer, chousingha, bluebull and wild pig between the years 2010 and 2020 was observed. Dispersal of hard ground barasingha from parts of Kanha range to other parts indicates that ungulate having exacting habitat requirement tend to move as the population grows. To facilitate equitable use of habitat, corridors were created to encourage dispersal of spotted deer from high to low population density areas in KTR, besides physically moving the animals. In most of the forest ranges rising trend in ungulate population was recorded, except in Kisli range, which validates the finding of this study. A close watch on dispersing population and in-depth study of habitat condition at forest range or smaller unit may be required to ensure success of natural dispersal as well as translocation of animals. A combined use of field observation and geomatics could be a good source of information for planning dispersal and translocation of ungulates.

Keywords: Ungulate population, Animal biomass, Grass cover, Remote sensing, Normalised Difference Vegetation Index (NDVI), Above ground biomass, Forage production.

Functionality assessment of Ratapani Satpura corridor; *Is Ratapani tiger population isolated?*

Mayank Makrand Verma and Uma Ramakrishnan

State Forest Research Institute (SFRI), Jabalpur, MP, National Centre for

Biological Sciences (NCBS), Bangalore, KA

Email- mayanksfri@gmail.com

Abstract

The results of the research project conducted by SFRI Jabalpur in collaboration with NCBS under the project titled "*Study on tiger presence and their dispersal movements in Ratapani-Kheoni landscape of Vindhyan range*" noninvasive DNA samples of the tiger were collected from Ratapani Sanctuary and Satpura Tiger Reserve in the year 2018 _ 19. Samples were collected from Ratapani and Satpura tiger reserves for NGS-based population genetics analysis, results give a very clear opinion that Ratapani is not closely related to the Satpura population which is located near the sub meta population of Ratapani, the reason for this fact is dominated human presence prevailing in the Narmada valley for centuries. In another word, we can say that the Ratapani population structure is significantly unique in comparison to the Satpura TR population genetic structure. The land under TCPUS between 2018 and 2019 had a minimum of 19 tigers, based on the next-generation sequencing (Next-Generation Sequencing) DNA test conducted in NCBS Bengaluru. Evidence of close genetic relatedness of the Ratapani Tiger population is not found in the present scenario with other populations of Central Indian Highlands like Kanha, Pench, Satpura, and Bandhavgarh. To find out the above facts, we plotted the clustering of populations to assess which populations group more closely together and identify whether any of the populations are likely to have shared ancestry or low divergence based on shared genotypes. First, we visualized the clustering of these four central India populations relative to other populations across central India, including Tadoba, Nagpur, and Simlipal based on 85 shared SNPs from the SNP panel among these populations. Then we show the structure and clustering of the four populations, Bandhavgarh, Kanha, Ratapani, and Satpura to focus on the structure of these populations at a finer scale.

For the STRUCTURE analysis that included additional populations from within central India more broadly the population clustering was best explained by K=5 clusters. This plot indicates that Kanha and Satpura are generally more mixed in terms of sharing genetic variation between these populations, but also some shared variation with both the 'Orange' cluster that includes Tadoba, Nagpur, and Brahmapuri and some with Bandhavgarh. Bandhavgarh and Ratapani for their own clusters at K=5. However, when we reduce K to K=4 Bandhavgarh and Ratapani form one cluster relative to the other clusters across central India. Analysis of the four focal populations using structure indicates K=4 best explains the genetic clustering of these populations. This fact conveys to us the historical functional connectivity between Ratapani and Bandhavgarh TR. This finding supports the hypothesis that genetic distance is multiple times influenced by human footprint in comparison to the geographic euclidian distance between the two sub-metapopulations.

Here, the resistance of matrix is more dominant on the linear distance between Ratapani and Satpura TR for gene flow or in other words landscape connectivity is more dominant on the linear distance between Ratapani and Bandhavgarh TR for gene flow. In both cases linear distance not playing a critical role in gene flow between two sub-meta populations bearing PAs.

Within the population, genetic analysis revealed that Ratapani and Bandhavgarh have the lowest genetic diversity compared to Kanha and Satpura populations. The lower diversity is also reflected in the relatedness estimates for these populations; Ratapani and Bandhavgarh have mean relatedness of close to 0.25 whereas Kanha and Satpura within population relatedness are close to 0.15.

Analysis of clustering of these populations and assignment based on STRUCTURE indicate that there is some clustering of Kanha and Satpura populations, and these have the lowest F_{st} estimate. There is some shared ancestry between Satpura and Kanha, and Bandhavgarh with some individuals sharing high proportions of ancestry based on the STRUCTURE plot. In addition estimates of F_{st} between Bandhavgarh and Kanha and Satpura are relatively low. This suggests that there may be some movement of individuals among these populations. Additionally, it is known that one individual from Bandhavgarh was relocated to Satpura. Ratapani has moderate F_{st} with all of the three other populations in the landscape (0.2-0.25). Based on STRUCTURE analysis of the four populations Ratapani has very little shared ancestry with any of the populations.

Overall it does not appear that Ratapani is more closely related or connected to any of these three populations within the landscape. Further landscape-level analysis that assesses the impact of landscape features and distance across the landscape could help in explaining the apparent isolation or low connectivity of Ratapani with other populations within this landscape.

Therefore, it has been recommended to connect Ratapani with Nauradehi_Panna_Bandhavgarh and Kheoni_Omkareshwar through habitat improvement of the corridor. The present study will be helpful for Decision Supporting Systems (DSS) for wildlife management of tiger conservation.

Key words: Vindhayan landscape, Satpura Maikal landscape, corridor Functionality assessment, Corridor, Ratapani tiger population

Population dynamics of Tiger at Kanha Tiger Reserve

Ujjwal Kumar, Jayanta Kumar Bora, Shravana Goswami, Neha Awasthi,
Qamar Qureshi and Yadvendradev V Jhala

Wildlife Institute of India, Chandrabani, Dehradun

Email- ujjwalsinha00@gmail.com

Abstract

Knowledge of key vital rates such as reproductive parameters and survival rates is important for developing effective recovery strategies for the endangered species. However, such information is rare due to its elusive nature, low density and methodological challenges for assessing carnivore populations. Tigers shape the ecosystem function by virtue of their top position in the food chain. Despite its ecological importance, there are limited studies on their long-term population ecology. To best plan conservation strategies at the landscape level, it is crucial to understand the population dynamics of tigers. We attempted to study the demography of these two competing carnivores in the Kanha tiger reserve from long-term monitoring through camera traps in the capture-mark-recapture framework using multi-session spatial capture-recapture and open population models. Tiger densities of Kanha PA (at 100 km^{-2}) ranged 4.5 ± 0.72 to 8.26 ± 0.83 between 2011 to 2021 and the leopard densities (at 100 km^{-2}) varied between 6.63 ± 0.71 to 8.64 ± 0.75 from 2011 to 2016. The overall sex ratio in Kanha National Park (M:F) was biased towards females for both tigers and leopards. By using continuous monitoring data of 19 years from known individual in known fate model framework, we estimated key vital rates of tigers, such as age-specific survival and reproductive parameters. Age-specific survival estimates were the lowest for cubs (0.59 ± 0.06), and highest for the adult stage (3-10 years) e.g. for males (0.88 ± 0.02) and females (0.96 ± 0.01). Females showed higher survival throughout their adult stages. Male tigers exhibited a typical Type II survivorship curve, while the survivorship of tigresses was a curve between Type I & II. The apparent survival estimate from the camera trap-based CJS open model was 0.83 ± 0.017 & 0.76 ± 0.021 . In conclusion, this study provides important information on the population dynamics of tigers in the Kanha tiger reserve, which is crucial for developing effective conservation strategies for this threatened carnivore.

Keywords: Long term monitoring, Demography, Known fate models, capture-mark-recapture, Survival

Long-term monitoring of ungulates in Kanha Tiger Reserve

Neha Awasthi, Ujjwal Kumar, Qamar Qureshi and Yadvendradev V Jhala

Wildlife Institute of India

Email- neha4nrm@gmail.com

Abstract

Density of large carnivores is primarily dictated by the density of their prey. Therefore, optimal management of ungulates population permits harbouring of viable large carnivore populations within smaller protected areas. Ungulate density is likely to respond to regimes of protection and to vegetation types. Kanha Tiger Reserve is accustomed to intensive habitat management practices such as controlled burning and village relocation. A scientific understanding on how ungulates respond to management and amongst themselves to partition resources is required. Herein, we document the patterns of how the community of sympatric ungulates in Kanha Tiger Reserve (KTR) might partition resources across space and time in different habitats by evaluating i) habitat-specific seasonal densities and spatial co-occurrence; ii) demographic parameters; iii) temporal activity and food habits and; iv) factors affecting their group size. We found that the inviolate core area had 4.8 times higher wild ungulate biomass compared with the multiple use area, stressing the importance of inviolate spaces amidst human dominated landscape. Maximum diversity and ungulate biomass were supported by grassland followed by bamboo-mixed habitat in both summer and winter. Grasslands in KTR accounts for 9% of the core area (940 km²), maintained in arrested stage of succession, therefore management of habitats which maintain ungulate diversity, density and cater to the conservation needs of an endangered species is recommended.

Keywords: Ungulates, Community, Habitat specific, Demography

Demography of a keystone species, "The Chital"

Shravana Goswami, Qamar Qureshi and Yadvendra V Jhala

Wildlife Institute of India, Chandrabani Dehradun

Email-shravanagoswami@gmail.com

Abstract

The chital (*Axis axis*) is a keystone species in Indian forests. It is the primary prey of large carnivores, such as tigers and leopards, and its ability to achieve higher densities shapes the abundance of high trophic levels. Group living is a characteristic feature of chital, with varying group sizes comprising different age categories. However, the demography of this keystone species is not well known. Understanding Chital demography is crucial for conservation strategies for large carnivore recovery. A study was conducted in Kanha tiger reserve to assess the density, group size, age structure, and breeding biology of chital using distance sampling and systematic observational data. Each individual chital was aged and sexed based on methods outlined by Schellor (1967), and the proportion of lactating females in the population determined fecundity and seasonality of fawning. The estimated overall density of chital in Kanha was found to be 46.77 (SE ± 5.3). The age and sex structure showed that highest contribution to the population is from adult females. Adult male to female ratio is 0.58 and adult female to fawn ratio of 2.96. The highest percentage of fawn in the population was found in June, and fawning and lactation were observed throughout the year, with the highest number of fawns seen in June and the highest number of lactating females seen during April. The rutting season in Kanha was found to be from May to July when most of the males were in hard antlers. In conclusion, the demography of chital is an essential aspect of understanding their role as a keystone species in Indian forests. Kanha tiger reserve acts as a source site of chital for many low prey density tiger reserves, making the above information crucial for planning prey augmentation. This study conducted in Kanha tiger reserve provides valuable information on the density, group size, age structure, and breeding biology of chital, which can be used to develop conservation strategies for prey recovery and augmentation in low-density areas.

Key Words: Demography, Age structure, principal prey, Prey augmentation

A photograph of two deer in a grassy field. In the foreground, a male deer with large, velvet-covered antlers stands facing the camera. In the background, a female deer stands facing the camera. The field is filled with tall, green grass.

THEME 2

Wildlife Habitat Ecology and Management

THEME 2
(Wildlife Habitat Ecology and
Management)
ORAL PRESENTATIONS

Ecology and monitoring wetland ecosystems of India: An Overview

S Narendra Prasad

International Institute of Information Technology, Hyderabad

Email- snarendra.prasad@gmail.com

Abstract

Wetlands are among the most threatened ecosystems on earth. The global agencies including the Convention on Biological Diversity, have urged the stakeholders to focus on conservation management and bring in sustainability practices for the wetlands. This presentation deals with details of inventory of wetlands, tools used to include the open-source geospatial techniques, community approaches in the wise use and possible policy formulations in long term management of this important biome.

India, with an average rainfall of 1300 mm, has a range of bio-geographic regions extending from Andaman Islands to the Himalayan ranges. By virtue of the climatic, edaphic, and ecological diversity, a variety of fascinating wetland habitats are extant in the country. India, with a landmass of 2.42 per cent in global context, supports 16 per cent of human population. Wetland ecosystems have traditionally been a part of the human society for food, fibre, folklore and much more. The Indian wetlands are rich repository of aquatic biodiversity and are associated with diverse socio-cultural traditions including wise use from times immemorial. The individual extent of each of this habitat varies widely from less than a hectare to several thousand hectares. With over 4.63 percent of geographical area under wetlands, India has a rich aquatic flora and fauna. It is estimated that Indian wetlands harbour about 1200 species of flora, over 18000 species of fauna including about 250 species of birds as per the Wetland International, South Asia (WISA) in 2017.

The Ministry of Environment and Forests and climate change (MoEF&CC), the nodal Indian governmental agency, has taken a proactive policy and has put in place an actionable agenda on wetland conservation and management. So far, the MoEF &CC has declared 75 Ramsar sites spread over several diverse biogeographic zones. These wetlands are being managed by adoption of diverse conservation strategies. Since wetlands are dynamic ecosystems from hydrological, ecological and biodiversity perspectives, management requires frequent information and data on the biodiversity elements as well as from a perspective of habitat ecology.

A case study incorporating data on the habitat, extent and biodiversity was carried out for the Kerala Biodiversity Board by the Salim Ali center for Ornithology and Natural History in 2009. This study has elements of landscape ecology incorporated in the first ever web-based GIS for the entire state and having incorporated 2.25 ha size wetlands. The Kerala State Biodiversity Board sponsored project on the directory of wetlands of Kerala aims to provide an extensive baseline information and data on spatial distribution of wetlands in the six northern districts of Kerala. As the scale of mapping is found to be a very crucial issue for wetland conservation, an attempt has been made to use existing land use land cover information including wetlands at 1:12500 scale at different hierarchical levels, viz., District, Block and Panchayat level. Since the data base has been organized and compatible with a Geographic Information System, many relevant themes such as plant and bird diversity, socioeconomic, demographic, economic dimensions can be easily captured and added as thematic layers. Further with the aim of taking the data and stake holders to the actual stakeholders, a web

based Geographic information system has been developed. A novel feature added onto the web GIS, is to enhance usability and ready access. Hence the web GIS has been dovetailed with Google earth map application. This effort at high scale resolution is one of the first of its kind in conservation and management of fast depleting wetland ecosystems in the country. The land use data that has been developed at 1:12500 scale for the Kerala State Planning Board using LISS III satellite data was carried out by a collaborative effort of ISRO and the Kerala State Remote sensing centre. However, this data was found to have many lacunae and these were resolved both at thematic and at basic data preparation level using Open-source geospatial tools. The reconstructed data thus formed the basis for developing a web enabled wetland information system. Thus, the use of open-source geospatial tools has helped furthering the goals of a participatory wetland monitoring at four hierarchical levels of Panchayat, block, district and state. A spatial database was developed for it in PostgreSQL / PostGIS, two key open-source geospatial tools. The major advantage of creating spatial database for the entire state is that the data resides in a central database with well-defined user privileges and with minimal outlay of financial resources. This model can easily be replicated elsewhere.

It is imperative, therefore, to all stakeholders in the wise use of wetlands that a carefully designed system of inventorying, monitoring the wetland ecosystems at frequent intervals of say two years be adopted. This would help active management of this critical wetland ecosystem.

Keywords: wetland, management, SQL, GIS

Assessment and monitoring of grassland habitats in Kanha Tiger Reserve, Madhya Pradesh using multi-year remote sensing data

Jai Singh Parihar*, Jasbir Singh Chauhan, Dharmendra Singh, Sheshakumar Goroshi, Sunil Kumar Singh, Ajinkya Deshmukh, Shilendra Kumar Uikey, Virendra Singh Jamor and Reb Singh Dawar

Space Applications Centre (ISRO)

**Email- jsparihar@yahoo.com*

Abstract

Kanha Tiger Reserve (KTR) in Madhya Pradesh is a world-famous Protected Area (PA) in the country. Besides hosting large tiger population, it is the abode of hard ground barasingha (*Cervus duvauceli branderi*). It has large population of several other ungulates thriving on grasslands. Phen Wildlife Sanctuary (WS) located nearby is also under KTR management. The KTR management has taken several initiatives to develop grassland habitat in the village relocation sites of Phen WS. This study deals with recent changes in the grassland habitats within KTR including areas of Phen WS using remote sensing techniques.

This study covers assessment and monitoring of grass cover in KTR and Phen WLS, over six monsoon years (2016-17 to 2021-22) using multispectral, temporal satellite image of 10m spatial resolution for assessment of grass cover study Landsat-8 images of 2020-21 for mapping the burnt areas. Kharif (autumn) and Rabi (spring) season grass cover has been mapped at beat level using the images acquired in October and March months, respectively. Herbaceous vegetation cover was assessed using 10-day composite (Dekadal) Normalised Difference Vegetation Index (NDVI) images. NDVI values for green vegetation ranges between 0.01 and 1.00 and higher NDVI indicates high leaf area index and/or above ground green biomass. Greening and browning of herbaceous vegetation has been derived for autumn and spring seasons using Dekadal NDVI images. Daily rainfall data pooled to Dekad has been used to study the relation of phenology and above ground biomass on rainfall and no. of rainy days.

NDVI of herbaceous vegetation sliced in six levels indicated a total of 10640ha area under grass cover and water bodies in KTR. Area under NDVI in the range of 0.35 and above varied between 9017-10327ha in Kharif and 370-4342ha during Rabi season during the six monsoon years. The general trend is continuous rise in area under 0.35-0.51 NDVI with passing years, at the cost of NDVI of 0.52-0.68, indicating progressive decrease in area of higher above ground herbaceous biomass. Maximum area was found under NDVI range of 0.52-0.68 during 2019-20 in all the forest ranges of KTR. Bhaisanghat, Sarhi and Supkhar range of KTR and Phen WS recorded large grass cover areas with >0.85 NDVI in the year 2019-20, a high rainfall year with maximum number of rainy days in most of the forest ranges. At beat level large variability in NDVI was observed across KTR and Phen WLS. The Dekadal NDVI indicated occurrence of peak NDVI or peak green biomass, mostly in October and March months for Kharif and Rabi seasons, respectively, followed by its senescence. Large tract was found burnt by fire incidences/fire lines in grasslands in parts of Bhaisanghat and Supkhar ranges between December 2020 and May 2021. Ajanpur-Sukdi beats have shown progressive increase in high NDVI grass cover, particularly in Rabi season. Multispectral temporal satellite images of 10m spatial resolution have been found effective in capturing area under herbaceous vegetation in grasslands, phenology, and green biomass. Management implications of these observations are discussed.

