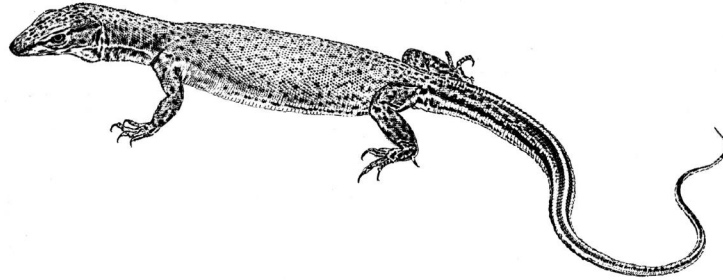


**BIO 373. Ecology.** An introduction to ecology, the study of relationships among organisms and between organisms and their environment; adaptations, population, communities, and ecosystems. Includes both plants and animals and both terrestrial and aquatic ecosystems. Three lecture hours and one discussion hour a week for one semester. Prerequisite: Biology 325 or 325H with a grade of at least C.



### **Biology 373: Ecology, Fall 2014**

Tuesday-Thursday 12:30-2PM, RLM 5.104

#### **Instructors**

Eric R. Pianka (Prof.)

#### **E-mail Addresses**

Eric R. Pianka ([pianka@mail.utexas.edu](mailto:pianka@mail.utexas.edu))

Teaching Assistant ([TA@gmail.com](mailto:TA@gmail.com))

#### **Office Hours**

Eric (PAT 125, Mon., Fri. 1-2) or by appointment (471-7472 or by email)

TA (PAT) or by appointment (no phone, please use e-mail)

#### **Textbook**

Pianka, *Evolutionary Ecology, 6<sup>th</sup> or 7<sup>th</sup> eBook Edition*

Please read Chapters 1 and 8 (posted on **Blackboard Course Documents**)

#### **Websites**

<http://www.zo.utexas.edu/courses/bio373>

<http://www.zo.utexas.edu/courses/THOC>

#### **Discussion Sections**

Wednesday

Wednesday

Friday 9-10,

Friday 10-11

### **Suggested Additional Reading**

Case, *An Illustrated Guide to Theoretical Ecology* (read pp. 79-100)

Ginzburg and Golenberg, *Lectures in Theoretical Population Biology*

(read pp. 1-5 and 193-219)

Gotelli, *A Primer of Ecology* (read pp. 2-85)

### **Exams**

Three in-class exams during the semester (only the best two will be counted) plus one comprehensive final, scheduled as follows:

First Exam: Oct.

Second Exam: Nov.

Third Exam: Dec.

Final Exam: December, 2-5 PM

### **Letter Grade**

Your lowest hour exam will be thrown out (no "make up" exams!).

Your best two exams will each count 25% of your course letter grade.

The comprehensive Final counts for 50% of your course grade. These are the only four ways you can earn your grade. No "extra" points are available. Final grades are FINAL, carved in stone, and will not be changed. UT's "new" plus- minus system will be used.

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## **Course Outline, Biology 373: Ecology**

**(Subjects will be covered in the following order)**

### **Background**

Scaling and the hierarchical structure of biology, levels of approach in biology, domain of ecology, definitions and ground work; anthropocentrism, the importance of wild organisms in pristine natural environments, the urgency of basic ecological research; scientific methodology; models; multiple causality; limiting factors, tolerance limits, the principle of allocation; natural selection and adaptation, self-replicating molecular assemblages; units of selection; speciation; phylogeny; classification and phylogenetic systematics.

## **History and Biogeography**

Self-replicating molecular assemblages, geological past, classical biogeography, Wallacea, continental drift (plate tectonics)

## **Meteorology**

Major determinants of climate, oceans, local perturbations, variations in time and space, global weather modification

## **Climate and Vegetation**

Plant life forms and biomes, the interface between climate and vegetation; classification of climates and vegetation; microclimate; potential and actual evapotranspiration and productivity; leaf and root tactics; adaptive geometry of trees; soil formation and succession; biogeochemical cycles, soil formation and primary succession, energy flow, primary production and evapotranspiration, ecotones, classification of natural communities, freshwater aquatic ecosystems

## **Physiological Ecology**

Physiological optima and tolerance curves, energetics of metabolism and movement; energy budgets and the principle of allocation; adaptation and deterioration of environment; heat budgets and thermal ecology; water economy in desert organisms; other limiting materials; sensory capacities and environmental cues; adaptive suites and design constraints.

## **Principles of Population Ecology**

Life tables and schedules of reproduction; net reproductive rate and reproductive value; stable age distribution; Leslie matrices; intrinsic rate of increase; evolution of reproductive tactics; avian clutch size; evolution of old age and death rates; population growth and regulation -- Pearl-Verhulst logistic equation; density dependence and independence;  $r$  and  $K$  selection; population "cycles," cause and effect; use of space (vagility, home range, territoriality, foraging tactics); evolution of sex; sex ratio; mating systems; sexual selection; fitness and the individual's status in the population; kin selection, inclusive fitness; reciprocal altruism, parent-offspring conflict.

## **Interactions Between Populations**

Direct versus indirect and complex population interactions. Parasitism, Commensalism, Mutualisms, etc.; Competition and Niche Theory: Lotka-Volterra equations and competition theory; diffuse competition; niche overlap and competition; niche dimensionality; niche breadth (specialization versus generalization); evolutionary consequences; laboratory and field experiments; other evidence from nature; future prospects. Predation: Theory; predator-prey oscillations; aspect diversity; "prudent"

predation and optimal yield; evolutionary consequences; predator escape tactics; adaptive coloration; mimicry; warning calls; coevolution; plant-herbivore interactions and plant-apparency theory; selected other observations and experiments.

### **The Role of Phylogenetics in Ecology**

Phylogenetic systematics, independent contrasts, the comparative method, evolutionary ecomorphology, recovering the history of the vanishing book of life on Earth

### **Community Ecology**

Macrodescriptors; compartmentation in communities (trophic levels, guild structure, and food webs); connectance; pyramids of numbers, biomass, and energy; energy flow and ecological energetics; secondary succession and transition matrices; community matrix; saturation with individuals and with species; species diversity; diversity of lowland rainforest trees; community stability; types of stability; chaotic attractors; evolutionary convergence and ecological equivalents; evolution of communities; pseudo-communities.

### **Island Biogeography and Conservation Biology**

Classical biogeography; biogeographic “rules;” continental drift; island biogeography; species-area relationships; equilibrium theory; compression hypothesis; islands as ecological experiments: Krakatau, Darwin's finches, Hawaiian Drosophilidae, other examples; metapopulations, conservation biology, human impacts on natural ecosystems, hot spots of biodiversity, applied biogeography and design of nature preserves.