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IMTA ECOPATH MODEL METHODOLOGY: FOCUS ON A POND POLYCUltURE SYSTEM

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Fish farming is increasing worldwide and faces number of different social and environmental issues. Integrated Multitrophic Aquaculture (IMTA) is a production system using trophic interactions in order to limit input uses and environmental impacts. Using modelling might be an interesting way to support management and optimization of complex multitrophic systems. The aim of this study is to provide a methodology for model building, using Ecopath software, applied on a polyculture system based on common carp (*Cyprinus carpio*) culture.

In our study, Ecopath modelling methodology was supported by experimental data gathered from small pond (500m²) polyculture system. Dataset concerned a polyculture of different species: common carp, roach (*Rutilus rutilus*), and Perch (*Perca fluviatilis*) (140 kg/ha of introduced fish) raised for 280 days, fed with 108.5 kg of commercial pellets. Information on chlorophyll, zooplankton and macroinvertebrates biomasses was also recorded.

A mass balance snapshot model of the system was built in Ecopath following six steps: (1) Defining trophic groups allocated as consumers, producers or detritus; (2) Determination of biomass and production using *in situ* data for fish and detritus or estimation methods for macroinvertebrates, zooplankton and phytoplankton; (3) Estimation of consumption over biomass ratio for all consumers groups; (4) Description of the diet of each consumer group based on published data (Fishbase mainly) and available food sources in the system; (5) the results were refined by stable isotope analysis ($\delta^{13}\text{C}$ and $\delta^{15}\text{N}$) of the different species and sources; (6) Interpretation of key outputs of Ecopath model.

IMTA are complex production systems, they require precise knowledge of trophic interactions. Ecopath software provides an interesting tool to represent what occurs in the rearing environment. This method enlightens the use efficiency of each trophic compartment and possible improvement solutions in terms of species stocking. Modelling can help maximising the contribution of each trophic groups and thus fish productivity. However, running Ecopath software requires a large variety of data, missing information can be estimated but degrade the reliability of the outputs of the model.

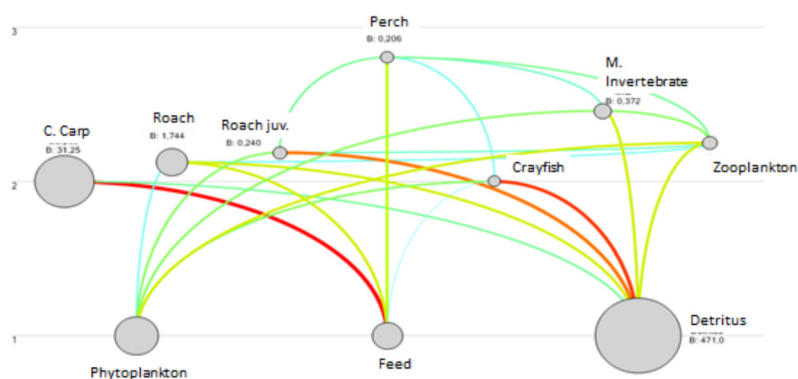


Figure 1: example of trophic interactions in a polyculture pond system under Ecopath software