

Genetics for Monitoring and Management Workshop Outline

The purpose of this 1-day workshop is to review current genetic techniques and how they can be applied to monitoring and management needs for rare and endangered species, ecological communities and the broader landscape. A panel of population genetic experts will provide general reviews of important concepts in population and landscape genetics, genetic markers, and techniques for data analysis. The focus will be how specific management questions can be addressed, and how recent advances in the field affect our ability to answer these questions. Recent examples from projects focusing on management issues in Southern California will be discussed.

Outline of Topics

1. Genetics 101 (Andrew J. Bohonak)
 - a. Genetic variation is ubiquitous
 - b. Modes of inheritance
 - c. Population genetics: diversity within populations and divergence among populations
 - d. Factors affecting patterns of genetic variation: mating patterns, mutation, drift, gene flow and natural selection
 - e. Introduction to types of genetic markers
 - f. General categories of genetic data analysis
 - i. Summary statistics for genetic diversity and divergence
 1. Estimate summary statistics
 2. Test hypotheses
 3. Interpret in terms of the 5 microevolutionary processes
 - ii. Analysis with gene genealogies (trees)
 - iii. *A priori* models of a process
 1. Estimate model parameters
 2. Compare alternative models of different processes
 - iv. Quantitative genetics
 - v. Genomics
 - g. Methodological and logistical issues
 - i. Identify goals for data collection
 - ii. Sampling strategy and marker choice are goal-specific
 - iii. Tissue collection and preservation
 - iv. Specialized training (laboratory, biological, analytical)
2. Diversity within populations (gene pools) (Jonathan Richmond)
 - a. What is a "population"?
 - b. What are the population boundaries?
 - c. How large is a population?
 - d. How diverse is a population?

- e. How connected or isolated is a population?
 - f. What are the mating relationships (aggregate, and individual)?
3. Divergence among populations ("genetic structure") (Amy Vandergast)
 - a. How connected are populations in a particular landscape?
 - b. How do landscape features, ecology and behavior affect genetic connectivity?
 - c. Markers and techniques for measuring genetic divergence, gene flow, movement and landscape effects.
 4. Distinct population segments and subspecies designations (Invited Speaker)
 - a. What constitutes a unique species, subspecies and distinct population segment?
 - b. Incorporating genetic, morphological and behavioral data to review traditional taxonomy
 5. Genetic identification for surveys and monitoring (Invited Speaker)
 - a. Traditional phylogenetic studies (of cryptic species, hybrid zones)
 - b. Genetic mark recapture
 - c. DNA barcoding
 - d. E-dna
 6. Next generation sequencing and other evolving techniques (or this could be folded into each of the five subjects above).
 7. Group workshops: planning a population genetic study, and interpreting the results.

Products

1. Workshop organization, presentation
2. Electronic copies of presentations
3. Summary Report