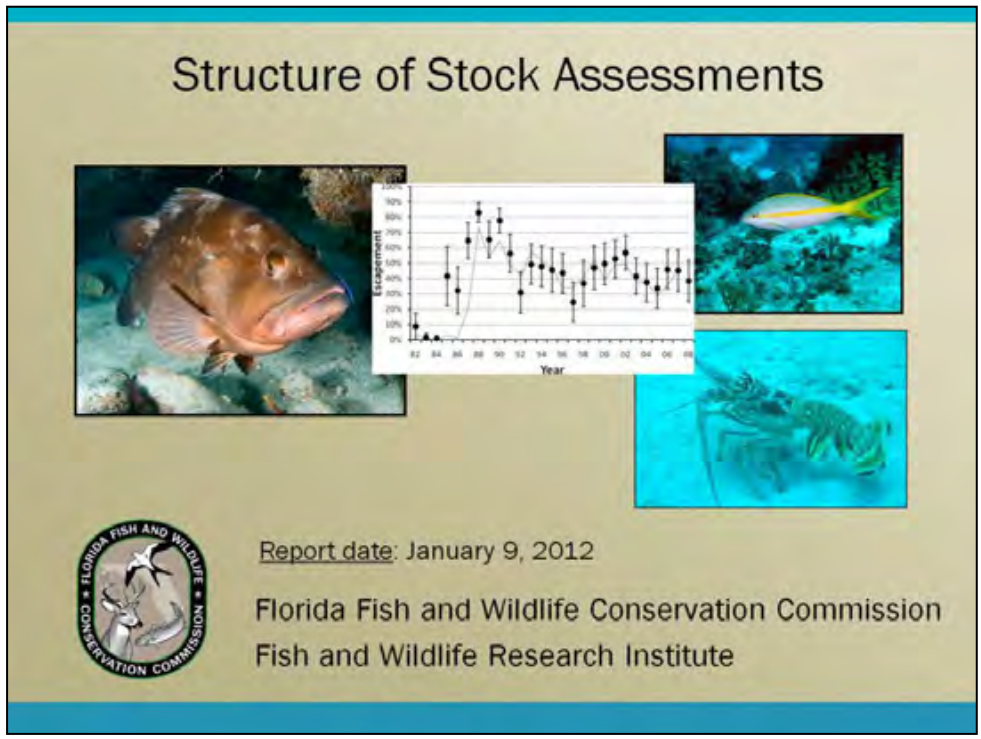
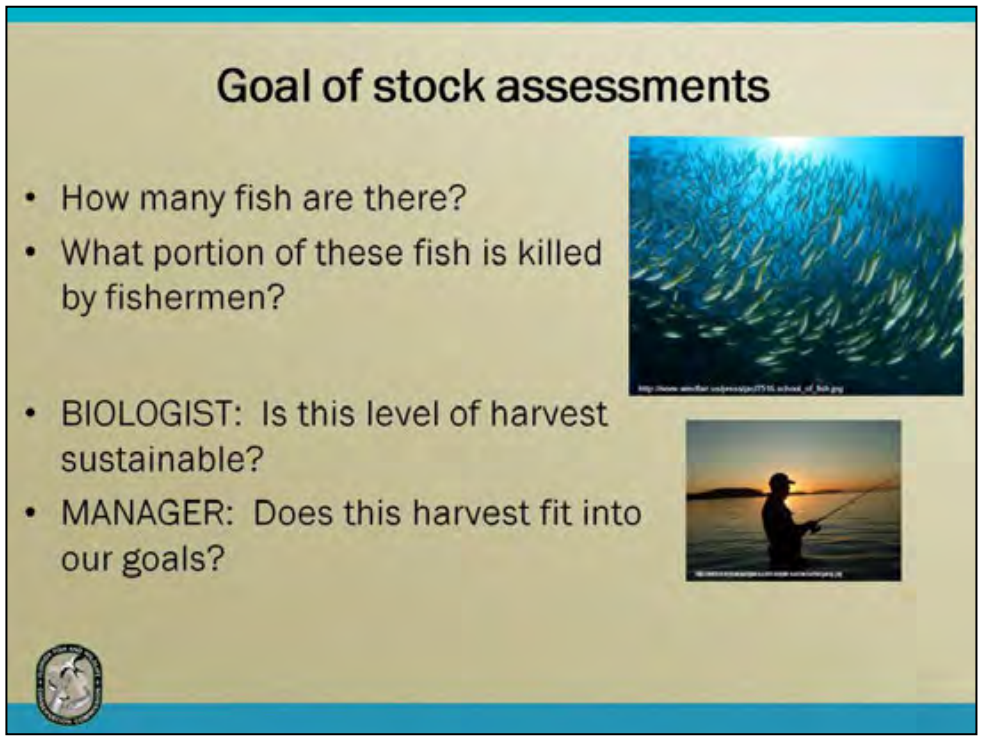
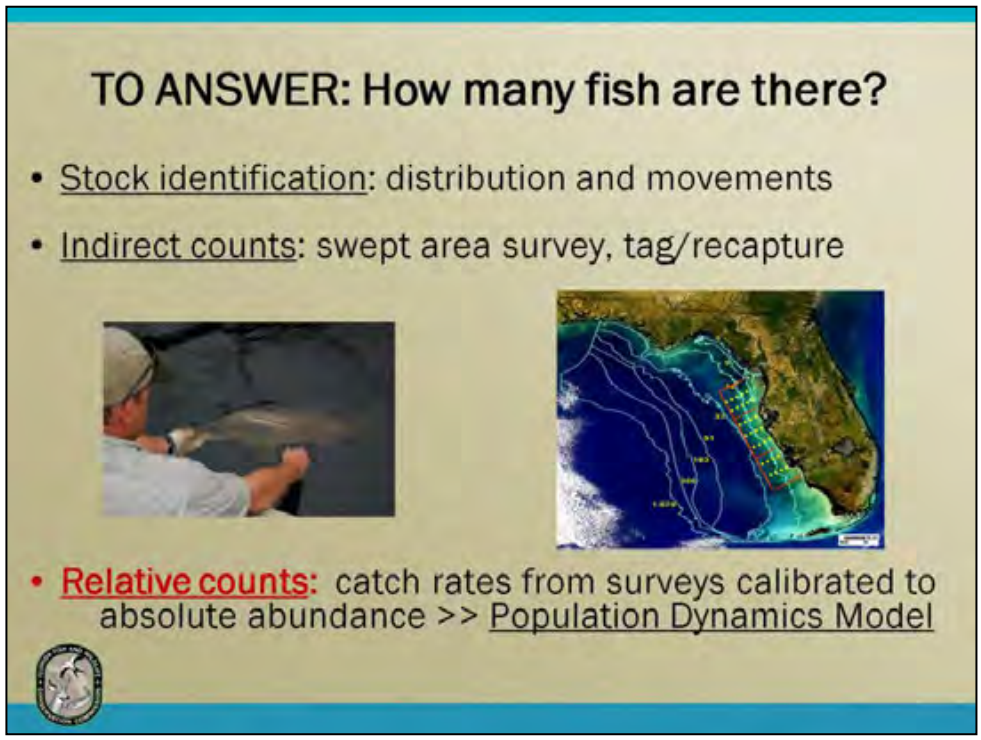


