

FISH POPULATION DYNAMICS

Definition:

Population is a group of interbreeding organs of the same species whose breeding is localized in time and space such that they are substantially reproductively isolated from other geographically isolated individuals.

Characteristics of fish population:

- i. Presence of birth and death rates
- ii. Presence of growth rate – number of biomass
- iii. Presence of age class structure
- iv. Presence of sex ratio
- v. Presence of density
- vi. Presence of pattern of distribution during its life span spawning ground nursery, feeding ground, etc

For a proper management of the fishery, there is a need for knowledge of the dynamics of fish population being managed.

There are various methods of fish population estimation and the use of anyone of the methods will depend on a number of factors which include:

- i. The biology of fish
- ii. The characteristics of the habitat
- iii. The resources available
- iv. Objectives of the study

States of fish stocks:

- i. Steady: fish population is the same year after year
- ii. Cyclical: fish population is variable but catches are predictable
- iii. Irregular: catches of fish are very unpredictable
- iv. Spasmodic: stocks develop and collapse and reappear some other time.

Primary objective of fish stock Assessment.

The basic is to provide advice on the optimum exploitation of aquatic living resources e.g. fish

Since living resources are limited but renewable, therefore fish stock assessment (FSA) is the search for the exploitation level which in the long-run gives the maximum yield in weight from the fishery?

The concept of stock dynamics:

When describing the dynamics of an exploited aquatic resource, a fundamental concept is that of the stock

STOCK. is a subset of a species, which is generally considered as the basic taxonomic unit. i.e a sub-set of one species having the same growth and mortality parameters, and inhabiting a particular geographical area.

Stock shows the following features;

- I. Little mixing with the adjacent groups
- ii . Growth and mortality parameters remain
- iii. Belongs to the race within the species i.e share a common gene pool

A Growth parameters;

There are numerical values in an equation by which we can predict the body size of a fish when it reaches a certain age.

B Mortality parameters;

The rate at which the animals die i.e the number of death per time unit. e.g fishing and natural mortalities

MODELS

A fishery consists of three(3) basic elements.

- i the input (the fishing effort e.g number of fishing days)
- ii the output (the fish landed) and
- iii the process which links input and output

Types of models;

- i Analytical models
- ii Holistic models

Analytical models

These models require the age composition of catches to be known e.g the numbers of 1 year old with caught, the number of 2year old fish caught, e.t.c

The basic ideas of the models may be expressed as follows;

- i If there are ‘too few old fish’ the stock is overfished and the fishing pressure on the stock should be reduced.
- ii If there are ‘very many old fish’ the stock is underfished and more fish should be caught in order to maximize the yield.

Therefore, one can say analytical models are age structured models working with concepts such as mortality rates and individual body growth rates.

While the basic concept in age-structured models is that of a COHORT.

A COHORT of fish is a group of fish all of the same age belonging to the same stock.

Holistic models

These are less data demanding methods of assessing fish stocks. These methods disregard many of the details of the analytical models. They do not use age or length structures in the description of the stocks but consider a stock as a homogeneous biomass

Types of holistic models

- i. Swept area model
- ii. Surplus production model

The swept area model:

This model is based on research trawl survey catches per unit of area. From the densities of fish observed (the weight of the fish caught in the area swept by the trawl) we obtain an estimate of the biomass in the sea from which an estimate of the MSY is obtained.

The surplus production model:

This uses catch per unit effort (e.g. Kg of fish caught per hour trawling) as input. The data usually represent a time series of years.

ESTIMATION OF FISH ABUNDANCE

Estimation of abundance is one of the most interesting aspects of fish biology. The mobility of the fishes, coupled with their invisibility” due to cover, habitat preference or occupation of

spaces or water bodies that can only be surveyed on a piecemeal basis, presents an enormous challenge to the biologist who must know how many fishes are present in a given population. Because direct enumeration is rarely possible, biologists generally use estimates of population size based upon some kinds of survey procedures rather than a census. The diversity of life histories, social and behavioural habits of the fishes often present special opportunities for the biologists to estimate population size. Often too, these characteristics intervene to make population estimation particularly biased or imprecise.