

# Headlines Himalaya

October 16 – October 31 (2022)

No. 719-720

Editorial Team: Deepa Dahal and Prerana Shrestha

For the 719<sup>th</sup> - 720<sup>th</sup> issues of Headlines Himalaya, we reviewed news from four sources and selected 10 researches from five countries. We selected three researches from Nepal and seven from other Himalayan countries (India, China, Bhutan and Pakistan).

Headlines Himalaya, a weekly research based fact file is an attempt to keep our global readers abreast with the happenings in the Himalaya. Please share it with your colleagues and friends. Also, subscription is free. Enjoy!

**NEPAL**      *GHARIAL (GAVIALIS GANGETICUS, GMELIN, 1789) ABUNDANCE IN THE RAPTI RIVER, CHITWAN NATIONAL PARK, NEPAL*

*TRANSFORMING AGROFORESTRY IN CONTESTED LANDSCAPES: A WIN-WIN SOLUTION TO TRADE-OFFS IN ECOSYSTEM SERVICES IN NEPAL*

*ANTHROPOGENIC MORTALITY OF LARGE MAMMALS AND TRENDS OF CONFLICT OVER TWO DECADES IN NEPAL*

**INDIA**      *SEASONALITY OF MICRO INHABITANTS AND ABIOTIC PARAMETERS OF PERENNIAL POND OF JAMMU*

**CHINA**      *HISTORICAL CHANGES OF BLACK CARBON IN SNOW AND ITS RADIATIVE FORCING IN CMIP6 MODELS*

*THE SOUTH ASIAN MONSOON MAINTAINS THE DISJUNCTION OF RUMEX HASTATUS BETWEEN THE WESTERN HIMALAYAS AND THE HENGDUAN MOUNTAINS, SOUTHWEST CHINA*

*THE SEASONAL AND DIURNAL VARIATION CHARACTERISTICS OF SOIL MOISTURE AT DIFFERENT DEPTHS FROM OBSERVATIONAL SITES OVER THE TIBETAN PLATEAU*

*STRENGTHENING PROTECTED AREAS FOR CLIMATE REFUGIA ON THE TIBETAN PLATEAU, CHINA*

**BHUTAN**      *SUBSISTENCE FARMERS' UNDERSTANDING OF THE EFFECTS OF INDIRECT IMPACTS OF HUMAN WILDLIFE CONFLICT ON THEIR PSYCHOSOCIAL WELL-BEING IN BHUTAN*

**PAKISTAN**      *SOCIO- ECONOMIC FACTORS DETERMINING EXTRACTION OF NON-TIMBER FOREST PRODUCTS IN THE JAMMU REGION OF JAMMU AND KASHMIR*

## Nepal-Himalaya

**GHARIAL (GAVIALIS GANGETICUS, GMELIN, 1789) ABUNDANCE IN THE RAPTI RIVER, CHITWAN NATIONAL PARK, NEPAL**

Ramesh Kumar Yadav, Saneer Lamichhane, Dol Raj Thanet, Trishna Rayamajhi, Santosh Bhattarai, Ashish Bashyal, and Babu Ram Lamichhane

*Ecology and Evolution* 12: e9425

Gharial (*Gavialis gangeticus*) is a Critically Endangered crocodylian species whose abundance in Nepalese rivers is low due to the threat they face. We estimated Gharial abundance in the Rapti River, one of the major rivers in Chitwan National Park (CNP) holding the largest numbers of Gharials in Nepal. The Rapti River, running across the CNP, was divided into 18 segments; each measuring ~4 km, and Gharials were counted directly with three replicates. Gharial count data were analyzed using an N-mixture model (negative binomial) and the overall occupancy of Gharials was estimated using a single season occupancy model. Covariate effects were also investigated on Gharial abundance. Our findings revealed that the Rapti River is home to 150 Gharials (119–181), with a mean abundance of 8.3 (SD = 3.45) across each segment. The presence of humans and square of Rapti River depth were the significant covariates that had a negative and positive impact on Gharial abundance, respectively. Similarly, the number of sandbank present influenced the detection probability of Gharials. Our study shows that Gharial population estimation can be improved using the N-mixture model. The overall Gharial occupancy estimated using single season occupancy model was 0.84 (SD = 0.08), with a detection probability of 0.37 (SD = 0.02). The management authority should concentrate on segments to minimize human disturbance (e.g., fishing, washing clothes, extraction of riverbed materials). If the Gharial population in this river declines, their population in central Nepal will be threatened. Hence, we suggest designating the Rapti River section that passes across the CNP as a “no extraction zone.”