Keywords: Grassland habitat, Grass cover, Above Ground Biomass, Remote Sensing, Normalised Difference Vegetation Index (NDVI), Phenology.

Riverine wetlands in the Ganga plains: strategies for conservation and sustainable management

Rajiv Sinha

Department of Earth Sciences

Indian Institute of Technology Kanpur

Email- rsinha@iitk.ac.in

Abstract

Riverine wetlands are an important and integrated component of the riverscape in the Ganga plains as they perform various ecological and hydrological functions. However, these wetlands are constantly threatened because of several human interventions - direct (e.g., human occupation, agriculture) as well as indirect (e.g., groundwater abstraction, diversion/blocking of feeder channels). Protecting riverine wetlands would therefore improve water resources development through natural processes (without any interventions), would support ever increasing agriculture water demand and sustain ecology leading to green growth. Stakeholders (e.g., wetland management authorities) need a science-based information about wetlands at basin scale for prioritising them for restoration and monitoring. Strategies for conservation and sustainable management of these wetlands would require multi-source data analysis from basin- to wetland-scale using modern technology such as satellite remote sensing and drone based sensors as well as application of emerging concepts such as connectivity, wetland dynamics, and wetland cover types. This presentation will use examples from our research on wetlands from different parts of the Ganga plains, mainly Uttar Pradesh and Bihar, to develop basin-scale inventory, protocols for wetland health assessment and sustainable restoration plans.

Keywords: wetlands, Gangetic plains, stakeholders, sustainable restoration

Wildlife use of forest connectivity in the Western Terai Arc Landscape

Nishant Verma*, Samrat Mondal and Bivash Pandav

Wildlife Institute of India, Chandrabani, Dehradun

**Email- nvermaifs1999@gmail.com*

Abstract

We assessed the wildlife corridors and their functionality in Western Terai Arc Landscape, which includes parts of the Dehradun Forest division connected to Rajaji Tiger Reserve (Kansro-Barkot and Chilla-Motichur corridors), and some parts of the Shivalik and Lansdowne Forest divisions. This area encompassed a mosaic of Protected Areas (PAs) and scrubland, grassland and human settlements to a larger extent. In this study, the Kans Rao-Barkot and the Chilla-Motichur corridors were studied in detail and investigations were carried out to ascertain whether these corridors are being used by wildlife, to what extent, and which species.

To obtain data on the presence, absence and intensity of use of a beat by wildlife, we have quantified the encounter rate of tiger, leopard, and their co-occurring carnivore species and their prey. We collected direct and indirect signs in our study area. A beat is considered as a sampling unit; we walked trails and transects (N=37, walk effort=389 km) to determine the wildlife presence between January 2022 to February 2023. Trails were walked during the morning and evening. During the trail/transect walks, all prey and predators were recorded. The number of individuals within the group, their activity and habitat details were also noted. For this survey, 9 forest beats of Rajaji Tiger Reserve and Dehradun Forest Division, Uttarakhand viz Andheri, Chandi, Chilla-Motichur corridor, Danda East, Gaula East, Golatappar West-1, Gularpadawa East, Jakhan-1 and Suswa were selected. Indirect evidence such as dung, spoor, pellets, and feeding signs were also recorded. The results were estimated as the number of signs/km walk. After the sign survey efforts, we carried out opportunistic camera trapping (N=27) to assess the functionality of the corridors. We deployed the camera traps at different locations for more than a month. We collected all the ecological factors and geo-coordinates from the deployed locations. We deployed camera traps mostly near the trails based on our reconnaissance survey. The abundance index was estimated as Encounter rates (number of sightings or signs/km walk). The entire field data collected was used to map the distribution and estimate relative abundance. We used the data from the signs survey (recorded through trails and camera traps) to assess the encounter rate on the 37 trails. The encounter rate of leopard (1.22 ± 0.17 SE) signs was found to be maximum, followed by Asiatic elephant (0.62 ± 0.23 SE) and tiger (0.38 ± 0.41 SE), Striped Hyaena (0.14 ± 0.09 SE) and Golden Jackal (0.11 ± 0.09 SE) respectively during the sign survey (visual encounters and signs)

Similarly, the habitat connecting the western part of Rajaji Tiger Reserve and the Shivalik Forest division, Saharanpur (UP) is also studied during the period December 22 to February, 23 to obtain data on the presence, absence and intensity of use of the area by wildlife. Here also, we have quantified the encounter rate of tiger, leopard, and their co-occurring carnivore species and their prey; we collected direct and indirect signs in our study area. After the sign survey efforts, we did the opportunistic camera trapping to assess the functionality of the corridors. We collected all the ecological factors and geo-coordinates from the deployed locations. The abundance index was

estimated as Encounter rates (number of sightings or signs/km walk). The entire field data collected was used to map the distribution and estimate relative abundance. We used the data from the signs survey (recorded through trails and camera traps) to assess the encounter rate. Moreover, the relative abundance of prey is also estimated through the camera trap data. In the carnivore sign survey carried out in the area, it was found that the leopards, followed by elephants are using the corridors to a great extent. In contrast, in the human-dominated landscapes of the study area, the tiger movement was not recorded.

Keywords: Wildlife corridors, Rajaji Tiger Reserve, camera trapping, relative abundance, carnivores

Use of novel devices for monitoring habitat use by wildlife and other ecological parameters: A case study from Madhya Pradesh

Ankur Awadhiya

Forest Department, Madhya Pradesh

Email- mp572@ifs.nic.in

Abstract

Management of natural resources including forests and wildlife necessitates reliable information on several ecological and habitat parameters comprising, *inter alia*, the availability of food and water, presence and load of pathogens and parasites, illegal activities such as poaching and extraction of bio-resources. Studies on habitat use and ethology of a number of elusive species are extremely difficult through conventional tools. Thus, natural behaviour of wildlife frequently become difficult to note and study, requiring recourse to instrumental monitoring. Trap camera devices are, therefore, extensively deployed in wildlife areas by both managers and researchers for this purpose. Notwithstanding, commercial trap camera devices, designed to take photographs of megafauna such as tigers are ordinarily ill-suited for alternative uses with other species, especially those whose heat signatures are feeble enough not to trigger the passive infrared sensors employed therein. To overcome the challenges associated with trap cameras, the Madhya Pradesh Forest Department developed and deployed devices utilizing optical triggers in place of thermal sensors. These devices, tested in Kanha Tiger Reserve, were later utilised for monitoring of wildlife including canids and aves in Kanha-Pench corridor areas, and in the deciduous forests of Nauradehi Wildlife Sanctuary. In particular, the study of ethology of wild dogs revealed aspects including protection of den and exposure of puppies to sunlight, and study of birds demonstrated optimisation of timing of egg laying. The current paper details the construction and deployment of such devices, the ethological, habitat, and ecological information collected, and implications for wildlife management.

Keywords: Wildlife management, Protection, Monitoring of habitat and ecology, Instrumentation, Proxy indicator, Madhya Pradesh

Predicting suitable habitats for Asiatic caracal in Madhya Pradesh based on advanced geo-informatics

Chandra Prakash Singh, Jai Singh Parihar*, Ashish Kumar Jangid, Jasbir Singh Chauhan, Rajnish Kumar Singh, Prakash Kumar Verma, Amritanshu Singh, Shantanu Sharma and Shekhar Kolipaka

Space Applications Centre, Indian Space Research Organisation,
Ahmedabad, Gujarat 380015, India.

Email- cpsingh@sac.isro.gov.in

*Email- jsparihar@yahoo.com

Abstract

Asiatic caracal (*Caracal caracal schmitzi*) is an elusive, medium-sized wild cat, facing threats of local extinction in many parts of its historical distribution range. The International Union of Conservation of Nature (IUCN) lists caracal as a species of 'least concern', mainly due to its good population in Africa. But in India its 'endangered' and falls under Indian Wildlife (Protection) Act, Schedule-I. In order to recover the population of this species we need to identify and map its suitable habitat. We attempted to identify suitable caracal habitat in the states of Gujarat and Madhya Pradesh using advanced geospatial tools viz., remote sensing, GIS, and GPS. We generated data on vegetation, topography, land use and topography from the historically known localities (n=70). The information thus generated was used to develop predictive models for the species. We added a few recent presence records, used machine learning-based spatial niche models and created an ensemble prediction using ecological variables (aridity, vegetation physiognomy and vigour, rainfall seasonality, temperature seasonality, terrain properties) along with correcting markers of human presence (remotely-sensed nightlight information). Caracal being a generalist in feeding behaviour and due to paucity of data on its main prey bases this could not be included in the study.

Out of eight prediction models, the two best models, Random Forest (AUC 0.91) and MaxEnt (AUC 0.89) were weighted and ensembled. The ensemble model indicated several clustered habitats, covering areas in Kachchh (Gujarat), Aravalli (Rajasthan), Malwa (Rajasthan and Madhya Pradesh), and Bundelkhand (Madhya Pradesh) as potentially suitable habitats for caracals. Output probabilities were further fine-tuned with vegetation height and proposed as priority areas for conservation. This study brings out the caracal-specific pockets of suitable landscapes in and around dryland-protected areas, suitable for caracal conservation, with urgent and proactive initiatives from forest departments.

Focusing on the state of Madhya Pradesh for on-ground conservation initiatives for the species, we reconstructed the previously established models with a recent record from Sarmathura Rajasthan. The current models yielded more accurate results with 0.93 AUC of Random Forest and 0.9 of Maximum entropy (MaxEnt) algorithms. Further, we targeted the only protected areas, which have patches of moderate and highly potential habitats (> 10 km² in area) within or nearby (<1 km). The proposed set-up identified Sheopur (1692 km² potential habitat), followed by Morena (481 km²), Shivpuri (265 km²), Neemuch (77 km²), Mandsaur (40 km²) and Gwalior (37 km²) districts. Within these districts, Kuno National Park, National Chambal Wildlife Sanctuary, Ghatigaon Wildlife Sanctuary and Gandhi Sagar Wildlife Sanctuary were found as the preferable conservation priority areas for caracals. This study is expected to help in planning the conservation of dwindling population of caracal through ecorestoration in the recommended areas.

Key words: Geoinformatics, random forest, MaxEnt, caracal, suitable habitat

Spatio-temporal habitat ecology of otters in the Bhavani-Noyyal River basin of Western Tamil Nadu

Ankit Moun, Riddhika Kalle and Tharmalingam Ramesh

Sálim Ali Centre for Ornithology and Natural History

Email- ankit.moun29@gmail.com

Abstract

Fine-scale resource availability and habitat suitability of riverine-edge habitats are crucial for the survival of otter populations in India's threatened fresh water ecosystems. Otters are crucial indicator species of healthy riparian ecosystems. We performed field surveys in the Bhavani-Noyyal River basin of Coimbatore Reserve Forest to record evidence/encounter rate of Smooth-coated otter (SCO) and Asian small-clawed otter (ASO) and to quantify riparian habitat parameters in the dry and wet seasons using 2x2 km grids as sampling units. Each grid was walked for 1 km to record direct and indirect evidences of otters and also habitat variables at each 250m using vegetation plots. We employed ordinary least-square regression models to connect otter encounter rates with habitat factors at the sampling grid size. To assess riparian habitat characteristics and make comparisons between the otter species at the stream-segment size of 250 m. We employed artificial neural networks to build self-organizing maps based on which clusters were discovered and otter evidence/encounter rates were compared. To map the fine-scale (250 m x 250 m) seasonal habitat suitability of SCO we applied a wide range of machine-learning techniques to understand areas of niche contraction and expansion. Dry season SCO encounter rate decreased with the presence of dams/check dams, a high proportion of dense vegetation, and high salinity concentration and wet season encounter rates decreased with the presence of man-made structures, a high proportion of scrub jungle, moist deciduous forest, and high ammonia concentration. Dry season SCO encounter rates increased with riparian habitat quality index, and proportion of dry-deciduous and degraded forest while the wet season encounter rates increased with the presence of sandbanks, pools, smooth/non-turbulent stream flow, and fast turbulent stream flow near river confluences. In all seasons, SCO encounter rates increased with the proportion of barren terrain, and the prevalence of emergent shoreline vegetation while it reduced with grass cover. Variation in the choice of stream flow directions in both seasons was shown to relate to other habitat characteristics. The highest stream order indicated moderate to high SCO encounter rates, while ASO evidence was found prominently in the clusters with lower-order streams flowing through protected areas (PA). Outside of PA, clusters showed limited or no otter evidences. Clusters with a high riparian habitat quality score, moderate proportion of dry and moist deciduous forests with a high riparian tree density, and low human disturbance related to moderate to high SCO and ASO encounter rates. The better habitat suitability in the rainy season than the dry season for SCO relates to locations having low anthropogenic disturbance, medium riparian habitat quality, and high channel substrate index. Although lower-order streams were revealed to be more favorable near locations with their confluence with higher order stream, only the fourth-order stream showed improved habitat suitability for SCO in wet season. We confirm that the regional environmental changes across seasons are driving the spatiotemporal habitat usage of SCO in the Bhavani-Noyyal River basin. This study is the first to address the spatiotemporal niche dynamics of otter populations in southern Indian river basins.

Keywords: Otters, anthropogenic disturbance, spatiotemporal niche, riparian habitat

A typology framework to manage and restore dry tropical forests of Central India infested with invasive alien species

Rajat Rastogi and Ninad Mungi
Aarhus University, Denmark
Email- rajat.rastogi0648@gmail.com

Abstract

Biological invasions pose as one of the formidable challenges for management of natural habitats and conservation of native biodiversity. The tropical and sub-tropical ecosystems are particularly vulnerable to biological invasions. Despite huge resources invested in invasive species control, invasions are unceasingly increasing, and restoration has rarely revived native ecosystems completely. It is seen that conventionally the management interventions within protected areas have focused on removing common woody invasive plants and sometimes assisting the growth of native plants. Upscaling this strategy to the present expanse of invasions is resource-exhaustive, and arguably futile in terms of biodiversity returns, necessitating a transformative approach to restoration.

This presentation deals with an overview of efforts made in management of invasive alien species in India. Adapting global research and considering the availability of biodiversity data, we develop a framework to prioritize restoration activities based on the stage of invasion, the status of native biodiversity, and adaptive conservation goals. We suggest interventions to resist and prevent invasions in their initial phase; contain the spread and impacts in the advanced stage to direct the coexistence of native and non-native species; and in case of invasion-centered systems, adapt management to mitigate the negative impacts and steward biodiversity. Using this framework, we provide a working example of restoring invaded areas in Central India and suggest novel approaches to steward biodiversity in invaded ecosystems. We show how adaptive conservation goals and scientific approaches to restoration can contribute to biodiversity recovery and a nature-positive future.

Keywords: Biological invasions, Restoration, Adaptive management, Typology framework.

Fire, a Versatile Tool to Manage Wildlife Habitats

H.S. Pabla, IFS (Retd)

Forest Department, Madhya Pradesh

Email- pablahsifs@gmail.com

Abstract

Fire has been by far the most powerful force in shaping terrestrial ecosystems since its advent on earth. It has done this by killing organisms and burning dead biomass and, by doing this, creating new opportunities for those who survive, or can exploit its touch of death. The species of plants and animals that we see around us today are the ones that have survived millennia of recurring fires. They have done it by developing features that either reduce the impact of heat on their bodies or by ensuring that their reproductive processes continue even if they themselves die. Some species are even fire-dependent for their regeneration and survival. Therefore, if the historical fire regime (the sum of fire frequency, seasonality, intensity, severity etc.) is altered, these adaptations become useless and the species suffer the adverse consequences.

Fires are both natural (caused by lightning) and human-caused. But, for the last 10,000 years or so, man has been the principal factor in causing and preventing forest fires. We have been burning some forests and excluding fires from others, for ages, depending upon the way we use them. Most of the terrestrial organisms have adapted to human influence on fire regimes over the period of this long association with man on earth. However, since the beginning of organised forestry, with focus only on timber production, nearly 300 years ago, total fire exclusion became a standard practice, with varying levels of success. But the world returned to a more graduated approach to wildland fires when it was noticed that fire always returned, and with a vengeance, to areas where it has been suppressed. Total fire exclusion has harmed as many species (even timber species) as it helped, due to their divergent habitat requirements and adaptations. Hunters and wildlife managers noticed similar impacts on ungulates and birds by the middle of the 19th century. Emergence of the concerns for biodiversity conservation, in the later part of the 20th century, has finally sealed the issue. Since then, total fire exclusion has been abandoned almost in all countries and fire is now used more as a tool to achieve the objectives of management rather than as something totally hated. However, India has not cared to keep in step with the world and is still stuck with the idea of total fire exclusion from all wild lands.

Fire decomposes biomass, both dead and living, and creates opportunities for new life by recycling materials and space. It does so much faster than biological decomposition and complements the latter in continuing life on earth. It is inevitable in certain ecosystems especially deciduous forests and grasslands. The longer the period since the previous fire, the more devastating the next one will be. Therefore, there is no alternative to learning to live with wild fires and trying to turn it to our advantage as far as possible. That is, use it as a tool to manage and modulate natural ecosystems.

Fire influences organisms by killing them, their predators and competitors differentially, and, by altering their habitats. The influence depends on fire frequency, seasonality, intensity and severity, i.e. the fire regime, as well as on the adaptations of the affected species. Therefore, in order to be able to use fire as a wildlife habitat management tool, we need to understand both, the nature and behaviour of fire, as well as, the adaptations of various species related to the presence of fire. Sadly, that knowledge is missing in India. We do not use fire as a forest or wildlife management tool.

Even when we use fire, we do it mostly on personal whims rather than on the basis of solid science. As a rule, we put out every fire, good, bad, or benign.

