

The concept of population and unit stock

The concept of population

- Population is the breeding unit of species having common spawning grounds.

A population is a group of individuals of the same species that live together in the same place, and that possess an average set of properties, such as birth rates and death rates.

- This definition recognizes that populations are made up of individual organisms but does not require that we know which individuals give birth or die, or where they are located in space.
- Instead the population is characterized by average birth and death rates, and variability in these averages is treated as a statistical property of the population.

The concept of population conted.....

- Most definitions of population have some kind of spatial reference.
- The simplest and least restrictive of these is that a population is a group of individuals of the same species that live together in a particular area (e.g., Roughgarden, 1989).
- However, even though this definition is widely used by ecologists, it gives rise to serious difficulties and misinterpretations.
- A more rigorous definition should define the spatial dimension more precisely; for example, a group of individuals of the same species that live together in an area of sufficient size that all the requirements for reproduction, survival and migration can be met (e.g., Huffaker et al. 1984).

The concept of population contd.....

- It may be helpful to conceive of an area of sufficient size such that the rates of emigration out of the area and immigration into the area are roughly balanced.
- Whatever method is used to define the appropriate size of an area within which the population of a particular organism exists, it is important that most of the change in population size or density is due to births and deaths rather than immigration and emigration because the theory of population dynamics is based on this assumption.
- Local population is a group of organisms of the same species that live together in an area where there is a high probability of interbreeding.

The concept of population contd.....

- Also called a subpopulation or, in systematics, a deme. Emigration and immigration from local populations need not necessarily be balanced and there may be fairly high probability of local extinction.
- Metapopulation is a group of populations that share occasional migrants.
- Absolute population is an estimate of the total number of organisms in an area.
- Population density is an estimate of the number of organisms per unit area (e.g., hectare) or unit of habitat (e.g., kilogram of soil).

The concept of population contd.....

- Size of population is determined by growth which is influenced by natality ('+' influence) mortality ('-' influence) and dispersion ('+ & -' influence). Various ecological density dependent and density independent factors that are the factors that controls the growth.
- For the purpose of fitting yield models, males and females of the populations are treated as separate units, if differences exist in all morphological and biological characters.
- For modelling purposes, population of different species coexisting in a particular area having similar characters can sometimes be treated as a single stock.
- Assessment could be made on stock of a species, only when biology of species is clearly understood which includes its feeding, growth, spawning and migration habits.

The concept of stock

- Unit stock is a self contained and self perpetuating group. Having defined geographical limits of spawning and gene exchange within stocks having same growth patterns and mortality rates.
- They should have same morphometry-meristics and spawning patterns and season.
- In terms of stock assessment, stock is designated as a subset of species.
- For fishery management purposes, stock is a sub group of species. Stock include portion of a population.

The concept of stock

contd....

- Fish stocks are subpopulations of a particular species of fish, for which intrinsic parameters (growth, recruitment, mortality and fishing mortality) are the only significant factors in determining population dynamics, while extrinsic factors (immigration and emigration) are considered to be insignificant.
- All species have geographic limits to their distribution, which are determined by their tolerance to environmental conditions, and their ability to compete successfully with other species.

The concept of stock

conted....

- In marine environments this may be less evident than on land because there are fewer topographical boundaries, however, discontinuities still exist, produced for example by mesoscale and sub-mesoscale circulations that minimize long-distance dispersal of fish larvae.
- For fishes, it is rare for an individual to reproduce randomly with all other individuals of that species within its biological range.
- There is a tendency to form a structured series of discrete populations which have a degree of reproductive isolation from each other in space, in time, or in both.

The concept of stock

contd....

- This isolation is reflected in the development between sub-populations of genetic differences, morphological variations and exposure to different chemical regimes and parasitic species.
- Sub-populations also respond to fishing in such a way that fishing on one population appears to have no effect on the population dynamics of a neighbouring population.
- The currently accepted definition of a stock in fisheries science, is that of Begg et al. (1999), "...[a "stock"] describes characteristics of semi-discrete groups of fish with some definable attributes which are of interest to fishery managers."

The concept of stock

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Straddling stock

- The United Nations defines straddling stocks as "stocks of fish such as pollock, which migrate between, or occur in both, the Exclusive Economic exclusion zone (EEZ) of one or more states and the high seas".
- Sovereign responsibility must be worked out in collaboration with neighbouring coastal states and fishing entities.
- Straddling stock can be compared with transboundary stock.
- Straddling stock range both within an EEZ as well as in the high seas.
- Transboundary stock range in the EEZs of at least two countries. A stock can be both transboundary and straddling.