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Editorial

Conservation, Sustainability, Conflict and Coexistence: Key Themes in Wildlife Management

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1. Introduction

Human activities have shaped the Earth's biotic and abiotic elements for millennia [1]. These activities have become so significant, both in their extent and intensity, that negative anthropogenic impacts have affected even the most remote places where human presence is scarce or even non-existent [2,3]. This profound impact of humans on Earth has led scientists to propose the dawn of a new geological epoch, aptly named the Anthropocene [2,3]. These impacts, the most important among which are habitat destruction and degradation, overexploitation, and climate change, have caused an unprecedented rate of vertebrate species loss over the last century, up to 100 times higher than the pre-human background rate [4–6]. These rates of extinction indicate that a sixth phase of mass extinction is already in progress [4].

The world's population exceeded 8 billion people in 2022, and the latest projections by the United Nations suggested that it could grow to around 8.5 billion in 2030, 9.7 billion in 2050, 10.4 billion in the 2080s and remain stable until 2100 [7]. This increase in the global population size is accompanied by an increase in urbanization: the global urban population was 50% for the first time in 2007, and 57.5% of people currently live in cities, which is a percentage that is projected to reach 68.4% by 2050 [8]. The large human population and the ever-increasing rates of urbanization are detrimental to biodiversity because the need for natural resources also proportionately increases and these cities now occupy former natural ecosystems [9,10]. This situation has called for our better use of resources and led to the formulation of the concept of sustainability. In 1987, the United Nations Brundtland Commission defined sustainable development as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" [11]. Sustainability is achieved when the goals of its three basic components—society, environment, and economy—are satisfied (Figure 1). The integration of all environmental, social, and economic interests into all aspects of decision making in a bearable, equitable, and viable way is key to achieving sustainability [12].

The ever-increasing rates of global population size and urbanization increase the pressures on wildlife. These pressures often result in human–wildlife conflicts (HWC) that occur "when the needs and behavior of wildlife impact negatively on the goals of humans or when the goals of humans negatively impact the needs of wildlife" [13]. These conflicts are better perceived as conservation conflicts, "situations that occur when two or more parties with strongly held opinions clash over conservation objectives and when one party is perceived to assert its interests at the expense of another" [14,15]. Conservation conflicts can be separated into two components: (a) human–wildlife impacts, i.e., the direct interactions between humans and wildlife [16], and (b) the inherent human–human conflicts between those interested in wildlife conservation and those with other priorities [17].

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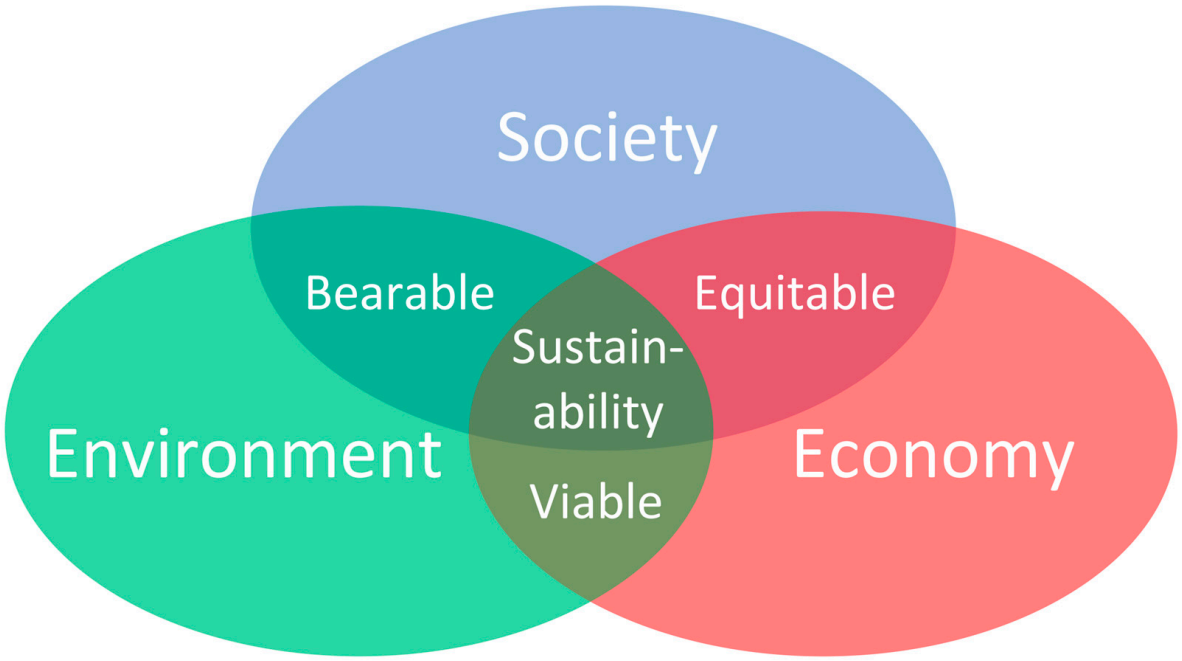