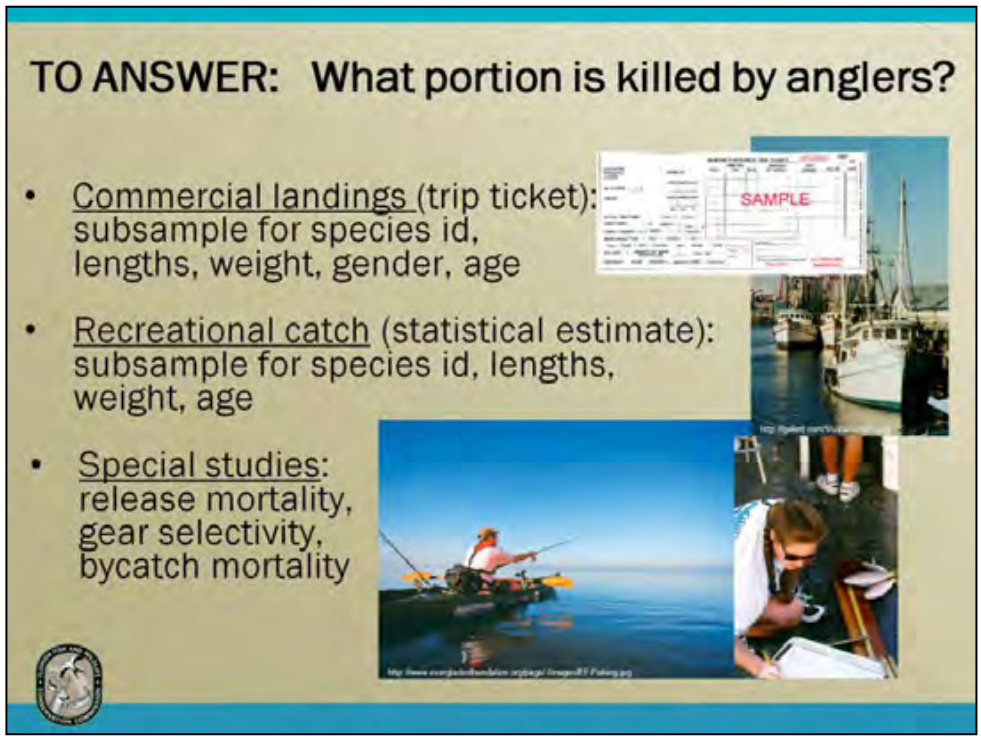
This presentation gives a brief overview and discussion of the conceptual structure and function of a stock assessment including data, population model, and assessment procedure.



