Applying ecological models to manage and conserve natural resources

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This class will use lectures and practical computer labs to teach students how to fit maximum likelihood models to data for the management and conservation of natural resources. The first part of the course will be run in Excel in the evenings 4:30pm-8:30pm 25-28 January; the second component will use the statistical programming language R and will be run 9am-4:30pm 29-30 January.

Excel model fitting component 25-28 January 4:30-8:30pm

Those participating in the first component should have a basic knowledge of Excel spreadsheets. Advanced skills will be taught. Knowledge of statistics will be a bonus, e.g. normal and lognormal distributions, and likelihood functions.

Daily plan: lecture 4:30-6:00, break for dinner 6:00-6:30 (bring dinner, food not included), lab 6:30-8:30.

Lecture 1: modeling overview, introduction to age-structured models
Lab 1: age-structured elephant example
Lecture 2: non-linear minimization and sum of squares; introduction to likelihoods
Lab 2: sum of squares and Eastern Pacific gray whales
Lecture 3: maximum likelihood and likelihood profiles; likelihood and AIC
Lab 3: likelihood profiles and hake fits
Lecture 4: depensation, extinction risk and catastrophes
Lab 4: AIC and detecting regime shifts

R modelling component 29-30 January 9-4:30pm

Participants will need to have some proficiency in R, in other words be able to program for-loops, manipulate data, write functions, and read data from csv files, at a minimum. Knowledge of statistics will be useful, e.g. normal and lognormal distributions, likelihood functions, Bayesian statistics.

R modeling participants must attend at a minimum the lectures of the Excel modeling component.

Morning schedule: lecture 9:00-9:50, break, lab 10:00-12:00. Lunch break.
Afternoon schedule: 1:30-2:20, break, lab 2:30-4:30pm.

Lecture 1: spatial modeling and MPAs
Lab 1: Intro R; maximum likelihood fitting in R to Antarctic blue whales
Lecture 2: harvesting strategies; simulation and estimation
Lab 2: simulation and estimation, catch status plots
Lecture 3: Bayesian I
Lab 3: Spatial modeling and marine protected areas
Lecture 4: Bayesian II
Lab 4: Bayesian yelloweye rockfish