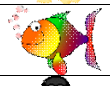
Figure 1. The sustainable development concept.

Wildlife management seeks to satisfy three basic societal desires: (a) species conservation, (b) sustainable use, and (c) addressing the negative impacts of certain behaviors. Wildlife management is the science of applying methods and practices to regulate the interactions between society, wildlife, and their habitats to satisfy society's wishes [18,19]. Wildlife managers need to apply suitable management strategies to improve habitats, address conflicts, and promote coexistence, following the principles of sustainability, to achieve wildlife conservation. Only in this way will it be possible to simultaneously satisfy the needs of wildlife species and humans. This volume includes relevant research comprising the Special Issue "Wildlife Conservation: Managing Resources for a Sustainable World". Overall, 11 articles are presented, showcasing research regarding the conservation management of wildlife species across the globe under the prism of sustainability.

2. Geography, Taxa, Management Themes

Contributions to our Special Issue span the globe: three came from Africa (Shiweda and colleagues, Zyambo and colleagues, Lines and colleagues), three from Asia (Sun and colleagues, Yin and colleagues, Abd Rahman and Matthew), four from Europe (Katselis and colleagues, Raftogianni and colleagues, Sultana and colleagues, Liordos and colleagues), and one covers global wildlife (Prokop and colleagues) (Figure 2). Furthermore, they involved species from many taxa: six articles involved mammals (Shiweda and colleagues, Zyambo and colleagues, Lines and colleagues, Sun and colleagues, Raftogianni and colleagues, Prokop and colleagues), six articles involved birds (Yin and colleagues, Katselis and colleagues, Raftogianni and colleagues, Sultana and colleagues, Liordos and colleagues, Prokop and colleagues), two articles involved reptiles (Raftogianni and colleagues, Prokop and colleagues), two articles involved fish (Abd Rahman and Matthew Prokop and colleagues), one article involved amphibians (Prokop and colleagues), and one article involved invertebrates (Prokop and colleagues). A variety of wildlife management themes, often more than one per study, were identified from the contributed research, highlighting similarities and differences in hot contemporary issues across continents: eight articles tackled conservation issues (Shiweda and colleagues, Lines and colleagues, Yin and colleagues, Abd Rahman and Matthew, Sultana and colleagues, Liordos and colleagues, Prokop and colleagues), five articles tackled sustainability issues (Zyambo and colleagues, Lines and colleagues, Abd Rahman and Matthew, Katselis and colleagues, Raftogianni and

colleagues), four articles addressed human–wildlife coexistence (Shiweda and colleagues, Yin and colleagues, Sultana and colleagues, Liordos and colleagues), two articles tackled human–wildlife conflict issues (Shiweda and colleagues, Katselis and colleagues), and two articles examined wildlife use issues (Zyambo and colleagues, Raftogianni and colleagues).

Article	Key management themes					Continent
	Conservation	Conflict	Coexistence	Sustainability	Wildlife use	
Shiweda and colleagues						Africa
Sun and colleagues						Asia
Katselis and colleagues						Europe
Yin and colleagues						Asia
Prokop and colleagues[a]						Global
Raftogianni and colleagues[b]						Europe
Zyambo and colleagues						Africa
Sultana and colleagues						Europe
Lines and colleagues						Africa
Abd Rahman and Matthew						Asia
Liordos and colleagues						Europe

Icons refer to the taxa involved in each study:
 Mammals  Birds  Fish

[a] Also invertebrates, fish, birds, reptiles, amphibians; [b] Also reptiles

Figure 2. Management themes, taxa, and continents involved in each article of the Special Issue.

