Syllabus
Workshop on Ecological Niche Modeling and Conservation Biogeography

Hosting Institution: **Mpala Research Centre**
Laikipia County, KENYA

Project Partners:

Instructors:

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Duration: 6 days, March 21-26, 2017.

Tentative schedule: 8 am to 6 pm

Desired skills: Geographic Information Systems (GIS), Ecological Niche Modeling, Conservation Planning, Conservation Biogeography, Computer Programs (e.g., R, QGIS, Zonation, and Maxent)

BACKGROUND AND JUSTIFICATION

Ecological niche modeling represents a set of analytical techniques in which species presence or absence-presence observations are related to a set of environmental variables to identify their ecological requirements and potential geographic distribution. This field of research has had a truly explosive growth in recent decades and has been used to address a wide range of issues (e.g., biological conservation, public health, climate change, invasive species, natural resource management, evolutionary biology). This is due in large part to: 1) technical advances in geographic information systems and algorithms that allow estimating and projecting niches and distributions, 2) availability of species presence records thanks to the massive digitization of biological information from collections, museums and herbaria, and 3) availability of environmental layers at global scales.

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This is a theoretical-practical course in which students will be expected to understand the basic concepts related to these techniques and acquire the skills to make the best methodological decisions when they are put into practice. This course will also touch on applying predicted ecological niches in systematic conservation planning with a particular focus on Kenya's 31 species of small, mammalian carnivores.

OBJECTIVES

To understand the theoretical concepts of modeling ecological niches and conservation biogeography and learn to make methodological decisions that allows the student to use these tools in an appropriate manner. This workshop will also contribute to the training of students and professionals in museum science and wildlife management to understand and apply the modeling of ecological niches as a conservation tool.

TOPICS

Theory

1.- Workshop presentation
1.1.- Review on Biodiversity Informatics

2.- Ecological niches
2.1.- Why use ENM?
2.2.- Concepts of ecological niche
2.2.1.- Grinnell, Elton, Hutchinson, Maguire Jr., Chase & Leibold
2.2.2.- Fundamental niche and realized niche
2.3.- Types of variables (scenopoetic and bionomic)

3.- Connecting niches with geographic distributions
3.1.- Hutchinson's duality: the relationship between geographic and ecological spaces

4.- Estimating ecological niches and geographic distributions
4.1.- The BAM diagram (what is it, configurations and implications)

5.- Ecological niche conservatism

6.- Model transference in space and time
6.1.- Assumptions
6.2.- Strict extrapolation and challenges

7.- Steps and methodological considerations in modeling ecological niches
7.1.- Preparing biological and environmental data
7.2.- Modeling
7.2.1.- What do algorithms estimate?

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7.2.2.- Modeling algorithms (generalities)
7.2.3.- Model calibration and the importance of M
7.2.4.- Model output and reclassification to a binary map (thresholding)
7.2.5.- Complexity and overfit
7.3.- Model evaluation

8.- Conservation biogeography and systematic conservation planning
8.1.- Principles of conservation planning
8.2.- Stages in the planning process
8.3.- Spatial conservation prioritization
8.4.- The Zonation framework

Exercises

1.- Cleaning data and having it ready for ENM/Zonation

2.- Installing software (Maxent, QGIS, R, Zonation)

3.- Spatial summary and interpretation of occurrence records

4.- Modeling ecological niches/favorable environments with Maxent

5.- Systematic conservation planning with Zonation

DELIVERY STRATEGY
The sessions will be theoretical and practical and will involve oral presentations and applied demonstrations with the support of a projector and Internet access. During the exhibitions, practical examples of applications will be used and group participation and discussion will be sought during the course. Students will also be asked to perform certain practices to better understand issues related to basic concepts in both ENM and spatial prioritization using biodiversity data collected during the first workshop. Students will also be responsible for generating predictive ENMs for their respective focal species for use in the small carnivore conservation strategy. Together as a class, students will generate spatial datasets for asking conservation-oriented questions (e.g., where does the highest diversity of small carnivores exist in Kenya) which will be used as the foundation for a national conservation strategy for these species.

MATERIALS AND RESOURCES
The students will have different didactic resources in which they will be able to support to develop their activities and to achieve the learning objectives and there will be a repository in Dropbox for exchange of materials.

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SUGGESTED REFERENCES

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