Realising the unavailability of local expertise in fire management, we invited fire ecologists, including the most famous among them all, Dr. Winston Trollope, from South Africa, to educate us in the use of fire as a wildlife habitat management tool, in 2010 and 2011. Although we were specifically interested in their guidance for the management of Kanha meadows which were (still are) degraded due to preponderance of unpalatable grasses, Dr. Trollope's recommendations are applicable to several wildlife habitats in India. Here are the salient points from his report:

- Grasslands and woodlands in India can best be managed using an optimal burning regime as against random burning and as per the response of various grasses and herbaceous species.
- In order to implement this system, we need to classify our native grasses and herbs on the basis of their response to grazing, as given below, because their prevalence will determine whether to burn or not, namely:
Decreaser species: Grass and herbaceous species which decrease when rangeland is under or over grazed;
Increaser species: Grasses and herbaceous species which increase when rangeland is under or selectively grazed;
Increaser II species: Grass and herbaceous species which increase when rangeland is overgrazed.
- The decision to burn or not should also depend on the grass fuel load (kg/ha). This can be very easily done with the help of a pre-calibrated instrument called Disc Pasture Meter (DPM).
- Grassland needs to be burnt when dominated by Increaser-I species, i.e. in undergrazed condition, to increase Decreaser species.
- No burning is required if the grassland is dominated by Decreaser species or Increaser-II species as a result of overgrazing.
- Burning is not recommended if a rangeland is dominated by Increaser-II species.
- Burning is necessary when grass fuel load reaches or surpasses 4000 kg/ha.
- Very hot fires, including fuel manipulation, are required to eliminate undesirable plants, including encroaching woody species.
- Fires burning against the direction of wind, closer to the ground, kill more plants than those burning with the wind. This feature can be used to alter the composition of grasslands as required.
- Least damage is done to grasses if burned when they are dormant i.e. in November-December.
- Frequency of burning should depend on the rate at which fuel load accumulates and the growth patterns of the target species.
- Not more than 50% area in high rainfall regions and 33% in low rainfall regions should be burned in any year in order to ensure there is no shortage of forage.
- Total area to be burnt in any year should be subdivided into monthly burning blocks to prevent overgrazing of burnt areas. Temporary fencing may also be used to regulate the use of burned plots.

- The time of burning should depend on Fire Danger Index (FDI) which indicates environmental conditions for safe burning. FDI can be determined with the help of a Kestrel Weather Meter 4500.
- The need to burn or not depends on the relative abundance of bulk (coarse) grazers and concentrate (fine) grazers. No burning is required if stocking rates are high and the dominant species are fine feeders, and *vice versa*.
- Practice of burning only to produce an out-of-season flush of grass is injurious to the health of grassland as it reduces plant vigour and increases chances of soil erosion.
- India must start its own fire trials (design given by Trollope) to generate local ecological information. Africa may be similar to India but it is not exactly the same.

Fires create habitat conditions required by all species by burning forests and rangelands unevenly and randomly. Different animals respond differently to an incidence of fire depending on their evolutionary adaptations. For example, birds are classified as invaders, exploiters, resisters, endurers, avoiders, and vacillators on the basis of their attraction, or otherwise, to burned patches. Other faunal classes may have similar response systems but have not been so well studied. The effects of fire on wildlife habitats and associated animal populations, and communities, may last from a single season to decades, even centuries, depending on the severity of a burn and the responses of the species inhabiting the landscape. Composition of faunal communities in a burn site keeps changing from year to year depending on the state of recovery of the burned vegetation.

In recognition of the importance of fire to ecosystems, most countries try to mimic historical fire regimes in their fire policies. Some allow natural fires to burn uninhibited and put out all man-made fires. Others put out all unplanned fires, both natural and accidental, and burn their forests as per their fire management plans. Some countries and states have prescribed fire laws to ensure that their ecosystems stay as close to natural as possible, without endangering human lives and properties.

India needs to follow the world in its response to forest fires. We need to discover our historical fire regimes, and try to simulate them as far as possible. Until we do that, running a light fire (cool season) every 5-6 years through every forest, varying it slightly in relation to the rainfall gradient (higher the rainfall, shorter the fire return interval), may be the most prudent approach. It will create suitable habitats for most organisms, and shall also prevent devastating fires that may result from long periods of fire exclusion. Grasslands and savannas, of course, have to be treated in accordance with their floral and faunal compositions and rates of fuel load accumulation.

However, there is no alternative to generating indigenous scientific knowledge to fine-tune our approach to wildland fires.

Keywords: Fire, management, biodiversity, conservation, habitat

Assessment of Habitat Suitability for Hardground Barasingha in Selected Protected Areas of Central India

Khageswar Nayak*, R K Pandey and Satwant Kaur Saini

Kanha Tiger Reserve

*Email- kagana2007@rediffmail.com

Abstract

We assessed the habitat suitability for the hard ground Barasingha (*Cervus duvauceli branderi*) in selected protected areas of Central India using a well tested Habitat Suitability Index (HSI) model that was prepared following the Habitat Evaluation Procedures (HEP) originally by the United States Fish and Wildlife Service (USFWS). The HSI models are based on species-habitat relationships and the values are given on a scale of 0 to 1 where 0 is unsuitable habitat and 1 is most suitable (ideal) habitat. This value is derived from an evaluation of the key habitat components to supply life requisites of selected species of wildlife.

Ideal habitat conditions for the hard ground barasingha are characterized by flat areas with over 60% area under mosaics of tall, medium and short palatable (native) grasses coupled with 10 – 15% area under shallow water bodies dominated by palatable hydrophytes. For the evaluation of swamp deer habitat in selected areas of Central India we assessed the food, cover and water requirements of Barasingha against key habitat variables such as % cover of tall, medium and short palatable grasses in various localities, above ground biomass of tall, medium and short grasses, biomass of palatable aquatic herbs, % canopy cover of trees in and around grasslands that may be required as loafing cover during peak summer. We used a combination of GIS and remote sensing tools for assessment of proportionate area under different classes of grassland vegetation, area under water bodies and stratified random quadrats for assessment of % cover of tall, medium and short grasses. These variables were then given the suitability scores using the existing models.

With the help of GPS the polygons of various habitat variables were digitized in separate layers in the GIS domain. Considering the importance of the edge of the forest for diurnal activities of barasingha, a 20 m width of forest edge along the grassland perimeter was also buffered in the Arc GIS. The area of each polygon of various habitat types was thus measured and depicted on the digitized maps. The HSIs of different life requisites were calculated and subsequently integrated using different requisites. The study revealed that overall HSI₀ for Sonph area in Kanha Tiger Reserve (KTR) was 0.82 while HSI₀ for Bori (STR) was much lower (0.66). Low suitability of Bori (Satpura Tiger Reserve) was due to lack of permanent water bodies. In order to improve the habitat suitability for swamp deer in Bori, a few water bodies were created and some of the habitats were restored by increasing the area under grasslands. Results of these interventions are discussed.

Keywords: Habitat Evaluation Procedure (HEP), Habitat restoration, Habitat Suitability Index (HSI) model, Hard ground barasingha, Model Variables

Securing Wildlife Habitats in PA's of Central India

R. P. Singh, IFS (Retd)
Forest Department, Madhya Pradesh
Email- rp.inforest@gmail.com

Abstract

Wildlife conservation is a delicate and extremely sensitive subject, since the long-term objectives of consistent conservation often conflict with short-term goals of local populace. While giving space and zero-disturbance to wildlife is paramount to their breeding and conservation, the same strategy also reduces situations of conflict that emerge when wildlife come into contact with humans. To attain this win-win situation, voluntary relocation of villagers from wildlife areas has emerged as a panacea. The prevailing thought that people do not wish to move from their ancestral lands has been found untrue in practice, since mainstreaming not only saves the villagers from crop and cattle depredation, but also connects them with the society, bringing in benefits of development including electrification, schools, and hospitals. However, taking the villagers into confidence is crucial to the complete process, enabling them to take informed decisions. Results from voluntary relocations through confidence building measures have been extraordinarily exceptional and long-lasting, bringing benefits not only to people but also to all forms of biodiversity — large and small. In this talk, I'll present examples from village relocations from Kanha and Satpura Tiger Reserves, and how the relocated areas have been converted into wildlife habitats. The talk will also discuss policy issues and modus operandi that can be utilised in other protected areas of the country.

Keywords: Wildlife conservation, cattle depredation, human-wildlife conflict, mitigation, habitat, breeding

Grassland Habitat Development in relocated village sites of Kuno Palpur National Park, Madhya Pradesh

Ravikant Mishra, IFS (Retd)
Forest Department, Madhya Pradesh
Email-mravikant9@gmail.com

Abstract

Kuno National Park is located in Sheopur district of Madhya Pradesh. In order to maintain a healthy prey-predator population, the park management has taken up several steps for improvement of wildlife habitat. This includes restoration of degraded grasslands so as to increase productivity of palatable and preferred grasses. More than 30 km² was developed as grassland by relocating 24 villages in 2004. However, the relocated village sites were initially infested with the several unpalatable and shrubby species such as *Sorghum halepense*, *Ziziphus nummularia*, *Saccharum* spp, *Desmostachya bipinnata* and invasive alien plants (IAPs), especially *Parthenium hysterophorus*.

With increasing abundance of wild ungulates and over grazing by domestic livestock in the village fringes, there has been a decline in grass cover. Although, most of these species are adapted to grow on relatively nutrient poor soil, rocky substratum and

frequently grazed areas, at several places the grasslands are severely degraded as evident from high proportion of non-palatable grasses and IAPs.

In the year 2013 onwards, the vacated arable lands and habitation sites of the villages were treated for grassland development by eradication of the weeds, ploughing of the open areas and plantation and sowing of seeds of palatable grasses and legumes. Annual grasses and IAPs were targeted for replacement by perennial tussock forming grasses and forbs. Seeds of palatable grasses were collected with the help of trained field staff and propagated within nursery and later planted in selected areas. About 2 hectare area was selected and fenced to raise the plantation stock for further propagation in restoration sites. In addition to grasses, several native browser species and wild fruit bearing plants were selected for propagation. Removal of IAPs was taken up 3-4 times in a year which played an important role in easy establishment of grasslands with good heterogeneous association of the grasses in the developed grasslands. The present paper highlights restoration techniques of grassland habitats and results of participatory approaches on these grasslands of the relocated village sites of Kuno National Park.

Keyword: Grassland Habitat, Relocation sites, Alien Invasive Species, Grassland Habitat Management.

Status of Grasslands in Protected Areas of Central India and Management Strategies

R. K. Pandey

Senior Scientist and Head of Forest Ecology and Environment Division (Retd),

State Forest Research Institute, Jabalpur (M P)

Email- bicasrpk@gmail.com

Abstract

The grasslands of protected areas of Central India are mostly anthropogenic in origin derived from either abandoned arable lands or village relocation sites subsequent to the commencement of Project Tiger in 1974. Anthropogenic grasslands are largely successional in nature and give way to woodlands or forests if not managed. This presentation deals with the status of anthropogenic grasslands within Kanha Tiger Reserve (KTR) and Bandhavgarh Tiger Reserve (BTR) in Madhya Pradesh. Based on detailed ecological studies on the grasslands of KTR (38 sites) and BTR (29 sites) a total of 19 communities in KTR and 26 communities in BTR were identified distributed across the gradients of biotic and abiotic pressures viz., intensity of grazing, frequency of fire and inherent property of soil. These communities are liable to change in response to autogenic as well as allogenic changes. Most of the grasslands in KTR as well as BTR are in a state of flux due to selective removal of highly palatable species by grazing ungulates, repeated fire and invasion by woody species. Some of the overgrazed sites are dominated by coarse grasses viz; *Desmostachya bipinnata* (Kush), *Imperata cylindrica*, *Saccharum spontaneum* and *Aristida setacea*.

Sustainable management of grasslands are crucial for maintenance of populations of wild herbivores. Regular eradication of invasive alien species, sapling or seedling of woody species should be undertaken to provide the congenial conditions for growth of graminoids. It is suggested that the rotational grazing practices should be adopted in the grasslands facing to heavy grazing pressure on priority basis. This system consists of subdividing grassland into three or more compartment. One of these compartments is closed for grazing during one or two seasons by chain link enclosure along with treatments of weed eradication, seed sowing of palatable grasses and legumes for one or two seasons until seed maturity. The other compartments may be opened for grazing during the season. Similar treatments are required for next compartment by opening the previous enclosure. This way each compartment gets adequate period of rest and chance for recovery.

Keywords: Grassland communities, weed eradication, Overgrazing, Impact of fire, Grassland habitat

THEME 2
(Wildlife Habitat Ecology and
Management)
POSTER PRESENTATIONS

Habitat Selection and Use by Bonnet Macaque (*Macaca radiata*) in Urban and Sub-urban areas of Bengaluru, India

N Kushal and Usha Anandhi

Reproductive physiology unit, Department of Zoology Bangalore University, Bengaluru, India.

Email- yaduvspecial@gmail.com

Abstract

Bonnet Macaque (*Macaca radiata*) is a commensal species with human in peninsular India. It is mostly found in urban and sub-urban environments including villages, roadside and religious places. We studied behaviour and habitat uses of bonnet macaque in and around Bengaluru city by direct observations. A total of 122 locations were identified and recorded for the presence of macaque groups. Group size and composition (single individual, bachelor groups, multi-male, multi-female groups) were recorded. Most groups moved among high raised apartment complexes equally along with natural green spaces. The groups mostly rested during night on the terraces of high raises or on the window panels. Any overhanging cement structure away from human sight at an elevation makes an ideal resting place and for their daily socializing activities. The macaques fed on provisioned food from humans comprises major bulk and occasionally supplemented by the natural food. Stealing or house raiding is commonly found across the groups with varying intensity. Shop raids are seen as an opportunistic behaviour where risks of being chased are high. Begging behaviour by infants and juveniles seen around eateries with fencing, well seen in tourist places. Overhead tanks are the best spots for water intake and also act as swimming pools and entertainment spots to bath and play, taps manipulated skilfully and discarded water bottles were also utilized.

The learned behaviour of Bonnet macaque in urban region revealed particularly to open bottle caps, fridge doors, container bottle caps, manipulate window doors to gain access to homes, chasing of pets to feed from their bowls. It shows fearless attitude towards humans, vehicles and dogs when compared to more wilder counterparts. Though the fast-changing urban landscapes pose many challenges to the Bonnet macaque's survival, the ability to adapt to survive for long remains a question to be answered in further studies.

Keywords: Urban wildlife, Bonnet Macaque, Habitat, Human-monkey interphase.

Evaluating the potential for reintroducing the endangered wild water buffalo (*Bubalus arnee*) in central India

Jayanta Kumar Bora, J. S. Chauhan, Ajinkya Deshmukh, Shravana Goswami, Vishnuvardhan, Srinivas Yellapu, Harshini Jhala, S. K. Singh, Ujjwal Kumar, Ninad Mungi, Qamar Qureshi and Yadvendradev V. Jhala.

Wildlife Institute of India
Email- jkborah@gmail.com

Abstract

Species extinction rates have accelerated over the last several decades due to habitat loss, fragmentation and pervasive human impacts. One-fourth of the world's mammals are now threatened with extinction and large herbivores are at the highest risk, even when compared to large carnivores. Megaherbivores are considered keystone species as they influence ecosystems, by modifying species composition, nutrient cycling and primary productivity. They directly modify vegetation through grazing, trampling, wallowing, regulating successional processes, and indirectly impacting other animals in the food web, including their predators, scavengers, smaller herbivores and other lower order species. Reintroduction of megafauna across their historic range is emerging as an effective strategy to halt their extinctions. The wild water buffalo (*Bubalus arnee*, buffalo) is one of the last surviving and critically affected megaherbivores that has lost 95% of its distribution range. About 90% of its global population (~4000) resides within India, in two isolated populations: northeast and central India. The central Indian population, with < 50 individuals, is on the verge of extinction and warrants urgent interventions for population recovery. Present study provides recovery strategy for buffalo in central India by reintroducing to Kanha National Park, identifying suitable source population and potential implications of the recovery. Habitat suitability using global occurrence of the buffalo revealed low-lying grasslands with least human pressure to be suitable in Kanha National Park (390 km²). Within this suitable range, we examined vegetation composition and biomass across all grasslands. Multidimensional ordination classified these sites into two clusters: moist grasslands and dry grasslands. Due to the higher productivity (biomass, foliar cover and basal cover), low grazing pressure and availability of perennial water sources, moist grasslands were found to be better suited for initial reintroduction. Genetic assessment of all extant buffalo populations revealed little merit in differentiating between the northeast and central Indian population. In consonance with the IUCN guidelines, we discuss the reintroduction strategy that could sustain ~200 buffaloes in the area and subsequently other suitable habitats in central India. If implemented as desired, recovery of this lost ecosystem engineer will restore grasslands, seasonal swamps, nutrient dynamics and re-establish a locally extinct endangered species within its historical range thereby contributing to its global conservation efforts.

Keywords: Megaherbivore, grassland, restoration, MaxEnt, line point intercept, quadrat harvest, India.

Restoration of grasslands dominated by *Desmostachya bipinnata* in Kanha National Park, Madhya Pradesh

A.V. Deshmukh, S.K. Singh, S.K., Sharma and M.K. Jamor

Kanha Tiger Reserve, M.P. Forest Department

Email- deshmukhajinkya1997@gmail.com

Abstract

Kanha national park is an internationally renowned wildlife protected area harbouring several ungulates species, besides a sizable tiger population. The Kanha meadow alone, with an area of 660 ha., supports several species of ungulates i.e., the hard ground barasingha (*Rucervus duvaucelii branderi*), chital (*Axis axis*), sambhar (*Rusa unicolor*), gaur (*Bos gaurus*), and wild pig (*Sus scrofa*) etc. Chronic grazing pressure has led to selective removal of palatable species and preponderance of coarse grasses such as *Desmostachya bipinnata*, *Pennisetum hohenackeri*, and *Aristida setacea*.

D. bipinnata has a long, deep root system that has the capacity to regenerate. Eradication techniques vary from one species to another due to its extensive root systems. To do that, we implemented restoration process over a period of three years. We applied fire to eliminate the vegetation, followed by three ploughing operations and root eradication in late winter after allowing the vacant field to acclimatize all summer. After planting and sowing of desirable grass species like *Bothriocloa* sp., *Dicanthium* sp., *Saccharum* sp. *Themeda* sp., and other palatable species, were finished, grasses start to grow in the monsoon.

In addition to investigating the restoration potential of grassland areas invaded by less palatable grasses, we used integrated management techniques such as burning, plowing, weeding, temporary fencing and sowing of seeds of some native grass species. The combination of burning, ploughing, and weeding changed native species composition more quickly and favorably than any single practice. The removal of *D. bipinnata* litter in burned plots may have allowed for germination opportunities, resulting in a positive effect on native richness and diversity.

As per our observation, it is crucial to maintain fencing of desirable grasses for three years after they have been restored in order to provide the grass an opportunity to regenerate naturally. This demonstrates encouraging outcomes in the restoration of grasslands after planting of desirable native species.

