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Editorial: Transboundary conservation

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Editorial on the Research Topic Transboundary conservation

Introduction

Transboundary areas often contain critical ecosystems that support rich biodiversity and play important roles in maintaining ecological connectivity. More than half of terrestrial vertebrate species have ranges spanning international borders. Many species may shift their distributions by crossing international borders in response to climate change or human disturbances. Yet species in transboundary regions are in increasing peril due to uncoordinated management among neighboring countries and artificial barriers, such as walls and fences along borders and cross-border roads that result in habitat fragmentation and the loss of ecological connectivity. Transboundary conservation can significantly contribute to ongoing efforts to reduce the risk of future extinctions by expanding protected areas and promoting collaborative management. Therefore, more attention to this topic is urgently needed. The Research Topic of *Transboundary Conservation* aims to enhance understanding of the potential, patterns, and effects of transboundary conservation by collecting studies that analyze transboundary conservation across different terrestrial and marine landscapes. Simultaneously, it aspires towards broader goals of international environmental governance and security.

Transboundary conservation research from different continents

The construction of a wall at the United States-Mexico border poses a direct threat to terrestrial wildlife between the two countries. Water sources and broader regions along the United States-Mexico border provide vital habitat for the jaguar (*Panthera onca*). [Chambers et al.](#) developed a spatial model to describe the projected energy expenditure required for jaguars to reach the key water sources north of the international border. By

comparing walled and unwalled border sections, along with three remediation scenarios, they demonstrated that existing border infrastructure significantly increased energy expenditure for jaguars and that certain partial remediation scenarios were more beneficial than others. These findings contribute to a better understanding of how border infrastructure impacts the physiological requirements of jaguars in the United States-Mexico borderlands, and they highlight opportunities for remediation. The study will benefit conservation and reintroduction efforts for jaguars in the United States.

In Africa, many ecosystems and species ranges span multiple countries. The establishment of transboundary conservation areas will enable countries to coordinate cross-border governance and management, strengthen relationships between neighboring countries and communities, expand protected area coverage, and enhance landscape connectivity. Therefore, successful biodiversity conservation will be enhanced by increased efforts in transboundary conservation. Kamath et al. compiled a list of existing transboundary conservation areas on the continent, identified potential transboundary conservation areas, evaluated connectivity between the protected area pairs, and prioritized potential transboundary conservation areas based on size, connectivity, and ease of establishment. The identified 8,481 potential transboundary conservation areas underscore the need for strategic planning to address the interconnected challenges faced by the continent.

Kamath et al. conducted a spatial analysis of protected areas across 42 Asian countries to understand the distribution, proximity and land-use change of protected areas across different buffer distances from the borders. The study found that larger protected areas in Asian countries were frequently located near international borders, especially within 50 km of these borders. Furthermore, the median distance between protected areas across international borders was nearly three times shorter compared to the median distance between protected areas within the country. Accordingly, Asian borderlands can provide opportunities for enhancing connectivity across the borders. The study also emphasized the role of multi-use protected areas in engaging communities, which are crucial in transboundary conservation initiatives.

The Arctic harbors globally substantial populations of unique cold-adapted species, supporting traditional cultures and contributing to global biodiversity. Many species in the Arctic are forced to confront challenges posed by climate change and invasive species. Biodiversity monitoring is an indispensable component for effectively preserving the biodiversity of the Arctic. However, biodiversity monitoring in the Arctic is largely fragmented and primarily focuses on specific species, neglecting a comprehensive, ecosystem-based approach that spans geographic and temporal scales. A paper by Barry et al. described the process and approach undertaken in the last two decades to develop and implement the Circumpolar Biodiversity Monitoring Programme (CBMP), established by the Arctic Council working group, the Conservation of Arctic Flora and Fauna. The paper documented the challenges faced, lessons learned, and solutions. With lessons learned and challenges addressed, the CBMP's impact extends beyond the Arctic, influencing regional and global biodiversity agreements.

Conclusion and recommendations for future research

Species distribution, climate change, anthropogenic activities, and biodiversity crisis recognize no borders. Transboundary conservation is playing an increasingly important role in addressing global changes. The aforementioned studies offer new knowledge and insights for transboundary conservation, contributing to the improvement of the effectiveness of conservation planning and practices. Amidst the diversity of challenges and opportunities across continents, common threads emerge. Successful transboundary conservation will rely on effective coordination, knowledge co-production, sufficient funding, and stakeholder engagement.

Despite global progress in transboundary conservation, biodiversity loss has continued at an alarming rate. To halt the loss of biodiversity, the Kunming-Montreal Global Biodiversity Framework has set an ambitious pathway, notably Target 3, which aims to conserve at least 30 per cent of terrestrial and inland water areas, and of marine and coastal areas by 2030 (known as “30 by 30”). Future research in transboundary conservation should emphasize a multidisciplinary approach, highlighting:

- Patterns, potential pathways, and consequences of species' cross-border movements and distribution shifts in the context of the synergistic effects of climate change and land-use change.
- Contributions to maintaining ecological integrity and enhancing ecosystem services.
- Drivers, benefits, and effectiveness of stakeholder engagement in transboundary conservation.
- Criteria for measuring the success of transboundary conservation.
- Temporal and spatial characteristics of coordinated management, and mechanisms to promote successful and efficient collaboration.

These research findings can support the implementation of the Kunming-Montreal Global Biodiversity Framework.

Research on transboundary conservation is also linked to the growing genre of literature on environmental security and peace-building. The concept of “peace parks” whereby conservation across borders could instrumentally lead to conflict resolution provides an opportunity to move conservation to the high politics of defense and security. Given the rapid rise in global conflicts within the past two years in the Black Sea region, the Middle East and the Horn of Africa, transboundary conservation might also be linked to such broader goals in international environmental engagement.

Author contributions

LW: Writing – original draft, Writing – review & editing, Conceptualization. SA: Writing – review & editing. DT: Writing – review & editing. MF: Writing – review & editing.

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Conflict of interest

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