

Headlines Himalaya

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Editorial Team: Prabhat Adhikari and Rejina Khanal

For the 583-584th issues of Headlines Himalaya, we reviewed journal articles from five sources and selected 10 happenings from five countries. We selected two happenings from Nepal and eight happenings from other Himalayan countries (India, China, Bhutan and Pakistan). The overall coverage of this issue is Biodiversity, wildlife, water, biodiversity, climate change, agriculture and environment.

Headlines Himalaya, a weekly research based information 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!

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Nepal-Himalaya

LIVESTOCK DEPREDATION BY LEOPARDS AROUND CHITWAN NATIONAL PARK, NEPAL

Rajendra Dhungana, Babu Ram Lamichhane, Tommaso Savini, Maheshwar Dhakal, Buddi Sagar Poudel, and Jhamak Bahadur Karki

Mammalian Biology 96 (2019): 7-13

Leopards are known to prey on livestock throughout their range. Depredation of livestock makes leopards vulnerable to retaliatory killings and reduces public support for conservation. We examined spatiotemporal patterns, correlates, as well as economic losses and compensation paid for livestock depredation by leopards in buffer zone of Chitwan National Park, Nepal during 2007–2016. Records of compensation applications filed by livestock owners with the park and buffer zone authorities were collected and then triangulated through a questionnaire survey (n = 123). Of the 424 livestock that were reportedly killed by leopards, goats were disproportionately represented (87.3%), 20% more than expected from their relative livestock population, followed by pigs (8.7%) and cattle (4%). A conflict map prepared depicted "depredation hotspots" and clustering of incidents in certain parts of the area. There was a general decrease in livestock killings during the ten-year period. The killings varied significantly among years and months, but not among seasons. None of the examined factors namely, human population (abundance), livestock population (abundance), forest area in buffer zone, national park boundary (defined as the length of buffer zone user committee border abutting the park), livestock depredation by tigers, rainfall, and temperature were correlated with livestock depredation. Depredation by leopards resulted in a total economic loss of US\$ 24,621 (\$2462 per year) and compensation amounted to a total payment of US\$ 19,719 (\$1972 per year). We suggest improved husbandry practices, promotion of livestock insurance scheme, and conservation education for vulnerable communities in buffer zone.

For further reading: <https://doi.org/10.1016/j.mambio.2019.03.006>

TOURISM AND SACRED LANDSCAPE IN SAGARMATHA (MT. EVEREST) NATIONAL PARK, NEPAL

Yang Mu, Sanjay K. Nepal, and Po-Hsin Lai

Tourism Geographies 21 (2019): 442-459

While tensions between the sacred and the profane in tourism have been of long standing interest to tourism scholars, there is a dearth of literature on the growing influence of tourism on local residents' spirituality and religious practices in sacred landscapes. This paper examines how local residents' interpretations of sacred landscapes are influenced by tourism development, and whether tourism plays a role in influencing and reproducing sacred landscape and place-based spiritual values. This exploratory study is based on four months of fieldwork conducted in 2014 and 2015 in Sagarmatha (Mt. Everest) National Park in Nepal's Khumbu Region. Results of the 33 interviews conducted with ethnic *Sherpa* community indicate the Sherpa consider their homeland as a *beyul* (sacred, hidden valley), and its landscapes (i.e. mountains, forests and lakes) as the abode of local deities. Tourism's influence on local spiritual values is evident and reflected in changes in mountain deity worship, shift in human-environment relationship, and alterations in religious routines and practices. Although Sherpa still regard Khumbu as a sacred place and are actively involved in maintaining their spiritual values and cultural identity, the religious influence of *beyul* is slowly diminishing as reliance on tourism grows.