Keywords: Grassland, Invasion, Palatability and weed management

Habitat evaluation for markhor, world's largest goat in Kashmir Himalaya: A conservation perspective

Riyaz Ahmad, Tanushree Srivastava, Poonam Chandel and Rahul Kaul

Wildlife Trust of India, Noida, Uttar Pradesh – 201301.

Email- head.markhor@wti.org.in

Abstract

Wildlife populations are facing a drastic decline across their distribution ranges globally. Major drivers of such decline are habitat fragmentation, degradation, and loss due to anthropogenic pressures. Anthropogenic activities such as resource removal by humans and livestock have been one of the major causes to such declines. Impacts of anthropogenic pressures are much more pronounced in the mountain ecosystems which are highly fragile and limited by high seasonality and low productivity. Decline in population of several mountain ungulate species has already been reported by several authors. This calls for identification of potential habitat, their protection and species-specific recovery program. We conducted a detailed study on the distribution and abundance of the world's largest goat, *Capra falconeri cashmeriensis* in Kashmir Himalaya in order to identify the suitable habitats, potential threats, and initiate conservation measures. We carried out seasonal block counts between 2007 and 2017 and used the markhor presence points and the associated habitat variables to identify their critical and suitable habitats at local as well as the landscape level using MaxEnt. The study reveals that the markhor population has remained relatively stable in the less disturbed habitats, while there is a drastic decline in the areas which are heavily grazed by migratory livestock. MaxEnt based habitat suitability models suggested that more suitable areas are present outside the Protected Areas (PAs). Alongwith various conservation initiatives to protect the identified critical and potential habitats through increased protection and notification of more PAs, participation of local communities in the conservation efforts is extremely crucial. This combined with regular monitoring and further scientific studies would be crucial for the long-term persistence of the only population of the threatened markhor in the Indian subcontinent.

Keywords: Kashmir markhor; *Capra falconeri cashmeriensis*; Habitat suitability models; Critical Habitats; Kashmir Himalaya.

Status of anthropogenic grasslands at village relocation sites in Satpura Tiger Reserve, Central India

Anjana Rajput

State Forest Research Institute, Jabalpur, Madhya Pradesh, India

Email- dranjana.rajput@gmail.com

Abstract

In order to secure wildlife habitat, management authorities of Satpura Tiger Reserve, Madhya Pradesh relocated several villages from this reserve in a phased manner during 2004 – 2015. The evicted sites were developed as grassland habitat through various management interventions such as demolition of old buildings and bunds, eradication weeds, introduction of palatable grasses, etc. This study was conducted during 2017 to 2019 to assess the current status of grasslands at these sites. We assessed current status of grass cover, and mapped grassland habitats. Composition and structure of grasslands were assessed by using quadrat sampling method. Sampling was done in each 10 ha grid size marked on selected grassland sites. A quadrat of 0.1 hectare (31.62m × 31.62m) were laid in each grid, inside it three plots of 10m × 10m were laid and five plots of 1m × 1m laid within each 10m × 10m plot. Number and name of all the grass, weed, herbs and shrub species fall under the quadrat were recorded along with its GPS coordinates. Density/ha, frequency %, abundance, importance value index and biodiversity index were estimated. Productivity of each grassland site is assessed in term of the biomass per kilogram per hectare. Biomass of grasses was taken to measure productivity or total forage production of the grasslands. Random plots of 1 × 1m × 5 nos. were laid in each site and all plants fall in the quadrat were clipped to the ground level and fresh green weight and dry weight recorded and site-wise figures estimated. In all, 170 plant species were recorded belonging to 26 families which included species of 63 grasses, 25 legumes and 82 other herbs and forbs. Highest density/ha of grasses was recorded in Khakhrapura followed by Dhain, Bori and rest other village sites. This paper provides the current status of grasslands in the village relocation sites based on above study in terms of abundance and cover of palatable and non-palatable grasses, legumes, other herbaceous plant species, weeds, and their above ground biomass and animal presence. Site-wise interventions are recommended for further habitat improvement based on the findings of the study.

Keywords: Grassland habitat, Village relocation, Grass composition, Above Ground Biomass, Dominant grass, Animal abundance, Weed eradication.

Assessment of wildlife habitat along proposed railway line in Sanjay - Dubri Tiger Reserve, Madhya Pradesh

Aniruddha Majumder, Tanuj Suryan, Janam Jai Sehgal, Satyadeep Nag, Tanveer Rizvi, Ravindra Mani Tripathi and Amitabh Agnihotri

State Forest Research Institute, Jabalpur, Madhya Pradesh, 482001

Email- aniruddha.tiger@gmail.com

Abstract

Sanjay-Dubri Tiger Reserve, located in Central India is threatened due to proposed doubling of 28.65 km long railway line passing through it. The railway line partly passes through Critical Tiger Habitat (CTH). In addition, other features of habitat used by various mammalian prey and predators need to be assessed in order to develop mitigation plans and other safety measures. Hence we conducted assessment of wildlife habitat in and around impacted area. We used maximum entropy model (MaxEnt) to assess the habitat suitability for various species within an area of 776.540 km² in 55 forest beats falling under the impact zone of 10 km from the railway line. Data were collected through systematic 2 sq km grid wise camera traps (n=225 & 6032 trap nights), beat wise carnivore sign survey (600 km) and also sign survey of 17 railway underpasses, line transects (n=15) walked for 5 km on each side of the rail line to model the habitat suitability of large mammalian species. Based on regular utilization pattern of various wild animals, each camera traps were deployed on forest trails, dry stream beds and railway under passes following All India Tiger Estimation protocol. All the predictor variables were collected from freely available remote sensing and publicly shared government data resources. We used elevation, vegetation, NDVI, LULC, distance factors (used for proximity analysis e.g., distance from road, railway, villages and other settlements) from road, distance from, and bioclimatic variables for landscape-level analysis.

We categorized habitats into highly suitable, moderately suitable, low suitable and non-suitable classes and obtained species wise results separately for each class and mapped them for the present study to show suitable habitat for each species. Result of our study showed that impact zone is suitable (sum of high, moderate and low) for all major mammalian species - tiger (43.34%), sloth bear (62.87%), leopard (84.66%), striped hyena (86.89%), golden jackal (65.66%), jungle cat (74.58%), civets (85.11%), Indian fox (71.18%), chital (71.94%), chinkara (74.71%) and wild pig (71.55%).

Result of our habitat suitability model exercise showed that the impact zone is suitable for all major species. Hence, doubling of line may cause high fragmentation to their habitat. There are 22 existing underpasses, the dimension of majority underpasses traversed through forested patches need to be reconstructed for easy movement of wild animals. As per the guidelines issued by the Ministry of Environment, Forest and Climate Change (MoEF&CC) various suitable mitigation measures are suggested on existing or proposed span/passage way/width of the underpass/over passes and other infrastructure inside the CTH.

Keywords: MaxEnt, Species distribution modeling, Habitat suitability model, Central India

Tiger Occupancy in Ratapani-Kheoni Landscape: Reasons Behind Tiger Presence in Proximity of Capital Bhopal, Madhya Pradesh

Mayank Makrand Verma and Satyadeep Nag

State Forest Research Institute, Jabalpur-482008, Madhya Pradesh

Email- mayanksfri@gmail.com

Abstract

Bhopal is the capital city of Madhya Pradesh state, situated in fertile plain of Malwa plateau in vicinity of the Vindhyan ranges in central India. This area acknowledges the presence of historical tiger population. The present study deals with tiger occupancy in Ratapani-Kheoni landscape (RKL) and the reasons behind the tiger presence in the vicinity of Bhopal. The RKL landscape is undulating, with hills, plateau, valley, and planes, spread over the area of Bhopal, Raisen, Sehore, Obedullahganj and Dewas districts of Madhya Pradesh. Tiger occupancy survey was performed in RKL from December, 2018 to April, 2019 to estimate the overall occupancy rate Ψ on presence software version 13.6. The total studied forest area was around 4620.84 sq. km of Vindhyan landscape. The occupancy survey across the study area was 5312 sq. km, segment distribution was 83 grid cells and each grid cell size was 64 sq. km. The tiger sign was detected and confirmed in 49 grid cells, which indicated naïve occupancy of 0.59%. Tiger, Leopard, Nilgai, Cheetal, Sambar, Sloth bear and Cattle sign were recorded in 49,62,67,22,29,56,76 grids respectively, along with species wise encounter rate 0.25, 0.18, 0.34, 0.07, 0.12, 0.14, 0.42 sign/km. were recorded respectively. The tiger occupied estimated potential habitat was 70.83% of the total study area, or an area of 3762.48 ± 482.34 out of 5312 sq. km in RKL. In contrast, a naïve estimate derived from the traditional 'presence-versus-absence' approach was only 3136.20 sq.km and underestimated true occupancy was 59.04%. Among tested 44 models, the best-fitted model was Hines model under which ψ (Cattle+Ruggedness), $\theta(\cdot), \theta'(\cdot)$, pt (Nilgai+Water) showed the lowest Akaike information criteria (AIC) value of 1144.59. The model-specific β (beta) coefficient estimate for covariates determining the tiger occupancy in RKL was tiger $\beta_0(\text{SE}[\beta_0])$ - 0.52(0.61). The rugged terrain, abundant perennial water availability and Nilgai/Cattle presence were influencing historical tiger population in proximity of Bhopal by occupancy modeling. Cattle presence influences the occupancy with high significance along with Nilgai, the feral cattle presence in general elsewhere in the elevated rugged terrain and providing easy prey for predation. Cattle kill evidence by the tigers are regularly reported and documented by the concerned forest divisions. The physical factor of rugged terrain also supporting tiger population as providing shelter i.e. den, cliffs, and overhangs. So, we can say safely that the Ratapani-Kheoni landscape population is artificially supported by the presence of cattle due to anthropogenic reasons. The tiger presence also playing the critical role of habitat protection due to rugged terrain is not suitable for the sudden escape of forest dwellers during accidental encounters with carnivores.

Keywords: Ratapani-Kheoni landscape, tiger conservation, critical tiger habitat, naïve occupancy, Akaike information criteria.

Monitoring spatio-temporal use of habitat by large carnivores and associated prey species in Obedullahganj Forest Division, Madhya Pradesh

Ruhi Haque

Assistant Conservator of Forests

Obedullahganj Forest Division, Madhya Pradesh

Email- ruhihaque2017@gmail.com

Abstract

Obedullahganj Forest Division (OFD) in Madhya Pradesh harbours rich forest cover and diverse habitats. It comprises two wildlife sanctuaries viz., Ratapani and Singhori sanctuary. With increased protection and conservation awareness, there has been a steady growth in the populations of wild herbivores as well as carnivores during recent decades. However, no detailed ecological studies have been conducted in this area on the patterns of habitat use and dispersal and co-existence of carnivores.

This study was conducted in different parts of OFD to assess the occupancy of two large carnivores viz., tiger and common leopard. Monitoring of wild carnivores and herbivores were done along selected trails / transects following the **M-STripES** (Monitoring System for Tigers: Intensive Protection and Ecological Status) protocol. The M-STripES program uses patrol based monitoring using Global Positioning System (GPS), GIS and remote sensing tools to analyze information that allow tiger reserve managers to better manage their wildlife resources. Presence, absence and frequency of use of the habitats along the trails were recorded using Camera traps (around 1200 grid points) in OFD. Spatio-temporal variation in habitat use based on direct and indirect evidences was analyzed. The study reveals that despite high anthropogenic disturbance both tiger and common leopard use the forested habitats frequently. This may be due to abundance of wild prey and availability of around other habitat features. The forests between the two sanctuaries serve as important bio-corridor for the movement of tiger and leopard. It is recommended that remaining forested corridor should be given high priority for conservation so as to minimize fragmentation and human encroachment and human-wildlife conflicts. Further, we need to invest more in capacity building of frontline staff for continued monitoring of habitat and wildlife in the area and train them in wildlife management.

Keywords: Temporal and Spatial distribution, Obedullahganj Forest Landscape.

THEME 3

Wildlife Policy Issues and Challenge



THEME 3

(Wildlife Policy Issues and Challenge)

ORAL PRESENTATIONS

Wild Life and Biodiversity Conservation approach: Current policy environment and the evolving trends

S K Khanduri, IFS (Retd)
Email- skhanduri57@gmail.com

Abstract

Wild life Protection Act came in our country in 1972 primarily to facilitate creation of Protected Areas, enforcement related to prevention of wildlife crime and regulation of wild life trade. There has not been a specifically articulated wild life conservation policy as such. The National Forest Policy 1988, which is the one currently under implementation officially, refers to conservation of biological diversity through extension of National Parks, Sanctuaries, Biosphere Reserves and other Protected Areas. The stated strategy does mention need of taking into account the needs of wild life and maintenance of corridors linking the Protected Areas (para 4.5, NFP 1988). National Environment Policy 2006 prescribes expansion of Protected Area network, specific programs for conservation of endangered species, captive breeding for conservation, building up fringe dwellers' stakes in conservation and regulation of activities in fringe areas in line with conservation. An interesting prescription provides for "Review and tighten the provisions of relevant legislation to enhance their deterrence".

Several evolutions have taken place in the meanwhile in practice as well as approach in conservation of wildlife and biological diversity overall. The Act has been amended several times since 1972, the latest amendment being in 2022. National Wild Life Action Plan 2017-2031 provides for a few approaches to wild life management based on the existing challenges and trends. It captures the important aspects of conservation which need to be integrated in policy, laws, programs and management. One National Strategy and Action Plan for management of Human Wildlife Conflict has also been worked on and released recently. This strategy dwells upon the drivers of conflict and managing those to avoid the circumstances leading to it. Thus, it prescribes a new look at the approach to the existing management itself.

Broad policy approaches in wildlife conservation can be summarized in a few points which need to be debated now in view of global concepts of conservation.

1. No hunting/ killing/ trading of scheduled animals even if the population is overflowing – locally or all over. Exemptions permitted are too centralized and not easy to define in the field circumstances.
2. Trade related exemptions like peacock feathers and captive elephants are seen as not effective enough and not practically helping the stakeholders.
3. Though the WLPA provides power to central government for putting species in specific schedules, no specific mechanism works in this matter.
4. No access in the PAs including Wild Life Sanctuaries (WLS). Incidentally though the WLPA provides for selective access in WLS, the management and even the courts are made to believe and provide same treatment to National Parks and WLS. Interestingly there are no specifics available for Conservation Reserves and Community Reserves in the law.
5. Except penal provisions related to offences against scheduled animals, the WLPA does not deal with the issues related to scheduled species found beyond Protected Areas.

The protection orientation of the WLPA provided some way for integration of known wildlife habitats into Protected Areas. However, there are very few of those that receive adequate management attention and resources. Wild life in other parts of the forests and those at the fringes and outside forests receive little attention. It is a well stated fact that more wildlife exists in non-PA forests in the country. Taking all these facts in view a relook is essential in our approach to conservation. The state of wildlife management at present presents a few challenges and questions related to the conservation policy including the approach to management. Following are a few aspects that look important in this context and need to be taken up in institutionalising the approach to conservation of biological diversity in the country, including faunal wild life.

1. Conservation approach to include floral and faunal diversity.
2. Assessment of the state of wild life as an integral part of management. Periodic census mandatory for the whole state within and beyond Protected Areas. Similarly inventory of the floral diversity facing threat of overexploitation, trade and extinction.
3. Conservation to be made equally important part of management planning in all forests – PA or non-PA.
4. Urgent action on settlement of pending issues related to notification of declared PAs.
5. Conservation Plans to be on landscape level, to define the plans of management units – PA or non-PA.
6. Population assessment on density as well as spatial basis to work on local abundance-based management – for translocation and population augmentation planning for selected species.
7. State of population of Appendix I and II species of CITES in wild to be assessed periodically to ensure sustainable use for international trade. Similar approach for the species frequently collected from wild and trade domestically.
8. A debate and approach to sustainable harvest of the species which have utilisation value and potential for population management.
9. Human wild life conflict preparedness in all – PA and non-PA areas.
10. Participatory approach towards conservation needs impetus in terms of earmarked plans / allocations and monitoring of functions of the community institutions.

The points discussed are not all that need a fresh approach. A comprehensive and clearly defined approach is needed in the conservation policy in context of the global thrust on sustainable use of biological resources, technological and conceptual ways available for assessment and planning the management, emerging threats from the circumstances like fragmentation of habitats, climate change related extremities impacting the species, increasing human wildlife conflict situations etc. Wild life management being one of the most important components of the conservation movement, a new vision is needed to be worked on in this regard.

Keywords: Wildlife crime, captive breeding, conservation, policy, management

Wildlife conservation in India: prospects and problems

A. J. T. Johnsingh

WWF-India, The Corbett Foundation and Nature Conservation Foundation

Email- ajt.johnsingh@gmail.com

Abstract

India, despite having a huge population of 1.4 billion, of which the largest number of poor people in any single country in the world form a substantial part, is a beacon in Asia for wildlife conservation. This is largely due to the superb biome and habitat diversity which has earned for India, the tag of one of the important mega biodiversity hot spots in the world. This biodiversity is represented by nearly 50,000 plant species, >1300 butterfly species, > 1000 species of freshwater fish, > 400 amphibians, > 500 reptiles, ca. 1300 species of birds, and ca. 430 mammal species.

If large mammals are to be taken for branding India as the leader in wildlife conservation in Asia, then it may be noted that India has 70 per cent of the world's tiger population, the only population of thriving ca. 800 Asiatic lions, ca. 60 percent of the wild Asian elephant population, 75 per cent of greater one-horned rhinoceros and a large population of more than 3000 wild buffaloes. Thanks to the Himalayas, India has 14 species of mountain ungulates (if barking deer and sambar are included, which occur even in the high Himalaya, then the number would be 16) and four bear species, matched only by China. All these find a home in the ca. 1000 protected areas which cover nearly 6 percent of the Indian landmass. A significant number of species occur outside the protected areas too.

The threats that loom over Indian wildlife can be divided into two broad categories viz distinctly perceptible and subtle. Then there are those that relate to policy and administrative functioning of the concerned authorities. These too could either be distinctly perceptible or subtle.

Some of the distinctly perceptible threats are, habitat fragmentation, habitat degradation as a result of the proliferation of inedible plants, lack of regeneration of edible plants, a growing population of free-ranging largely unproductive cattle, free-ranging dogs, aggressive rhesus macaques and an abundance of peafowls which cause enormous damage to crops. All these require our attention and immediate remedial measures. Our track record in establishing corridors is extremely poor. The Chilla-Motichur corridor across Ganges between two halves of Rajaji Tiger Reserve, for example, has taken 30 years to become functional.

