**Ecological spatial connectivity modeling for effective planning and management of Marine Protected Areas***Ayah Lazar1*​ *\* , Eyal Ofir2*​, *Jacob Silverman*​*1, Gideon Gal2*​, *Nir Stern*​*1*

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**Abstract**

In order to bridge the existing scientific gaps for ​the planning, evaluation and management of the  
network of MPAs along Israel’s coast, there is a need to understand the circulation patterns and  
ecosystem dynamics that in combination determine the connectivity within the network. We propose  
to use a set of models describing the circulation as well as the ecosystem dynamics with the aim of  
brigiding those gaps. First, a full primitive equation model of the physical ocean will be used to  
explore physical connectivity. A biogeochemical model will be coupled with the physical model to  
explore the spatial-temporal variations in available nutrients, phytoplankton and zooplankton biomass  
that could affect larval survival throughout their trajectory between and within MPAs. Agent based  
models will then be used, modeling specific biological traits with the along trajectory parameters from  
the physical and biogeochemical model, to investigate the effects of the biological interactions on the  
connectivity patterns. Finally, a fully coupled high resolution spatial ecological model will be run to  
study trophic interactions and different management and environmental impact scenarios. In addition,  
these results will be analyzed using Lagrangian tools, providing the most complete picture possible.  
Field surveys will be conducted during the reproduction seasons of the majority of the near-shore  
species (early spring and late summer) to complement and reinforce the parameters implemented in  
the models, and to test monitoring strategies we will suggest based on model outcomes.