For further reading: <https://doi.org/10.1080/14616688.2018.1558454>

India-Himalaya

MAPPING GLACIAL GEOMORPHOLOGY AND LIVELIHOOD RESOURCES IN URGOS WATERSHED, LAHUL AND SPITI DISTRICT, HIMACHAL PRADESH, INDIA

Satya Prakash, Milap Chand Sharma, Shahnawaz, Vijendra Kumar Pandey, Pritam Chand, and Sanjay Deswal

Journal of the Indian Society of Remote Sensing 47 (2019): 1295–1305

The Urgos watershed is situated in the rain shadow zone of the Pir Panjal Range of the Lahul Himalaya, where western disturbances dominate with solid precipitation. Consequently ice, permafrost and snow meltwater is the main source of the Urgos Nala (stream), which supports agriculture and replenishes drinking water sources downstream in the watersheds. The effect of small amount of glacier retreat and changes in seasonal snow cover is critical for the functioning of meltwater and high natural resources dependent mountain communities. Agriculture, vegetation, fodder and pasture land in the watershed are all entirely dependent on meltwater. Therefore, the study aims to make a quantitative and large-scale map of the study area in relation to rural livelihood. Resource mapping (1:5000) and quantitative characterization of Urgos watershed are achieved using high-resolution satellite images, digital elevation models, Total Station mapping, differential Global Positioning System and collection of field evidences. The landform evolution in the watershed is a result of intense glaciofluvial processes in the past as well as present. The geomorphic features mapped in the area reveal multiple glacial advances in the watershed, in the past. This has direct links with climatic fluctuations and its impact on agriculture and allied activities for the sustenance of people. The analysis shows 22.49% area under glacier and only 1.04% area of the entire watershed under agriculture, fodder, and pasture and vegetation land. This 1.04% area of the watershed plays a significant role in the livelihood of the people.

For further reading: <https://doi.org/10.1007/s12524-019-01002-9>

EVALUATION OF GROUNDWATER QUALITY AND ITS SUITABILITY FOR DRINKING AND AGRICULTURAL USE IN DISTRICT KANGRA OF HIMACHAL PRADESH, INDIA

Rahul Dev and Manoj Bali

Journal of the Saudi Society of Agricultural Sciences 18 (2019): 462-468

In the administration of water assets, quality of water is as important as its amount. Disintegration of groundwater quality due to the anthropogenic exercises is expanding at a disturbing rate in many parts of the Himachal Pradesh. Yet the information related to the groundwater quality and other physiochemical parameters is still limited. This report features the analysis of groundwater quality and its suitability for drinking and irrigation purposes in the Kangra region, a southwestern part of Himachal Pradesh located in the foothills of Himalayas. The Kangra district makes up the most developed zone of Himachal with high utilization of pesticides and composts. With a specific end goal to know the quality and appropriateness of groundwater for local and water system in Kangra district, water samples from 17 different locations were collected and tested for various parameters. These samples were analyzed for significant pH, electrical conductivity, total dissolved solids, calcium, magnesium, sodium, potassium, bicarbonate, carbonate, sulfate, chloride, nitrate, fluoride and various other physicochemical parameters. The results of this study will be helpful in designing an effective strategy to utilize the ground water for various purposes such as drinking and agricultural practices in the Himalayan region and other hilly regions including Kangra.

For further reading: <https://doi.org/10.1016/j.jssas.2018.03.002>

China Himalaya

PORCINE EPIDEMIC DIARRHEA: AN EMERGING DISEASE IN TIBETAN PIGS IN TIBET, CHINA

Xing Gao, Lihong Zhang, Xiong Jiang, Khalid Mehmood, Lei Wang, Xiaole Tong, Meng Wang, Hui Zhang, and Jiakui Li

Tropical Animal Health and Production 51 (2019): 491-494

Porcine epidemic diarrhea virus (PEDV) is a devastating cause of diarrhea in pigs worldwide, and has caused enormous economic losses in the pork industry. To date, however, it is still unclear whether Tibetan pigs from the Tibetan Plateau of China are exposed to PED. This study was to investigate the seroprevalence of PED in Tibetan pigs in Tibet, China. A total of 364 serum samples were collected from Tibetan pigs in Nyingchi in 2014 and 2015. Each sample was assayed for PED antibodies by commercial enzyme-linked immunosorbent assay (ELISA) kits. Our results showed that the seroprevalence of PED in Tibetan pigs was 39.56% with the further distribution of 26.37% and 52.75% in Nyingchi and Mainling (odds ratio was more commonly affected in Mainling than Nyingchi), respectively. Moreover, the seroprevalence of PED was 65.28%, 35.83%, and 28.57% in juveniles, sub adults, and adults, respectively. The prevalence was found as 40.63% in males and 38.37% in females. The present survey indicated that the infection of PED in Tibetan pigs was widely spread in Tibet, which should arouse public concern of the threat to the health of Tibetan pigs and the development of breeding industry in this unique region of the world.

