The Silent Crises of Wildlife in Changing World

Sundus Iqbal[1], Sidra Abbas[1*], Mazhar Abbas[2], Muhammad Arfan Zaman[3*], Tariq Hussain[4], Tashifa Naheed[1], Faiza Mubeen[1], Marriam Fatima[1] and Ateeb Ali Chishti[1]

[1]Department of Zoology, University of Jhang, Jhang, Pakistan
[2]Department of Biochemistry, College of Veterinary and Animal Sciences, Jhang, Sub-Campus University of Veterinary and Animal Sciences, Lahore, Pakistan
[3]Department of Pathobiology, College of Veterinary and Animal Sciences, Jhang, Sub-Campus University of Veterinary and Animal Sciences, Lahore, Pakistan
[4]Department of Basic Sciences, College of Veterinary and Animal Sciences, Jhang, Sub-Campus University of Veterinary and Animal Sciences, Lahore, Pakistan
*Corresponding author: sidraabbas39@gmail.com; arfan.zaman@uvas.edu.pk

Abstract

Ecosystem plays a key role in sustaining species survival. The earth's ecosystem is changing rapidly due to various anthropogenic activities leading to mass extinction. Habitat loss is one of the major reasons for the decline in wildlife species. About 69% of the world's animal population has decreased in last 48 years. Climate change has cause many problems for the animals but the most important issue that needs to be addressed specially in Pakistan is the change in migratory routes of different birds like cranes. There is an urgent need to conserve the vulture population also. Various sea species like European eel and Antarctic krill are also near extinction because of over hunting and climate change. On the other hand, wildfires are another major threat to organisms which are habituated to particular habitat characteristics as they are predominantly affected by wildfires, particularly those that are extremely sensitive to changes in the ecosystem's properties. In case of Pakistan, it is estimated that 42,000 hectares of forest is being vanished each year. This chapter mainly focuses on the factors that cause reduction in wildlife species and how to conserve them.

Keywords: Ecosystem, Habitat loss, Wildlife decline, Climate change, Over hunting, Specie conservation

Cite this Article as: Iqbal S, Abbas S, Abbas M, Zaman MA, Hussain T, Naheed T, Mubeen F, Fatima M and Chishti AA, 2025. The silent crises of wildlife in changing world. In: Kausar R, Nisa ZU, Jamil M and Bashir I (eds), Integrated Health and Sustainability: Plants, Wildlife, and Genetic Resilience. Unique Scientific Publishers, Faisalabad, Pakistan, pp: 334-338. https://doi.org/10.47278/book.HH/2025.331

A Publication of Unique Scientific Publishers

Chapter No: 25-043

Received: 13-Feb-2025
Revised: 15-Apr-2025
Accepted: 12-May-2025

Introduction

Ecosystems are made up of living things interacting with their nonliving environment (Wang & Zhai, 2019). Many species are in danger of going extinct as a result of human actions like extensive land usage, which is drastically reducing natural habitats. Human well-being is impacted by the disruption of vital ecological services caused by habitat loss. These services include natural diseases and pest control, as well as access to essential resources like clean air and water. Additionally, considering the various values humans set on nature such as its aesthetic, social, religious, economic & scholastic significance, the loss of species and their habitats has a detrimental impact on human quality of life (Carter et al., 2012). Ecosystems are continuously changing as a result of both natural and anthropogenic factors in the world, as evidenced by ecosystem degradation, biodiversity loss, eutrophication, biological invasion, or novel ecosystems (emerging ecosystems, which arise when species occur in a variety and relative abundances that have not previously occurred inside a given biome) and climate change (Stige & Kvile, 2017).

There is a pressing need to restore habitat and ecosystems since habitat destruction and degradation remain the primary causes of animal in all ecosystems. In addition to multifaceted landscape planning (i.e., planning for broadened land use and integrated, connected, and intricate landscape structure), sustainable cultivation and agro- ecological practices (e.g., reduced tilling, utilization of pesticides and reduced pharmacological use etc.) will decrease pollution and habitat loss, improve food security, and aid in the goals of global carbon absorption. The planet lost approximately 69% of its total population of fish, amphibians, reptiles, birds, and mammals in just 48 years, from 1970 to 2018 (Cerda & Webb, 2023). If the effects of human activity on Earth persist, one million more species could go extinct in the ensuing decades (Watson et al., 2019).