Some of the subtle threats that are bound to cause damage in the long run are; the inability and unwillingness to make use of the skills and capabilities of tribal people in conservation, lack of interest in acquiring the necessary knowledge of forests and wildlife on the part of most foresters after joining service, their unwillingness to walk in the jungle for learning in the field, lack of understanding of the value and use of fire and waterholes,

Some examples from the third category related to policy and administration are as follows;

In the absence of a scientific policy, grasslands outside protected areas are considered as wastelands, where periodically, trees, often not native to the area, are planted. There is an unwillingness to accept the conservation value of catch and release angling program. Functioning of trout breeding stations (eg., Nuranang near Tawang and Avalanche in the Nilgiris) needs to be critically evaluated. Mindless introduction of exotic fishes has eliminated most of the native fishes in our freshwater habitats and so there should be an immediate and total ban on the import of alien

fishes. Ill-conceived construction of anti-poaching camps without giving sufficient thought to the needs of staff and wildlife should be avoided. Constructions that are not needed and are inimical to conservation should be demolished. The number of animals getting killed by speeding vehicles is larger than those killed by poachers. Management of roads and traffic going through wildlife habitats should be a national priority. Many involved in conservation suffer from an inability to observe and comprehend the information visible in the wildlife habitats. Yarding sites of chital throughout its range should be identified and maintained to keep them free of vegetation cover. There is an urgent need to revisit the tiger conservation strategy to decide the population India can support and through periodic scat studies understand the contribution of prey to the fare of tiger on a time scale. Sambar, very vulnerable to poaching, needs the maximum protection as sambar conservation in most hilly areas is tiger conservation. Lions should be reintroduced in the Kuno landscape as the Kuno Wildlife Sanctuary was specifically developed for establishing a second population of lions. Reintroduction of Nilgiri tahr in the former habitats should be a priority goal for Kerala and Tamil Nadu in order to ensure a population of 5000 tahr in the Western Ghats.

Finally, human wildlife conflict is increasing at an alarming rate and an effective program, including measures to reduce the number of problem animals, benefitting the local people, is the need of the hour. In India, annually, 500-600 people get killed by elephants and nearly 200 by tigers. Most of the victims are poor. Their meagre means of livelihood often bring them into sharp conflict with elephants and tigers. This problem requires greater empathy on the part of Government particularly the concerned state Government so that the tragedy that takes place year after year can be averted.

Corrective measures for all the above problems and acceptance of above suggestions need to be taken with sustained dedication, vision, and a missionary zeal if we are to save our wildlife for posterity.

Keywords: Wildlife conservation, Himalayas, conservation, human-wildlife conflict, management

Extant Policies on Ecotourism in India and their implementation in Protected areas and Forest areas in Madhya Pradesh

Suhas Kumar, IFS (Retd)
Email- sukum48@rediffmail.com

Abstract

My presentation explores the extant policies on ecotourism in India in the context of the nature and objectives of tourism in protected areas and Territorial Forest Areas. It brings out the differences in the rationales of tourism practiced in Africa, the USA, and India and the tenets on which tourism should be practiced and managed in Indian forest areas and protected areas primarily set aside for the conservation of wildlife and their habitats. It also highlights the roles and responsibilities of the stakeholders and examines the present characteristics of tourism at the destinations. My talk suggests ways to improve the current unsustainable practices.

Keywords: Eco-tourism, stake holders, policy

Coastal Regulation Zone Notifications- a legal tool to protect wildlife habitat in Coastal West Bengal

Subhrajit Goswami

Associate Analyst, Legal Initiative for Forest and Environment (LIFE)

Email- subhrajitgoswami96@gmail.com

Abstract

The surge in tourism over the years has resulted in a prominent boost in the number of hotels and resorts and other anthropogenic activities along the coast of India. This has led to a major impact on the mangroves and ecologically sensitive coastal areas. In 1991, India introduced the provision for Coastal Regulation Zone (CRZ), which underwent several amendments and was consolidated in the CRZ 2011 notification and further in 2019. The CRZ regulates and even restricts anthropogenic activities along the coast and protects fragile coastal ecosystems. Coastal West Bengal, with its diverse wildlife and unique habitats, has also been subject to the implementation of these regulations. The state of West Bengal in India has a coastline of approximately 210 km length. The western part of the coast is characterized by sand dunes, tidally influenced waterbody like minor river discharges, less turbid but high saline sea water influence, while the Sunderbans delta and mangrove have an intricate coastline with clusters of deltas interlinked by channels, creeks, and estuaries.

This study investigates the efficacy of CRZ Notifications as a legal tool to protect wildlife habitats in Coastal West Bengal, focusing on the Sundarbans mangrove forest, which is home to several endangered species, including approximately 96 tigers. It has been evaluated how creative use of the provisions of CRZ Notifications can help protect the mangroves as well as the wildlife habitat in the Sundarbans. Findings indicate that despite challenges faced in the implementation of these regulations, creative use of CRZ notification can significantly mitigated the threats to the ecosystem, resulting in enhanced conservation of wildlife.

The study emphasizes the role of stakeholders, including the government, non-governmental organizations, and local communities, in the implementation of CRZ Notifications alongside the legal intervention which has been done in the region. Effective collaboration and coordination among these stakeholders are critical to achieving conservation goals.

Overall, our research contributes to the growing body of literature on the effectiveness of legal tools, such as CRZ Notifications, in protecting fragile ecosystems and wildlife habitats. The findings have significant implications for policymakers, conservationists, and other stakeholders involved in coastal zone management and wildlife conservation. The incorporation of the results in decision-making processes can lead to more effective conservation strategies and ensure the long-term protection of these fragile ecosystems.

Keywords: Coastal Regulation Zone, Wildlife Habitat, Policy Intervention, Stakeholders engagement.

Proposed Socio-Legal changes as a solution towards effective management of man-wildlife conflicts in Madhya Pradesh

Anshuman Singh

Madhya Pradesh High Court, Jabalpur (M.P.)

Email- theofficeofanshumansingh@gmail.com

Abstract

The implementation of effective conservation measures in the State of Madhya Pradesh has resulted in an encouraging growth in the population of wild animals. However, shrinking habitats and loss of corridor connectivity are resulting in a surge in cases of man-wildlife conflicts.

The State is thus required to prepare itself to face new challenges. The paper proposes to highlight these challenges and seeks to provide socio-legal solutions to mitigate the clash points and to substantially reduce the risk of conflicts.

The focus areas of the research paper are legal changes required in dealing with the issues of:

The focus areas of the research paper are legal changes required in dealing with issues of:

- (i) Compensation policy for crop-damage by wild animals:

There is no separate policy in Madhya Pradesh for payment of compensation against crop damage by wild animals. The general policy crop damage of the revenue department and provisions in Revenue Book Circulars are applied in such cases for assessment of damage, determination of entitlement and fixing of quantum of compensation. Though this is in the hands of Patwaris and RIs, the brunt of the conflict situation which emerges from rejection of claims, improper quantification and delays in payments is borne by the forest department. Therefore, a dedicated policy for compensation upon damage to crops by wild animals is needed, preferably with statutory colours, and the entire process has to be placed exclusively in the hands of the forest department. Fair determination and timely disbursement of compensation will go a long way in mitigating the crop damage conflict points.

- (ii) Preservation of corridors and mitigation measures in implementation of infrastructural projects and in allotment of *Pattas* under the FRA, 2006 [Schedules Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006.]

Corridors connecting one PA to another now have statutory protection under Sec. 38V(3)(b) of the Wildlife (Protection) Act, 1972. The NTCA has already published its compilation on tiger corridors across the country. Despite this, corridors face the most potent threats from infrastructural projects such as national highways and rail lines and also allotment of *Pattas* under the FRA, 2006.

Provisions such as Sec. 4 of the FRA, 2006 therefore need to be seriously reconsidered and amended to treat corridors at par with critical wildlife habitats which must be kept inviolate, at least in matters of grant of forest rights. Despite the incorporation of Rule 12A in the Forest Rights Rules, 2008, the role of the forest department under the FRA is far too restricted. Thus, further amendments to various provisions (especially in the process of recognition of rights) are required to enhance the say of the forest department in grant of *pattas* etc under the FRA.

The Tiger Conservation Plans need to comprehensively incorporate restrictive provisions regarding corridors and dispersal areas.

Several infrastructure projects are undertaken for the NHAI, even in corridors, by simply taking permission under Sec. 2 of the Forest (Conservation) Act, 1980 without having any consideration to the corridor value of the site of construction. There is a thus a crying need to incorporate suitable provisions in Sec.3A to 3C of the National Highways Act, 1956 to make prior consultation with the State Forest Department a condition precedent before initiation of any project relating national highways, including expansions etc, wherever forest land is involved. This will give the Forest Department an opportunity to identify the projects that affect the corridors and thus ensure proper compliance of Sec. 38V(3)(b) read with 38O(1)(g) of the Wildlife (Protection) Act, 1972 in implementation of mitigating measures.

Key words: Socio-legal, Protected areas, man-wildlife conflicts, Mitigation and policy.

Unlocking Protected Areas: A critical analysis of functioning of statutory bodies for wildlife conservation

Tanvi Sharma

Associate Analyst, Legal Initiative for Forest and Environment (LIFE), New Delhi

Email- tanvi@lifeindia.net.in

Abstract

In the Wildlife (Protection) Act, 1972, National Parks, Wildlife Sanctuaries, Conservation Reserves and Community Reserves are designated as Protected Areas. The Wildlife act specifically prohibits both denotification and diversion of protected areas for activities which are not for the benefit for wildlife. The paper focuses on the functioning of National Board for Wildlife and its Standing Committee which are statutory bodies formulated under the act. The mandate of these bodies is to promote the conservation and development of wildlife and forests by such measures as it thinks fit. However, an analysis of the decisions of these bodies from past five years has shown that they have given approval to projects which do not comply with the Section 29 of the act, which prohibits to destruct, exploit or remove any wildlife from Protected Areas unless it is for improvement and better management if wildlife therein. In past five years, the Standing Committee has approved a total of 11,833.27 ha protected area and wildlife habitat land which includes 4,380.01 ha land of Tiger Reserve to be diverted for development activities. Within this period, three wildlife sanctuaries were completely de-notified and partial-denotification was approved for eight sanctuaries and one Tiger Reserve.

This is evident from the case of approval granted for Ken-Betwa River Interlinking (KBRIL) Project which spreads in the states Uttar Pradesh and Madhya Pradesh. The project will submerge 5,803 ha of critical tiger habitat with tiger presence in the area in high density. Similarly, recommendation was granted to holistic development project of Great Nicobar Island (GNI), led by NITI Aayog. The project will use 16,610 ha in its Phase-1 which will cover roughly a quarter of the island's shoreline and almost 18% of its 910 sq. km. total area. Protected Area network is at greater risk because of allowing such diversions and denotification.

Besides, as Tiger attains the uppermost priority in terms of conservation efforts and enactment on ground, this steers into Tiger Reserves relishing protection similar to Protected Areas in the Wildlife (Protection) Act, 1972. However, unlike tigers such a status is not enjoyed by Elephant Reserves or by any other animal. As a result, important wildlife habitat gets subjected to easy destruction.

This paper draws attention towards some lacunas found in the implementation of wildlife policies present in our country such as procedural violations in clearances and dilution of appraisal guidelines and laws are a cause of concern. Disproportionate implementation of policies has also been found to be owing to lack of funds for wildlife protection. Major challenge is the mindset that conservation is an option and not a necessity. Nation's development and economic growth takes a precedence when placed in front of wildlife habitat protection. The concept of sustainability plays its part in this situation; however, sustainability is subjected to the fair implementation of existing policies. This will further help India in achieving our international commitments under COP 15 on 30 by 30 goal. The paper hence talks about the execution status of policies that concern with CBD COP 15 goals.

Keywords: Wildlife (Protection) Act, 1972, Protected Area, de-notification, diversion, National Board for Wildlife.

Wildlife Conservation Policy for India

C. N. Pandey

*Professor of Practice, Indian Institute of Technology Gandhinagar
Indian Forest Service (Rtd.) and Ex. Chief Wildlife Warden-Gujarat, Ex. Principal Chief
Conservator of Forests & Head of the Forest Force, Gujarat.
Email- cnpandey@iitgn.ac.in*

Abstract

There is no Wildlife Conservation Policy in India at present. However, The Wildlife Conservation Action Plans are generally regarded as the Policy. However, there is a need for having a policy which may give a general framework for desired conservation action for wildlife. Some of the important initiatives in wildlife conservation include - (i) the landscape approach, (ii) efficient and smart human-animal conflict management, (iii) Conceptualising eco-tourism as tool for wildlife awareness, (iv) Action based programmes on mass awareness and communication about wildlife, (v) connectivity and corridors for linking habitats, (vi) people's participation wildlife protection, rescue and planning, (vii) corporate involvement in wildlife conservation, (viii) sustainable development in and around wildlife protected areas etc., (ix) Institutionalisation of eco sensitive zones and their management and (x) conservation of wildlife outside Protected Areas.

Key words: Landscape approach; Centrality of peoples' participation; wildlife vulnerable areas and species; alien and invasive species.

75 Years of Wildlife Policy and Conservation Issues in Independent India

R. Sreenivasa Murthy, IFS, Retd, Bhopal

Email- rseenu60@gmail.com

Abstract

When India attained independence in 1947, we had Wild birds and Animals Protection Act 1912 and Indian Forest Act 1927 enacted by the British. Section 4 (iii) (IFA 1927) defines wild animals and skins, tusks, horns, bones, silk, cocoons, honey and wax, and all other parts or produce of animals, as Forest Produce. The Wild birds and Animals Protection Act 1912 was totally outdated. When the Constitution was adopted, forests, wild animals, and birds were included in the State List. The Central Forestry Board was set-up in the year 1950 and this was followed by a National Forest Policy in the year 1952. National Forest Policy 1952 set the target of 33% of the total land to be covered by forests. Besides above in S.No 20 the above policy covered Wild life with emphasis on the need for affording protection to the animal kingdom and particularly to rare species as, the lion and the great one-horned rhinoceros, which were fast disappearing at that point of time. Damage caused by wild pigs, game and porcupine was identified. So GoI felt the necessity of enacting special laws for bird and animal life by setting up sanctuaries and large-scale national parks. For this purpose, a Central Board of Wild Life has been constituted by the Government of India, in the Ministry of Food and Agriculture Resolution No. 7-110/51-F, dated the 4th April, 1952.

Between 1952 and 1976 wild life remained a state subject and various states managed wildlife and wildlife areas in their own way mostly as a shooting reserve. But it was realised that the State Acts were inadequate to deal wildlife matters thus Wildlife Protection Act 1972 came into existence to bring in uniformity in administration and management of wildlife issues in the country. Subsequently Project Tiger was launched on 1st April 1973 with declaration of 9 tiger reserves. In 1976 the subjects, forests and protection of wild animals were moved to the Concurrent List under the Seventh Schedule (Article 246) of the Constitution. This amendment enabled both the Central and State Governments to enact laws on forests and wildlife. Further, the protection of wildlife and forests included under the Directive Principles of State Policy – **Article 48A**, mandates that the State shall endeavour to protect and improve the environment and safeguard the forests and wildlife of the country. In addition to Fundamental Rights, it is now enshrined in Article 51 A (g) of the Constitution that it shall be the fundamental duty of every citizen to protect and improve the natural environment including forests and Wildlife. Article 51A (i) also makes it a fundamental duty of citizens to safeguard public property (forests are treated as public property).

To fill in the detailed policy gap in wildlife policy matters the first National Wildlife Action Plan (NWAP) was adopted in 1983, based upon the decision taken in the XV meeting of the Indian Board for Wildlife held in 1982. Then Second one was brought for 2002-2016 and as on date 3rd 'National Wildlife Action Plan' for a period of 2017 to 2031 is in force. Presently 21 critically endangered species have been identified under 'Development of Wildlife Habitats' programme.

Then came Forest Policy 1988 where in Basic Objectives clearly emphasised importance of

- (i) Maintenance of environmental stability through preservation and, where necessary, restoration of the ecological balance that has been adversely disturbed by serious depletion of the forests of the country.

- (ii) Conserving the natural heritage of the country by preserving the remaining natural forests with the vast variety of flora and fauna, which represent the remarkable biological diversity and genetic resources of the country. And declared that Special care to be given to wildlife protection as a part of its strategy. Madhya Pradesh brought out its own Forest policy 2005 where in wildlife had been given enough importance with lots of details.

MoEF, State Forest Departments, Wildlife Institute of India and NTCA played a major role in shaping the wildlife management over last five decades in a bigger way after 1976. Wildlife management in India are basically prescribed in Sec 27 to 34 and basically PA governance had been delegated to State Chief Wildlife Wardens declared under Sec 33. In 2006 Project Tiger (NTCA) was given a Statutory Authority to govern issues related Tiger Reserves and Wildlife Crime Control Bureau and Central Zoo Authority came into existence. Management Plans for PAs other than TRs and Tiger Conservation Plans for TRs are the execution instruments to manage the PA network of India as on today.

The basic steps of any governance and management are

1. A broad policy,
2. Act and Rules of legislature which leads to
3. Management Plans

That are necessary in a picture-perfect situation. But if we see and analyse the above evolution of Wildlife Management issues in India it is not exactly linear but it is in a zig zag fashion which got evolved as a need arose. Similarly, there are several other umbrella policies and Acts that affect wildlife issues which to great extent are inconsistent in achieving the enunciated goals. This paper tries to address some of these issues in brief.

Keywords: Indian Forest Act, policy, management, wildlife, flora and fauna, laws

Principled Diversion of Forest Lands and Pragmatic Participatory Management of Forest Resources

Shahbaz Ahmad, IFS (Retd)
Email- shahbaz_in@rediffmail.com

Abstract

While there is a concern to increase the tree cover of the country, the developmental projects and welfare schemes of the government put a strain on the existing forest land. Ever since independence, large chunks of forest land have been diverted for different projects. It is only after coming of the Forest Conservation Act, 1980 (FCA) that the pace of diversion has decreased substantially. Prior to 1980, the rate of diversion of forest land for non-forestry purposes was about 1,43,000 ha per annum. After the enactment of FCA, the rate of diversion has come down to about 15,000 ha per annum and diversion of forestland is mostly allowed to meet the developmental needs for Drinking Water Projects, Irrigation Projects, Transmission Lines, Railway Lines, Roads, Power Projects, Defense-related Projects, Mining and so on. Although the coming of the Forest Conservation Act, 1980 has brought down to a large extent, the pace of diversion of forest land, there is still a continuous demand to divert forest land for various projects. It is essential that the diversion of forest land is linked with sustainability and the issues of ecological footprint and carbon budgeting. This will mould the whole exercise of a NPV centered forest land diversion to a sustainability linked natural resource management.

