Resource Competition

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As one of the most quantitative of ecological subdisciplines, resource competition is an important, central area of ecology. Recently research into this area has increased dramatically and resource competition models have become more complex. The characterisation of this phenomenon is therefore the aim of this book. Resource Competition seeks to identify the unifying principles emerging from experimental and theoretical approaches as well as the differences between organisms, illustrating that greater knowledge of resource competition will benefit human and environmental welfare. This book will serve as an indispensable guide to ecologists, evolutionary biologists and environmental managers, and all those interested in resource competition as an emerging discipline.

Competition for Water Resources: Experiences and Management Approaches in the U.S. and Europe addresses the escalation of global issues regarding water scarcity and the necessary, cost-effective strategies that must be put in place in order to deal with escalating water crisis. The book evaluates use and competition for water resources in the U.S. and Europe, emphasizing the problems and challenges of dealing with tradeoffs in water. In addition, the book discusses water management strategies that can be used to optimize water use and allocation, mitigate water scarcity, and adapt to water scarcity. Supplementing the numerous case studies, the book includes lessons learned from applying specific strategies and

approaches. This comprehensive overview and comparison of management practices across two continents is an invaluable resource for researchers, policymakers, and educators in water. Provides a national and regional perspective through the use of country specific case study examples Includes a comparative analysis between the U.S. and Europe, illustrating experiences in water management from two sides of the Atlantic Covers interdisciplinary topics related to water, such as agriculture and energy

Conflict management is an intrinsic element of natural resource management, and becomes increasingly important amid growing pressure on natural resources from local uses, as well as from external drivers such as climate change and international investment. If policymakers and practitioners aim to truly improve livelihood resilience and reduce vulnerabilities of poor rural households, issues of resource competition and conflict management cannot be ignored. This synthesis report summarizes outcomes and lessons from three ecoregions: Lake Victoria, with a focus on Uganda; Lake Kariba, with a focus on Zambia; and Tonle Sap Lake in Cambodia. Partners used a common approach to stakeholder engagement and action research that we call “Collaborating for Resilience.” In each region, partners assisted local stakeholders in developing a shared understanding of risks and opportunities, weighing alternative actions, developing action plans, and evaluating and learning from the outcomes. These experiences demonstrate that investing in capacities for conflict management is practical and can contribute to broader improvements in resource governance.

RESOURCE COMPETITION BETWEEN TWO CO-OCCURRING SPECIES OF POLYTRICHUM.

Critical Energy and the Resource Challenge

Resources, Competences, Productivity, Economic Growth

Dialogue to address the roots of resource competition: Lessons for policy and practice

Case Studies Into Commercial Livestock Ranching and Pastoral Institutions

Competitiveness describes a key ability important for plants to grow and survive abiotic and biotic stresses. Under optimal, but particularly under non-optimal conditions, plants compete for resources including nutrients, light, water, space, pollinators and other. Competition occurs above- and belowground. In resource-poor habitats, competition is generally considered to be more pronounced than in resource-rich habitats. Although competition occurs between different players within an ecosystem such as between plants and soil microorganisms, our topic focusses on plant-plant interactions and includes inter-specific competition between different species of similar and

different life forms and intra-specific competition. Strategies for securing resources via spatial or temporal separation and different resource needs generally reduce competition. Increasingly important is the effect of invasive plants and subsequent decline in biodiversity and ecosystem function. Current knowledge and future climate predictions suggest that in some situations competition will be intensified with occurrence of increased abiotic (e.g. water and nutrient limitations) and biotic stresses (e.g. mass outbreak of insects), but competition might also decrease in situations where plant productivity and survival declines (e.g. habitats with degraded soils). Changing interactions, climate change and biological invasions place new challenges on ecosystems. Understanding processes and mechanisms that underlie the interactions between plants and environmental factors will aid predictions and intervention. There is much need to develop strategies to secure ecosystem services via primary productivity and to prevent the continued loss of biodiversity. This Research Topic provides an up-to-date account of knowledge on plant-plant interactions with a focus on identifying the mechanisms underpinning competitive ability. The Research Topic aims to showcase knowledge that links ecological relevance with physiological processes to better understanding plant and ecosystem function.