1. Environmental Change and Its Drastic Effects

Environmental degradation caused by anthropogenic activities is pushing biodiversity on Earth towards a sixth major extinction catastrophe (Li et al., 2024). It is commonly acknowledged that changes in the morphological environmental, geographical and conservational status of wildlife species are significantly influenced by global climate change. Over 500 terrestrial vertebrate species have gone extinct or are thought to be in danger of being so in the past few decades due to a sharp increase in the rate of species extinction (Cowie

et al., 2022).The ecology and conservation of wildlife are being severely impacted by the growing usage of airspace by human constructions and gadgets (Rebolo-Ifran et al., 2023).

1.1. Disruption of Species' Life Patterns

Since the loss of biodiversity is a worldwide environmental concern, certain species, such as vultures, receive very less attention, particularly in countries with limited resources like Pakistan. Very little research has been done on the decline of Pakistani vultures throughout time. The vulture population in Pakistan is rapidly declining due to a variety of challenges. However, they are unique among animals due to their extraordinary ability to have an exceptionally low stomach pH. This significant decline in the vulture species was discovered as a result of the birds' exposure to diclofenac, which directly causes renal failure (Yasmeen et al., 2021).

Additionally, it was shown that diclofenac was toxic to all Gyps species, including *G.africanus, G.coprotheres, G.fulvus*, and *G.bengalensis*. Since the diclofenac prohibition, Chaudhry et al. (2012) found that vultures' abundance, nest occupancy, and production increased within a year or two. Unfortunately, a thorough investigation and current statistics are still lacking. In addition to the negative impacts of diclofenac, other factors contributing to the vultures' decline include temperature fluctuations, habitat loss, and changes in their dietary patterns (Yasmeen et al., 2021).

Migratory birds, like many other species are also impacted by climate change in a variety of ways. Due to climate change, migratory bird populations and numbers have drastically decreased in recent decades. For instance, the Demoiselle Crane (*Anthropoides virgo),* a migratory bird species with a wide distribution, is thought to have a global population of over 230,000–261,000 individuals. It makes a treacherous journey among its breeding locations in Europe and Asia, and then travels through the Indus Flyway to find winter shelter in Pakistan. Due to various climatic threats and human pressures, migratory species' habitat and stopovers have been severely degraded (Khan et al., 2024).

Light pollution is another problem that animals, birds in general and migratory birds, in particular confront. It is a worldwide danger to biodiversity, particularly for migratory creatures, some of which travel across hemispheres (Burt et al., 2023). Nocturnal animals with dark-specific morphological features are thought to be the most susceptible to changes in light regimes. The development of mammals was probably influenced by adaptations for nighttime activity, as almost 70% of extant mammal species are categorized as being active at night or during periods of low light (Ditmer et al., 2021). This overlooked yet very pressing issue needs to be addressed.

2. Human Wildlife Conflict and Disease Outbreak

Conflicts and competition between humans and wildlife have existed throughout the evolution of humanity. It is evident that over thousands of years dating back to the Pleistocene and Holocene human commensals and domesticated species has coevolved with human societies (Schell et al., 2021). An increasing risk of disease spillover to human populations is thought to be the result of increased contacts between humans and wild vertebrates brought on by escalating anthropogenic activity in recent decades, such as shifts in land use and human population development (Keenan et al., 2024).

One of the most serious risks to the health and survival of all living things, including people, is the emission and discharge of chemical pollutants into the environment, also known as chemical pollution (Cristiano et al., 2021). As they are widespread and persistent, microplastics have also become a major contaminant in recent years. The decomposition of plastic waste produces microplastics, which are ubiquitous in oceans worldwide and can be found in both surface and deep water masses. The primary microplastic constituents frequently observed in ocean surface waters are microfibers (Le Guen et al., 2020).