Moreover, although NPV is estimated for the purpose of convenience to recover compensation from the user agency, the fact is that all the ecological services cannot be replaced by human efforts even by huge investments. Some of the ecological services will go with the forest forever, and there cannot be any replacement for them. Hence, to avoid this dilemma, it would be prudent to assume that the natural ecosystems are in their best land use. Any other land use (even if it is estimated to be economically more beneficial) would be a worse land use and can only be justified by the logic of dire social necessity.

Hence, the reappears dire need for a decision-making tool which may help to decide whether a forest land can be diverted or not. A decision-making tool for forest land diversion should not be confined to the issue of NPV only. Such a tool should also incorporate the issues of the substitutes to ecosystem services, sustainability, environmental impacts, ecological footprint, carbon budgeting and so on. With this background and with this assumption, there can be a step-by-step examination of any proposal to divert a forest land with the help of the following check list—

1. Will the implementation of the project make extinct any rare and threatened species in the locality or cause irreparable damage to any unique ecosystem or wildlife corridor?
2. Is it possible to rehabilitate the displaced population (if any) with any acceptable package? Or Is it possible to provide the local people with similar essential facilities in lieu of ecosystem services going to be lost due to the project?
3. Is it possible for the project to keep itself within the limits of ecological footprint of the area?
4. Is it possible for the project to keep itself within the limits of carbon emission allotted to the country/region?
5. In case of projects involving extraction of fossil fuels, does the proposed extraction comply with the carbon budgeting of the country/region?

6. Does the proposal have a plan and assured budget to provide ecosystem services/rehabilitation package to the local population?

Hence, there must be a policy decision that no diversion of any forest land or natural ecosystem can be permitted unless the proposal for diversion is able to steer through an accepted check-list based examination. Such a policy decision needs to be incorporated as a Proviso in the FCA, 1980.

The 1988 National Forest Policy of India envisages people's involvement in the development and protection of forests. The requirements of fuel wood, fodder and small timber of the tribal and other villagers living in and near the forests are to be treated as first charge on forest produce. With this background, the Govt. of India on June 1st, 1990 wrote to the Forest Secretaries of all States and Union Territories, detailing the process of involvement of village communities and voluntary agencies in the regeneration of degraded forest lands. The stage having been set for the involvement of village communities, Joint Forest Management (JFM) resolutions or rules have been framed by a majority of the States. These Rules and Resolutions provide for the formation of JFM Committees, their rights and duties, roles of the forest departments, usufruct sharing etc. Forest areas were allotted to these committees which are to be worked and managed as per the rules or resolutions. This arrangement made it convenient for the governments to receive external aid from donor agencies. But before the forest departments of various States could gear up to involve the people in natural resource management according to the spirit of the National Forest Policy, the healthy concept of involvement of people was hijacked. The World Bank had been experimenting with its own concept of participation in Nepal and some other developing countries.

Papua New Guinea (PNG) is an island country just north of Australia. In 1975 it achieved complete independence from Britain. According to a World Bank report 70% of the country lives in poverty. In PNG there is a PNG Forest Authority and there also exists a logging code of practice. The two main factors which have been a challenge to the conservation of natural resources in PNG are—1. The land tenure according to which the communities own 97% of the land making it difficult for the government to procure land for conservation. 2. PNG raises all her revenue from the extraction of natural resources. As a consequence, environmentally destructive projects take precedence over natural resource protection and conservation.

The consequence of such a land tenure system is that about one third of PNG's rainforest have been destroyed or degraded by logging in the last four decades. The situation with regard to land tenure in PNG is similar to what is envisaged in the World Bank concept of Community Forest Management (CFM). PNG is an example and also an eye opener for all those involved in the management of natural resources.

In India a legislation Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006 (also known as Forest Rights Act) has been enacted which came into effect from January, 2008. The Act seeks to recognize and vest those rights of vulnerable tribal and forest dependent communities who have not been given their due and whose rights to the resource have been denied due to erroneous settlements and recording of rights process. The Act also empowers the Gram Sabha (a village body) to manage the Community Forest Resource (CFR). Section 5 of the Act enlists the duties of the holders of forest rights as--(a) protect the wild life, forest and biodiversity; (b) ensure that adjoining catchments area, water sources and other ecological sensitive areas are adequately protected; (c) ensure that the habitat of forest dwelling Scheduled Tribes and other traditional forest dwellers is preserved from any form of destructive practices affecting their cultural and natural heritage; (d) ensure that the decisions taken in the Gram Sabha to

regulate access to community forest resources and stop any activity which adversely affects the wild animals, forest and the biodiversity are complied with.

Although Participatory Forest management or Joint Forest Management is a common terminology all over the country, the concept of participation is still not very clear to the State Forest Departments. No State has been able to assert in principle that village level participatory committees, by whatever name they are called, are not viable units, both in terms of organisational structure and area of jurisdiction, for complete ownership and management of forests. Forests can be best managed as large chunks of ecosystem units comprising of interlinked forest areas of JFM committees. The concept of Participation as a mosaic of roles is still not emphasized. A practical participatory management of forests is the mosaic of complementary roles of the forest department, the JFM Committees and other stakeholders.

Madhya Pradesh has been a pioneer in JFM and has taken a lead in providing 20% of the revenue received from the sale of timber to JFM committees. But the issue of the management of common forest resource as mentioned in the Forest Rights Act is still unsettled. The State Government, through a government notification, amended the JFM resolution on 11th March, 2022 renaming the existing three type of JFM committees as Community Forest Management Committees (CFMs). The Tribal Department and some activists strongly reacted to this move. Since the difference between JFM and CFM have not been institutionally established, the forest department could not convincingly respond to the objections raised. As a result, the State Government had to cancel its notification and had to concede that the forests which have been settled as 'community forest resource' (CFR) under the Forest Rights Act will be managed as per the provisions of that Act. Now, the dilemma is that the Forest Rights Act only mentions the duties of the holders of forest rights, but it nowhere mentions the mechanism of its management.

Hence, there must be a policy decision that there cannot be two parallel management of any forest area by two different agencies. The Community Forest Resource (CFR) settled as such under the Forest Rights Act be managed according to the JFM Resolution of the State. The village level JFM Committees are not viable bodies for independent ownership and management of small units of a vast ecosystem. Participation has to be there as a mosaic of roles of all concerned stakeholders. Such a policy decision needs to be incorporated in the Indian Forest Act, 1927 and the JFM Resolution.

Keywords: Forest conversion, management, tree cover, policy, tribals

Human-Wildlife Conflicts in India- A Study of the Emerging Policy Landscape

Nimisha Chauhan, Pankaj Sekhsaria and Vinay Kumar
Centre for Technology Alternatives for Rural Areas, IIT Bombay
Email- 214460003@iitb.ac.in

Abstract

In India, interactions of humans with wildlife are complex, marked by fear, reverence, protection, as well as persecution. Negative interactions, or conflicts arise when humans or wildlife pose actual or perceived threats to each other's interests. This paper would explore the scale, costs, and mitigation measures for human-wildlife conflicts in India, as well as try to understand how human-wildlife conflicts operate in, and are influenced by the policy landscape.

According to a 2021 report by the World-Wide Fund for Nature (WWF) and the UN Environment Programme (UNEP), India is going to be seriously affected by human-wildlife conflict as it has the world's largest human population, as well as large populations of tigers, elephants, one-horned rhinos, lions, and other species. At least 500 people and 100 elephants are killed each year due to human-wildlife conflicts. Factors such as deforestation, growth of invasive species and climate change have restricted elephants to only 3-4 per cent of their original habitat, and intensified their search for food, and interactions with humans. These encounters frequently result in destruction of homes, crops, and livelihood loss, as well as human deaths in severely-affected areas. Between 2018 and 2020, about 125 humans died in conflict with tigers. Notwithstanding the magnitude of the problem, India still does not have a national level policy on human-wildlife conflict.

In the current context, numerous policy drivers, as well as policy gaps influence the emerging dimensions of human-wildlife conflicts. Conflict mitigation involves different strategies which may be technical, structural, or cognitive in nature. As the nature of human-wildlife conflict, animals involved, as well as mitigative measures vary from region-to-region, any future policy on human-wildlife conflict will have to take this diversity into account. One commonly used measure employed by policymakers to prevent conflicts between humans and leopards, is translocation of the animals involved in conflict. However, recent studies have pointed that translocation can in fact result in an increase in conflict. There is also a lacuna in the policy domain to contend with issues created, paradoxically, by wildlife conservation efforts. An increase in populations of certain wildlife species due to successful conservation, combined with shrinking natural habitats, and shifting human attitudes towards wild animals, have increased the instances of human-wildlife conflicts. There is also an absence of a comprehensive policy to address the impact of infrastructure development, especially the rapid expansion of linear infrastructure, despite enough empirical evidence indicating an increase in conflict cases due to this. Other policy drivers which affect the human-wildlife interactions include loss of traditional knowledge practices, and cultural beliefs, which can create a further rift in human-wildlife relationships in a rapidly-changing ecological scenario.

A thematic review of literature, including research papers, government reports, official policy documents, and other secondary data sources will help in understanding the above policy gaps and drivers of human-wildlife conflicts. The paper will try to understand the interplay between conflicts and the policy landscape, which can help in creating more widely applicable principles of conflict management, and enabling respectful space and resource-sharing.

Key Words: Human-wildlife conflict policy; human-wildlife conflict mitigation, linear infrastructure development and human-wildlife conflicts

Human Wildlife Conflict with Special Reference to Wildlife Crime and Requirement of Law Related to it

Rekha Giri

Email- girirekha81@gmail.com

Abstract

Interactions between people and wildlife are often mediated by laws, policies, and other governance instruments with profound implications for species conservation and contain the wildlife crime. Despite its importance for conservation practice, governance of these human-wildlife relationships is an under-researched area. The research aim is to understand the link between wildlife crime as a consequence of human-wildlife conflict (HWC) and law/policy related to it for species conservation using a systematic quantitative review of the literature on the human dimensions of HWC. Researcher identified found good amount of literature which is relevant to HWC and law related to it, conducted in 20 countries, involving different type of species. Researcher tries to compare the different laws with the national legislation as expressly it seems silent on the issue but impliedly it tackles many issues, where the politics of vermin revolve. The perceived ineffectiveness of law was primarily attributed to lack of implementation, support, and enforcement. The holistic approach towards the implementation with few positive associations with different stakeholder like villagers, different administrative units, different NGO with involvement, management flexibility, and adequate compensation in case of casualty.

The findings reveal a knowledge deficit on the detailed effects of law on HWC and conservation conflicts in general. Overall, law as an institution seems to important tool to contain the crime but it many a times prolong conflicts instead of providing a pathway to coexistence. Law in India is expressly silent on HWC which need to be incorporate. The conflict has many facets but the main is land use, which is a limited resource and use by both but growing human population engulfing this limited resource which not only shrinking the habitat of wildlife but increase the direct contact. That direct contact many a times ends up in the form of loss of valuable life, that not only require a clear law on such issue. Ministry of Environment releases its first guideline on the issue in March 2023 which is only advisory in nature. The paper deals with the effective formation on law and its implementation on HWC with policy on human land use and their growing population.

Keywords: Law, policy, human-wildlife conflict, crime, conservation.

MSTripES - an Adaptive Management Tool for Conservation

**Ashish Prasad, Deb Ranjan Laha, Krishna Mishra, Anup Pradhan, Kainat Latafat,
Manish Singanjude, Nanka Lakra, Dhruv Jain, Rutu Prajapati, Qamar Qureshi,
Rajan Amin and Yadvendradev V Jhala**

Wildlife Institute of India

Email- ashish@gmail.com

Abstract

Parks and wildlife sanctuaries are legally created and designated to protect, and maintain biological diversity and natural history from human activities. However, illegal activities, and poaching or illegal hunting continue to confound conservation efforts across the globe. Foot patrolling by frontline staff is central to the conservation and management of wildlife resources.

Although, the exercise in practice for decades, but there are voids when it comes to analyze the data and therefore evidence-based decision-making. In recent past, there is a global surge of developing and implementing Law Enforcement Monitoring (LEM) to combat ever increasing illegal wildlife trade and declining wildlife resources. These LEM tools help wildlife managers in decision making through real-time evidences. Several programs assist with LEM technology however, MSTripES (Monitoring System for Tigers- Intensive Protection and Ecological Status), a unique LEM tool, is curated to match the hierarchy of Indian forest administration, and to address law enforcement and ecological monitoring in Indian forests. MSTripES is built using open-source software and comprises android-based mobile applications as data recording interface, local desktop application, and a central server system for data archiving and analysis. It uses GPS, and GPRS to collect information from the field, creates a database using cutting edge IT-based tools, analyses the information using GIS and statistical tools.

Duties and responsibilities of Indian foresters are multifaceted, and it includes law enforcement as primary and foremost responsibility with monitoring ecological status, addressing human-wildlife conflict and liaising with local communities as additional responsibilities. The state-of-the-art MSTripES program brings together law enforcement monitoring, ecological status monitoring and human-wildlife conflict in a single platform for evidence-based adaptive management, and better knowledge sharing.

MSTripES plays a crucial role in wildlife policy issues and challenges by providing accurate and real-time evidence for the wildlife crimes, illegal activities, human disturbances, ecological status of important species, and habitat parameters. This information is essential for designing and implementing effective conservation policies and measures. Some of the ways in which MSTripES contributes to wildlife policy are:

Conservation planning: MSTripES helps in identifying areas that are important for wildlife conservation and monitoring the effectiveness of conservation efforts in those areas. This information can be used to prioritize conservation efforts and allocate resources effectively. **Anti-poaching measures:** MSTripES provides real-time information on the movement of tigers and potential threats to their survival, such as poaching. This information can be used to deploy anti-poaching teams to specific areas and prevent illegal activities. **Identification of hotspots:** Smart patrolling can help identify hotspots for illegal activities, such as poaching or illegal logging. By focusing resources on these hotspots, managers can more effectively combat illegal activities and protect forest resources.

Human-wildlife conflict: MStrIPES also provides information on human-wildlife conflict, such as instances of tigers straying into human settlements. This information can be used to develop strategies to minimize conflict and ensure the safety of both humans and tigers. **Scientific research:** MStrIPES generates a large amount of data that can be used to develop more effective conservation policies and measures and in addressing the challenges faced by wildlife conservationists.

Patrol module of MStrIPES is meant for law enforcement and implanted across all the tiger reserves in India, and Ecology module is used for the countrywide assessment of "Status of Tigers, Co-predators, Prey and their Habitat". The archived data in the central server acts as the repository of our national efforts of ecological status and law enforcement monitoring. Owing to the centralized and incentivized implementation across the country, MStrIPES holds the largest known data on protection indicators of tiger reserves of India and their spatio-temporal trends. The overarching goal of MStrIPES program is to help monitor and achieve thematic components of National Wildlife Action Plan 2017-31 i.e., strengthening and improving protected area network, landscape level approach for wildlife conservation of threatened species, control of poaching and illegal trade in wildlife etc.

Keywords: MStrIPES, conservation tools, wildlife monitoring, tigers

Leonine tale: Ecology, Economics and Politics of Conservation

Kausik Banerjee and Yadvendra V. Jhala

Wildlife Institute of India

Email- sawaj.shardul@gmail.com

Abstract

Recovery of Gir lions (*Panthera leo*) from ~50 individuals in 1920's to the current population of ~700 individuals elucidate India's conservation commitments. Lions that once ranged from Persia to eastern India were almost driven to extinction and restricted only to the Gir forest (1,800 km²), western India by indiscriminate hunting and habitat loss. With timely protection by the princely rulers and State and Federal Governments; Gir lions have been increasing with an annual rate of ~2% and have dispersed to occupy ~30,000 km² of human-dominated Saurashtra landscape since 1990's. Nonetheless, Gir lions typify major challenges of carnivore conservation: historical bottlenecks, habitat fragmentation, small population resulting in decreased heterozygosity and conflict with humans. We herein present findings from one of the longest-running ecological research in India on lions based on radio-telemetry (n = 35 lions) to understand the factors behind their recovery and future viability and demonstrate amalgamation of long-term research outcomes into management decision making and conservation governance.

Current lion density ranged from 15/100 km² within the Gir Protected Area to 2/100 km² in the agro-pastoral landscape. Demographic parameters of genetically less diverse Gir lions were not depauperate compared to African lions. Lions outside Gir were long-ranging and ventured inside hamlets at nights in search of food; but required specific daytime and breeding habitat *refugia*. We discuss policies adopted by Gujarat Forest Department in securing future of those less protected, crucial habitat patches within human-dominated landscape against possible conversions into lion-hostile land-use patterns. Despite lions' occurrence in juxtaposition with humans, conflicts were minimal since lions mostly scavenged on carcasses of unproductive cattle. Forest dwelling pastoralists made substantially more profit with free grazing rights coupled with a government compensation scheme for livestock depredation; the crux of human-lion coexistence.

We submit that strict protection regime by forest department, local communities' tolerance, abundant prey, economics of livelihood securities and low lion density outside Gir were all key recipes behind successful lion conservation in India. Threats from stochastic events like epidemics were yet to be addressed by establishing a second independent lion population. We also discuss the facets of conservation politics and the roles State and Federal Governments, Scientific Institutions, and the Judiciary have played.

Increasing lion density and lowered tolerance due to erosion of traditional values, sets the stage for enhanced human-lion conflict. In the absence of any legal protection to refuge habitats and corridors, these are being lost to hostile land use patterns. We demonstrate role of different best management practices and policies adopted by the state forest department and Federal government in recovery of lion population and their *legendary* harmonious coexistence with local communities in Saurashtra landscape.

The future success of lions would largely depend on syncing lion conservation dynamics with its landscape dynamics. This warrants a centrifugal approach to look beyond the portals of Gir Protected Area. We, thus, recommend a policy roadmap for recognizing all land uses, and prescribing a mutually gainful engagement with all stakeholders, including community stewardship.

