BioMaPS: UBM @ MSU
Biology and Mathematics in Population Studies

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Program Overview

Our objective is to equip 25 students over a five year period with the skills necessary to understand and develop accurate models of biomedical and ecological phenomena. Students are selected in the Fall and work for a calendar year. There are weekly mentor meetings, monthly BioMaPS meetings, and full time research in the summer months. A final report is completed in December. The students are expected to give at least one presentation yearly.

2007 BioMaPS participants: Dr. Maeve McCarthy, Dr. Terry Derting, Sarah Thomason, Ashley Hagan, Dr. Renee Fister, Dr. Chris Mecklin, Courtney Thomason, Michael Whitby, Jake Elliott, Todd Schoborg), and Dr. Howard Whiteman (Not pictured Drs. KateHe, Nicole Gerlanc, and David Roach)

BioMath Seminar

In order to further develop our collaborations, we have run a Biomathematics Seminar since Spring 2004. This seminar is open to all interested MSU faculty and students. Recent speakers have included faculty from Vanderbilt University, Meredith College, Rice University, Loyola University, College of William and Mary, Kennesaw State University, Western State College of Colorado, Old Dominion University, and Murray State University.

Biomathematics Workshops

Year 1: Workshop at Murray State University that focused on specific research questions, Matlab studies, Mark and Recapture software demonstrations, and BioQuest Modules
Year 2: Student Participation in the MAA/SBM short course on Mathematical Biology in San Jose, CA
Year 3: National Workshop organized by our BioMaPS group with three plenary speakers (Beloit College, Northern Kentucky University, and Murray State University) and student poster presentations

Tigers salmanders

Academic Emphases

Applied Mathematics Area with Biology Track

- **Requires Mathematics Minor, 2 computer science courses, at least 6 Biology courses in a given track,**
- **Developed in Fall 2006, approved in Spring 2007.**

Principles of Biomathematics Course

- **Biological and mathematical models are united in this research-based course. Students engage in team driven research**
- **The prerequisites are Calculus I and Biological Inquiry.**
- **It was approved in Fall 2007 and is now taught to 12 students in Spring 2008.**

Highlighted Projects

- Ashley Hagan, Todd Schoborg, Nicole Gerlanc, Chris Mecklin, Maeve McCarthy and Howard Whiteman

This group (2006 and 2007) investigates pedigrees from a Colorado population of Tiger Salamanders (*Ambystoma tigrinum*) by analyzing microsatellites. Their work assigns parentage accurately from known families that can then be used to assign parentage/relatedness among members from the population using statistical techniques..

BioMaPS students studying Tiger Salamander in Colorado and at Murray State.

- Tiffany Hedrick, Courtney Thomason, Terry Derting, and Renee Fister

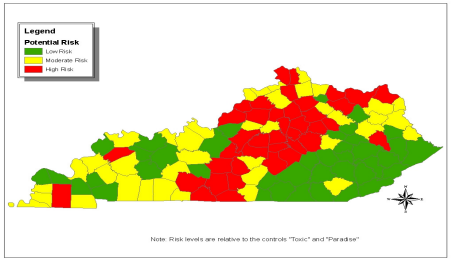
This study focused on changes in fluctuating asymmetry (FA) based on different stress levels in White-footed mice (*Peromyscus leucopus*). FA can provide an early-warning signal in regard to the effects of habitat disturbance on the health of small mammals and the risk of disease in adjacent human populations.

White-footed mouse

Highlighted Projects

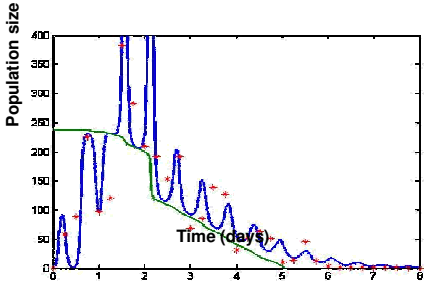
- Jake Elliott, Courtney Thomason, Terry Derting, and Renee Fister

This team is concentrating on deelopment of a prediction model for Lyme disease for the state of Kentucky based on their studies of white-footed mice and habitat disturbances.



- Sarah Thomason, Michael Whitby, Nicole Gerlanc, and David Roach

This project involves experiments to estimate the number of live *E. coli* bacteria. A system of differential equations describes the bacteria growth and glucose depletion. In the graph below, the green curve represents the variable carrying capacity. The red data points are the bacteria and the blue oscillating curve depicts the numerical solution to the system. The numerics are able to capture the fluctuations in the bacterial growth successfully.



Student/Faculty Publications and Presentations:

1) *Two student-authored publications: Hedrick and Thomason, Chrysalis, MSU, Vol 3 (2007); Thomason and Derting, Permosycus* Newsletter, Vol 42: 42-44.
2) Six other publications from faculty-student collaborations
3) Over 25 regional and national presentations by students and faculty

Acknowledgements

Support for this program was provided by Murray State University, a Kentucky EPSCoR Research Initiative Grant and a National Science Foundation award DMS #0531865.

campus.murraystate.edu/biomaps