



Reconstruction of the pre-Lessepsian invasion baseline for the fish fauna of the Israeli coast

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Lack of data on the marine fish fauna along the Israeli coast before the Suez Canal opening prevents predictions on the progress and impacts of the Lessepsian invasion, the introduction of tropical species into the Mediterranean via the Suez Canal. Here, we compare the marine fish death assemblages (DAs) in surficial sediments along the Israeli coast with the living assemblages (LAs) in the same area, in order to quantify the magnitude of major assemblage shifts in recent times, because DAs retain a strong signal of the pre-impact assemblages. The fish DAs were determined from otoliths contained in grab sediment samples collected along two transects from 10 to 40 m water depth. Data on the LAs were taken from trawl survey records conducted in the 1990s and 2000s. Because these two periods correspond to distinct stages of the Lessepsian invasion, they have been treated as distinct LAs coded as LA1990s and LA2000s, respectively. Assemblage shifts were quantified by comparing the DAs with the two LAs in terms of species richness, evenness, taxonomic similarity, and rank-order in species abundance. Moreover, we compared the relative species abundances in DAs and LAs. Finally, we compared community composition by multidimensional scaling plots.

The DAs are dominated by native Mediterranean species: the bandtooth conger in 10 m depth and the European anchovy in deeper water. In contrast, the LAs are dominated by alien species, especially LA2000s. LD comparisons suggest the occurrence of a massive shift in the composition and structure of fish assemblages. The taxonomic similarity is low (<0.5), that is, the species which constitute the LA are different from those of the DA. The rank order of species abundance also differs between LAs and DAs. The DAs are characterized by a higher species richness and evenness, well within the expectations of the effects of time-averaging, suggesting the absence of factors that can alter the reliability of LD results. A temporal trend in the LD fidelity is also noticeable: LA1990s appear less impacted than LA2000s with regard to the participation of invasive species in the assemblage, suggesting an increased rate and magnitude of assemblage change. The DA is clearly distinguished from both LAs in multidimensional scaling plots.