

Headlines Himalaya

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Editorial Team: Prabhat Adhikari and Rejina Khanal

For the 581-582th issues of Headlines Himalaya, we reviewed journal articles from three sources and selected eight happenings from five countries. We selected four happenings from Nepal and four happenings from other Himalayan countries (India, China, Bhutan and Pakistan). The overall coverage of this issue is Biodiversity, wildlife, water management, 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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MANAGING HUMAN-TIGER CONFLICT: LESSONS FROM BARDIA AND CHITWAN NATIONAL PARKS, NEPAL

Babu Ram Bhattarai, Wendy Wright, Damian Morgan, Simon Cook, and Hem Sagar Baral

European Journal of Wildlife Research 65 (2019): 34

Successful conservation outcomes for the tiger (*Panthera tigris*) have been achieved in Nepalese protected areas. However, an unwelcome consequence of greater tiger numbers is the increased prevalence of human-tiger conflict (HTC), particularly in buffer zone areas adjacent to key tiger reserves, which are heavily utilised by farming communities. HTC events may manifest as attacks by tigers on livestock or people, or as people harming tigers. Since 1994, 12 and 99 fatal tiger attacks on people were reported in and near Bardia and Chitwan National Parks, respectively; and since 1979, 34 tigers from these Parks have been killed due to HTC. HTC presents major threats to local people and to the continuing success of tiger conservation programmes. Conservation authorities in Nepal are implementing innovative solutions to prevent and mitigate HTC. These include financial compensation for damage caused by tigers and locally based community projects and programmes focussed on changing livestock husbandry practises, raising awareness of tiger ecology among local residents and supporting families to reduce their reliance on park resources. While these approaches have been successful in mitigating HTC and its effects in Nepal, further developments and refinements are required. This paper provides a synthesis of published and unpublished reports of HTC, in order to demonstrate the magnitude of the problem faced in Nepal. A critical summary of current management practises adopted in two of Nepal's key tiger reserves is intended to provide a tool for managers to target their efforts towards methods likely to achieve success.

For further reading: <https://doi.org/10.1007/s10344-019-1270-x>

CLIMATE CHANGE AMPLIFIES PLANT INVASION HOTSPOTS IN NEPAL

Uttam Babu Shrestha and Bharat Babu Shrestha

Diversity and Distributions 25 (2019): 1599–1612

Climate change has increased the risk of biological invasions, particularly by increasing the climatically suitable regions for invasive alien species. The distribution of many native and invasive species has been predicted to change under future climate. We performed species distribution modelling of invasive alien plants (IAPs) to identify hotspots under current and future climate scenarios in Nepal, a country ranked among the most vulnerable countries to biological invasions and climate change in the world. We predicted climatically suitable niches of 24 out of the total 26 reported IAPs in Nepal under current and future climate (2050 for RCP 6.0) using an ensemble of species distribution models. We also conducted hotspot analysis to highlight the geographic hotspots for IAPs in different climatic zones, land cover, ecoregions, physiography and federal states. Under future climate, climatically suitable regions for 75% of IAPs will expand in contrast to a contraction of the climatically suitable regions for the remaining 25% of the IAPs. A high proportion of the modelled suitable niches of IAPs occurred on agricultural lands followed by forests. In aggregation, both extent and intensity (invasion hotspots) of the climatically suitable regions for IAPs will increase in Nepal under future climate scenarios. The invasion hotspots will expand towards the high-elevation mountainous regions. In these regions, land use is rapidly transforming due to the development of infrastructure and expansion of tourism and trade. Negative impacts on livelihood, biodiversity and ecosystem services, as well as economic loss caused by IAPs in the future, may be amplified if preventive and control measures are not immediately initiated. Therefore, the management of IAPs in Nepal

should account for the vulnerability of climate change-induced biological invasions into new areas, primarily in the mountains.

For further reading: <https://doi.org/10.1111/ddi.12963>

SPATIAL ASSESSMENT OF THE IMPACT OF LAND USE AND LAND COVER CHANGE ON SUPPLY OF ECOSYSTEM SERVICES IN PHEWA WATERSHED, NEPAL

Kiran Paudyal, Himlal Baral, Santosh P. Bhandari, Anil Bhandari, and Rodney J. Keenan