For further reading: <https://doi.org/10.1007/s11250-018-1707-3>

COMMUNITY-BASED SEASONAL MOVEMENT GRAZING MAINTAINS LOWER GREENHOUSE GAS EMISSION INTENSITY ON QINGHAI-TIBET PLATEAU OF CHINA

Minghao Zhuang, Gongbuzeren, Jian Zhang, and Wenjun Li

Land Use Policy 85 (2019): 155-160

Global livestock husbandry provides ecosystem goods and services but also emits 7.1 Gt CO₂-eq. of greenhouse gases (GHGs) per year. To lower GHG emissions intensity, appropriate production management systems should be identified. Since the 1980s, grassland livestock husbandry in China has transformed gradually from pastoralism into individual household management under the Grassland Household Contract System Policy. However, little is known about how this transition influences GHG emissions. We selected two case study sites representing two different forms of rangeland management systems in Ruoergai county of the Qinghai-Tibet Plateau, viz. 1) household-based all year continuous grazing under the individual use of rangeland with fences demarcating boundaries; 2) community-based seasonal grazing under the common use of the whole rangeland. The objective was to examine the differences in greenhouse gas emission intensity between the two systems using life cycle assessment (LCA). The results showed that the transition from community-based seasonal grazing into household-based continuous grazing increased the GHG emissions intensity from -0.62 kgCO₂-eq/kg meat to 10.51 kgCO₂-eq/kg meat. The increase was primarily attributed to changes in soil carbon storage. Findings suggest that to minimize GHG emissions and environmental degradation, community-based seasonal grazing in the pastoral area of Qinghai-Tibet Plateau should be maintained. Enhancing soil carbon sequestration by adopting appropriate practices would further reduce the GHG emissions intensity arising from the livestock system.

For further reading: <https://doi.org/10.1016/j.landusepol.2019.03.032>

THE RELATIONSHIPS BETWEEN PLANT DIVERSITY, PLANT COVER, PLANT BIOMASS AND SOIL FERTILITY VARY WITH GRASSLAND TYPE ON QINGHAI-TIBETAN PLATEAU

Moses Fayiah, Shikui Dong, Yu Li, Yudan Xu, Xiaoxia Gao, Shuai Li, Hao Shen, Jiannan Xiao, Yunfeng Yang, and Kelly Wessell

Agriculture, Ecosystems and Environment 286 (2019): 106659

Biodiversity studies of grassland communities on Qinghai-Tibetan Plateau (QTP) produced dynamic results due mainly to environmental factors and anthropogenic activities. This study was designed to compare the plant diversity, plant biomass, plant total cover across different types of grasslands on the QTP. The various

relationships between plant diversity indices such as Shannon-Weiner, Simpson, Evenness, and plant biomass, plant cover and soil elements were examined through correlation analysis. Further investigation was performed to examine the plant soil fertility-plant biomass and plant cover-plant biomass relationship using simple linear regression. We found a weak positive relationship between Evenness index and plant biomass, while a positive relationship was detected between plant cover and plant biomass. We suggested that grassland types and grazing affected the plant diversity-biomass-cover relationships on the QTP. Soil nitrogen (N), carbon (C), phosphorus (P) and Magnesium (Mg) were positively correlated with plant biomass, suggesting that soil nutrients rather than plant diversity played critical roles in regulating plant biomass accumulation in alpine grasslands. For a comprehensive understanding of the interconnections between plant diversity, plant cover, soil fertility and plant biomass, more studies should be done to probe into these relations and hence make a decision along this path.

For further reading: <https://doi.org/10.1016/j.agee.2019.106659>

Bhutan-Himalaya

INFORMATION LEVERAGE: THE ADOPTION OF CLEAN COOKING FUEL IN BHUTAN

Ngawang Dendup and Toshi H. Arimura

Energy Policy 125 (2019): 181-195

The outcome of household choice depends on the private information available to an agent, particularly in terms of costs and benefits. This study examines the role of information in the adoption of clean cooking fuel in Bhutan. We use a rural subsample of nationally representative data from the 2012 Bhutan Living Standard Survey (BLSS) conducted in all twenty districts. We estimate a bivariate probit model to control for the potentially endogenous information variable. The results indicate that households that have access to information are approximately 39% more likely to adopt clean cooking fuel. Similarly, households are 49% less likely to adopt dirty fuel (firewood) when exposed to information. Other factors such as education, the electricity supply, access to liquidity and the distance to the market are important factors that contribute to adopting clean cooking fuel. The results also show that the effect of information varies depending on the level of education of the household heads, thus highlighting the importance of accounting for the level of education of information recipients when designing a similar information provision.