Keywords: Gir lions, Africa, communities, livelihood, conservation

THEME 3

(Wildlife Policy Issues and Challenge)

POSTER PRESENTATIONS

Exploring the possibility of spiritual teachings to restore and strengthen the alliance between communities, managers, forests, and wildlife

Pooja Chourasia and Ashwini Kumar Upadhyay

MP Rural Livelihood Mission (Environment)

[Email-pooja.wildlife@yahoo.in](mailto:pooja.wildlife@yahoo.in)

Abstract

This paper explores the scope of spiritual science and teachings to connect with the communities living in and around forests. The ground for this exploration is the overall well-being of humans as realized by many international and national policies. Delving into the past's environmental, cultural, and policy-based state of affairs, this paper tries to foreground concerns of present times and proffering human-centric community wellness concepts for the betterment of forest communities as well as for the communities sharing their space with any wild species of interest. Here, it is argued that forest and wildlife-related awareness programs usually feature problem statements about depleting conditions which are however true, but likely to inflict negative thought process loops at a subconscious level among people of forest communities that are already managing in ordinary living conditions. In general, the training, education, and community involvement programs are 'moralizing and instructive' while trying to improve the understanding of locals for any issues. In this process, the faculty of intelligence quotient of the providers is more involved, and little or no attention is given to the emotional and adaptability quotient of the people at receiving end. Managers and researchers are doing their part; and for the inseparable integration of communities, the involvement of spiritual counselors who can use science and psychology for this purpose is stressed in this paper. Calling attention to many established principles in the field of physics, medical science, and psychology it is propounded in this paper that spiritual knowledge is valuable and underutilized in harmonizing conservation practices. Delineating a doable and specified scheme of actions, this paper considers the scopes and challenges of implying spirituality in a community-based conservation framework. Discussing the norms for the selection of the best spiritual group or person, the emphasis was made that different locations and different communities may need different approaches. The paper further affirms that if the process is accepted and planned with perfection the outcome in the form of gradual adaptive mindset change would be steadfast. However, it states that the involvement and attitude of every stakeholder are required to be service-oriented and not success-oriented for the best implementation and execution of the process. This concept paper lauds the idea of reestablishing forest communities as the first guardians of wilderness by making them mindful and spiritually clear about their surroundings. The human-centric approach in forested and non-forested areas of importance is essentially needed for bracing the emotional connection of people with forest and wildlife helping them to be more reasonable and supportive.

Keywords: Community-wellness, Spiritual-science, Emotional-quotient, Service

Wildlife conservation need of the hour: A survey

Vidya S. Zope and Sudhir N Dhage

Sardar Patel Institute of Technology (SPIT), Mumbai, Maharashtra.

Email- vidya.zope@spit.ac.in

Abstract

A poacher's main objective is to gain a large profit by selling or illegally trading valuable products obtained after the processing of body parts of animals, such as an elephant's tusks used to make ivory, tiger's skin used to make leather, etc. The food web's structure and function may change as a result of poaching since it can have a cascade impact on other organisms. Monitoring biodiversity and the dangers it faces may be done using a wide variety of techniques.

The IoT (Drones, Sensors), Deep Learning, and Computer Vision practical solution for wildlife conservation supports active patrolling and the outlawing of poaching of all animal species. Smart technology can save them from extinction, protecting the different natural systems they are linked to. Machine learning and deep learning algorithms can emerge as a potential weapon to tackle poaching activities, poacher behavior, and wildlife healthcare improvement.

This survey will aid in setting the criteria for animal protection within and outside the protected areas and monitor their behavior, population, and health.

Keywords: Poachers, Wildlife, illegal trade, Deep learning, IoT, Computer Vision, Smart technology.

Tiger Conservation Prioritization Units (TCPUs) in Ratapani- Kheoni Landscape of Vindhyan range with Special Reference to Ecological Restoration of Wild Land Blocks

Mayank Makrand Verma and Amitabh Agnihotri
State Forest Research Institute, Jabalpur, Madhya Pradesh
Email- mayanksfri@gmail.com

Abstract

The capital Bhopal, located in Vindhya range, is an important political, commercial and economic center of India, where the total population resides 17, 98,218 according to the All India Census 2011. It is well known that human civilization has evolved along with the flora and fauna in the wild land blocks. Evidence of mutual interaction can easily be a notice from the ancient sculptures in the caves of Bhimbethika in which a Stone Age man is portrayed hunting with various herbivores and carnivores. The occupancy survey was performed from Dec 2018 to Apr 2019 across the study areato estimate the overall occupancy rate Ψ on PRESENCE software version 13.6 of a total of 5312 (km²), segment distribution was 83 grid cells (size 64km²). The detected tiger sign in 49 out of 83 grid cells was confirmed, which yielded naïve occupancy of 0.5904. The main reason for wildlife survival is the Vindhyan mountain range; the rocks with higher right-angled slopes, geographical formations are extended up to Bhopal. These geometrical structures limit the expansion of human zonation over the centuries and provide shelter and cover as a basis for the successful survival of wildlife. These are the reasons for wildlife presence and their survival near the city. The total 7210 km² area was mapped on the GIS platform by using ArcGIS 10.1 software to find out the tiger conservation prioritization areas (TCPUs). TCPU_1, TCPU_2, TCPU_3, TCPU_4 and TCPU_5 were identified by using MaxEnt software within a studied area of landscape. The probability of occurrence was predicted at 1409.08 km² in the study area of the landscape. The identified TCPUs area was spatially distributed in five conservation units, namely TCPU_1 (50.99 km²), TCPU_2 (724.20 km²), TCPU_3 (104.43km²), TCPU_4 (301.48km²) and TCPU_5 (227.98km²) TCPUs were required complete protection for optimum ecological restoration. The land falling under the TCPUs were holding minimal 19 tigers between 2018 and 2019 based on DNA Next-Generation Sequencing. The study finding will be helpful in DSS for the demarcation of critical Tiger habitat based on functional attributes and their connecting linkages. A landscape-level assessment was performed to find out the principal reason regarding the presence of tigers within the urban matrix. Study findings will be helpful in support to the strategic green development of Bhopal capital with special reference to Tiger conservation in the Ratapani-Kheoni landscape.

It is our priority to provide a safe habitat to the increasing population of tigers around Bhopal with minimum human-wildlife conflict. This effort will prove to be a foundation stone in establishing ecological resilience by restoring the forest areas around Bhopal city.

Keywords: Tiger conservation prioritization units, Wild land blocks, Landscape connectivity, Ratapani-Kheoni landscape, Landscape management, Co-existence, Zonation, Green development, Decision supporting system, Wildlife conservation, Bhopal development plan.

The need for sustainable development goal-based strategic approach to tiger conservation in proximity capital Bhopal

**Mayank Makrand Verma, Ravindra Mani Tripathi, Amitabh Agnihotri
and Dharmendra Verma**

State Forest Research Institute, Jabalpur-482008, Madhya Pradesh

Email- mayanksfri@gmail.com

Abstract

Bhopal city is the capital of Madhya Pradesh where tigers have been in co-existence in its juxtaposition of forested areas for centuries. The centuries-old presence of humans and wildlife was also depicted in the sculptures of Bhimbethika. The story of 100,000 years ago, wildlife remains alive even today.

The occupancy survey was performed from Dec 2018 to Apr 2019 across the study area to estimate the overall occupancy rate Ψ on PRESENCE software version 13.6 of a total of 5312 (km²), segment distribution was 83 grid cells (size 64km²). The detected tiger sign in 49 out of 83 grid cells was confirmed, which yielded naïve occupancy of 0.5904. The tiger-occupied estimated potential tiger habitat is 70.83% of the total study area or an area of 3762.48 (SE=482.34) out of 5312 (km²) Ratapani- Kheoni Landscape. The probability of occurrence for the tiger was predicted at 1409.08 km² in the study area of the landscape by using MaxEnt software. The identified Tiger Conservation Prioritization Units (TCPU) area was spatially distributed in five conservation units, namely TCPU_1 (50.99 km²), TCPU_2 (724.20 km²), TCPU_3 (104.43 km²), TCPU_4 (301.48 km²) and TCPU_5 (227.98 km²) The total TCPUs falling area is 1409.08 km² as recognized high conservation value prioritization area. The land falling under the TCPUs were holding a minimal 19 tigers between 2018 and 2019 based on DNA Next-Generation Sequencing. The study finding will be helpful in DSS for the demarcation of critical Tiger habitat based on functional attributes and their connecting linkages. A landscape-level assessment was performed to find out the principal reasons regarding the presence of tigers within the urban matrix. the urban expansion is very sensitive towards TCPU-5 and TCPU-2 regarding the human-tiger conflict. The study is unique in providing baseline data regarding the population-based temporal urban expansion intrusion delineation adjacent to TCPUs.

This present study aims to produce a land use/land cover map for Bhopal city that observed a rapid increase of urban population in the recent decades to detect changes mainly in the built-up land, and subsequently to analyse the urban sprawl of the different decades between the 1990 to 2020 and to predict the urban area growth in the same over a given period 2020 to 2050. A GIS-based analysis of urban sprawl research is a decision support system that can facilitate urban planning. The programming language R for statistical computing was used to understand the effects of urban sprawl on the natural environment. GIS reveals spatial land use land change patterns of urban sprawl. Last three decades, urban growth (sprawl) trend detection clearly warned us about associated anthropogenic interference critically deteriorating the Tiger habitat adjoining Bhopal city in the next three decades. If no strategic intervention is adapted to divert the urban growth towards safe and well-suited optional areas to keep a safe distance to forest patches, then indeed, the population & urban growth forcibly impose a negative impact on wildland eco-system function. Efficient and effective strong decisions are required at this juncture to save and protect the wildland blocks through the strategic green management policy of Bhopal city. Strategic planning is required

to divert human settlement towards non-forest areas from wildland blocks so that zonation can be distinctly separated from each other. The 2 km buffer green belt micro plan around the Tiger conservation prioritization unit (TCPU) is essentially required to keep in Bhopal development plan suggested here in the current communication to protect the integrity of the ecosystem in TCPUs and control the man-animal conflict at zonation.

Study findings will be helpful in support to the strategic green development of Bhopal capital with special reference to Tiger conservation in the Ratapani-Kheoni landscape. It is our priority to provide a safe habitat to the increasing population of tigers around Bhopal with minimum human-wildlife conflict. This effort will prove to be a foundation stone in establishing resilience ecosystem. The protection of TCPUs is most necessary to get the public cooperation of the people living in the villages around it. In order to get cooperation, the purpose of ecological resilience can be achieved by engaging in eco-tourism. The presence of *P.tigris* indicates the possibilities of a successful eco-tourism which will lead to the achievement of SDGs Goal 15: Life on Land for peace and resilience by creating means of livelihood. The UN Decade on Ecosystem Restoration (2021- 2030), Sustainable Development Goals, aims to prevent, halt and reverse the degradation of ecosystems. It will only succeed if all stakeholders work as a team for conservation with sustainable development and required land is available without conflict.

Keywords: Tiger conservation prioritization units, Wild land blocks, Landscape connectivity, Ratapani-Kheoni landscape, Landscape management, Co-existence, Zonation, Green development, Decision supporting system, Wildlife conservation, Bhopal development plan.

Abbreviations: TCPU (Tiger Conservation Prioritization Units), DSS (Decision supporting system), SE (Standard Error), GIS (Geographic Information System) SDGs(Sustainable development goal)

A leopard is sitting on the ground in a savanna-like environment at night. The leopard is facing right, looking towards a city skyline in the background. The city lights are visible through the silhouettes of trees and a fence. The sky is dark with some clouds. The text "THEME 4 Human Wildlife Interactions and Mitigation Measures" is overlaid on the image in a white, serif font with a black outline.

THEME 4

Human Wildlife Interactions and Mitigation Measures

THEME 4
**(Human Wildlife Interactions
and Mitigation Measures)**
ORAL PRESENTATIONS

Human - Wildlife Conflict Management in the Indian Himalayan Region: A review

S. Sathyakumar

Wildlife Institute of India, Chandrabani, Dehradun 248001, Uttarakhand, India

Email- ssk@wii.gov.in

Abstract

In the Indian Himalayan region (IHR), Human-Wildlife Conflict (HWC) is a major management issue. as large expanse of human habitations and agricultural/horticulture land areas are either interspersed with fragmented wildlife habitats or located in close proximity to wildlife habitats that are home to many wildlife species that are involved in crop/livestock depredations and attack on humans. This paper is a review on the research and management efforts made by the forest/wildlife managers and researchers/conservation agencies to reduce/prevent HWC in the IHR. Species such as the rhesus macaque, wild pig, porcupine, common leopard, snow leopard, Asiatic black bear, Himalayan brown bear, and wolf are involved in HWC. People living in the IHR suffer from the economic losses due to crop/livestock depredations by wildlife and have been using some indigenous protection measures to reduce losses. In the last two decades, the Forest / Wildlife Departments have not only improved the process for *ex gratia* /compensation disbursement but also enhanced their management response for HWC through well-equipped and well-trained field staff. Research has led to better understanding of conflict species ecology and behaviour, movement and ranging patterns using telemetry, and in identification of vulnerable areas for regular monitoring using risk assessment models. Managers and researchers have worked together for testing the efficacy of wildlife barriers, wildlife deterrents, improving awareness creation and using adaptive management strategies in vulnerable areas through community engagement. Lessons learnt till date includes successes and failures that indicates highly site-specific nature of mitigation strategies. Case studies will be presented and discussed along with a strategy for the future.

Keywords: Human-wildlife conflict, wildlife management, species, mitigation strategies, Indian Himalayas

Human Wildlife Conflict–Monkey Sterilization Himachal Pradesh

Rajeev Kumar and Karan Sehgal
Himachal Pradesh Forest Department
Email- pccfwl-hp@nic.in

Abstract

Himachal Pradesh has been reeling under the stress of monkey menace for many decades now. Over the years wholehearted steps have been taken to check the menace by all possible means. So far all the efforts to control the menace have only been carried out by Forest Department and needless to say only this department is being looked upon as a saviour to get rid of the problem. With continuing habitat loss these species have increasingly come into contact with humans predisposing them to become pests, stealing food from crops and gardens, and pestering people for food. Himachal is facing acute problem of the Rhesus macaque as a result of crop depredation, destruction to horticulture produce, aggressive behaviour by way of bites and destruction of property. As a result of this H.P. is facing a huge monetary loss resulting in unemployment problem and seriously affecting the tourist potential of the state. To mitigate this Rhesus macaque–human conflict the veterinarians of the department standardised the technique and adopted method to mass-sterilise the monkey in first Monkey Sterilisation Centre (MSC) of the state at Tutikandi, Shimla in February 2007. This was first such attempt by anyone in entire world to surgically manage the population of any wild population on such a large scale.

Keywords: Sterilization, Rhesus macaque, Monkey menace

Assessment of extent and severity of human-large carnivore conflict in Western Terai Arc Landscape, Uttarakhand

Nishant Verma, Samrat Mondal, Bivash Pandav
Wildlife Institute of India (WII), Saurashtra University, Gujarat, India
Email-nvermaifs1999@gmail.com

Abstract

The study area undertaken was Western Terai Arc Landscape, which includes parts of the Dehradun Forest division connected to Rajaji national park, Kansro Barkot, Chilla motichur, and some parts of the Shivalik and Lansdowne Forest divisions. This area encompassed a mosaic of Protected Areas (PAs) and scrubland, grassland, and human settlements to the larger extent.

The rising dispute between humans and wildlife, which can be seen in different forms, is a major threat to wildlife and habitat. Understanding conflict is the first step in finding solutions to its mitigation which is possible based on analysis of the historical data. The increasing human population, Land use transformations, Habitat fragmentation/shrinkage, Livestock grazing etc., are major reasons for the rising Human-Wildlife Conflict.

To assess the extent, and severity of the human-large carnivore conflict in my study area, I have collated the data pertaining to Human-Wildlife conflict (HWC) events from the Divisional Forest Officers (DFOs)/Director of the Rajaji Tiger Reserve and interacted with the field officials and with the affected persons/their family members. I have also collated and compiled the geo-locations of the conflict events. I have collected data related to human death, human injury, and livestock depuration for the events that have occurred in the last five years (2017-2022).

In my study area, I have analyzed the trend of wildlife conflict, especially regarding tigers, leopards, and elephants. After the data collation, the analysis on various aspects viz species-wise conflict events, species involvement in human-wildlife conflict, and analysis for ascertaining the hotspot areas of human-wildlife conflict have been carried out. After analyzing the HWC data of the last 5 years (2017-2022), the following observations have been obtained: -

- Leopards have been the most highly active species in the killing of humans over the last five years.
- Most females attacked were in the age group of 30-45 years old & most males attacked were in the age group of 45-55 years old.
- Elephants are the most active species in damaging crops, and the most damaged crop is sugarcane.
- Most Cattle attacked by leopard are Cow, followed by Ox, Goats and Mule.
- October-November is the most sensitive period for the occurrence of Human-Wildlife conflict events.

Based on my study, the recommendations for reducing Human-Wildlife conflict have been prescribed for the PAs/Divisions Management. The conflict hotspot areas have been identified, and suitable management interventions for managing the conflict in a sensitive, adequate, timely manner have been prescribed. The risk modelling using the compiled data including the spatial ecology has also been carried out.

The top three forest divisions in respect of human death are Rajaji Tiger Reserve followed by Lansdowne followed by Haridwar forest division and the top three forest divisions in respect of human injury are Lansdowne followed by Haridwar followed by Dehradun Forest division.

Keywords: Shivalik, habitat, Leopard, Human-wildlife conflict, hotspots

Modeling the hotspots of vehicle wildlife collisions in central India

Rajashekhar Niyogi, Diptesh Sarkar and Robert John

*Department of Biological Sciences, Indian Institute of Science Education and Research,
Kolkata, Mohanpur 741246, West Bengal
Email-rn16rs004@iiserkol.ac.in*

Abstract

Vehicle-wildlife collision (VWC) is one of the major causes of human-influenced wildlife mortality around the world. These collisions often result in injury or death of wild animals, property damage, and even pose a threat to human safety. Such incidents are particularly common in areas with high wildlife populations and heavy vehicle traffic.

The state of Madhya Pradesh is geographically located in India's centre, and hence contains a large network of roads and railways connecting the different parts of the country. VWC is the second largest cause of anthropogenic wildlife mortality in Madhya Pradesh. Therefore, it is essential to reduce the VWCs in this state. To devise appropriate mitigation measures, it is important to identify the hotspots of VWCs and understand the factors affecting a site's susceptibility to VWCs.

