

Headlines Himalaya

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Editorial Team: Puspa Aryal and Uma Dhungel

For the 679th-680th issues of Headlines Himalaya, we reviewed researches from three sources and selected 10 researches from three countries. We selected three researches from Nepal and seven researches from other Himalayan countries (China and Pakistan).

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**SEX-SPECIFIC HABITAT SUITABILITY MODELING FOR *PANTHERA TIGRIS* IN CHITWAN NATIONAL PARK, NEPAL:
BROADER CONSERVATION IMPLICATIONS**

Li An, Eve Bohnett, Curtis Battle, Jie Dai, Rebecca Lewison, Piotr Jankowski, Neil Carter, Dirgha Ghimire, Maheshwar Dhakal, Jhamak Karki, and Alex Zvoleff

Sustainability 13: 13885

Although research on wildlife species across taxa has shown that males and females may differentially select habitat, sex-specific habitat suitability models for endangered species are uncommon. We developed sex-specific models for Bengal tigers (*Panthera tigris*) based on camera trapping data collected from 20 January to 22 March 2010 within Chitwan National Park, Nepal, and its buffer zone. We compared these to a sex-indiscriminate habitat suitability model to assess the benefits of a sex-specific approach to habitat suitability modeling. Our sex-specific models produced more informative and detailed habitat suitability maps and highlighted vital differences in the spatial distribution of suitable habitats for males and females, specific associations with different vegetation types, and habitat use near human settlements. Improving and refining habitat models for this and other critically endangered species provides the necessary information to meet established conservation goals and population recovery targets.

Further reading: <https://doi.org/10.3390/su132413885>

**INVASIVE WATER HYACINTH LIMITS GLOBALLY THREATENED WATERBIRD ABUNDANCE AND DIVERSITY AT LAKE
CLUSTER OF POKHARA VALLEY, NEPAL**

Rajendra Basaula, Hari Prasad Sharma, Jerrold L. Belant, and Kumar Sapkota

Sustainability 13: 13700

Invasive species alter ecosystem structure and functioning, including impacts on native species, habitat alteration, and nutrient cycling. Among the 27 invasive plant species in Nepal, water hyacinth (*Eichhornia crassipes*) distribution is rapidly increasing in Lake Cluster of Pokhara Valley (LCPV) in the last several decades. We studied the effects of water hyacinth on threatened water bird abundance, diversity, and physico-chemical parameters of water in the LCPV. We found areas with water hyacinth present (HP) had reduced threatened water bird abundance relative to areas where water hyacinth was absent (HA; $p = 0.023$). The occurrence of birds according to feeding guilds also varied between water hyacinth presence and absence habitats. Piscivorous birds were more abundant in HA areas than HP areas whereas insectivorous and omnivorous birds had greater abundance in HP areas than in HA areas. Threatened water bird abundance and richness were greater in areas with greater water depth and overall bird abundance but declined in HP areas. Degraded water quality was also identified in HP areas. Our findings can be used as a baseline by lake managers and policy makers to develop strategies to remove or manage water hyacinth in LCPV to improve water bird conservation.

Further reading: <https://doi.org/10.3390/su132413700>

**ESTIMATING AND PREDICTING SNAKEBITE RISK IN THE TERAI REGION OF NEPAL THROUGH A HIGH-RESOLUTION
GEOSPATIAL AND ONE HEALTH APPROACH**

Carlos Ochoa, Marta Pittavino, Sara Babo Martins, Gabriel Alcoba, Isabelle Bolon, Rafael Ruiz de Castañeda, Stéphane Joost, Sanjib Kumar Sharma, François Chappuis, and Nicolas Ray

Scientific Reports 11:23868

Most efforts to understand snakebite burden in Nepal have been localized to relatively small areas and focused on humans through epidemiological studies. We present the outcomes of a geospatial analysis of the factors influencing snakebite risk in humans and animals, based on both a national-scale multi-cluster random survey and, environmental, climatic, and socio-economic gridded data for the Terai region of Nepal. The resulting Integrated Nested Laplace Approximation models highlight the importance of poverty as a fundamental risk-increasing factor, augmenting the snakebite odds in humans by 63.9 times. For animals, the minimum temperature of the coldest month was the most influential covariate, increasing the snakebite odds 23.4 times. Several risk hotspots were identified along the Terai, helping to visualize at multiple administrative levels the estimated population numbers exposed to different probability risk thresholds in 1 year. These analyses and findings could be replicable in other countries and for other diseases.