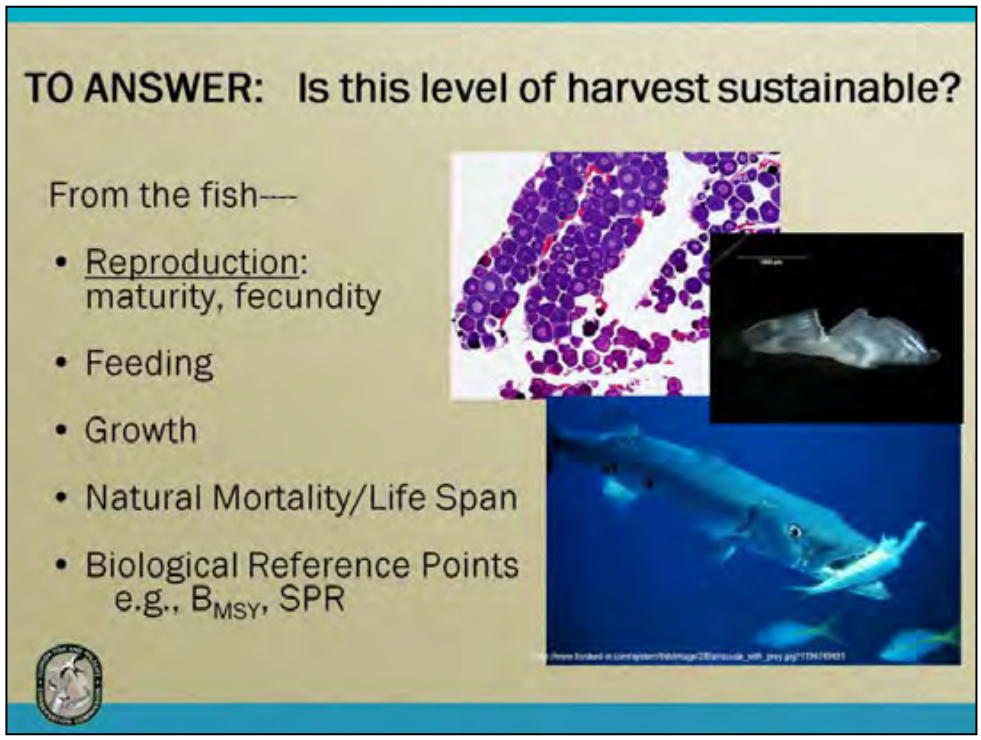
Stock assessments are a broad array of analytical techniques used to evaluate the status of a fish stock as well as the possible outcomes of different management alternatives. It tells us if the abundance of a stock is below or above a given target point and by doing so lets us know whether the stock is overexploited or not; it also tells us if a catch level will maintain or change the abundance of the stock.