To determine the high-risk areas, we used the government records on wildlife mortality due to vehicle collisions, for the past decade 2011-2020. We also analyzed the interannual and seasonal variations in the data available. Our final dataset consisted of around 1600 animal mortality incidents of which we could map ~80% of the cases. Additionally, we conducted on-ground surveys in four ecologically important areas (protected areas) of the state to assess the different mitigation measures and other human interventions that may be influencing the risk of VWCs. We applied a Bayesian regression model, which accounts for spatial autocorrelation, using the mortality data in combination with a number of eco-geographical variables to map the hotspots for VWCs and understand the spatial factors which influence an area's vulnerability to VWCs.

Our analyses reveal that highways passing through the Panna tiger reserve and its adjoining areas are the most susceptible to VWCs. The monthly trends indicate that the incidents peak in the winter months, particularly in December, and then gradually decline. The peak in December may be attributed to low visibility due to fog in the winter months. The interannual pattern of incidents shows a steep rise in cases from 2011 to 2015 followed by a steady decline in cases from 2015 to 2020. Finally, we integrate the outputs of the spatial analysis with data obtained from our field surveys and suggests the areas where different mitigation measures (like speed limit, overpasses, underpasses, etc) must be put up to minimize VWCs.

The analytical framework used in this study can be used by online mapping services (like Google Maps, Apple Maps, etc) to map the VWC hotspots and caution the drivers when they're approaching and passing through a high-risk area. Our analysis would help land-use planners and wildlife managers prioritize the areas where mitigation measures are required. It would also help them design specific mitigation measures based on the degree of estimated risk to the endangered species during using a susceptibility scoring system.

Keywords: Wildlife-vehicle collision, Hot spots, Bayesian model, Central India

Living with Predators and Pillagers

HS Pabla

Former Chief Wild Life Warden, Madhya Pradesh

Email- pablahsifs@gmail.com

Abstract

Human-wildlife conflict (HWC) is inevitable in India because large mammals have to compete with rural communities for space and critical resources. This conflict has escalated to extremely serious levels in many parts of the country, in recent years, due to the recovery of several species and growth of human population in forested landscapes. Fencing of wildlife habitats, management of wildlife populations, and, early elimination of problem animals can mitigate the conflict significantly. Economic benefits from wildlife conservation, through tourism and sustainable use, can further alleviate the pain of having to live in a dangerous environment. However, the country is doing almost nothing in this regard. The Wild Life (Protection) Act, 1972, which governs the conservation actions and policies of the country, just does not mandate such an approach. The author feels that increasing wildlife populations without adequate measures to protect people against their depredations is inhuman, and, also, violates the fundamental rights of the people to life and property as guaranteed by article 21 and article 300-A of the Constitution of India. He even goes further to opine that the government is criminally liable for the depredations of wild animals under several sections of the Indian Penal Code. Therefore, prevention and mitigation of HWC should be the core concern of wildlife conservation if only to bring it within the four corners of the Constitution and criminal law of the country. The author suggests several measures, both within the current law and beyond, to reduce HWC and make conservation of wildlife sustainable. Although the Wild Life (Protection) Act, 1972 needs to be completely revamped for effective management of HWC, a lot can still be done by interpreting the law positively, says the author.

Keywords: Human-wildlife conflict, conservation, wildlife laws, habitat management

A stakeholder centric approach to leopard management in Tehri, Uttarakhand, India

Koko Rose, Sanjay Sondhi, Shweta Shivakumar, Dhananjai Mohan, Sunil Limaye and Vidya Athreya

Uttarakhand Forest Department, New Tehri, Uttarakhand, 249001, India
Email-kokorose1982@gmail.com

Abstract

Very few habitats in the world can claim cohabitation of humans and large carnivores where both are at high densities but in countries like India lions, leopards and tigers co-occur with people regularly (Athreya et al., 2013; Dhanwatey et al., 2013; Landy, 2017; Meena et al., 2014). Uttarakhand, a Western Himalayan state of India, has historically reported negative leopard-human interactions (Corbett, 1948). Almost 149 people sustained injuries or died due to leopards (*Panthera pardus*) between 2001 and 2018 in just one forest division of the state (Uttarakhand Forest Department, 2022). Uttarakhand also has one of the highest numbers of leopards declared dangerous to human life and killed in the country. Traditional approaches of mitigation using leopard translocations, shooting of "man-eaters" and ex-gratia payments have been ineffective in reducing this conflict. Using evidence from baseline research of stakeholder interviews and leopard-cause attacks on people in Uttarakhand, a program called "Living with leopards in Uttarakhand" was implemented between 2016 -2020. This intervention program aimed at stakeholders' capacity building and had the following key elements: three official stakeholder consultation meetings, three exposure visits, multiple capacity-building training sessions, three media workshops, a children's ambassador program, and awareness programs at >80 schools. More than 2,000 people were exposed to different components of this program. This paper critically evaluates the "Living with leopards in Uttarakhand" intervention for its merits and demerits. The learning of this intervention will find applications in other areas where large carnivores share space with people.

Keywords: Leopards, capacity building of Forest Department, Uttarakhand, human-leopard interactions

Mumbaikars for Sanjay Gandhi National Park: A Citizen Science Programme for Shifting Focus of human-leopard conflict from leopards to human safety

Sunil Limaye, Vikas Gupta, Vidya Athreya and Vidya Venkatesh

Wildlife Conservation Society-India

Email-avidya.athreya@gmail.com

Abstract

In the past, Mumbai's leopards gained notoriety for attacking people and killing little children. An estimated 20,925 people per sq. km live in areas bordering Sanjay Gandhi National Park (SGNP), along with a few thousand indigenous tribal and non-indigenous tribal communities that live inside the park. The 103 sq. km area is managed by the Forest Department but, unlike most National Parks in India, faces intense anthropogenic impact by residents in and around the park. Leopards are the only large predator present in the landscape and recent studies found an extremely high density of leopards in the park. Between 2003 and 2005, about 30 leopard attacks on people were reported each year and the main management response was to capture leopards from in and around the park and to release them inside the Park. By 2004, researchers and managers realised that the capture and relocation was responsible for attacks on people but by this time there was a notion among the public, media and politicians that trapping was a solution. The department was then faced by the challenge of dealing with the pressure that people exerted on it to install traps, even when a leopard was merely sighted in an area.

In order to reduce the public pressure to traps leopards, in 2011, the Forest Department initiated a proactive project with four objectives; (i) engage with a wide range of people, (ii) carry out basic research about leopards and issues related to human-leopard conflict (iii) use the research to inform various stake holders about safer shared spaces (iv) build capacity within the forest department to respond to complaints about leopards. Leopard attacks on people have not occurred between 2013 and 2016. In December, a leopard was trapped due to a presence of a new field-level officer who had recently been posted. Although the animal was released, some attacks did occur in 2017 which were attributed to this animal, and he has since been removed and is in permanent captivity.

Key words: Mumbai, leopard, conflict, attacks.

A Study on Livelihoods Security and Human-Wildlife Conflicts in the Western Ghats of Maharashtra

Mayuresh Bhise, Sailaja Nandigama, Shruti Majumdar and Nikhil Nikam
*Department of Humanities and Social Sciences, Birla Institute of Technology and
Science, Pilani, Pilani Campus.*
[Email-p20170418@pilani.bits-pilani.ac.in](mailto:p20170418@pilani.bits-pilani.ac.in)

Abstract

Human-animal conflicts have become a crucial socio-political issue across the country. The regular interactions between humans and wildlife result mainly from rapid land use policy changes. Human activities such as agriculture, infrastructural development, expansion of villages, human presence in forest fringe areas and impacts of climate change on forest ecosystems are some of the critical factors which leads to habitat loss for wildlife. These conflicts often result in economic loss due to property damage, impact on agricultural production, restrictions of use of forest resources, physical injury or death to humans and wildlife.

The Western Ghats is one of the biodiversity hotspots in the world. The region is enriched with diverse cultures and biodiversity. The Western Ghats is one of the major biogeographic zones of India, and its spread from Gujarat to the Malabar coast of Kerala. It is home to many diverse communities, including nomadic tribes, pastoralists, farming communities and coastal fisherman communities. The livelihoods of these communities directly depend upon the rich biological diversity and locally available natural resources of the Western Ghats. Since 2012, UNESCO has recognised the region as World Natural Heritage Site while considering its unique flora and fauna and contribution towards ecosystem services to the people.

The study aims to understand primary factors contributing to rising human-wildlife conflicts in the region. The study uses sustainable livelihoods framework to understand the issue's intensity, and data were gathered using mixed methods approach to interact with the stakeholders. Primarily, the people residing in forest fringe areas suffer from conflicts with elephants, which are attracted to agricultural crops. Other incidents include the loss of livestock, physical injury, and economic loss due to wildlife, which puts pressure on the capital structure of the forest dependent people. Based on the findings, the study highlights the need for local stakeholders to participate in effective strategy making. These strategies can be proven beneficial to limit the impact of such disputes. Additionally, active participation for forest users can be crucial to form a collective effort to sustain livelihoods, adapt alternative livelihoods methods, mitigate climate change risks and minimise the damage due to human-wildlife conflicts.

Keywords: Human-Wildlife Conflicts, Livelihoods Security, Western Ghats, Participation

THEME 4

**(Human Wildlife Interactions
and Mitigation Measures)**

POSTER PRESENTATIONS

Human Wildlife Conflicts in Himachal Pradesh: Case Study of Chamba District

Vinay Kumar and Pankaj Sekhsaria

*Centre for Technology Alternatives for Rural Areas,
Indian Institute of Technology Bombay, Mumbai, Maharashtra
Email-pankaj.sekhsaria@iitb.ac.in*

Abstract

The study area is located in the North-western part of Himachal Pradesh. The study was conducted in the Dalhousie Forest division of the Chamba district. The study involved an understanding of two aspects: The pastoralist community which is called *Gaddi* and the second is human-wildlife conflict. People of the Gaddi community are living as transhumance for their livelihood. They majorly rear a herd of sheep, goats, and cows. Along the way, they are facing the issues of wild animal attacks on their flocks of the herd. We have documented the seasonal movement pattern of the people in the district. We also came to know about the routes followed by them and the advantages and challenges they faced on the same route. In the study, we also tried to understand the factors which define the driving forces behind human-wildlife conflict (HWC). The major stakeholder in the study were shepherds, local villagers, and staff of the forest department. The driving forces were not prioritized in the same way by these stakeholders. It tells that they have their perspective and challenges towards the conflict. We did semi-structured interviews with the shepherds and local villagers. The living conditions of the communities are different in different seasons throughout the year. The study involved interaction with different stakeholders and the linkage of shepherds/pastoralists with them. It was found that leopards and Himalayan black bears are major problematic species in the area. The secondary data available from the forest department was analysed for the study area for the last 21 years (2000-2021). It was found that there is a seasonal pattern of attack and the maximum occurred in the winter season. Leopard is the main species involved in the conflict and the easiest available prey for them is goat and sheep. The movement of wild animals with the shepherd is supported by the data along with interview information from the shepherds. People in the region are using traditional methods to mitigate HWC issues such as beating up tin, fencing, guarding by dogs of the gaddi breed, and yelling and whistling. There are other mitigation strategies started by the forest department such as compensation after conflicts occurred and insurance schemes.

Keywords: Human-wildlife conflict, Dalhousie, Gaddi, Shepherd

Comparing people's perception towards leopards in two areas with different human-leopard conflict scenario

Keyur Naria, Hiren Patel, Narendra Chetule, Chandni Valodkar and Geeta Padate

*Division of Wildlife Biology, Department of Zoology, Faculty of Science,
The Maharaja Sayajirao University of Baroda, Vadodra-390002, Gujarat, India.
Email-keyurnariah@gmail.com*

Abstract

Leopard-human interactions are becoming common in many parts of India, increasing challenges for their management. In such conditions it is important to understand perception of people towards leopard and its conservation. This increase has been attributed to the degradation and fragmentation of forested habitats which influence the availability of wild prey species. Decline in wild prey has forced Leopard, the opportunistic predator, to explore the food outside the forest in the form of livestock and stray animals. In addition to sub optimum prey with low energy demands, leopard has also found shelter in the form of agriculture farms. Thus, the depredation on livestock has become one of the major conservation issue in landscapes with limited resources around the world. Any attempt to mitigate conflict between humans and leopards and to conserve the species in conflict should be based on a clear understanding of conflict scenario. The present study was conducted to understand people's perception on livestock depredation on one side and conservation of Indian leopard on other. On the bases of Human-Leopard conflict data available with forest department of Surat district a questionnaire survey was conducted in two Talukas Mandvi with high human-leopard interactions and Umapada Taluka with low interactions to find out people's perception regarding both. Mandvi is a larger taluka while Umapada is approximately half of its size as well as population. In Mandvi Taluka 112 livestock were lost while from Umapada only 18 livestock fell to predation in last five years. From Both the areas together Calves (40.76%) and Goats (20%) were the most depredated livestock species. Randomly selected 239 individuals participated in the structured questionnaire-based survey. Majority of the respondents (64.2%) had negative feelings and considered leopards to be a dangerous animal and only 11.7% had positive feelings for leopards in Mandvi taluka, whereas majority of the respondents (37.7%) had positive feelings and 27.3% had negative feelings towards leopard in the Umapada area.

In response to question regarding importance of leopard for health of ecosystem, majority of people in both the talukas were neutral in their feelings. However, they were in favour of conserving leopards not only in their area but also in Gujarat. The responses of people in the areas with high and low man leopard conflicts are discussed.

Key words: People's perception, Human-Leopard conflict, Livestock depredation, Surat

Farmer's Perception Regarding Blue Bull Damage and Management in Punjab

Kiran Rani and B K Babbar

Department of Zoology, Punjab Agricultural University, Ludhiana-141004, Punjab, India

Zoologist (Rodents), Department of Zoology, Punjab Agricultural University,
Ludhiana-141004, Punjab, India

Email- kiruboor966@gmail.com

Abstract

In Punjab, farmers are facing many problems because of wild and stray animals. Wild animals including blue bulls create a lot of trouble. Blue bull/Nilgai (*Boselaphus tragocamelus*) is a largest antelope and native to Indian subcontinent. It is the only member of the genus *Boselaphus*. Due to explosion in human demand for shelter, food etc., urbanization, and industrialization, their habitat areas were diminished or converted into agricultural land. As a result, they started moving towards agricultural areas or human dwellings for their shelter and food and often raids on available crops in such areas and became serious pests. For this study, preliminary survey was done in different villages of district Mohali and Ludhiana to identify the habitat villages of blue bull, determine the time and mode of damage (feeding, trampling, running, sitting etc.), interacted with farmers to determine the management methods being adopted by them against blue bulls. Our surveys revealed that blue bulls are causing maximum crop damages in villages near canals and water holes. Our surveys and interaction with farmers have revealed crop raiding by *Nilgai* in few pockets of Punjab (villages in Mangat, Sidhwan, Jagraon, Doraha, Machhiwara, Mattewara and Sudhar blocks of district Ludhiana, villages near abandoned SYL canal in district SAS Nagar, Ropar, Fatehgarh Sahib, Kapurthala, few villages in district Sangrur, Hoshiarpur and Gurdaspur). They were found to cause maximum damage in milky grain stage of crops by feeding and at mature stage or near harvesting stage by feeding, trampling, or running. They prefer wheat, maize, oats, moong beans, peas, vegetables, and poplar nursery for feeding. They were also found to show seasonal migration in nearby villages for food and shelters. Our interactions with farmers of their habitat villages revealed huge losses suffered by them. Major management methods being adopted by them include guarding, firecrackers, reflective ribbons etc. Various farmer awareness campaigns were conducted in villages of district Mohali and Ludhiana, Punjab. Their feedback was taken through questionnaire. Farmers also informed that along with crop damage, the blue bull sometimes cost the human life and is responsible for accidents while crossing the roads or kacha paths. Farmers were educated about animal biocology, behaviour and various management methods. Brochures on blue bull management methods were distributed among farmers. Live demonstrations were given by installing different management technologies in their crop fields. It is concluded from surveys and interactions with farmers that while comprehensive damage prevention may be difficult but if management is done at crucial damaging stage of crops, can help reduce blue bull damage and could be a part of a cost-effective system for farmers to keep blue bull damage at acceptable levels.

Keywords: Blue bull, habitat villages, crop damage, management

A Case Study on Planning, Management and Execution of Leopard Rescue in Urban Area

Rajesh Kumar and Rakesh Kumar Singh

Divisional Director, Social Forestry Division, Meerut, India

Email-rkm.dce@gmail.com, rkszoovet@gmail.com

Abstract

Leopards are one of the most resilient and adaptable species among big cats of India. They can survive in variety of environment and habitation even near human habitation with lowest level of conflict. There are studies where they are reported to dwell near human habitation without conflict for years. As every individual in nature avoids conflict therefore young adults always search for a territory which has lowest level of conflict and competition. Rescue or monitoring operations of strayed out leopards in an urban area requires a well-executed and safe plan. During such operation a leopard was sighted in a densely populated urban area of Meerut city. Initially he was hiding behind an air cooler in frontal open space of a house. Efforts were made to trap him there only but somehow he escaped from that place. After examining movement of leopard in close circuit television cameras of that locality leopard was presumed hiding in an open plot having bushy canopy. In order to restrict movement of leopard the area was cordoned off. To encircle the entire plot from three sides, 12 feet high nets were installed vertically and horizontally by contacting the national capital region rapid rail transport system and Meerut development authority officials. It's worth mentioning that one side of the plot was having a two storied house. To support nets fourteen feet long poles were arranged by contacting local corporator of Municipal Corporation. Fastening hooks were arranged from a nearby tent house to tighten the nets to the ground. An additional team from the nearby zoo was also called to help in immobilising the leopard. Leopard was successfully immobilised by the teams climbing on the buckets of two backhoe loaders from two sides, which were provided by Meerut Development Authority and Regional Rapid Transit System (RRTS) project-National Capital Region Transport Corporation (NCRTC) system. Lateral boom of backhoe loaders provided safety and clear visibility of leopards to immobilising teams from above and was helpful in taking the aim. Public address system installed on divisional director's vehicle was helpful in controlling the mob in addition to police support. Despite being a social forestry division, operation was completed in just eight hours due to well executed plan and the mobilization of resources from local administration.

Key words: Rescue Operation, Leopard, Men Animal Conflict



State Forest Research Institute, Jabalpur

(An Autonomous Institute of Department of Forests, Government of Madhya Pradesh)

Website: www.mpsfri.org

Email: mpsfri@mp.gov.in, mpsfri@gmail.com

Landline- 0761-2665540, Fax: 0761-2661304