

The ecological and geographic dynamics of extinction: Niche modeling and ecological marginalization

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The extinction problem has little to do with the death rattle of its final actor. The curtain in the last act is but a punctuation mark—it is not interesting in itself. What biologists want to know about is the process of decline in range and numbers (1).

In the above passage from his book chapter, Michael Soule offers a compelling argument for conservation biologists to focus on the process of decline of species well before they become endangered. By the time species are critically endangered, our options are sorely limited and, although species may persist as small populations for some time,

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Author contributions: M.V.L. wrote the paper.

The author declares no competing interest.

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See companion article, "Ecological marginalization is widespread and increases extinction risk in mammals," 10.1073/pnas.2220467120.

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Published January 12, 2023.

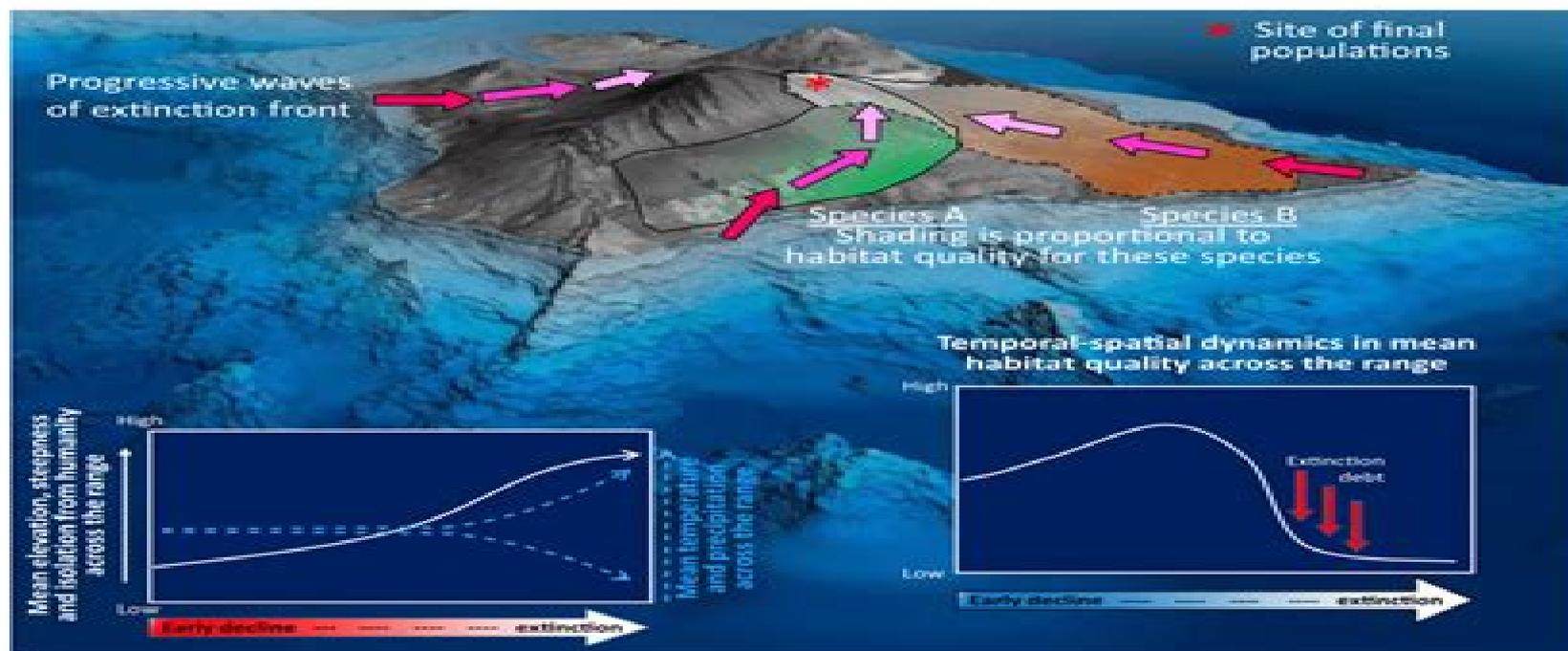


Fig. 1. Anthropogenic forces that cause wholesale range collapse and extinction of species are, by definition, so powerful that they render preexisting patterns in population densities irrelevant. Range contraction is thus determined by the geographic dynamics of those extinction forces, which tend to spread like a contagion across landscapes and seascapes. Final populations are those least and last impacted by anthropogenic forces (habitat loss and fragmentation, the spread of disease and problematic invasive species, etc.), persisting in the most remote reaches of their historic range—those at the highest elevations, in the steepest regions, and in areas of climatic extremes. One salient result is ecological marginalization, with remnant populations persisting only in suboptimal habitats where depressed survival, reproduction, and dispersal ultimately create an extinction debt that eventually leads to the final, albeit often long-delayed demise of the species.

Dynamics Of Extinction

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Table of Contents Dynamics Of Extinction

1. Understanding the eBook Dynamics Of Extinction
 - The Rise of Digital Reading Dynamics Of Extinction
 - Advantages of eBooks Over Traditional Books
2. Identifying Dynamics Of Extinction
 - Exploring Different Genres
 - Considering Fiction vs. Non-Fiction
 - Determining Your Reading Goals
3. Choosing the Right eBook Platform
 - Popular eBook Platforms
 - Features to Look for in an Dynamics Of Extinction
 - User-Friendly Interface
4. Exploring eBook Recommendations from Dynamics Of Extinction
 - Personalized Recommendations
 - Dynamics Of Extinction User Reviews and Ratings
 - Dynamics Of Extinction and Bestseller Lists
5. Accessing Dynamics Of Extinction Free and Paid eBooks

- Dynamics Of Extinction Public Domain eBooks
 - Dynamics Of Extinction eBook Subscription Services
 - Dynamics Of Extinction Budget-Friendly Options
6. Navigating Dynamics Of Extinction eBook Formats
 - ePub, PDF, MOBI, and More
 - Dynamics Of Extinction Compatibility with Devices
 - Dynamics Of Extinction Enhanced eBook Features
 7. Enhancing Your Reading Experience
 - Adjustable Fonts and Text Sizes of Dynamics Of Extinction
 - Highlighting and Note-Taking Dynamics Of Extinction
 - Interactive Elements Dynamics Of Extinction
 8. Staying Engaged with Dynamics Of Extinction
 - Joining Online Reading Communities
 - Participating in Virtual Book Clubs
 - Following Authors and Publishers Dynamics Of Extinction
 9. Balancing eBooks and Physical Books Dynamics Of Extinction
 - Benefits of a Digital Library
 - Creating a Diverse Reading Collection Dynamics Of Extinction
 10. Overcoming Reading Challenges
 - Dealing with Digital Eye Strain
 - Minimizing Distractions
 - Managing Screen Time
 11. Cultivating a Reading Routine Dynamics Of Extinction
 - Setting Reading Goals Dynamics Of Extinction
 - Carving Out Dedicated Reading Time
 12. Sourcing Reliable Information of Dynamics Of Extinction
 - Fact-Checking eBook Content of Dynamics Of Extinction
 - Distinguishing Credible Sources
 13. Promoting Lifelong Learning
 - Utilizing eBooks for Skill Development

- Exploring Educational eBooks
14. Embracing eBook Trends
- Integration of Multimedia Elements
 - Interactive and Gamified eBooks

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