

Ecopath

ECOPATH

- Fish or crustacean or any aquatic population is considered as an integral part of marine ecosystems.
- The aquatic resources can be made sustainable only if the ecosystem in which living resources live is studied.
- Hence in 'ecosystem based fisheries management, the impacts of fishery on the ecosystem is taken into account.
- The ecopath software is used for analysing the trophic reactions in fisheries resources systems.
- This software could be used to assess the stock in an aquatic system. This model describes the ecosystem at a steady state for a given period.

ECOPATH

contd.....

- This model is called Ecosys as it envisages the steady state ecosystem changes over time, This model incorporates all major components of the ecosystem including the feeding interactions.
- Ecopath keeps track of all species and all the feeding interactions within the system at one point of time, while the ecosystem emphasizes the changes in one or more components affecting the ecosystem over time.

Principles :

This model is based on two major equations

Describes the production term

Energy balance of each group

The model is computed from the equation

$$P_i = Y_i + B_i \cdot M_{2i} + E_i + BA_i + P_i \cdot (1 - E_i)$$

P_i = Total production rate (i)

Y_i = Total fishery catch rate of (i)

M_{2i} = Total predation rate for group

B_i = Biomass of the group.

E_i = Net migration rate which includes emigration –
immigration

Principles :

BA_i is the biomass accumulation rate for (i) while $MO_i = P_i (1 - EE_i)$ is the other mortality rate for (i).

The above equation can be expressed as

$$B_i \cdot (P/B)_i \cdot EE_i - \sum_{j=1}^n B_j \cdot \left(\frac{Q}{B}\right)_{ji} \cdot DC_{ji} - YA_i - E_i - BA_i = 0$$

Where P/B_i is the production/biomass ratio

Q/B_i is the Consumption/biomass ratio

DC_{ji} , the fraction of prey (i) in the average diet of predator (j).

Principles :

The production rate, P_i could be calculated as the product of B_i . the biomass of (i), while the P_i/B_i is production / biomass ratios for group (i). The P_i/B_i rate mostly corresponds to total mortality Z .

The other mortality includes mortality due to decrease of old age and could be computed from

$$M_{o_i} = P_i \cdot (1 - EE_i)$$

Where, EE_i is called eco tropical efficiency of (i).

The ecotropic efficiency is described as the production that is utilized in the system.

M_2 is the production term link production and prey as

Principles :

M_2 is the production term link production and prey as

$$M_{2i} = \sum_{j=1}^n Q_j \cdot DC_{ji}$$

The summation includes all (n) predator groups (j) feeding on group (i),

Q_j is the total consumption rate for group (j)

DC_{ji} is the fraction of predator (j) diet contributed by prey (i).

Q_j is calculated as the product of B_j , the biomass of group (j) and Q_j / B_j the consumption / biomass ratio for group (j).

Principles :

Ecopath model sets up a system with many linear equations for parameterization. This model usually solves the set of one of the following parameters for catch group in a system. The parameters are biomass, production/biomass ratio, consumption/biomass ratio or ecotrophic efficiency.

Parameters to be entered for all groups

Catch rate

Net migration rate

Biomass accumulation rate

Annihilation rate

Diet compositions

END