In addition, as One Health viewpoints gain popularity, new enquiries concerning the effects of MP pollution on the ecology of infectious diseases particularly vector-borne diseases are being raised (Prata et al., 2021). The Republic of China's recent coronavirus (COVID-19) outbreak, which resulted in pneumonia and acute respiratory issues, is one example (Song et al., 2023). Globally, gastrointestinal parasite illnesses are one of the most serious parasitic infections. It impacts both the nutritional status and overall health of the host (Sarfaraz et al., 2025).

Numerous animals, especially snakes and bats, harbor the vast family of viruses, which can then spread to humans. Therefore, it is important to note that climate change has an impact on the survival of many vectors that carry various ailments (Abbass et al., 2022). Mosquito-borne and parasitic infections are the most concerning of the diseases linked to climate change. The vector-borne diseases will continue to develop in a changing environment as they have done historically to continue to afflict global health (Mojahed et al., 2022).

3. Subtle but Devastating effects of Climate Change

According to research, the effects of climate change include altered species distributions, altered life history, demographic rates such as fecundity and survival, population size declines, and the extinction or elimination of isolated or range-restricted species and populations (Gundale & Kardol, 2021). The extinction of many plant species will likely come from changes in weather patterns brought on by a lack of natural resources (water), increased meltdown of glaciers, and rising mercury levels (Mihiretu et al., 2021).

In addition, it has been demonstrated that Antarctic krill are impacted by climate change. Antarctic krill are an important grazer and food source for numerous fish species that are the focus of commercial fishing in the Southern Atlantic Ocean (Cavan et al., 2019). The periodic weakening of the ice cover is also contributing to a decline in polar bear populations. Reductions in ice cover are linked to rising Arctic temperatures. However, the coastal environment is also in risks of being destroyed. There is a high likelihood that the current trends of rising temperatures, insect epidemics, health issues, and periodic and lifestyle shifts will continue in the future (Abbass et al., 2022).

3.1. Wildfires and Habitat Loss

With the broad implications on the climate, biogeochemical cycles, and human health, fire has been and remains an important part of the Earth's system. Wildfires are unplanned, uncontrolled flames that can be started by lightning, eruptions from volcanoes, or anthropogenic activities (e.g., fireworks, campfires, cigarettes, burning debris, electrical shocks, malfunctions in equipment, etc.) (Haque et

al., 2021). The fragmentation of natural covers brought about by changes in land use, forest exploitation, transformation, the disposal of burning substances, a spike in the incidence of purposeful wildfires, the introduction of new different species, and climate change, however, has reduced the wildfire resilience of those systems (McWethy et al., 2019).

Organisms which are habituated to particular habitat characteristics are predominantly affected by wildfires, particularly those that are extremely sensitive to changes in the ecosystem's properties. The severity of fires can create conditions that both help and hinder the evolution of native, exotic, and invasive species. These conditions may be unfavorable for native species that are not adapted to them(Gonzalez et al., 2022). In Khyber Pakhtunkhwa, Pakistan, especially in the Northern Mountains, forest fires are a constant threat (Ali et al., 2020), because of a number of things, such as the arid climate, the bare landscape, the widespread grazing, the human intrusion of forest area, and the highly flammable crops like maize (Ullah et al., 2022). This type of vulnerable location is best represented by the Chitral district, which is primarily mountainous and has one of the highest percentages of forest cover (10%). Because these regions are isolated and remote, the people living there are least prepared for disasters, including forest fires, which makes them the most vulnerable to their effects (Sultan et al., 2022).

A 2011 survey in Pakistan revealed that forests covered only 5.1% of the country's land. Alarmingly, Pakistan is losing 42,000 hectares of forest each year. According to the United Nations' Food and Agriculture Organization (FAO), Pakistan's current forest cover stands at 1.617 million hectares, a mere 2.2% of the total land area. This places Pakistan at a concerning 113th position among 143 countries worldwide in terms of declining forest cover (Najeeb et al., 2023).

