frontiers | Frontiers in Conservation Science

TYPE Editorial
PUBLISHED 17 July 2023
DOI 10.3389/fcosc.2023.1225841

OPEN ACCESS

EDITED AND REVIEWED BY
Gustavo Hallwass,
Universidade Federal de Lavras, Brazil

*CORRESPONDENCE
Silvio J. Crespin
screspin@itres.science

RECEIVED 19 May 2023
ACCEPTED 06 July 2023
PUBLISHED 17 July 2023

CITATION
Crespin SJ, Bhatia S and Jiren TS (2023) Editorial: Coexistence between conservation and food security in social-ecological systems.
Front. Conserv. Sci. 4:1225841.
doi: 10.3389/fcosc.2023.1225841

Editorial: Coexistence between conservation and food security in social-ecological systems

Silvio J. Crespin[1,2]*, Saloni Bhatia[3] and Tolera S. Jiren[4]

[1]Institute of Ecology and Biodiversity (IEB), Santiago, Chile, [2]Instituto de Investigaciones Tropicales de El Salvador, San Salvador, El Salvador, [3]Centre for Environment and Development, Ashoka Trust for Research in Ecology and the Environment, Bengaluru, India, [4]International Center for Biosaline Agriculture, Dubai, United Arab Emirates

KEYWORDS

tolerance, peace, sustainability, health, agroecological landscapes, multi-use landscapes, human-wildlife interactions

Editorial on the Research Topic
Coexistence between conservation and food security in social-ecological systems

Introduction

Nature's demise is a global crisis that jeopardizes food security and human well-being. Due to human activities, close to a million plant and animal species face extinction within the ensuing decades (IUCN, 2022). However, November 15th, 2022 is touted as the day our species reached 8 billion people on Earth (United Nations, 2022). Although food production is sufficient to feed everyone, the distribution of nature's contributions to people is unequal and unfair (IPBES, 2019). This inequality puts pressure on farmers to increase food production, which in turn drives biodiversity loss by having altered 75% of the global land area (IPBES, 2019). The erosion of biodiversity reduces the resilience of agricultural systems to climate change, plagues and diseases, and undermines the diversity and quality of human diets. To safeguard biodiversity and ensure food security, transformative changes are needed in the way we produce, consume and value food. However, this is not an easy task as biodiversity conservation and food security often have conflicting interests and trade-offs.

Concurrently, the Living Planet Index indicates a 69% decline in the global populations of vertebrate wildlife between 1970 and 2018 (WWF, 2022). In fact, humans and livestock comprise 96% of the world's mammalian biomass (Bar-On et al., 2018). This mounting pressure on biodiversity stability does not show signs of declining naturally. On the contrary, human actions such as expanding the cultivation area to grow crops, tend livestock, and urbanize further aggravate biodiversity loss. Similarly, conservation efforts that disregard human well-being, such as the fortress approach, affect the prospects of ensuring food security for the growing population.Conservation efforts often push back against what we see as a necessity and what other species might consider hoarding if they had our insight, creating conflicting interests between food security and biodiversity conservation. However, to feed the human population and avoid further species extinction and ecosystem collapse, both activities must coexist in the same space.

Thus, owing to the complexity inherent in food security and biodiversity conservation, studying the two sectors in tandem requires integrating disciplines that might traditionally not have been associated with one another. In this sense, biocultural approaches (a combination of inter- and transdisciplinary sciences) appear as an effective lens to achieve the dual goals of ensuring food security and conserving biodiversity, especially at the landscape scale where the two emerge as integrated (Hanspach et al., 2020).

Therefore, this Research Topic addressed the relation between food security and biodiversity conservation to aid in generating pathways to landscapes where both goals can coexist. The contributors to this topic present four distinct approaches which illuminate the need for a diverse perspective when dealing with such a complex and integrated issue.

Identifying emerging food-conservation trade-offs

Kiffner et al. used 14 years of ecological monitoring data to identify correlates between patterns of livestock loss and carnivore recolonization (wolves in Germany). They found that 1) 42% of cases are confirmed wolf predation events, 2) the number of livestock kills per predation event were higher in farms with larger herd sizes and most often occurred on sheep, farmed deer, and other livestock as opposed to cattle, 3) wolf populations in the process of recolonizing and expanding are associated with higher frequencies of predation events and a broader offer of domestic prey species, and finally 4) show how wolf predation occurred in seasonal patterns. They suggest a seasonal adjustment of husbandry practices, exposit how compensation schemes are a central tool in facilitating enduring persistence of wolves on multi-use lands, and call for a renewed investment in prevention methods, particularly when risk is high. It is important to note that conflicts and resolutions can vary between regions of the world according to species type, economic development, and the policies governing the land where conflicts take place (see Peterson et al., 2010).