In this paper, we test a model in which it is assumed that the left and right cerebral hemispheres have access to independent supplies of resources, which they may each use in most kinds of information processing situations. Eight male subjects were specifically selected for having demonstrated a strong right-hand superiority on several manual tasks, and a strong RVF-LH superiority for processing the stimuli we would be using as a verbal memory load in a dual-task situation. Their performance was then measured on the memory load task, on a target task in which pairs of stimuli were presented to either visual field and subjects performed physical or name identity judgments, and in a situation in which both tasks were combined. In our approach, right and left visual field trials of the target task combined with the verbal memory load are treated as two different dual-task situations, comprising cases of complete vs. no overlap in demand for left hemisphere resources, respectively. Subjects were paid for both single and dual-task performance; in the latter case, the payoff ratios rewarded them more for either their memory or target task accuracy. Decrements from single-task performance were less severe on both tasks when subjects were performing physical rather than name matches, and importantly, when the target stimuli were presented to the LVF rather than the RVF. The data support the idea that the resource supplies of the left and right hemispheres are independent, and have implications for both cerebral specialization and divided attention issues.

Antelopes constitute a fundamental part of ecosystems throughout Africa and

Asia where they act as habitat architects, dispersers of seeds, and prey for large carnivores. The fascication they hold in the human mind is evident from prehistoric rock paintings and ancient Egyptian art to today's wildlife documentaries and popularity in zoos. In recent years, however, the spectacular herds of the past have been decimated or extripated over wide areas in the wilds, and urgent conservation action is needed to preserve this world heritage for generations to come. As the first book dedicated to antelope conservation, this volume sets out to diagnose the causes of the drastic declines in antelope biodiversity and on this basis identify the most effective points of action. In doing so, the book covers central issues in the current conservation debate, especially related to the management of overexploitation, habitat fragmentation, disease transmission, climate change, populations genetics, and reintroductions. The contributions are authored by world-leading experts in the field, and the book is a useful resource to conservation scientists and practitioners, researchers, and students in related disciplines as well as interested lay people.

The Effect of Area on Resource Competition Among Migrant Birds at a Stopover Site

Evolution's Wedge

Pastoral Resource Competition in Uganda

A GIS approach to identifying territorial resource competition

From Diagnosis to Action

The Role of Resource Competition in Ungulate Diversity and Community Structure in Africa

One of the central questions of ecology is why there are so many different kinds of plants and animals. Here David Tilman presents a theory of how organisms compete for resources and the way their competition promotes diversity. Developing Hutchinson's suggestion that the main cause of diversity is the feeding relations of species, this book builds a mechanistic, resource-based explanation of the structure and functioning of ecological communities. In a detailed analysis of the Park Grass Experiments at the Rothamsted Experimental Station in England, the author demonstrates that the dramatic results of these 120 years of experimentation are consistent with his theory, as are observations in many other natural communities. The consumer-resource approach of this book is applicable to both animal and plant communities, but the majority of Professor Tilman's discussion concentrates on the structure of plant communities. All theoretical arguments are developed graphically, and formal mathematics is kept to a minimum. The final chapters of the book provide some testable speculations about resources and animal communities and explore such problems as the evolution of "super species," the differences between plant and animal community diversity patterns, and the cause of plant succession.

In the Ankole region the overriding concern since the colonial period has been the commercialization of livestock production through the introduction of commercial ranching. The lack of success in this endeavor is due not only to the political and economic crises over the years, but to a

failure to understand the underlying bottlenecks faced by the various categories of cattle keepers. In pastoral Karamoja the proliferation of firearms has had a profound impact on the organization of herd management. The inherent military organization of the harding cooperatives forced the Ngakarimojong people to adapt not only to changes in their physical environment but also to regional factors. This study examines the two issues that figure large in contemporary Ugandan agricultural and political studies -- ranching and pastoral institutions where the cattle move with seasons and droughts.