The first step is to define the group of fish being assessed. This can be addressed through genetic studies or large tag-recapture programs. The most common method of determining how many fish there are is to combine a well-designed scientific survey that measures relative abundance trends over time with harvest information into an population dynamics model that can be used to estimate stock size.

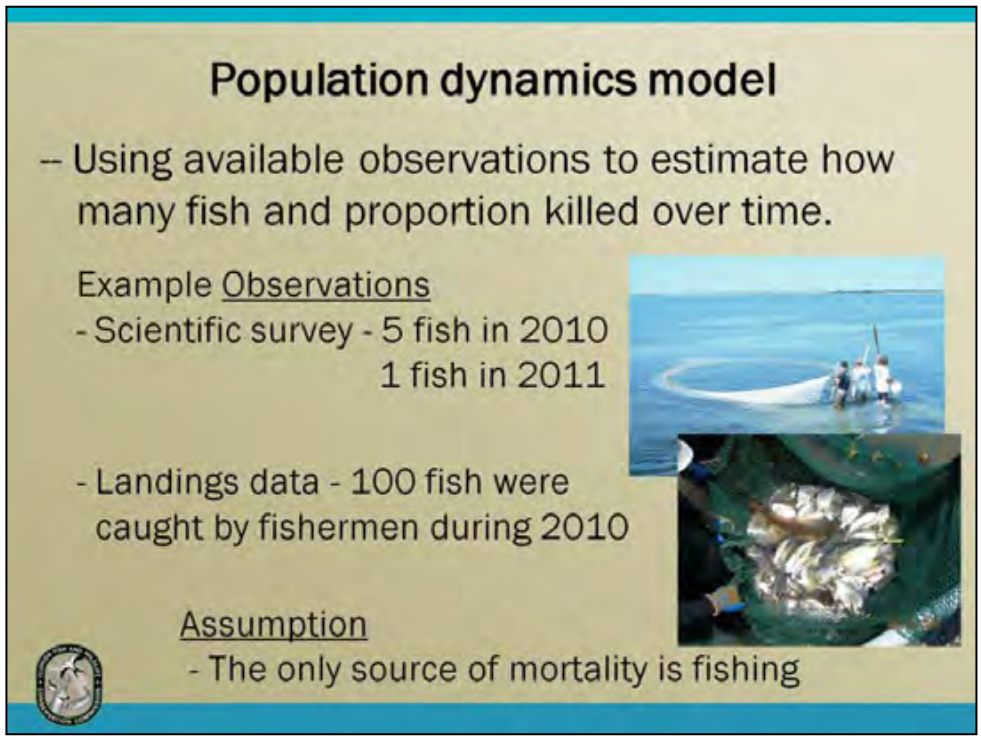


To get a good estimate of the absolute catch by fishers generally requires large programs specifically designed to record commercial landings and to estimate recreational catch. Of course, to complete these tallies we need special studies that help us determine the numbers killed that are not recorded in the traditional programs, that is, the numbers released alive that die subsequent to release and the number landed commercially that are dead but returned to the sea.