Aligning food security and conservation challenges through legal frameworks

Jouzi et al. offer a perspective piece that explains how the four dimensions of food security, namely food availability, accessibility, its utilization and the overall stability of the first three dimensions through time, are affected by protected areas (PAs) and posits that rights-based approaches can aid in finding common ground between conservation and food security. Focusing on the communities that live inside and surrounding PAs, the authors explore both negative and positive impacts of PAs on the four dimensions of food security by analysing food security in the oldest way humans have of feeding themselves (wildlife hunting and shifting agriculture) and present a conceptual framework to illustrate positive and negative pathways. PAs offer renewable wild food for direct consumption but may also restrict access to it. Cash can flow into communities by the selling of natural products from traditional livelihoods or be restricted. Nature's contributions to people can be positive ecosystem services or result in negative interactions such as crop-raiding and predation of livestock. New livelihoods such as tourism can emerge, but land might be limited for shifting agriculture. From this analysis, Jouzi et al. manage to elucidate how rights-based approaches can facilitate the alignment of food security and conservation goals by explaining how the integration of rights to conservation and to food as human rights into national constitutions can provide legal frameworks and mechanisms to protect rights to nutrition and a healthy environment. In practical terms, the authors list the Universal Declaration of Human Rights, article 25, (United Nations General Assembly, 1948) as one of the first and most important of international laws relating to food as a human right and the recent UN Declaration on the Rights of Peasants and Other People Working in Rural Areas (United Nations Human Rights Council, 2018), along with the initiatives to implement the latter.

Finding pathways to coexistence

Boronyak and Jacobs use social-ecological systems framing to explore the potential pathways toward coexistence in the human-dingo conflict by constructing a qualitative model of transformative change developed from field observations and stakeholder interviews. They describe Australia as being locked into a 'conflict paradigm' where dingoes are perceived as a detrimental cost to society and the application of lethal methods deemed a justified means of improved food production systems. This business-as-usual system state needs to shift toward a transformed system state of dingo-human coexistence. Establishing the conditions necessary for coexistence requires identifying drivers of system change, of which Boronyak and Jacobs identify four in (i) loss of biodiversity due to lethal control of dingoes loosening top-down control, ii) landscape degradation caused by loss of ecosystem services by declining biodiversity, iii) low efficacy of lethal control due to indiscriminate trapping and poisoning of non-target species, and iv) growing economic costs of lethal control and the NGOs lobbying for change. To operationalize these four drivers of dingo intolerance, they also identify seven strategic pathways for intervention to be enacted in tandem. In this particular case, adoption of Predator Smart Farming (non-lethal practices for livestock protection) emerges as a pivotal pathway towards a state of human-dingo coexistence. This study shows how to transition from conceptual to qualitative modelling to better inform on strategies for coexistence.

Incentivizing farmers to implement conservation actions

Sidemo-Holm tackles the reason that inadequate incentives in conventional payment schemes are the cause behind low cost-effectiveness of conservation actions in agricultural landscapes

and propose alternative schemes that do incentivize farmers to implement them. This opinion piece details alternative payment schemes that conditionally adjust payment according to fulfilment of indicators or improvements in conservation outcomes, such as context-, result- and model-based payment schemes, as well as auctions for funding based on claimed costs of detailed conservation actions. With the advances and development of conservation science, ecological indicators, empirical and theoretical modelling, and the digital platforms that are available or that can be developed for the public and policy administration, policies aiming for cost-efficiency in conservation are now feasible. Sidemo-Holm discusses how these outcome-based schemes remain rare at the moment, and how implementing policies that increase cost-effectiveness are a global urgency to solve biodiversity crises.

Conclusions

These papers show how research into the conflict/coexistence duality in multi-use landscapes draws heavily from ecological disciplines when studying the human-wildlife interactions which generate biodiversity impacts.