Further reading: <https://doi.org/10.1038/s41598-021-03301-z>

China Himalaya

UNDERSTANDING CLIMATE HAZARD PATTERNS AND URBAN ADAPTATION MEASURES IN CHINA

Shao Sun, Zunya Wang, Chuanye Hu, and Ge Gao

Sustainability 13: 13886

Climate-related risks pose a great threat to urban safety, infrastructure stability and socioeconomic sustainability. China is a country that crosses diverse geomorphic and climatic regions in the world and is frequently affected by various climate hazards. In this study, we propose a comprehensive analysis on the spatial pattern of major climate hazards in China from 1991 to 2020, including rainstorms, droughts, heatwaves, coldwaves, typhoons, and snowstorms, and generate an integrated sketch map on multi-hazard zones. It is detectable that South of the Yangtze River is in danger of heatwaves, rainstorms, and typhoons, while the North China Plain is more likely to suffer droughts. Coldwaves, snowstorms, and freezing mainly affect Northeast China, Northwest China, and the Qinghai–Tibet Plateau. In the view of climate governance, cities are hotspots affected by intensified climate hazards in a warmer climate. There is an urgent need to incorporate a climate adaptation strategy into future city construction, so as to improve social resilience and mitigate climate impacts in rapid urbanization process. Specific adaptation measures have been developed from the perspectives of land-use planning, prevention standard, risk assessment, and emergency response to facilitate the understanding of climate resilience and urban sustainability.

Further reading: <https://doi.org/10.3390/su132413886>

SPATIOTEMPORAL VARIATIONS OF AGRICULTURAL WATER FOOTPRINT AND ITS ECONOMIC BENEFITS IN XINJIANG, NORTHWESTERN CHINA

Yinbo Li and Mingjiang Deng

Scientific Reports 11: 23864

Agriculture is the largest water user and is the main driving force behind water stress in Xinjiang, northwestern China. In this study, the water footprint (WF) (blue, green and gray WF) of main crop production and their temporal and spatial characteristics in Xinjiang were estimated in 2006, 2010, 2014 and 2018. The blue water footprint deficit (BWF_d) was conducted and food productivity and economic benefits of WF were also analyzed via the water consumption per output value (food productivity and economic benefits). The results reveal that the WF

increased from 22.75 to 44.16 billion m³ during 2006–2018 in Xinjiang, of which cotton, corn and wheat are main contributors of WF. In terms of different regions, corn has the largest WF in north Xinjiang and cotton has the largest WF in south and east Xinjiang. The BWF_d broadened from – 11.51 to + 13.26 billion m³ in Xinjiang with the largest increased BWF_d in Kashgar (from – 3.35 to 1.40 billion m³) and Aksu (from – 2.92 to 2.23 billion m³) of south Xinjiang and in Shihezi (from – 0.11 to 2.90 billion m³) of north Xinjiang. In addition, the water footprint food productivity does not well correspond with the water footprint economic benefits in prefectures of Xinjiang. It means we should consider the food yields priority and economic benefits priority to formulate a scientific and effective supervisor mode to realize the sustainable management of agricultural water in prefectures of Xinjiang.

Further reading: <https://doi.org/10.1038/s41598-021-03240-9>

MIGRATORY WILD BIRDS CARRYING MULTIDRUG-RESISTANT *ESCHERICHIA COLI* AS POTENTIAL TRANSMITTERS OF ANTIMICROBIAL RESISTANCE IN CHINA

Yue Yuan, Bing Liang, Bo-wen Jiang, Ling-wei Zhu, Tie-cheng Wang, Yuan-guo Li, Jun Liu, Xue-jun Guo, Xue Ji, and Yang Sun