Among scholars who focus on the politics of natural resources, conventional wisdom asserts that resource-scarce states have the strongest interest in securing control over resources. Counterintuitively, however, in Perils of Plenty, Jonathan N. Markowitz finds that the opposite is true. In actuality, what states make influences what they want to take. Specifically, Markowitz argues that the more economically dependent states are on resource extraction rents for income, the stronger their preferences will be to secure control over resources. He tests the theory with a set of case studies that analyze how states reacted to the 2007 exogenous climate shock that exposed energy resources in the Arctic. Given the dangerous potential for conflict escalation in the Middle East and the South China Sea and the continued shrinkage of the polar ice cap, this book speaks to a genuinely important development in world politics that will have implications for understanding the political effects of climate change for many years to come.

Antelope Conservation

Perils of Plenty

Resource Competition and World Politics in the Twenty-first Century

Competition and Resource Partitioning in Temperate Ungulate Assemblies

Multispecies Resource Competition

Competition and Coexistence

This dissertation studies spatial resource competition settings where nomadic agents migrate across different locations, competing for time-varying and location-specific resources. Such setting arises in crowd-sourced transportation services, online communities, and traditional location-based economic activities. In these settings, many factors influence the agents' behavior: the resource dynamics, the way resource is shared among agents at different locations, the information available to the agents, etc. Understanding agents' behavior in equilibrium and how their decisions depend on these factors can help system operators design better mechanisms to improve social welfare of systems. Analyzing these settings systematically is challenging, since agents' decisions influence each other spatially and temporally in a complicated nested way. This dissertation aims at building models that capture the essentials of spatial resource competitions, and are analytically tractable, to help understand the nature of agents' interactions in these settings, from a game theoretical point of view. We first provide a general model for spatial resource competition settings. Using the methodology of mean field approximation, we analyze the dynamics and the game between the agents at a single location, in the limit where there are infinitely many locations. We characterize an equilibrium for agents in the mean field model where agents' equilibrium strategies have a simple Markovian structure. We then provide a

method to approximately compute the equilibrium for a common case of resource competition where the amount of resource each agent gets decreases as the number of agents competing with her increases. We study numerically how different factors affect agents' equilibrium behavior. We also extend our model and analysis to more general settings where locations are non-homogeneous and there is a two-sided market at each location. Finally, we study information design problem in spatial resource competition scenarios. That is, how should a system operator communicate her extra information about the system to the agents in order to better position them and increase their welfare? We study both private and public signaling mechanisms. For private signaling, we provide a method to obtain the optimal mechanism in polynomial time. For public signaling, we show the sender preferred equilibrium has a simple threshold structure and characterize the structure of the optimal public mechanism under the sender preferred equilibrium. We show via numerical computations that the optimal private and public signaling mechanisms achieve substantially higher social welfare compared with no information sharing or full information sharing in many settings.

A General Theory of Competition develops a ground-breaking new theory of competition - `resource-advantage theory'. Recent thinking on competition has assumed the premises, structure and implications of the theory of perfect competition. In his long-awaited book Shelby Hunt draws on economics, management, marketing and sociology to articulate resource-advantage theory. The author proceeds to illustrate how and why his theory may be used to explain and predict economic phenomena with great accuracy. This volume is extremely well-referenced, with detailed source notes.

The question "Why are there so many species?" has puzzled ecologist for a long time. Initially, an academic question, it has gained practical interest by the recent awareness of global biodiversity loss. Species diversity in local ecosystems has always been discussed in relation to the problem of competi tive exclusion and the apparent contradiction between the competitive exclu sion principle and the overwhelming richness of species found in nature. Competition as a mechanism structuring ecological communities has never been uncontroversial. Not only its importance but even its existence have been debated. On the one extreme, some ecologists have taken competi tion for granted and have used it as an explanation by default if the distribu tion of a species was more restricted than could be explained by physiology and dispersal history. For decades, competition has been a core mechanism behind popular concepts like ecological niche, succession, limiting similarity, and character displacement, among others. For some, competition has almost become synonymous with the Darwinian "struggle for existence", although simple plausibility should tell us that organisms have to struggle against much more than competitors, e.g. predators, parasites, pathogens, and envi ronmental harshness.