For further reading: <https://doi.org/10.1002/ece3.9425>

#### **TRANSFORMING AGROFORESTRY IN CONTESTED LANDSCAPES: A WIN-WIN SOLUTION TO TRADE-OFFS IN ECOSYSTEM SERVICES IN NEPAL**

Kishor Aryal, Tek Maraseni, and Armando Apan

*Science of The Total Environment* 857: 159301

Trade-offs in ecosystem services (ES) is increasingly becoming a pressing issue in sustainability science, to deal with supply constraints of landscape and divergence in demand from local and global stakeholders. Agroforestry is a well acknowledged and established management practice to minimize the trade-offs, and to sustainably manage the contested landscapes while satisfying the growing demands of both local and global ecosystem beneficiaries. However, various facets of agroforestry, its management modality, institutional arrangements, and implementation outcomes are inadequately understood. This paper aims to scrutinize major agroforestry practices through the methods of systematic review of literature, government policies, and project reports. Taking a case of Nepal, this paper presents agroforestry transition from forest-based agroforestry (i.e., shifting cultivation) to farm-based integrated approach to agroforestry in Nepal. This paper reveals that integrated agro-forestry approach is crucial in creating win-win scenarios among various stakeholders by minimizing trade-offs and maximizing synergies among ES, especially food, fibre, and other ES (i.e., biodiversity, soil functioning, water, and climate regulation). Analysing socio-economic, ecological, and institutional factors that are affecting agroforestry for the last fifty years, we further suggest an integrated model of agroforestry which is replicable in other countries with similar socio-economic status, practicing subsistence farming system. The findings of the paper are crucial in awakening scholars, policy makers and landscape managers for up-scaling and out-scaling of integrated approach to agroforestry for ecosystem management and attainment of various sustainable development goals such as, no poverty (#1), zero hunger (#2), climate action (#13), and life on land (#15).

For further reading: <https://doi.org/10.1016/j.scitotenv.2022.159301>

### **ANTHROPOGENIC MORTALITY OF LARGE MAMMALS AND TRENDS OF CONFLICT OVER TWO DECADES IN NEPAL**

Kedar Baral, Shivish Bhandari, Binaya Adhikari, Ripu M. Kunwar, Hari P. Sharma, Achyut Aryal, and Weihong Ji

*Ecology and Evolution* 12: e9381

Wildlife conservation in human-dominated landscapes faces increased challenges due to rising conflicts between humans and wildlife. We investigated the human and wildlife loss rates due to human–wildlife conflict between 2000 and 2020 in Nepal. We concentrated on Asian elephant (*Elephas maximus*), greater one-horned rhino (*Rhinoceros unicornis*), tiger (*Panthera tigris*), and leopard (*Panthera pardus*) mortality, as well as human mortality caused by these species. Over the 21-year period, we recorded 1139 cases of wildlife mortality and 887 cases of human mortality. Leopard mortality was the highest, followed by that of greater one-horned rhinos, tigers, and Asian elephants. Overall, the rate of wildlife mortality has been increasing over the years. Asian elephants were found to be more responsible for crop damage than greater one-horned rhinos, while leopards were found to be more responsible for livestock depredation than tigers. The generalized linear model indicated that the mortality of wildlife in the districts is best predicted by the additive effect of human mortality, the proportion of agricultural land, and the literacy rate of the districts. Retaliatory wildlife mortality was the most challenging issue for wildlife conservation, especially for the large mammals. Findings from this study are important for mitigation of human–wildlife conflicts, controlling retaliatory killing, and conserving these threatened large mammals.