4. Overexploitation and Unsustainable Practices

4.1. Illegal trade and Poaching

Wildlife crime poses a significant threat to global biodiversity and sustainable development (Figure 1) (Banjade et al., 2020). Illegal wildlife trade (IWT) is a highly profitable transnational environmental crime, generating over USD 280 billion annually. This makes it the third largest illegal trade globally, surpassed only by drugs and weapons (Spaseska, 2023). IWT encompasses a wide range of illegal activities, including the capture, poaching, smuggling, and trade of wild plants, animals, and fungi, both terrestrial and aquatic that is protected by national and international laws (Mozer & Prost, 2023).

The critically endangered European eel serves as a stark example, with its decline largely attributed to illegal trade to meet human consumption demands (Gutierrez & Duffey, 2024). The Lower Danube Basin, Black Sea, and Caspian Sea historically supported 90% of the world's sturgeon populations. However, overfishing and poaching have decimated these wild stocks. A 2021 WWF report further reveals the continued trafficking of sturgeon and caviar in the Lower Danube region (Dickinson, 2022).

5.1. Monoculture Agriculture and its Impact on soil Health and Biodiversity

Whenever the same crop is planted in the same spot every year, nutrients are taken out of the soil, making it fragile and unable to sustain the growth of healthy plants. Additionally, mono-cropping leads to the spread of illnesses and pests that need chemical treatment. The natural composition of the soil is then disturbed by fertilizers, herbicides, and other similar substances, which further depletes the nutrients. Additionally, soil scientists have found that mono-cropping changes the soil's microbial environment, reducing helpful bacteria and eventually leading to poor plant development (Belete & Yadete, 2023).

A single predatory species can easily wipe out an entire crop when there is a dense abundance of a single cultivar that is genetically equipped with a single resistant technique. Therefore, when organic management and nutrient application are reduced, it is now possible to understand nutrient depletion or soil degradation caused by continuous cropping. Organic farming must be implemented in order to solve this issue. Crops that are grown with a variety of plant species are more resilient to insect and pest attacks, which reduce the demand for pesticides (Belete & Yadete, 2023).

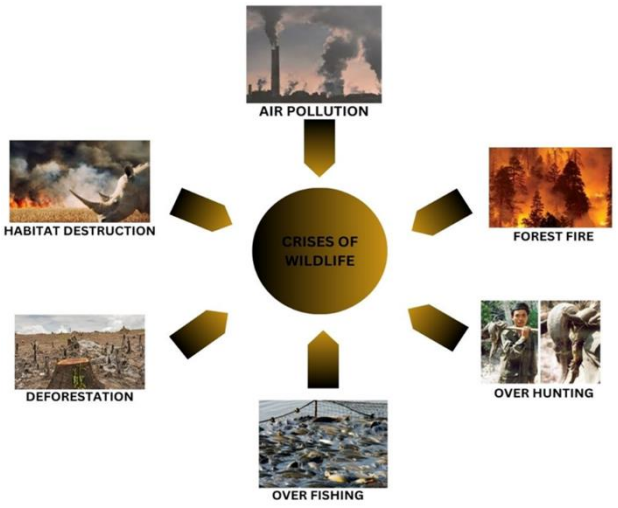

Fig. 1: Pictorial display of wildlife crisis

5.2. Unsustainable Fishing Methods and their Consequences

Ocean farming plays a vital role in our society's supply, provides resources, and guarantees food security (Duarte et al., 2020). However, the FAO reports that human population growth has led to a decline in physiologically sustainable fishing supply chains, which has recently decreased from roughly 89% to less than 70%. In particular, the consumption of marine seafood grew by about 60% from the years 1990 to 2018. Marine fish have a major role in the dietary and nutritional well-being of the world, especially in the Global South and through small-scale commercial, artisanal, and subsistence fishing (Kearney & Hilborn, 2022). The global rate of seafood consumption is predicted to nearly double by 2050 and continues to outperform the rise of the human population due to its healthier nutritional profile when compared to terrestrial animal diets (Naylor et al., 2021).

When fish populations decline due to defaunation and inadequate fishing, this is referred to as overfishing as shown in fig.1 (Pham et al., 2023). Deoxygenation and acidification of oceans are two climate-driven phenomenon that are expected to have an increasing impact on global fisheries productivity in the near future. Fundamental

alterations to ocean biogeochemistry have been observed in recent research, including lower subsurface oxygen levels (also known as hypoxia), altered primary production, bottom temperatures, rising sea surface and, and decreased pH in coastal waters (Issifu et al., 2022).