A General Theory of Competition

Watershed Governance

Experiences and Management Approaches in the US and Europe

U.S.-Soviet Resource Competition in Central and Southern Africa

Measuring and Analyzing Resource Competition in Genetic Circuits

The Effects of Resource Competition and Dilution on Sibling Rivalry in Rural Dominica

An examination of the challenges of managing the upper watersheds of mainland South East Asia, taking local livelihoods and resource competition as its point of departure. It presents the factors of change that drive the economic, environmental and social transformations of the area.

Evolutionary biology has long sought to explain how new traits and new species arise. Darwin maintained that competition is key to understanding this biodiversity and held that selection acting to minimize competition causes competitors to become increasingly different, thereby promoting new traits and new species. Despite Darwin ' s emphasis, competition ' s role in diversification remains controversial and largely underappreciated. In their synthetic and provocative book, evolutionary ecologists David and Karin Pfennig explore competition's role in generating and maintaining biodiversity. The authors discuss how selection can lessen resource competition or costly reproductive interactions by promoting trait evolution through a process known as character displacement. They further describe character displacement ' s underlying genetic and developmental mechanisms. The authors then consider character displacement ' s myriad downstream effects, ranging from shaping ecological communities to promoting new traits and new species and even fueling large-scale evolutionary trends. Drawing on numerous studies from natural populations, and written for a broad audience, Evolution ' s Wedge seeks to inspire future research into character displacement ' s many implications for ecology and evolution.

The field of synthetic biology aims to engineer organisms has shown great promise for exciting applications in fields such as medicine, pharmaceuticals, agriculture, and chemical engineering. However, the design and implementation of genetic circuits is hampered by resource competition between genetic circuit parts, where separate genetic parts become coupled due to individual parts competing for the use of shared cellular resources necessary for the part's function such as ribosomes. These resource competition effects create undesired interactions in genetic circuits and may cause engineered systems to behave unexpectedly, which impedes the design of complex genetic circuits. This thesis analyzes the effects of resource competition on the behavior of genetic circuits. Using mechanistic mathematical models, we first present a theoretical framework and give conditions to determine when the number of equilibrium points of a dynamical system is subject to change due to state-dependent perturbations, which is applicable to genetic circuits with resource competition. These tools can inform genetic circuit design for improved robustness to resource competition. Next, we develop a method to experimentally measure and predict resource competition in genetic circuits. We propose two key measures of resource competition based on a mathematical model that determine a genetic circuit module's behavior under changes in the availability of cellular resources. Using a special module, called a resource sensor, we experimentally estimate the resource competition measures for any genetic circuit module and are able to accurately predict the circuit's behavior in new contexts. Finally, we analyze the effects of resource competition in biomolecular controllers regulating bacterial population size. We demonstrate that the controller faces a fundamental trade-off making it impossible

for the population size to be robust to both resource competition disturbances and environmental disturbances simultaneously. This work enables a better-informed approach to genetic circuit design where resource competition is accounted for, leading to more robust outcomes.

Resource Competition and Community Structure. (MPB-17), Volume 17

Arctic Resource Competition and the Return of the Great Game

A Virtual World Method : a Dissertation Presented

Cerebral Economics: Resource Competition Within But Not Between Hemispheres

Intergroup and Interindividual Resource Competition Escalating Into Conflict

Ethnicity and Resource Competition in Plural Societies

Rory Putman addresses the question of how, in many temporate ecosystems, diverse and species-rich assemblies of ungulates manage to co-exist despite often quite extensive overlap in ecological requirements. Putman explores the potential for competition, competition tolerance and even positive facilitation amongst the members of such guilds of ungulates. As a central worked example, the author employs data resulting from over 20 years of personal research into the ecology and population dynamics of various large herbivores of the New Forest in Southern England. With these, he applies formal protocols in resource use, evidence for resource limitation and evidence for interaction between species in changing population size over the years.