For further reading: <https://doi.org/10.1002/ece3.9381>

## **India-Himalaya**

### **SEASONALITY OF MICRO INHABITANTS AND ABIOTIC PARAMETERS OF PERENNIAL POND OF JAMMU**

Sarbjeet Kour, Dipti Bains, Nidhi Sharma, Supreet Kour, and Deepanjali Slathia

*Indian Journal of Ecology* 49: 1800-1804

The present study aimed to analyse the seasonal variations and zooplankton composition of a lentic water body located at Kathua district of UT Jammu and Kashmir. The main water source of this perennial pond is rain. In the present study, 27 species of zooplankton were recorded, out of which, group Rotifera was represented by 15 species, Cladocerans by 6 species and Protozoa and Copepoda both were represented by 3 species each. During present investigation, the rotifer count was found to be the highest and constituted around 62.99% of total zooplankton reported, followed by cladocerans, protozoa and copepoda. The peak in the zooplankton population density was observed during summer season while the lowest density was recorded during the spring season. Among all the zooplankton studied, *Brachionus calyciflorus*, belonging to group Rotifera, outnumbered others. Different abiotic parameters were also analysed seasonally, of which the highest value of dissolved oxygen was obtained in winter season while carbonates were recorded only during autumn season. The concentrations of sulphates remained negligible throughout the study period and all parameters (biotic and abiotic) showed seasonality.

For further reading: <https://doi.org/10.55362/IJE/2022/3738>

### HISTORICAL CHANGES OF BLACK CARBON IN SNOW AND ITS RADIATIVE FORCING IN CMIP6 MODELS

Yang Chen, Xuejing Li, Yuxuan Xing, Shirui Yan, Dongyou Wu, Tenglong Shi, Jiecan Cui, Xueying Zhang, and Xiaoying Niu

*Atmosphere* 13: 1774

Black carbon in snow (BCS) has a significant impact on global climate and is an important component of Earth system modeling. Here, we provide a comprehensive evaluation of BCS simulations in the Coupled Model Intercomparison Project Phase 6 (CMIP6) and its radiative forcing on a global scale. Overall, the multi-model mean generally captures the characteristics of BCS spatial patterns, with maximum concentrations in East Asia and the Tibetan Plateau ( $\sim 120 \text{ ng-g}^{-1}$ ), and the lowest in Antarctica ( $\sim 0.05 \text{ ng-g}^{-1}$ ). The BCS concentrations in all CMIP6 multi-model mean and individual models generally exhibit a temporally increasing trend globally, with particularly large increases after the 1940s. In terms of seasonal cycles, individual models are generally consistent in most regions. Globally, BCS concentrations are highest around January and lowest in September. The albedo reduction in the Tibetan Plateau and East Asia simulated by the CMIP6 multi-model mean reached  $\sim 0.06$  in 2014 and may influence climate more than expected.

For further references: <https://doi.org/10.3390/atmos13111774>

### THE SOUTH ASIAN MONSOON MAINTAINS THE DISJUNCTION OF *RUMEX HASTATUS* BETWEEN THE WESTERN HIMALAYAS AND THE HENGDUAN MOUNTAINS, SOUTHWEST CHINA

Eric Martiné, Dirk Zeuss, Christian Lampei, Hang Sun, Georg Miehe, and Lars Opgenoorth