The world is changing swiftly, and current fisheries management practices mainly lack steps to guarantee social justice and long-term ecological resilience in ethical and sustainable fisheries (Sumaila et al., 2020). To reduce environmental damage and advance societal gain, private fishermen and fishing businesses should take advantage of public resources from fishing with the associated ethical responsibilities (Roberts et al., 2024)

Conclusion

As wildlife plays a crucial role for human survival, anthropogenic activities are destroying natural cycles. Extinction due to habitat destruction and over hunting, endangerment due to illegal trades, diseases due to pollution, over fishing and monoculture agriculture due to population rise are some of the main reasons of specie decline as shown in fig.1. Public awareness is needed for the conservation of endangered species as well as strict laws should be enforced. There should be stringent rules about hunting and permits should be given for a specific time and for specific area for hunting. Anthropocentric mindsets should be abandoned and for the sake of humanity we all should play our roles to conserve our species.

References

Abbass, K., Qasim, M. Z., Song, H., Murshed, M., Mahmood, H., & Younis, I. (2022). A review of the global climate change impacts, adaptation, and sustainable mitigation measures. *Environmental Science and Pollution Research*, *29*(28), 42539-42559.

Ali, A., Ashraf, M. I., Gulzar, S., Akmal, M., & Ahmad, B. (2020). Estimation of soil carbon pools in the forests of Khyber Pakhtunkhwa Province, Pakistan. *Journal of Forestry Research*, *31*, 2313-2321.

Banjade, M., Adhikari, P., & Oh, H. S. (2020). Illegal wildlife trade in local markets of Feuang and Mad districts of Vientiane Province, Lao People's Democratic Republic. *Journal of Asia-Pacific Biodiversity*, *13*(4), 511-517.

Belete, T., & Yadete, E. (2023). Effect of Mono Cropping on Soil Health and Fertility Management for Sustainable Agriculture Practices: A Review. *Journal of Plant Science*, *11*, 192-197.

Burt, C. S., Kelly, J. F., Trankina, G. E., Silva, C. L., Khalighifar, A., Jenkins-Smith, H. C., & Horton, K. G. (2023). The effects of light pollution on migratory animal behavior. *Trends in Ecology & Evolution*, *38*(4), 355-368.

Carter, N. H., Riley, S. J., & Liu, J. (2012). Utility of a psychological framework for carnivore conservation. *Oryx*, *46*(4), 525-535.

Cavan, E., Belcher, A., Atkinson, A., Hill, S. L., Kawaguchi, S., McCormack, S., Schmidt, K. (2019).The importance of Antarctic krill in biogeochemical cycles. *Nature Communications*, 10(1), 1-13.

Cerda, J. R., & Webb, T. L. (2023). Wildlife conservation and preserving biodiversity: impactful opportunities for veterinarians. *Journal of the American Veterinary Medical Association*, *261*(7), 1077-1085.

Chaudhry, M.J.I., Ogada, D.L., Malik, R.N., Virani, M.Z. and Giovanni, M.D., (2012). First evidence that populations of the critically endangered long-billed vulture *Gyps indicus* in Pakistan have increased following the ban of the toxic veterinary drug diclofenac in south Asia. *Bird Conservation International*, 22(4), 389- 397.

Cowie, R. H., Bouchet, P., & Fontaine, B. (2022). The Sixth Mass Extinction: fact, fiction or speculation? *Biological Reviews*, *97*(2), 640-663.

Cristiano, W., Giacoma, C., Carere, M., & Mancini, L. (2021). Chemical pollution as a driver of biodiversity loss and potential deterioration of ecosystem services in Eastern Africa: A critical review. *South African Journal of Science*, *117*(9-10), 1-7.

Dickinson, H. (2022). Caviar matter (s): The material politics of the European caviar grey market. *Political Geography*, *99*, 102737-102749.