They integrate ecological understanding of how nature impacts people's livelihoods and vice versa with social disciplines, allowing the dissection of the human-human interactions that can lead to biodiversity conflicts when interests misalign or oppose each other. These papers emphasize how agroecological landscapes are social-ecological systems, showing why research now needs to apply both inter- and transdisciplinary disciplines in the same landscape. Biocultural approaches should aim to address conflicts resulting from anything that prevention and compensation of impacts (i.e., livestock predation, crop damage, economic solvency) cannot handle, unrealized food security being one of them (Crespin and Simonetti, 2021). However, we would be remiss not mentioning a missing critical approach, one based on the nonmaterial. Be it psychological, social, or behavioural in origin, conflicts can have deep-rooted issues that need more than the material, further requiring a biocultural approach (see Barua et al., 2013; Echeverria et al., 2018; Crespin and Simonetti, 2021).

Here, we have seen *i)* how the identification of patterns of food production (via crop or livestock) and conservation actions should remain a constant to properly prevent losses of either side (Kiffner et al.), *ii)* how the establishment of legal-frameworks to protect both people and nature should be synergetic (Jouzi et al.), *iii)* how pathways to coexistence are rooted in the local context that surround the multiplicity of stakeholders involved (Boronyak and Jabobs), and iv) how fairly incentivizing those responsible of producing the world's food (Sidemo-Holm) is a requisite to achieving coexistence between conservation and food security in social-ecological systems.

Author contributions

SC wrote the first draft; all authors edited and approved for publication.

Funding

SC was supported by ANID-FONDECYT N° 3200386.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

References

Bar-On, Y. M., Phillips, R., and Milo, R. (2018). The biomass distribution on Earth. *Proc. Natl. Acad. Sci.* 115 (25), 6506–6511. doi: 10.1073/pnas.1711842115

Barua, M., Bhagwat, S. A., and Jadhav, S. (2013). The hidden dimensions of human–wildlife conflict: Health impacts, opportunity and transaction costs. *Biol. Conserv.* 157, 309–316. doi: 10.1016/j.biocon.2012.07.014

Crespin, S. J., and Simonetti, J. A. (2021). Traversing the food-biodiversity nexus towards coexistence by manipulating social–ecological system parameters. *Conserv. Lett.* 14, e12779. doi: 10.1111/conl.12779

Echeverria, A., Karp, D. S., Naidoo, R., Zhao, J., and Chan, K. M. A. (2018). Approaching human-animal relationships from multiple angles: A synthetic perspective. *Biol. Conserv.* 224, 50–62. doi: 10.1016/j.biocon.2018.05.015

Hanspach, J., Haider, L. J., Oteros-Rozas, E., Olafsson, A. S., Gulsrud, N. M., Raymond, C. M., et al. (2020). Biocultural approaches to sustainability: A systematic review of the scientific literature. *People Nat.* 2 (3), 643–659. doi: 10.1002/pan3.10120

IPBES (2019). *Global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services*. Eds. E. S. Brondizio, J. Settele, S. Díaz and H. T. Ngo (Bonn, Germany: IPBES secretariat). 1148 pages. doi: 10.5281/zenodo.3831673

IUCN (2022) *The IUCN red list of threatened species. Version 2022-2*. Available at: https://www.iucnredlist.org (Accessed 17 May, 2023).

Peterson, M. N., Birckhead, J. L., Leong, K., Peterson, M. J., and Peterson, T. R. (2010). Rearticulating the myth of human–wildlife conflict. *Conserv. Lett.* 3 (2), 74–82. doi: 10.1111/j.1755-263X.2010.00099.x

United Nations (2022) *World population prospects: The 2022 revision* (New York: United Nations Department of Economic and Social Affairs, Population Division). Available at: https://population.un.org/wpp (Accessed 11 May, 2023).

United Nations General Assembly (1948). *The universal declaration of human rights (UDHR)* (New York: United Nations General Assembly).

United Nations Human Rights Council (2018). United nations declaration on the rights of peasants and other people working in rural areas: resolution / adopted by the human rights council on 28 september 2018. Available at: https://digitallibrary.un.org/record/1661560/files/A_RES_73_165-EN.pdf

WWF (2022). "Living Planet Report 2022 – Building a nature-positive society,". Eds. R. E. A. Almond, M. Grooten, D. Juffe Bignoli and T. Petersen (Gland, Switzerland: WWF).