*Nordic Journal of Botany* 40: e03706

The Himalayas and the Hengduan Mountains of southwest China are hotspots of both climatic and species diversity. Yet, the distribution patterns of semi-arid plant communities that have arisen throughout the region's complex uplift history remain insufficiently understood. In particular, the striking disjunctions of plants associated with dry river valleys that solely occur on the eastern and western ends of the Himalayan arc, but are absent in between, lack a sound explanation. Here we aim to disentangle the more recent environmental drivers behind the disjunction of the semi-woody shrub *Rumex hastatus* found in dry river valleys of the western Himalayas and the Hengduan Mountains. We used ecological niche modeling and enhanced random forest parameterizations (down sampling) to infer suitable and unsuitable habitats within the study area during the last glacial maximum, under present climate conditions, and under four future climate scenarios. Annual and seasonal precipitation contributed the strongest to the discrimination between occurrences and the distribution gap, with the latter showing much higher rainfall amounts. The gap was also characterized by low overall habitat suitability, whereas occurrence probabilities in dry river valleys inhabited by *R. hastatus* were very high. However, some suitable but isolated habitats within the gap were detected in Bhutan and the south-eastern Tibetan Plateau. The identified distribution gap was consistent in all simulated scenarios from the last glacial maximum to the near future. Our results suggest that the South Asian summer monsoon system acts as a persistent ecological barrier maintaining the disjunction distribution of dry river valley-dwelling plants in the western Himalayas and the Hengduan Mountains.

For further reading: <https://doi.org/10.1111/njb.03706>

## THE SEASONAL AND DIURNAL VARIATION CHARACTERISTICS OF SOIL MOISTURE AT DIFFERENT DEPTHS FROM OBSERVATIONAL SITES OVER THE TIBETAN PLATEAU

Hongyi Li, Ziniu Xiao, Junhong Wei, and Ge Wang

*Remote Sensing*: 14:5010

Using observational data of soil moisture from the third Tibetan Plateau Experiment for atmospheric science (TIPEX III), the seasonal and diurnal variations characteristics of soil moisture at different depths of 5–160 cm from seven stations were analyzed, with emphasis on the comparative analysis of the differences of soil moisture between different sites and the differences of the synergistic relationship between soil moisture and temperature. The soil moisture was wet in the southeast and dry in the northwest. The studied sites were Lhari, Biru, Nyainrong, Amdo, Nagqu, Baingoin and Seng-ge Kambab in descending order, according to the soil moisture. The seasonal variation of soil moisture at the different sites showed a significant three-peak structure, which was more obvious in the shallow layer than in the deep layer. The first peak occurred from March to May, which was mainly due to the soil thawing in spring. The other two peaks corresponded to the two rainy seasons in the plateau. Soil moisture was the greatest during this rainy period. The diurnal variations of soil moisture and temperature in Amdo, Nagqu, Nyainrong and Baingoin showed a significant positive correlation in the four seasons. The soil moisture and temperature in Lhari and Biru were significantly positively correlated in winter and spring but negatively correlated in summer and autumn. The profiles of the soil moisture with depth varied greatly at different stations in different seasons. The distribution of soil water content at each observational site did not increase or decrease with depth but showed a certain high aquifer, which might be related to the types of the underlying surface and physical properties of soil. During the summer monsoon period, soil moisture in the shallow layer of 5–10 cm was higher at all observational sites. The spatial distribution of soil moisture in the plateau was more heterogeneous than that in the plain area, and only in the central part of the Tibetan Plateau, the soil moisture varied greatly from site to site. This also indicated that it was unreasonable to only use the soil moisture of several stations to represent the overall soil moisture of the region. The results provided a multi-angle observational basis for the validation of satellite data and parameterization of the numerical model of soil moisture over the Tibetan Plateau.

For further reading: <https://doi.org/10.3390/rs14195010>

## STRENGTHENING PROTECTED AREAS FOR CLIMATE REFUGIA ON THE TIBETAN PLATEAU, CHINA

Ting Hua, Wenwu Zhao, Francesco Cherubini, Xiangping Hu, and Paulo Pereira

*Biological Conservation* 275: 109781

Protected areas (PAs) are at the forefront of efforts to conserve and restore biodiversity, while climate change can risk compromising the ecological benefits of PAs. Therefore, targeting conservation and adaptation efforts necessitate a well-understand of the relationship between PAs and climate refugia, defined as the regions can buffer the impact of climate change. Recent attempts to identify climate refugia were primarily based on terrain-mediated features or climatic velocity, ignoring the ecosystem's internal processes. This work identified climate refugia on the Tibetan Plateau (TP), an amplifier of drastic global climate warming, based on environmental diversity, phenology stability and climatic velocity, highlighting the capacity to cope with extreme weather events, synchronization with plant growth cycles and future climate adaptation, respectively. The results show the distribution of climate refugia using different environmental diversity indicators (e.g., vegetation and topography) vary slightly but differs substantially from the priorities using phenology stability and climatic velocity. For instance, the high distribution probability of climate refugia derived from environmental diversity and climatic velocity is