Ditmer, M. A., Stoner, D. C., & Carter, N. H. (2021). Estimating the loss and fragmentation of dark environments in mammal ranges from light pollution. *Biological Conservation*, *257*, 109135-109165.

Duarte, C. M., Agusti, S., Barbier, E., Britten, G. L., Castilla, J. C., Gattuso, J. P., & Worm, B. (2020). Rebuilding marine life. *Nature*, *580*(7801), 39-51.

Gonzalez, T. M., Gonzalez-Trujillo, J. D., Muñoz, A., & Armenteras, D. (2022). Effects of fire history on animal communities: a systematic review. *Ecological Processes*, *11*(1), 1-11.

Gutierrez, L., & Duffy, R. (2024). Harms and the illegal wildlife trade: Political ecology, green criminology and the European eel. *Critical Criminology*, *32*(1), 61-76.

Haque, M. K., Azad, M. A. K., Hossain, M. Y., Ahmed, T., Uddin, M., & Hossain, M. M. (2021). Wildfire in Australia during 2019-2020, its impact on health, biodiversity and environment with some proposals for risk management: a review. *Journal of Environmental Protection*, *12*(6), 391-414.

Issifu, I., Alava, J. J., Lam, V. W., & Sumaila, U. R. (2022). Impact of ocean warming, overfishing and mercury on European fisheries: A risk assessment and policy solution framework. *Frontiers in Marine Science*, *8*, 770805-770818.

Gundale, M.J., & Kardol, P. (2021). Multi-dimensionality as a path forward in plant-soil feedback research. *Journal of Ecology*, 109(10), 3446-3465.

Kearney, B., & Hilborn, R. (2022). Solutions to world-wide fisheries problems are mostly local or regional. *ICES Journal of Marine Science*, *79*(4), 997-1004.

Keenan, S., Niedziela, D., Morera-Pujol, V., Franklin, D., Murphy, K. J., Ciuti, S., & McMahon, B. J. (2024). Zoonotic disease classification in wildlife: a theoretical framework for researchers. *Mammal Review*, *54*(1), 63-77.

Khan, T. U., Ullah, I., Hu, Y., Liang, J., Ahmad, S., Omifolaji, J. K., & Hu, H. (2024). Assessment of Suitable Habitat of the Demoiselle Crane (Anthropoides virgo) in the Wake of Climate Change: A Study of Its Wintering Refugees in Pakistan. *Animals*, *14*(10), 1453-1473.

Le Guen, C., Suaria, G., Sherley, R. B., Ryan, P. G., Aliani, S., Boehme, L., & Brierley, A. S. (2020). Microplastic study reveals the presence of

natural and synthetic fibres in the diet of King Penguins (Aptenodytes patagonicus) foraging from South Georgia. *Environment international*, *134*, 105303-105312.

Li, Q., Shao, W., Jiang, Y., Yan, C., & Liao, W. (2024). Assessing reptile conservation status under global climate change. *Biology*, *13*(6), 436-449.

McWethy, D. B., Schoennagel, T., Higuera, P. E., Krawchuk, M., Harvey, B. J., Metcalf, E. C. & Kolden, C. (2019). Rethinking resilience to wildfire. *Nature Sustainability*, *2*(9), 797-804.

Mihiretu, A., Okoyo, E. N., & Lemma, T. (2021). Awareness of climate change and its associated risks jointly explain context-specific adaptation in the Arid-tropics, Northeast Ethiopia. *SN Social Sciences*, *1*, 1-18.

Mojahed, N., Mohammadkhani, M. A., & Mohamadkhani, A. (2022). Climate crises and developing vector-borne diseases: a narrative review. *Iranian Journal of Public Health*, *51*(12), 2664-2674.

Mozer, A., & Prost, S. (2023). An introduction to illegal wildlife trade and its effects on biodiversity and society. *Forensic Science International: Animals and Environments*, *3*, 100064-100076. https://doi.org/10.1016/j.fsiae.2023.100064.

Najeeb, R., Qaisrani, F. A., Akhtar, S., & Nazeer, I. (2023). The role and significance of forest on climate change and economy in Pakistan. *Al-Qanṭara*, *9*(2), 159-170.

