

Lab # : Virtual Lab – Population Biology

Problem How does competition affect population growth?

Background (Read the background in order to answer the Pre-Lab Questions that follow)

The genus *Paramecium* includes several species of one-celled protists that live in freshwater. When there is enough food, water, and space, populations of these species grow rapidly and follow a pattern known as exponential growth, in which the total number of potentially reproducing organisms increases with each generation. However, populations of any organism will not increase indefinitely. Eventually, limitations on food, water, and other resources will cause the population to stop increasing.



When a population arrives at the point where its size remains stable, it has reached the *carrying capacity* of the environment. The carrying capacity is the greatest number of individuals a given environment can sustain. Competition for resources among members of a population (*intraspecific competition*) places limits on population size.

Competition for resources among members of two or more different species (*interspecific competition*) also affects population size. In a classic series of experiments in the 1930s, a Russian ecologist, G.F. Gause, formulated his *principle of competitive exclusion*. This principle states that if two species are competing for the same resource, the species with a more rapid growth rate will outcompete the other. In other words, no two species can occupy the same niche.

In competing populations of organisms, genetic variations that reduce competition are favored through natural selection. Suppose two species (A and B) compete for the same food source. Individuals of species A can also use another food source, which reduces the competition over the food source needed by species B. The individuals of species A that can use another food source survive because they do not have to compete with individuals of species B for that food. In nature, organisms frequently invade unoccupied habitats simply to avoid intense competition. Once the organism is in a new habitat, any variations that allow it to use the available resources will tend to be perpetuated through the population. In this way, the genetic makeup of the population may slowly change, and the species will become adapted to a new niche.

Objectives

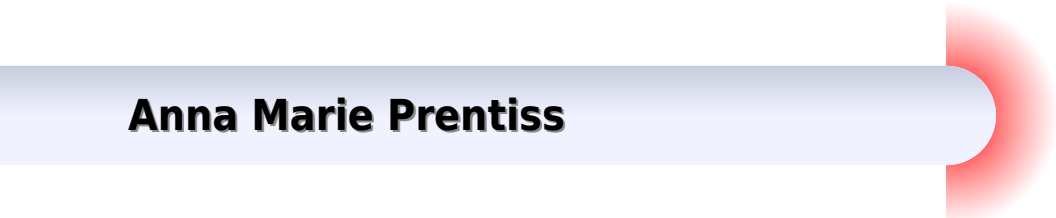
- Conduct an experiment on two species of the protozoan *Paramecium*, growing each alone and then growing them together.
- Graph and compare growth curves of the populations of each species, alone and together.
- Show how competition for natural resources in the environment can affect population growth.
- Explain how availability of resources, such as food, can be limiting factors for populations.

Materials: cultures of *Paramecium caudatum* and *P. Aurelia*

Procedure: See Virtual Lab at web site http://glencoe.mcgraw-hill.com/sites/dl/free/0078757134/383928/BL_04.html

Answers For Virtual Lab Population Biology

Anna Marie Prentiss



Answers For Virtual Lab Population Biology:

E-Learning as a Socio-Cultural System: A Multidimensional Analysis Zuzevičiūtė, Vaiva, Butrimė, Edita, Vitkutė-Adžgauskienė, Daiva, Vladimirovich Fomin, Vladislav, Kikis-Papadakis, Kathy, 2014-06-30 Information and communication technologies play a crucial role in a number of modern industries Among these education has perhaps seen the greatest increases in efficiency and availability through Internet based technologies E Learning as a Socio Cultural System A Multidimensional Analysis provides readers with a critical examination of the theories models and best practices in online education from a social perspective evaluating blended distance and mobile learning systems with a focus on the interactions of their practitioners Within the pages of this volume teachers students administrators policy makers and IT professionals will all find valuable advice and enriching personal experiences in the field of online education **K-12 STEM Education: Breakthroughs in Research and Practice** Management Association, Information Resources, 2017-10-31 Education is vital to the progression and sustainability of society By developing effective learning programs this creates numerous impacts and benefits for future generations to come K 12 STEM Education Breakthroughs in Research and Practice is a pivotal source of academic material on the latest trends techniques technological tools and scholarly perspectives on STEM education in K 12 learning environments Including a range of pertinent topics such as instructional design online learning and educational technologies this book is an ideal reference source for teachers teacher educators professionals students researchers and practitioners interested in the latest developments in K 12 STEM education

