

Title: **Modeling the Collision of Two Different Management Regimes: When Catch Share System Meets Common Pool Fishery**

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Abstract: The New England Multispecies (groundfish) fishery is about to implement the catch share management system, where self-identified groups of harvesters called sectors receive quota allocations of total allowable catch (TAC) proportional to the harvest history of their members. Joining a sector is voluntary, thus there will be both sector members and non-sector members, which will remain in a common pool fishery, coexisting in this fishery. Basic game theory tells us that relative profitability between the sector and non-sector will dictate the flow of membership, while the profitability itself is an inversely related function of membership size. This raises an important question: will a success of a sector, measured by its increased profitability (rent), ultimately undermine the sustainability of that sector? What are the characteristics of an equilibrium, and how would that be affected by (a) the dynamics of biology (fish population) and economics (rent generation), and (b) the management scheme chosen by a sector? This paper develops a microeconomic model of fishers behavior under sector allocation program based on the differential game theory, and solves for dynamic equilibrium in aim to answer these questions. The first model developed is where sector members with individual quota coexisting with non-sector members. Generally, sector members will wait until the non-sector members reach their collective quota, but an interesting result is that there will be some sector members who will opt to fish with the non-sector members. Revenue sharing in aim to foster collective effort coordination within a sector is also considered.