Naylor, R. L., Kishore, A., Sumaila, U. R., Issifu, I., Hunter, B. P., Belton, B., & Crona, B. (2021). Blue food demand across geographic and temporal scales. *Nature Communications*, *12*(1), 5413-5427.

Pham, C. V., Wang, H. C., Chen, S. H., & Lee, J. M. (2023). The Threshold Effect of Overfishing on Global Fishery Outputs: International Evidence from a Sustainable Fishery Perspective. *Fishes*, *8*(2), 71-96.

Prata, J. C., da Costa, J. P., Lopes, I., Andrady, A. L., Duarte, A. C., & Rocha-Santos, T. (2021). A One Health perspective of the impacts of microplastics on animal, human and environmental health. *Science of the Total Environment*, *777*, 146094. https://doi.org/10.1016/j.scitotenv.2021.146094

Rebolo-Ifran, N., Plaza, P., Perez-Garcia, J. M., Gamarra-Toledo, V., Santander, F., & Lambertucci, S. A. (2023). Power lines and birds: An overlooked threat in South America. *Perspectives in Ecology and Conservation*, *21*(1), 71-84.

Roberts, C., Bene, C., Bennett, N., Boon, J. S., Cheung, W. W., Cury, P., & O'leary, B. C. (2024). Rethinking sustainability of marine fisheries for a fast-changing planet. *NPJ Ocean Sustainability*, *3*(1), 41-52.

Sarfaraz, M. Z., Abbas, S., Zaman, M. A., Parveen, A., Kousar, S., & Zulqarnain, M. (2025). A Step Forward to Revolutionize the Eimeriosis Controlling Strategies in Cattle by Using Traditional Medication. *Experimental Parasitology*, 108926-108939. https://doi.org/10.1016/j.exppara.2025.108926

Schell, C. J., Stanton, L. A., Young, J. K., Angeloni, L. M., Lambert, J. E., Breck, S. W., & Murray, M. H. (2021). The evolutionary consequences of human–wildlife conflict in cities. *Evolutionary Applications*, *14*(1), 178-197.

Song, Y., Fan, H., Tang, X., Luo, Y., Liu, P., & Chen, Y. (2023). The effects of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) on ischemic stroke and the possible underlying mechanisms. *International Journal of Neuroscience*, *133*(2), 176-185.

Spaseska, M. (2023). Threats to earth biodiversity: wildlife poaching and illegal trafficking of exotic animals for production with luxury materials used by fashion industry. *International Journal of Science and Arts - IDEA*, 7(14), 123-129.

Stige, L. C., & Kvile, K. O. (2017). Climate warming drives large-scale changes in ecosystem function. *Proceedings of the National Academy of Sciences*, *114*(46), 12100-12102.

Sultan, H., Zhan, J., Rashid, W., Chu, X., & Bohnett, E. (2022). Systematic review of multi-dimensional vulnerabilities in the Himalayas. *International Journal of Environmental Research and Public Health*, *19*(19), 12177-12197.

Sumaila, U. R., Palacios-Abrantes, J., & Cheung, W. W. (2020). Climate change, shifting threat points, and the management of transboundary fish stocks. *Ecology & Society*, *25*(4), 11660-250440.

Ullah, S., Gang, T., Rauf, T., Sikandar, F., Liu, J. Q., & Noor, R. S. (2020). Identifying the socio-economic factors of deforestation and degradation: A case study in Gilgit Baltistan, Pakistan. *Geo Journal*, 87, 1-14.

Wang, K., & Zhai, X. (2019). The creation of "Ecosystem Core" hypothesis to explain ecosystem evolution. *BMC Ecology*, *19*, 1-9.

Watson, R., Baste, I., Larigauderie, A., Leadley, P., Pascual, U., Baptiste, B., & Mooney, H. (2019). Summary for policymakers of the global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. *IPBES Secretariat: Bonn, Germany*, 22-47.

Yasmeen, R., Asif, L., & Djeffal, S. (2021). Impact of diclofenac a non-steroidal anti- inflammatory veterinary pharmaceutical drug on vultures. *Pakistan Journal of Zoology*, *54*(1), 423-432.