PLoS ONE 16: e0261444

Migratory birds play an important role in the spread of multidrug-resistant (MDR) bacteria. To investigate the prevalence of MDR *Escherichia coli* in migratory birds in China and potential relationships with the environment, a total of 1387 samples (fecal samples, cloacal swabs, or throat swabs) were collected from migratory birds from three different river basins in China. The collected samples were processed and subjected to bacteriological examinations. Antimicrobial susceptibility testing of the recovered isolates was performed using the E-test for the detection of minimum inhibitory concentrations (MICs). Some antibiotic resistance genes were detected and the PCR products were confirmed by sequencing. In total, 478 (34.7%) *E. coli* isolates were recovered. The results showed that the drug-resistant *E. coli* isolates were highly resistant to β-lactams (43.7%) and tetracycline (22.6%), and 73 (15.3%) were MDR, including eight that were extended spectrum β-lactamase-positive. The retrieved strains harbored the *bla*_{CTX-M}, *bla*_{TEM-1}, *tet(A)*, *tet(B)*, *tet(M)*, *sul1*, *sul2*, *sul3*, *cmIA*, *floR*, and *intI1* genes with a prevalence of 5.9%, 36.4%, 80.5%, 11.9%, 6.8%, 6.8%, 47.5%, 12.7%, 50.8%, 37.3%, and 61.0%, respectively. The drug resistance rate of the isolates from southern China was higher than those from northern China. The *E. coli* samples collected for migratory birds in the Pearl River Basin had the highest proportion (46.7%) MDR isolates. Furthermore, MDR bacteria carried by migratory birds were closely related to the antibiotic content in the basin, which confirms that MDR bacteria carried by migratory birds are likely acquired from the environment. This study also confirmed that migratory birds are potential transmitters of MDR bacteria, demonstrating the need to reduce the use and emission of antibiotics and further in-depth studies on the mechanisms underlying drug resistance of bacteria.

Further reading: <https://doi.org/10.1371/journal.pone.0261444>

SOIL BACTERIAL COMMUNITY SHIFTS ARE DRIVEN BY SOIL NUTRIENT AVAILABILITY ALONG A TEAK PLANTATION CHRONOSEQUENCE IN TROPICAL FORESTS IN CHINA

Zhi Yu, Kunnan Liang, Guihua Huang, Xianbang Wang, Mingping Lin, Yinglong Chen, and Zaizhi Zhou

Biology 10: 1329

Soil bacterial communities play crucial roles in ecosystem functions and biogeochemical cycles of fundamental elements and are sensitive to environmental changes. However, the response of soil bacterial communities to

chronosequence in tropical ecosystems is still poorly understood. This study characterized the structures and co-occurrence patterns of soil bacterial communities in rhizosphere and bulk soils along a chronosequence of teak plantations and adjacent native grassland as control. Stand ages significantly shifted the structure of soil bacterial communities but had no significant impact on bacterial community diversity. Bacterial community diversity in bulk soils was significantly higher than that in rhizosphere soils. The number of nodes and edges in the bacterial co-occurrence network first increased and then decreased with the chronosequence. The number of strongly positive correlations per network was much higher than negative correlations. Available potassium, total potassium, and available phosphorus were significant factors influencing the structure of the bacterial community in bulk soils. In contrast, urease, total potassium, pH, and total phosphorus were significant factors affecting the structure of the bacterial community in the rhizosphere soils. These results indicate that available nutrients in the soil are the main drivers regulating soil bacterial community variation along a teak plantation chronosequence.

Further reading: <https://doi.org/10.3390/biology10121329>

Pakistan- Himalaya

INTEGRATED UNDERGROUND MINING HAZARD ASSESSMENT, MANAGEMENT, ENVIRONMENTAL MONITORING, AND POLICY CONTROL IN PAKISTAN

Hammad Tariq Janjuhah, Muhammad Ishfaq, Muhammad Ifzal Mehmood, George Kontakiotis, Syed Muzyan Shahzad, and Stergios D. Zarkogiannis

Sustainability 13: 13505

This study focused on the significance of underground mining in Pakistan, resulting in the employment of operational staff to undertake the primary tasks of this sector, such as explosions, rock excavation, mineral research, mining-supporting walls, and mine compactivity. Occupational accidents and illnesses arise due to the activities mentioned above because the working circumstances are not optimal. The decision-matrix risk-assessment (DMRA) approach, in which incidents are evaluated according to their severity and probability, was also utilized to improve working conditions, including public health and environment protection. To assess the risks and to select which actions should continue in the same manner, we highlighted hazards that need control measures and, as the last option, those that must be stopped. By taking into account the results of the study, corrective actions were proposed that can help avoid the occurrence of the presented accidents through applying occupational safety and health regulations issued by the Department of Minerals and Mines, which is a governmental entity responsible for both the issuing and the compliance to those regulations. The current study also outlined the requirements that must be reported under mining-related laws.