Ecosystem Services 36 (2019): 100895

Community-managed forested landscapes are complex social-ecological systems that supply a variety of ecosystem services (ES) to society. The flow of these services depends on land use and land cover (LULC) changes, ecological factors such as types, pattern and composition of vegetation, as well as anthropogenic factors. ES assessment helps to deal with the complexity of the interrelationships among LULC, ES supply and societal benefits. Using the case of the Phewa watershed, Nepal, this paper presents a quantitative and qualitative assessment of priority ES to understand how the supply of ES and their societal benefits have changed over the past 40 years. LULC changes were analysed using satellite images, ecosystem services were assessed using biophysical data and expressed spatially using ArcGIS. Results reveal a substantial reversal of land degradation and indicate forest recovery over the last 40 years. Dense forests increased by 1471 ha (88%) while sparse forests, grasslands and agricultural lands declined by 26%, 77% and 15%, respectively. These significant changes in LULC had a positive impact on ES due to the conversion of agricultural/grasslands and degraded forests to dense forests. ES varied significantly across the watershed. Dense forests provided relatively higher sediment retention (soil erosion rate decreased from $>30 \text{ ton ha}^{-1} \text{ yr}^{-1}$ to $<15 \text{ ton ha}^{-1} \text{ yr}^{-1}$), carbon stocks (from $<50 \text{ m}^3 \text{ ha}^{-1}$ to $>100 \text{ m}^3 \text{ ha}^{-1}$), habitat provision, and raw materials than other types of land cover, but reduced the water discharge. Increased aesthetic value from the restored landscape provides higher opportunities for recreation and ecotourism. Analysis of benefit-relevant indicators revealed that the perceived societal benefits from most of the ES were significantly lower than the potential supply of ES in the watershed.

For further reading: <https://doi.org/10.1016/j.ecoser.2019.100895>

TRADE AND CONSERVATION OF NEPALESE MEDICINAL PLANTS, FUNGI, AND LICHEN

Dipesh Pyakurel, Carsten Smith-Hall, Indira Bhattarai-Sharma, and Suresh Kumar Ghimire

Economic Botany 73 (2019): 505-521

Trade in Nepalese medicinal plants, fungi, and lichens is huge, yet there is no overview of traded species, impeding the development of targeted and appropriate conservation interventions. This study intends to identify all traded species from Nepal, analyze their distribution patterns, and assess their vulnerability, none of which has been done before. Contemporary data on traded species were obtained from 113 sub-local traders, 105 local traders, and 75 central wholesalers for case year 2014–2015, and historical data from a review of trade-related publications. We recorded 300 species in trade, double that of previous estimates, distributed across 97 families and 197 genera. Most species are concentrated in subtropical and lower temperate regions indicating an economic potential for increased cultivation and domestication at middle altitudes. About 39% of commercial species are formally protected, including through bans on collection and trade of certain species. But this approach does not appear to protect species from commercial harvesting, driven by increasing demand and higher prices. The high-altitude species *Nardostachys jatamansi*, *Rheum australe*, and *Picrorhiza scrophulariiflora* are the most vulnerable traded species, warranting the development of alternative protection mechanisms, e.g., transferring management rights to local communities.

For further reading: <https://doi.org/10.1007/s12231-019-09473-0>

India-Himalaya

THE ENDANGERED GANGES RIVER DOLPHIN HEADS TOWARDS LOCAL EXTINCTION IN THE BARAK RIVER SYSTEM OF ASSAM, INDIA: A PLEA FOR CONSERVATION

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Mammalian Biology 95 (2019): 102-111

The Ganges river dolphin (GRD) is an obligate freshwater cetacean that inhabits the Ganges-Brahmaputra-Meghna (GBM), and Karnaphuli-Sangu river basins of India, Bangladesh and Nepal. The other sub-species, Indus river dolphin, are distributed in the disjunct lower Indus basin of India and Pakistan. The global population and distribution range of the GRD has declined in the recent past, and thus the sub-species has been listed 'Endangered' by IUCN since 1996. In Assam (India), the Ganges sub-species occur in the Barak and the Brahmaputra River systems. The Barak River is a tributary of the Meghna River, and is the upstream distribution range of the sub-species in this branch of the GBM river basin. The dolphin inhabits meanderings and confluences of rivers, with prevalence of eddy counter-current and the resultant high aquatic diversity, including prey fish abundance. In the 1970s–1980s, the cetacean used to be fairly common in the Barak river system. Of late, it has been extirpated from the tributaries of the Barak River, and currently no longer occurs in any part of the main channel as well. However, it continues to occur in the downstream Kushiara River (a distributary of the Barak River) which suggests a decline in the upstream distribution range by approximately 135 km. The major factors which affected the decline and the extirpation of the cetacean from the Barak river system include poaching, by-catches and interactions with fisheries including prey-fish depletion, and habitat destruction and fragmentation due to construction of sluice gates, embankments, siltation of rivers, dredging, extraction of water for irrigation and domestic uses, aquatic pollution, and lack of awareness. Thus, for effective conservation of the dolphin, these threats need to be eliminated or managed. This article provides an exhaustive review of the distribution (past and present), population, ecology, threats and conservation recommendations of the GRD in the Barak river system of Assam, India. Further, the article includes data obtained from the recent surveys conducted by the authors in the Barak river system

For further reading: <https://doi.org/10.1016/j.mambio.2019.03.007>

China Himalaya

FEEDING SOLUTION: CROP-LIVESTOCK INTEGRATION VIA CROP-FORAGE ROTATION IN THE SOUTHERN TIBETAN PLATEAU

Cheng Duan, Peili Shi, Ning Zong, Jingsheng Wang, Minghua Song, and Xianzhou Zhang

Agriculture, Ecosystems and Environment 284 (2019): 106589

Separated, specialized crop and forage production has a long history on the Tibetan Plateau. Such isolated pattern has led to current concerns of intensified agriculture, environmental degradation and forage shortage in the increasing pressures of population and livestock growth. To tackle the predicament of feed shortage, an alternative to specialized agriculture is crop-forage rotation for potential crop-livestock integration (CLI). However, its feasibility is understudied and the potential remains unanswered in the southern Tibetan Plateau. Based on the analyses of grazing pressure index and growing degree days (GDD), we examined the practicability and modes of crop-forage rotation for feed solution in the middle reaches of the Yarlung Tsangpo Watershed (YTW).