For further reading: <https://doi.org/10.1016/j.enpol.2018.10.054>

WASTEWATER MANAGEMENT IN URBAN BHUTAN: ASSESSING THE CURRENT PRACTICES AND CHALLENGES

Ugyen Dorji, Ugyen M. Tenzin, Pema Dorji, Ugyen Wangchuk, Gem Tshering, Cheki Dorgi, Hokyong Shon, Kwabena Binitwum Nyarko, and Sherub Phuntsho

Process Safety and Environmental Protection 132 (2019): 82-93

This study reviews the current wastewater management practices and their challenges in urban Bhutan. The study data was collected from the local authorities of 35 classified towns, and the field survey was conducted for the two representative towns of Thimphu City and Khuruthang town. The study observed that only eight of the 35 classified towns (22.8%) have public sewerage systems, with an average coverage of 19.7% of Bhutan's total urban population, or 7.4% of Bhutan's entire population. The imported modular wastewater treatment technology was significantly more expensive than alternative options; however, approximately six towns have already adopted this technology, due to a lack of space for much cheaper waste stabilisation ponds. Currently, over 80% of Bhutan's

urban population depends on the on-site sanitation system for their domestic wastewater disposal; however, over 40% of these properties lacked a soak-pit system for the safe disposal of septic tank effluent. Therefore, this study indicates that urban settlements in Bhutan are potentially subjected to overflow of significant amount of hazardous septic tank effluents directly into the environment posing significant risk to public and the environment. A critical urban plot space analysis indicates that the current system of on-site sanitation is inadequate and unsuitable for the current urban settings. Since it is impractical for the government to provide public sewerage system to all the towns, a low-cost public sewerage system, or an alternative and improved on-site treatment system, needs to be explored and promoted to achieve long-term environmental objectives.

For further reading: <https://doi.org/10.1016/j.psep.2019.09.023>

Pakistan- Himalaya

ASSESSMENT OF TRACE ELEMENTS IN URBAN TOPSOILS OF RAWALPINDI-PAKISTAN: A PRINCIPAL COMPONENT ANALYSIS APPROACH

Muhammad Tahir Shehzad, Ghulam Murtaza, Muhammad Shafeeque, Muhammad Sabir, Haq Nawaz, and Muhammad Jamal Khan

Environmental Monitoring and Assessment 191 (2019): 65

Assessment of trace elements is inevitable to reduce stress on environment due to urbanization and industrialization. Rawalpindi, the fourth largest city of Pakistan, rapidly moving towards industrialization and has a large number of automobiles. In the present study, the urban area of Rawalpindi was divided into five parts: Gawal Mandi, Pir Wadhai, Soan Adda, Chah Sultan, and Central Ordinance Depot (COD), to determine distribution of trace elements. Soil samples were collected from 5 to 20 cm depth. After drying and sieving, samples were digested using di-acid (HNO_3 and HClO_4 at 2:1). Concentrations of heavy metals were determined using atomic absorption spectrophotometer (AAS). Principal component analysis (PCA) was performed to reduce multidimensional space of variables and samples. Observed mean concentrations of Cd, Co, Cr, Cu, Mn, Ni, Pb, and Zn were 164, 33.4, 295, 336, 634, 236, 1572, and 546 mg kg^{-1} , respectively. Mean concentrations of all the heavy metals in urban area soil were higher than the WHO permissible limits. Correlation coefficient analysis showed positive correlation among Cd, Co, Cu, Ni, and Pb, whereas no obvious correlation for Cr and Mn was found with any other heavy metal. Zn was positively correlated with Co, Ni, and Mn, whereas negative correlation was found with Cr. Results showed that Pir Wadhai and COD were the most and least contaminated parts of the city, respectively, and this is attributed to the presence and absence of heavy traffic loads and industrial effluents.

For further reading: <https://doi.org/10.1007/s10661-019-7212-y>