EGU2020-13783
https://doi.org/10.5194/egusphere-egu2020-13783
EGU General Assembly 2020

Climate change driven massive extirpation of native species from the Israeli Mediterranean shelf

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We quantify a large-scale extirpation of native species from the Israeli Mediterranean shelf, a region strongly affected by rapidly changing environmental conditions and the introduction of non-indigenous species, based on an extensive sampling programme of mollusks on intertidal to subtidal soft and hard substrata. We reconstruct historical species richness from shelly death assemblages, quantify the time range they cover with radiocarbon dating, and compare their richness with today's living assemblage diversity. The median native richness is 50% of the historical richness for the intertidal, but only 8% for the subtidal down to 40 m. Samples from the mesophotic zone show a much higher median of 42%, which is likely an underestimation due to sampling constraints. In contrast, non-indigenous species show assemblages matching the historical richness. Seasonality is very strong: autumn samples, after the summer heat peak, are highly impoverished in native species but enriched in non-indigenous ones. Additionally, a comparison between today's and historical native species maximum size shows that shallow subtidal native populations are mostly non-reproductive. In contrast, non-indigenous species reach reproductive size. These results suggest that a recent large-scale change in environmental conditions is strongly favoring non-indigenous species and is the main cause behind the shallow subtidal native species decline. Such an environmental factor is likely seawater temperature that plays a greater role in the shallow subtidal than in the cooler mesophotic zone, and affects subtidal species more than intertidal ones, pre-adapted to a climatically extreme environment.