

Session 04

Optimal fishing agreement between neighboring countries sharing a common migratory fish population

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Abstract

A mathematical model is developed to represent an idealized system of a shared fish stock associated with different exclusive economic zones. We apply such model on small pelagic fisheries shared between Southern Morocco, Mauritania and the Senegambia. The complete model is a set of six ordinary differential equations describing the time evolution of the fish biomass and the fishing effort in the three zones. The fish species targeted as small pelagics could be considered to perform quick displacement between the different zones, in comparison to their growth and harvesting. We take advantage of the two time scales to obtain a reduced model governing the total fish biomass of the system and fishing efforts in each zone. We study existence and stability of equilibrium points of the reduced model. The simulations show that as a result of competition between fisheries per zone there can only be one winner in the general case. Nevertheless there is also an arising case that allows an operational management of shared fisheries by acting on the cost of fishing unit effort, indeed we found that a large number of equilibrium exist. From this last case the initial distribution of fishing effort strongly impact the optimal equilibrium that can be reached. Lastly the model report that the country with the highest carrying capacity density may get less landings when collaborating with other countries than if it minimise its fishing costs. Such findings should allows regional fisheries organizations to get potential new ways for neighbouring fish stock management plan.



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Extended book of Abstract

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