Sustainable Health and Long-Term Care Solutions for an Aging Population Fong, Ben, Ng, Artie, Yuen, Peter, 2017-06-30 Lasting healthcare for the entire population specifically the elderly has become a main priority in society It is imperative to find ways to boost the longevity of healthcare services for all users Sustainable Health and Long Term Care Solutions for an Aging Population is a pivotal reference source featuring the latest scholarly research on issues pertinent to health cost and finding effective ways of financing healthcare for the elderly Including coverage on a number of topics such as provider accreditation corporate social responsibility and data management this book is ideally designed for policy makers academicians researchers and advanced level students seeking current research on the innovative planning and development of healthcare **Revolutionizing K-12 Blended Learning through the i²Flex Classroom Model** Avgerinou, Maria D., Gialamas, Stefanos P., 2016-06-20 Blended learning has gained significant attention recently by educational leaders practitioners and researchers i Flex a variation of blended learning is based on the premise that certain non interactive teaching activities such as lecturing can take place by students without teachers direct involvement Classroom time can then be used for educational activities that fully exploit teacher student and student student interactions allowing for meaningful personalized feedback and scaffolding on demand Revolutionizing K 12 Blended Learning through the i Flex Classroom Model presents a well rounded discussion on the i Flex model highlighting methods for K 12 course design delivery and

evaluation in addition to teacher performance assessment in a blended i Flex environment Emphasizing new methods for improving the classroom and learning experience in addition to preparing students for higher education and careers this publication is an essential reference source for pre service and in service teachers researchers administrators and educational technology developers **Overcoming Challenges in Online Learning** Areej ElSary,Abdulrasheed Olowoselu,2023-03-03 This book examines four distinct areas of education that suffered as a result of the COVID 19 pandemic in Asian and African regions and tackles the challenges and barriers that came as a result of the shift to online learning Presenting perspectives from China Malaysia Nigeria and the UAE chapters frame research within the context of innovation experiences to explore transformative learning theory and set out the ways in which leaders educators students and parents adapted to learning during the pandemic Foregrounding four central topics challenges and barriers teaching and learning assessment educational technology and interactive learning environments the volume provides globally relevant findings and implications for the effects of the pandemic on learning in these regions and furthers the field of educational technology more broadly Topics covered range from teaching and leading in the online learning environment to educational technology and the interactive learning space Sharing innovative experiences to aid progression and share best practice for online learning moving forward the book will be highly relevant to researchers academics and students in the fields of higher education online and eLearning and technology in education **FormaMente n. 1-2/2012 AA.**

VV.,2012-07-25T00:00:00+02:00 RICERCA Jet momentum dependence of jet quenching in PbPb collisions at SNN 2 76 TeV The CMS Collaboration Modeling the metaverse a theoretical model of effective team collaboration in 3D virtual environments Sarah van der Land Alexander P Schouten Bart van den Hooff Frans Feldberg The capture of moving object in video image Weina Fu Zhiwen Xu Shuai Liu Xin Wang Hongchang Ke Visual metaphors in virtual worlds The example of NANEC 2010 11 Dolores Capdet Von Neuromancer zu Second Life Raumsimulationen im Cyberspace Steffen Kr mer APPLICAZIONI APPLICAZIONI Sensor models and localization algorithms for sensor networks based on received signal strength Fredrik Gustafsson Fredrik Gunnarsson David Lindgren Interactive lab to learn radio astronomy microwave antenna engineering at the Technical University of Cartagena Jos Luis G mez Tornero David Ca ete Rebenaque Fernando Daniel Quesada Pereira Alejandro lvarez Melc n **Carolina Science and Math** Carolina Biological Supply Company,2003

The SAGE Encyclopedia of Online Education Steven L. Danver,2016-04-15 Online education both by for profit institutions and within traditional universities has seen recent tremendous growth and appeal but online education has many aspects that are not well understood The SAGE Encyclopedia of Online Education provides a thorough and engaging reference on all aspects of this field from the theoretical dimensions of teaching online to the technological aspects of implementing online courses with a central focus on the effective education of students Key topics explored through over 350 entries include Technology used in the online classroom Institutions that have contributed to the growth of online education

Pedagogical basis and strategies of online education Effectiveness and assessment Different types of online education and best practices The changing role of online education in the global education system Handbook of Evolutionary Research in Archaeology Anna Marie Prentiss, 2019-06-03 Evolutionary Research in Archaeology seeks to provide a comprehensive overview of contemporary evolutionary research in archaeology The book will provide a single source for introduction and overview of basic and advanced evolutionary concepts and research programs in archaeology Content will be organized around four areas of critical research including microevolutionary and macroevolutionary process human ecology studies evolutionary ecology demography and niche construction and evolutionary cognitive archaeology Authors of individual chapters will address theoretical foundations history of research contemporary contributions and debates and implications for the future for their respective topics As appropriate authors present or discuss short empirical case studies to illustrate key arguments *Essential iGenetics* Peter J. Russell, 2003 Building on the proven strength of Russell's step by step problem solving approach *Essential iGenetics* blends a classic Mendel first approach with modern molecular coverage This easy to read introduction to genetics presents full coverage of the subject in a brief and manageable format Readers develop and apply critical thinking skills as they work step by step through a number of solved genetics problems Readers can also apply the principles and techniques learned to a variety of problems at the end of each chapter The book covers basic genetics principles with balanced coverage of Mendel historical experiments and cutting edge chapters on Genome Analysis and Molecular Evolution

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