**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.