Advances in modeling the spatial dynamics of Pacific bigeye population with the use of conventional tagging data.

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Abstract: Adult bigeye tuna (*Thunnus Obesus*) has been exploited in the Pacific Ocean by large-scale longline fleets since the 1960s and since the early nineties the juvenile bigeye has been incidentally caught by the purse-seine fisheries targeting skipjack tuna in the tropical ocean. The recent reduction of longline catches raises the concern that the overall fishing mortality of this migratory species is too high and the stock may be depleted. We use the model SEAPODYM (Spatial Ecosystem And Populations Dynamics Model) to predict the spatio-temporal dynamics of bigeye tuna population under the influence of environment and fishing pressure. Describing the detailed spatial structure of the population this model provides also the estimate of the species abundance and can help us attributing the observed trends and stock variability to the impact of environment or exploitation. Using the maximum likelihood method to estimate the parameters of the model while incorporating catch and length frequencies data allowed significant improvement of the agreement between observations and model predictions. However the results were not fully satisfactory as not all model parameters could be estimated based on fishing data. Therefore we have integrated the fisheries-independent data into the maximum likelihood approach, namely the tagging data. Thanks to a considerable effort deployed in the Pacific Ocean for tagging tuna, 45 thousands of bigeye tuna were tagged with conventional tags and about 25% of them were recaptured. These data is the source of additional key information on movement, habitat distributions and stock age and spatial structure. In this talk we present the method employed to incorporate the individual tagging data within the Eulerian model and discussing the first results obtained on the basis of the integrated approach.