3. Research from Africa

In their article "Climate change and anthropogenic factors are influencing the loss of habitats and emerging human–elephant conflict in the Namib desert", Shiweda and colleagues studied how climate change and other human pressures affected the habitat of African elephants (*Loxodonta africana*) and induced human–elephant conflicts in the Ugab River basin in Namibia. They used geographical information systems to analyze data on land cover, African elephant movement, rainfall, and temperature. They found that farming activities, poor rainfall, and frequent droughts were responsible for the loss of around 73.0% of habitat in the lower river basin consisting of ephemeral streams. They also determined human–elephant conflict hotspots. Furthermore, they proposed a reduction in livestock numbers to favor vegetation growth and water conservation and the financial support of local organizations to provide local farmers with the skills to coexist with African elephants. They concluded that habitat conservation and farmer education would help protect African elephants and reduce conflicts.

In their article "Conceptualising drivers of illegal hunting by local hunters living in or adjacent to African protected areas: A scoping review", Zyambo and colleagues reviewed the drivers of illegal hunting among hunters living in protected areas in Africa. Illegal hunting activities endanger wildlife populations and are highly unsustainable. The need

to generate income and a lack of an income source, the need or preference for bushmeat consumption, cultural needs and rights, preventative or retaliatory killing, poverty, and weak or inadequate law enforcement were the main drivers of illegal hunting among African societies. They concluded that wildlife conservation and sustainability would not be achieved without the alleviation of deep-rooted social problems, public participation, and proper law enforcement.

Lines and colleagues integrated modeling and field observations of human pressure to generate a Human Footprint Pressure map at the Kafue–Zambezi interface in their article "Utility of human footprint pressure mapping for large carnivore conservation: The Kafue-Zambezi interface". Then, they used this model along with occurrence data for lions (*Panthera leo*), leopards (*Panthera pardus*), and spotted hyenas (*Crocuta crocuta*) to generate threshold ranges at which the concerned species can persist in their habitats. Model performance suggested great potential for such predictions in the study area, but it can also have implications for local and region-wide conservation planning. Mapping of human disturbances and the estimation of carnivore species' tolerance thresholds would help managers select and apply suitable strategies for their conservation.

4. Research from Asia

In their article "Habitat selection: Autumn and winter behavioral preferences of water deer (*Hydropotes inermis*) in Northeast China", Sun and colleagues investigated the habitat selection of the endangered water deer in the Baishan Musk Deer National Nature Reserve in Northeast China. They used 11 vegetation and matrix characteristics and found that the water deer preferred grasslands at sunny and middle slopes in both autumn and winter. The height of dominant herbage, hiding cover, distance from water, and distance to human settlements predicted habitat selection in winter. They concluded that this new information would be valuable for the restoration and conservation of the endangered water deer.

In their article "Birds' flight initiation distance in residential areas of Beijing are lower than in pristine environments: Implications for the conservation of urban bird diversity", Yin and colleagues determined the flight initiation distance of birds in both urban and natural areas in Beijing, China. They found that urban adapters, including ground foragers, insectivores, and omnivores, displayed shorter flight initiation distances in urban rather than natural areas. Additionally, tree canopy cover positively affected flight initiation distance and floor area ratio negatively affected it. They concluded that their findings would help urban managers promote the coexistence of urban birds and Beijing residents for both parties' benefit.

In their article "Fish hobbyists' willingness to donate for wild fighting fish (*Betta livida*) conservation in Klang valley", Abd Rahman and Matthew presented an econometric model to infer the fish hobbyists' willingness to donate for the conservation of the endangered endemic fighting fish in Klang Valley, Malaysia. They used single- and double-bounded contingent valuation methods that revealed a mean annual willingness to donate of MYR 9.04 among the fish hobbyists. Older fish hobbyists and those who owned fighting fish were more willing to donate for their conservation. These findings implied the preferences of fish hobbyists and provided insights into the potential for funding fighting fish conservation.