Additionally, cultivated land area suitable for forage rotation after crop harvest was defined. Livestock carrying capacity and grazing pressure indices under forage rotation were compared with those only with rangeland and crop residues. We found that the average number of livestock maintained about 9 million standard sheep unit (SU) in the period 2000–2015, which exceeded the carrying capacity provided by rangeland and crop residues. Growing season length are about 200 days ranging from late April to early November, with daily average temperature ≥ 5 °C and over 1500 GDD in the Yarlung Tsangpo River valley. About 158,377 ha, accounting for 74.4% of the cultivated land is suitable for annual forage rotation after crop harvest. The appropriate period for annual forage rotation is ca. 80 days, i.e. from 20th August to 8th November after spring crop harvest and from 1st August to 20th October after winter crop harvest. In addition, the information of GDD also provides elevational thresholds for implementing forage rotation practice in the future. The upper limits for forage rotation are 4000 m after spring crop harvest and 4500 m after winter crop harvest. The grazing pressure indices in most counties can be substantially reduced after filling feed gaps through crop-forage rotation. We demonstrate that crop-forage rotation could be a good solution to forage deficits. These findings also provide insights into promising potential for crop-livestock integration to alleviate grazing pressure in the southern Tibetan agricultural area. However, adoption will depend on farmers' preference and market factors. Further efforts are needed to encourage farmers' involvement into the forage rotation by policy guidance.

For further reading: <https://doi.org/10.1016/j.agee.2019.106589>

Bhutan-Himalaya

INTEGRATED WASTE MANAGEMENT IN BHUTAN

Ugyen Tshomo, Chhimi Dorji, and Yogeeta Dahal

Circular Economy: Global Perspective (2020): 67-86

Bhutan is widely renowned for its carbon negative status in the environmental arena. However, owing to its geographical location as a Himalayan country sandwiched between China and India, the influence of globalization from the north and south has drastically increased the rate of urbanization and economic activities in Bhutan over the years. This paper provides an account on waste management, policy, and initiatives taken by government, NGOs, and enterprises in Bhutan. Different streams of wastes are emerging and in particular, municipal solid wastes are serious waste management issues in Bhutan with a shift in consumption patterns and increasing population rate. Apart from the National Environment Commission (NEC) acting as an apex body for regulating and monitoring waste management, similar initiatives have been taken by local governments, other government agencies, private enterprises, and non-governmental organizations (NGO) to create litter-free and healthy environment by implementing 3Es and 4Rs towards circular economy. The concept of circular economy in Bhutan got introduced with the Waste and Climate Change Project (WWC) of NEC and WWF Bhutan. The circular economy concept is the main philosophy of the National Waste Management Strategy (NWMS) which aims to establish waste management as a national priority and provide information, logical steps and strategies required for its successful implementation. The NWMS aims to resolve data gaps, challenges, and issues between agencies regarding waste management. It would also ensure that waste management programs are trickling down to the gross root systems fostering a national waste reduction, reuse, and recycling concept.

For further reading: https://doi.org/10.1007/978-981-15-1052-6_4

SOCIAL NETWORK ANALYSIS OF ARMY PUBLIC SCHOOL SHOOTINGS: NEED FOR A UNIFIED MAN-MADE DISASTER MANAGEMENT IN PAKISTAN

Aisha Azhar, Muhammad Nasir Malik, and Asif Muzaffar

International Journal of Disaster Risk Reduction 34 (2019): 255-264

This study evaluates the effectiveness of inter-organizational collaboration in response to the Army Public School (APS) Shootings that happened on December 16th, 2014 in the city Peshawar, Pakistan. After reviewing the major changes in terrorism related policies and frameworks before and after September 11, 2002, this article applies a social network analysis to compare the disaster response networks enacted in the formal disaster management plans with the actual response networks formed during the APS attacks. Data were gathered from content analysis of the APS Shootings incident, national and international newspapers, situation reports and after-action reports. The timely response to shootings is attributable to the long term planning efforts of law enforcement agencies. However, for improved results, the response and relief efforts should have been coordinated with the national disaster management framework under the National Disaster Management Authority (NDMA) - the lead authority for disaster management in Pakistan.

For further reading: <https://doi.org/10.1016/j.ijdrr.2018.11.024>