mainly concentrated at low (<3000 m) or high elevations (>6000 m), while the one using phenology stability is mainly observed at 3000m–3800 m. The inconsistent distribution of different types of refugia weakens the potential of functional complementarity. The existing nature reserves, the primary type of PAs in China, have critical conservation gaps in different types of climate refugia, indicating the urgency of incorporating climate refugia into PAs conservation planning on TP. Our work could help inform local conservation policies and improve the effectiveness of PAs.

For further reading: <https://doi.org/10.1016/j.biocon.2022.109781>

## **Bhutan-Himalaya**

### **SUBSISTENCE FARMERS' UNDERSTANDING OF THE EFFECTS OF INDIRECT IMPACTS OF HUMAN WILDLIFE CONFLICT ON THEIR PSYCHOSOCIAL WELL-BEING IN BHUTAN**

Yeshey, Rebecca M. Ford, Rodney J. Keenan, and Craig R. Nitschke

*Sustainability* 14: 14050

Indirect impacts of Human Wildlife Conflict (HWC) are largely ignored, poorly understood, and scantily reported in the literature on HWC. Subsistence farmers in the Himalayan kingdom of Bhutan experience an increasing intensification of HWC impacts. Working across four districts representing different geographic regions of the country, we explored the perceived indirect impacts of HWC and how they affect the well-being and happiness of subsistence farmers using qualitative interviews (n = 48) and focus group discussions (n = 8). We conducted a qualitative thematic analysis. Based on respondent's explanations, we coded the data according to effect of indirect impacts on human, social, financial, physical, natural, and psychological capitals. Mental distress, constant worries about food insecurity, fears for physical safety, frustration of movement restriction due to fear of being attack by wildlife, feelings of economic insecurity and anger over loss of crop and livestock due to wild predators affect the psychological health and well-being of research participants. Vulnerabilities related to gender and wealth status further deepen the effect of indirect impacts. Policies designed to address HWC should incorporate an understanding of the effects of indirect impacts of HWC and should focus on female-headed and poor households to reduce the negative effects of wildlife impacts.

For further reading: <https://doi.org/10.3390/su142114050>

## **Pakistan-Himalaya**

### **SOCIO- ECONOMIC FACTORS DETERMINING EXTRACTION OF NON-TIMBER FOREST PRODUCTS IN THE JAMMU REGION OF JAMMU AND KASHMIR**

Y.S. Bagal, Rakesh Nanda, L.K. Sharma, N.S. Raina, and S.E.H. Rizvi

*Indian Journal of Ecology* 49: 1879-1884

Non-timber forest products (NTFPs) from natural forests provide significant benefits to forest dwellers. This study was conducted in the Jammu Region of Jammu and Kashmir, India assuming that the extraction of NTFPs by forest dwellers is related to income, age, type of family, education, land holding occupation and distance from the forest. The 150 NTFP collectors and 150 non-collectors from three forest divisions of Jammu region were interviewed.

There was significant difference between the NTFP collectors and non- collectors in case of socio-personal variables of age, farming experience, type of house, number of MGNERGA card holders, type of ration card, formal education, literacy rate and sex ratio. The binary regression model was used to identify factors that affect the participation of households in collection of NTFPs. Independent variables, age of respondent, education of respondent, type of house, occupation, and irrigated land holding negatively and significantly affected the dependent variable. The extension contact, source of information, off farm income, literacy index and family size positively and significantly affected the NTFP extraction.

For further reading: <https://doi.org/10.55362/IJE/2022/3750>