LEARNING STATISTICS IN AN UNDERGRADUATE INTERDISCIPLINARY RESEARCH SETTING – THE *CRAWL* EXPERIENCE

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THE CRAWL PROJECT

CRAWL (Collaborative Research on the Arthropod Way of Life) is a NSF-funded, collaborative, undergraduate research program between the Department of Biological Sciences and Department of Mathematics & Statistics at East Tennessee State University, now in its third year of implementation. We work with a small group of students majoring either in biology, mathematics, or both. Most of them had taken only one introductory course in statistics before joining the CRAWL team. The poster describes the adventure of learning statistics and applied mathematics in the process of doing research about the behavior of spiders, bees and flies. Group discussions, workshops and one-to-one mentoring all play a role in the learning process.

FROM FORMING RESEARCH QUESTIONS TO WRITING PAPERS

Students, under the guidance of faculty from both departments, participate throughout the entire research process involving:

- Posing research questions and formulating hypotheses
- Designing the experimental procedures, instruments and material
- Performing the experiments and data collection
- Discussing what data to produce and how to analyze them
- Discussing the need for new analysis tools which might lead to research in statistics
- Deciding among alternative ways of presenting the analysis so that it tells the story in the most coherent and clearest way possible
- Writing the paper with the results (some papers are in the final stage of preparation and will be submitted to biological journals)

THE STATS LEARNED

The statistical and mathematical methods to be learned were determined by the data produced and the posed research questions. Some of the statistical methods applied were:

- spatial point pattern analysis using the G function, density maps, ellipses and convex hulls
- a variety of statistical plots and graphs from network analysis
- statistical models of different type to find out which variables matter to explain a response
- tests of hypotheses of several types
- the analysis of two way tables with theoretically zero values in the diagonal

Two of the many gratifying outcomes of the project are the seamless integration of statistics and applied mathematics to answer biological questions and the development of new tools which resulted in a paper published in a statistical journal (Joyner et al., 2013) and two other papers (Seier et al. & Joyner et al.) submitted to statistical and mathematical journals in addition to several biological papers (in preparation) containing the results from the experiments.

REFERENCES

Joyner, M.L., Ross, C. , Seier, E. (2013) Distance to the Border in Spatial Point Patterns. *Spatial Statistics, 6 (November)* 24-40

Seier, E., Joyner, M.L., Jones, T.C. Distances to a point of reference in spatial point patterns. *(Submitted to Spatial Statistics)*

Joyner M.L., Ross, C.R., Watts J.C, Jones, T.C. A stochastic model for *Anelosimus sudiosus* during prey capture: a case study for the determination of optimal spacing. (*To be submitted to Mathematical Biosciences and Engineering)*

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