



Analysis of ecological transitions in the Black Sea during the last four decades: A modelling study

Ekin Akoglu, Baris Salihoglu, and Temel Oguz

Middle East Technical University, Institute of Marine Sciences, Biology and Fisheries, Mersin, Turkey (ekin@ims.metu.edu.tr)

This work investigates the Black Sea ecosystem and the changes it had undergone in the second half of the 20th century from a fisheries perspective using Ecopath, a widely adopted fisheries model. Different states of the Black Sea ecosystem were modeled using 5 simulation scenarios: Simulation 1, represents the quasi-pristine conditions of the Black Sea ecosystem during early 1960's; Simulation 2, represents the over-enrichment period of the ecosystem during early 1980's before the fisheries collapse and the outburst of alien ctenophore *Mnemiopsis leidyi*; Simulation 3, represents the changes in the ecosystem along with the outburst of *Mnemiopsis* in 1989; Simulation 4, represents the aftermath effects in the components of the Black Sea ecosystem just after the collapse of the fisheries; and Simulation 5, represents the recovery period of the fish stocks in the very beginning of the 1990's.

According to the results of the model runs, it was found that the Black Sea ecosystem in its quasi-pristine conditions during early 1960's was top-down controlled. The piscivorous pelagic fish and dolphins exerted predation pressure on small pelagic fish species and suppressed their over-development. Our findings suggest that after the removal of these top predators from the ecosystem due to fishing and whaling, the small pelagic fish species had the opportunity to thrive themselves along with the over-enrichment of the Black Sea and reached high biomass levels in 1980's. Small pelagic fishes prevailed in the Black Sea ecosystem until the highly debated outburst of alien ctenophore *Mnemiopsis leidyi*. In 1989, the biomass of small pelagic fish species declined drastically and their population did not recover until the very beginning of 1990's due to various ecological and anthropogenic effects put forward by the outcomes of the simulations.