Further reading: <https://doi.org/10.3390/su132413505>

PATTERNS OF LIVESTOCK DEPREDATION AND HUMAN–WILDLIFE CONFLICT IN MISGAR VALLEY OF HUNZA, PAKISTAN

Rubina Bano, Akbar Khan, Tahir Mehmood, Saeed Abbas, Muhammad Zafar Khan, Arshad Ali Shedayi, Sher Zaman, and Muhammad Ali Nawaz

Scientific Reports 11: 23516

Throughout the world, livestock predation by mammalian carnivores causes significant economic losses to poor farmers, and leads to human–wildlife conflicts. These conflicts result in a negative attitude towards carnivore conservation and often trigger retaliatory killing. In northern Pakistan, we investigated livestock depredation by large carnivores between 2014 and 2019, and subsequent Human–wildlife conflict, through questionnaire-based surveys (n = 100 households). We used a semi-structured questionnaire to collect data on livestock population, depredation patterns, predation count, and conservation approaches. We found a statistically significant increasing pattern of predation with influential factors such as age, gender, occupation, education of respondents, population of predators, threats index for predators and conservation efforts. Some 310 livestock heads with an average of 51 animals per year out of the total 9273 heads were killed by predators, and among them 168 (54%) were attributed to the wolf and 142 (45.8%) to snow leopard. Major threats to carnivores in the area included retaliatory killing, habitat destruction and climate change. Incentivization against depredation losses, guarded grazing and construction of predator-proof corral may reduce Human–wildlife conflict and both livelihood and predator can be safeguarded in the study area.

Further reading: <https://doi.org/10.1038/s41598-021-02205-2>

IDENTIFICATION OF CLIMATE INDUCED OPTIMAL RICE YIELD AND VULNERABLE DISTRICTS RANKINGS OF THE PUNJAB, PAKISTAN

Azhar Ali Janjua, Muhammad Aslam, Naheed Sultana, and Zia Batool

Scientific Reports 11: 23393

The study attracted to insinuate the inhabitant anomalies of the crop yield in the districts of the Punjab where climate variation, inputs utilization, and district exponents are indispensable factors. Impact evaluation of sowing and harvesting dates for rice yield has been analyzed. Suitable sowing and harvesting dates and potential districts for the crop are proposed. Data consisting of 13,617 observations of more than 90 factors encompassing valuable dimensions of the growth of the crops collected through comprehensive surveys conducted by the Agriculture Department of Punjab are formulated to incorporate in this study. The results establish the significant negative repercussions of climate variability while the impacts vary in the districts. The crop yield deteriorates considerably by delaying the sowing and harvesting times. Districts climate-induced vulnerability ranking revealed Layyah, Jhelum, Mianwali, Khanewal and Chinniot, the most vulnerable while Kasur, Gujrat, MandiBhaudhin, Nankana Sahib and Hafizabad, the least vulnerable districts. Spatial mapping explains the geographical pattern of vulnerabilities and yield/monetary losses. The study ranks districts using climate-induced yield and monetary loss (222.30 thousand metric tons of rice which are equal to 27.79 billion PKR climatic losses in single rice season) and recommends: the formation of district policy to abate the adverse climate impact, utilization of suitable climate variation by adhering proper sowing and harvesting times, setting the prioritized districts facing climate-induced losses for urgent attention and preferable districts for rice crop.

Further reading: <https://doi.org/10.1038/s41598-021-02691-4>

Highlight of the Issue

End of New day Darwin

Last week of 2021 (Dec 26, 2021) was saddened by the death of Edward Osborne Wilson (born in June 10, 1929), who was renowned insect expert, a true biologist, a naturalist and great writer. Wilson started his pioneer work on

insect and called as "Ant man" and later on he shifted his interest toward biodiversity and human nature. He is the one who introduced the theory of "Island Biogeography". Wilson has been called as "the father of sociobiology" and "the father of biodiversity". He wrote 32 books and thousands of important articles and won two Pulitzer Prizes. He was also listed in "25 impressive American" by Times Magazine and won more than 150 prizes. Wilson was also called as "21st century Darwin" as he is more into the pathway of Darwin. We would like to thank E.O. Wilson for his great contribution in science.

<https://www.nytimes.com/2021/12/27/science/eo-wilson-dead.html>

[https://en.wikipedia.org/wiki/E. O. Wilson](https://en.wikipedia.org/wiki/E._O._Wilson)