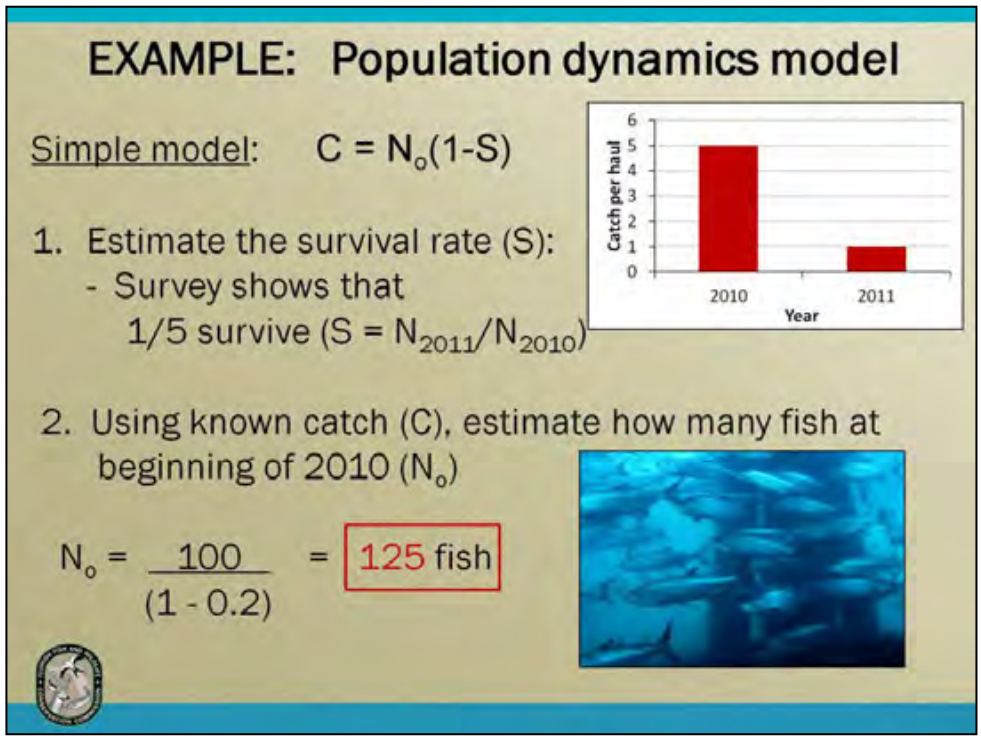


To address the question of whether the catch is sustainable we need ways to determine the resiliency of the stock to exploitation. This can be explored through studies of the animal's biology and ecology. For instance, information about age and growth and reproduction can be used to determine if fish reach maturity early or late in life and whether egg production changes rapidly with age. For an analysis that includes estimates of abundance through time, the trends in spawning stock abundance over time can be related to the subsequent production of new recruits to understand what optimal levels of spawning stock size produces large numbers of recruits.

Finally an assessment is designed to estimate a level for a benchmark chosen by managers as a metric to determine that stock status, i.e. overfished or not.



Since we cannot directly observe and count the number of fish in the population, stock assessments apply mathematical models to mimic as best as possible the real world. A population dynamics model can be used to organize and combine a variety of observations to develop a coherent, if not simplified, picture of the population abundance and fishing mortality over time.



In this hypothetical example, if the catch equals 100 fish catch this represents 80% mortality due to fishing (1-20%) - $C = N_o(1-S)$

- therefore, must have been 125 fish in 2010 (100/0.8) and 25 fish (125-100) in 2011 - $N_o = C/(1-S)$

- note that 125:25 is the relative change we saw in the survey data 5:1

Assessment Procedure

- Routinely initiate or requested by Commission (DMFM)
- Search literature and observation data
- Extract appropriate data and summarize
- Develop population dynamics estimation model
- Run analyses and test sensitivity to assumptions
- Report results including stock status determination
- Review with DMFM
- Develop and run analyses to support management

The complete process can take as little as 3-4 months for a routine stock assessment but upwards of 6-8 months for new in-depth analysis.