5. Research from Europe

In their article "Estimation of fishery losses from great cormorants during the wintering period in Greek lagoons (Ionian Sea, W. Greece)", Katselis and colleagues estimated fish losses from great cormorants (*Phalacrocorax carbo sinensis*) in lagoons of the Amvrakikos Gulf in Greece during the winter. They incorporated several parameters into their modeling approach, including fish population growth, age and size of fish prey, great cormorant numbers, and fishing strategies. Mugilids dominated both the lagoon fisheries and the great cormorant's diet, leading to the conclusion that there is a high level of conflict between great cormorants and fisheries in the lagoons of the Amvrakikos Gulf.

In their article "Wildlife knowledge and attitudes toward hunting: A comparative hunter–non-hunter analysis", Raftogianni and colleagues compared the attitudes toward hunting and the knowledge about wildlife species between hunters and non-hunters in Greece. The hunters stated significant motivations for hunting, especially as a recreational social activity, and considered hunting a valuable management tool. Non-hunters believed that hunting is a source of pride for hunters. They were critical or even negative toward hunting, mostly as an activity but also as a management tool. Interestingly, the hunters had greater knowledge about the biology and ecology of wildlife species, both game and non-game, than the non-hunters. These findings revealed a conflict between hunters and non-hunters and suggested that engaging in outdoor activities would increase public awareness about wildlife. Policies that could reduce this conflict include educating both hunters and the public about good hunting practices and promoting outdoor recreational activities.

Sultana and colleagues examined the factors that affected urban bird diversity in small green spaces in Freiburg and Regensburg, Germany, in their article "Neighboring green network and landscape metrics explain biodiversity within small urban green areas—A case study on birds". They found that variations in species richness and composition were explained by green networks in Freiburg and by green networks and landscape metrics in Regensburg. They concluded that bird communities in small urban green spaces could benefit from the spatial configuration that includes water bodies and other green areas in their vicinity. These findings could be used by urban managers to improve the habitat quality for urban birds and thus promote biodiversity, human well-being, and, ultimately, sustainability.

Liordos and colleagues investigated the ecological requirements of birds in small green spaces in the urban core of Kavala, Greece, and Rovaniemi, Finland, in their article "Niche analysis and conservation of bird species using urban core areas". They determined species niches using the outlying mean index. Niche characteristics differed between cities, while bird species occupied different niches, showing significant niche specialization. In both cities, bird species could be grouped into urban adapters (mostly found in larger green spaces, with high vegetation cover and far from the city center) and urban exploiters (mostly found in green spaces close to the densely built and noisy city center). The conservation priority of urban bird species was also determined based on niche specialization and conservation status. These findings allowed suggestions of measures for enhancing urban bird diversity. The creation and maintenance of large green spaces, the increase in tree and shrub cover, and the retention of mature trees and dense shrubberies would benefit adapter species. Urban exploiters would benefit from the retention of balconies, holes in roofs, and artificial nest boxes. The enhancement of bird diversity in urban areas would promote both the conservation of biodiversity and human well-being.

6. Global Wildlife Conservation

In their article "Prioritisation of charismatic animals in major conservation journals measured by the altmetric attention score", Prokop and colleagues investigated the representation of animals and plants in the covers and articles of three major conservation journals: *Conservation Biology, Journal of Applied Ecology*, and *Conservation Letters*. They found that the covers more often depicted mammals, reptiles, and amphibians, and depicted fish less often. Most published articles also concerned mammals, while articles about mammals, invertebrates, and amphibians received the most citations. These results suggested a taxonomic bias in scientific research, with scientists and the public preferring large mammals over other species. Policies are needed to promote support for taxa neglected by all parts of society to promote conservation and achieve sustainability.

7. Conclusions

This Special Issue included research concerning sustainable wildlife management in both natural and urban areas. Research was carried out in many countries around the globe, thus providing an overall snapshot of hot contemporary issues. Key management themes

were identified, such as wildlife conservation, human–wildlife conflict and coexistence, and sustainable resource management and use. The research presented would also appeal and be useful to scientists studying a variety of taxa, including mammals, birds, amphibians, reptiles, fish, and invertebrates. We hope that the research presented in this Special Issue will help wildlife managers design successful management plans and provide insights for promoting much-needed relevant research in the field.

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