# Fish Population Dynamics

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- Populations of all organisms fluctuate around a mean level as long as deaths are balanced by births. In cases of populations, such as many fish stocks, which are overexploited or threatened by environmental degradation, deaths will exceed births and numbers will decrease.

- The fishing effort level which in the long term gives the highest yield is indicated by F_{MSY} and the corresponding yield is indicated by "**MSY**", which stands for "*Maximum Sustainable Yield*". The phrase "in the long term" is used because one may achieve a high yield in one year by suddenly increasing the effort, but then meager years will follow, because the resource has been fished down. Normally, we are not aiming at such single years with maximum yield, but at a fishing strategy which gives the highest steady yield year after year.
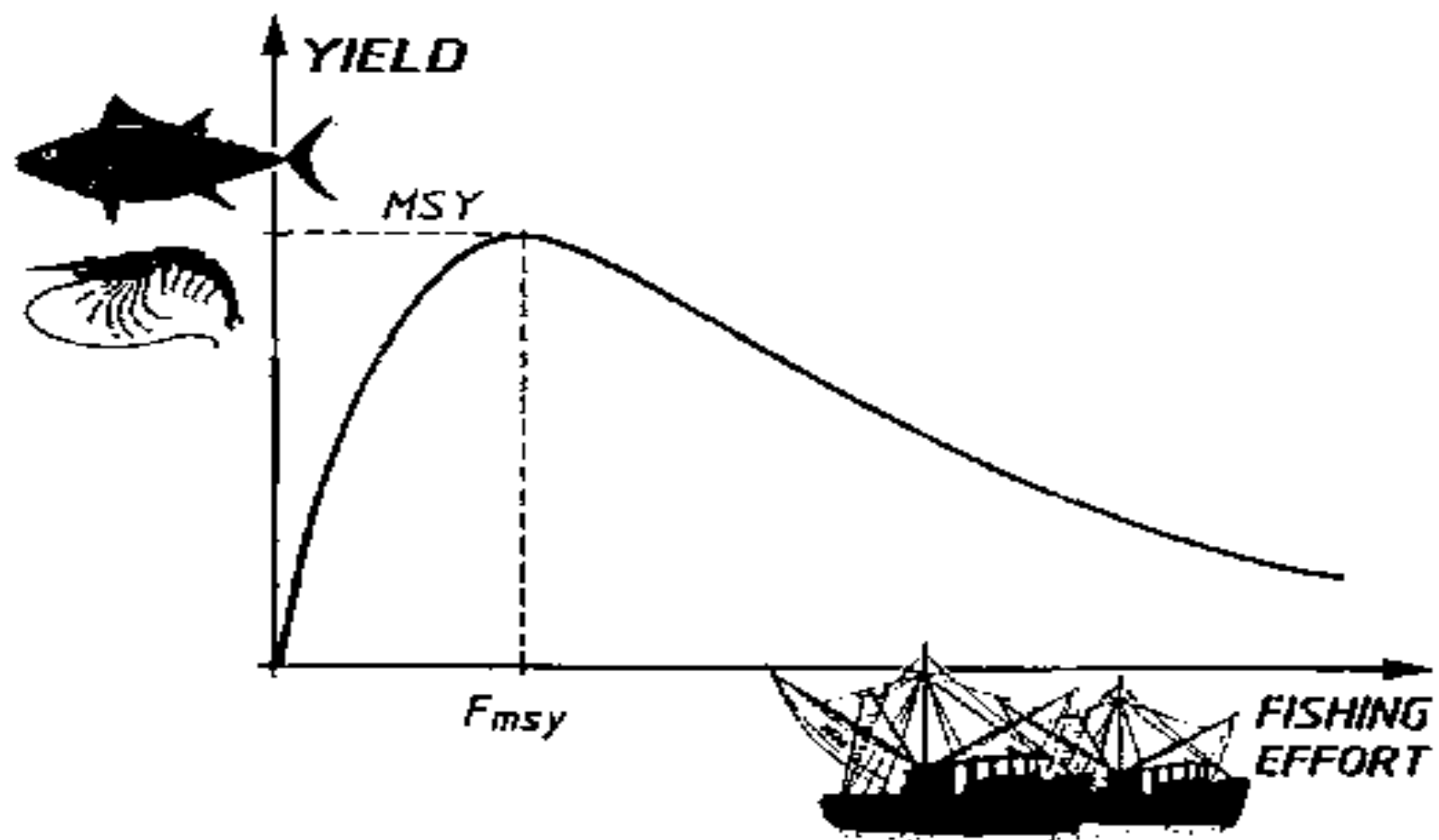
THE STOCK CONCEPT

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

- A stock is a sub-set of a "*species*", which is generally considered as the basic taxonomic unit. A prerequisite for the identification of stocks is the ability to distinguish between different species. Because of the great number of different, but often similar, species observed in tropical fisheries their identification can be problematic.

- By a "stock" we mean a sub-set of one species having the same growth and mortality parameters, and inhabiting a particular geographical area.

- To this definition we can add that stocks are discrete groups of animals which show little mixing with the adjacent groups. One essential feature is that the growth and mortality parameters remain constant over the distribution area of a stock, so that we can use them for making assessments.

- This definition may be too superficial for the taste of many biologists, and in the following paragraphs a few more aspects of the stock concept are mentioned.

- A group of animals for which the geographical limits can be defined may be considered a "stock" in terms of fish stock assessment. Such a group of animals should belong to the same race within the species, i.e., share a common gene pool. For species showing little migratory behaviour (mainly demersal species) it is easier to identify a stock than for highly migratory species, such as tunas.

- Fish stock assessment should be made for each stock separately. The results may (or may not) subsequently be pooled into an assessment of a multispecies fishery. Therefore, the input data must be available for each stock of each species considered. The stock concept is closely related to the concepts of growth and mortality parameters. The "*growth parameters*" are numerical values in an equation by which we can predict the body size of a fish when it reaches a certain age. The "*mortality parameters*" reflect the rate at which the animals die, i.e., the number of deaths per time unit. The mortality parameters considered in this manual are the "*fishing mortality*", which reflects the deaths created by fishing and the "*natural mortality*", which accounts for all other causes of death (predation, disease, etc.).