Author's abstract: Few studies have focused on the habitat and resource requirements of migratory landbirds along migration routes. Habitat fragmentation may exacerbate the costs of migration by reducing food availability and/or increasing competition at crowded stopover sites. I predicted that smaller forest fragments would have higher densities of birds, and that birds would compete for food more intensely in smaller fragments. I examined seven forest fragments of varying size (0.69 ha - 5.69 ha) at Savannah National Wildlife refuge in three migration periods between Spring 2007 and Spring 2008. I set up netted exclosure pairs to examine the relationship among fragment size, bird density and resource abundance. I found that in Fall 2007 and Spring 2008, the density of migrant birds was higher in smaller fragments. In all three field seasons, the density of resident birds was higher in smaller fragments than in larger fragments. Birds did depress arthropod abundance in Spring 2007 and 2008, but there was no relationship with hammock size. Birds did not have a measureable effect on fruit resources in the fall. The higher density of both migrants and residents in smaller hammocks indicates that birds are responding to area during stopover. The difference between arthropod abundance in exclosure pairs indicates that birds use this food

resource, and provides evidence for food competition.

CRISPR-mediated gene regulation is known for its ability to control multiple targets simultaneously due to its modular nature: the same dCas9 effector can target different genes simply by changing the associated gRNA. However, multiplexing requires the sharing of limited amounts of dCas9 protein among multiple gRNAs, leading to resource competition. In turn, competition between gRNAs for the same resource may hamper network function. In this thesis, we develop a general model that takes into account the sharing of limited amounts of dCas9 protein for arbitrary CRISPR-mediated gene repression networks. We demonstrate that, as a result of resource competition, hidden interactions appear, which modifies the intended network regulations. As a case study, we analyze the effects of these hidden interactions on repression cascades. In particular, we illustrate that perfect adaptation to resource fluctuations can be achieved for certain network topology. Then, we analyze the stability properties of uncertain systems that are affected by resource competition via contraction analysis. Finally, we perform a combined analytical and experimental study on a two gRNA parallel network to demonstrate the resource competition effect.

Plant Competition in a Changing World

The Extermination Option

Livelihoods and Resource Competition in the Mountains of Mainland Southeast Asia

phytoplankton growing according to the variable-internal-stores model

Dominance, Diversity, and Resource Competition in Old-field Plant Communities

Resource competition in a variable environment

Therefore, the long-term outcome, coexistence or competitive exclusion, should depend on the frequency of moderate droughts.

The globalizing world is increasingly confronting a new category of security issues related to resource availability. The resource environment contains both traditional categories, such as energy, foodstuffs, and water, as well as new technologically related resources, such as rare earth minerals. The essays in this volume emphasize both the uniqueness and the magnitude of these new challenges, while simultaneously acknowledging that cooperation and competition in response to these security concerns occur within the context of both the historical and contemporary international power configurations. Moreover, these challenges are of a global nature and will require global perspectives, global thinking, and innovative global solutions. Krishna-Hensel brings together a wide range of topics focusing on critical resource availability impacting upon global security and the geopolitical ramifications of resource competition. The volume addresses the development of strategic thinking on these issues and underscores the

increasing awareness that this is a critical area of concern in the twenty-first century global landscape.
The goal of this research was to evaluate and integrate gradient models and resource competition models to kinds of explanation of forest community structure and dynamics previously developed at different spatial scales. Progress was made in several areas of empirical gradient modeling and on issues regarding use of resource-competition models for use in forest modeling: Empirical gradient modeling: scaled rank variance, data transformation, applications, stand mapping, scale comparisons; Resource competition: resource limitation experiments, resource competition modeling; parameterization of resources competition models.
Biodiversity and Community Structure in a Tallgrass Prairie
Resource Competition in a Variable Environment
Resource Competition
Influences of Predation and Resource Competition on the Social System of Vervet Monkeys (Cercopithecus Aethiops) in Amboseli National Park, Kenya
The Influences of Social Identities and Resource Competition on Blacks' and Asians' Social Distance
New Security Frontiers