Sustainability of Katsuwonus pelamis in California Pelagic Fisheries: Analysis of Natural and Fishing Mortality Data

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The purpose of this study was to determine whether the California skipjack tuna fishery is sustainable or not. This particular study holds great importance in that no California fisheries had been previously analyzed with mathematical rigor for sustainability. We analyzed commercial annual landings of skipjack tuna from 1950 to 2015 in California in order to understand the present condition of the fisheries. The National Marine Fisheries Service (NMFS) database of landings per specified region provided the data for all landings analysis, price-per-pound information, and seasonal landings. All analyses were made via Excel graphs for easier data representation and visualization. In developing a necessary paradigm to determine sustainability, the rational model dictated that the total loss per the adult population must be less than or equal to the annual recruitment per newborn individuals. Originally, evaluating the model's output required cumbersome datasets such as spawning rate and specific recruitment rates. Simplifications to reduce such aspects of the model ultimately yielded an equation to determine sustainability using only mortality rates. These rates were available through the work of Mark Maunder who previously determined both the spawning and fishing mortalities of the species in question as a function of age. Testing the data within the algorithm yielded a positive result: Current farming of the skipjack tuna is sustainable. Such a result was also reinforced by other researchers and institutions who -- while not mentioning the use of a rigorous model -- reached a similar conclusion.