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Invasive symbiont bearing (and other) foraminifera altering the community structure of eastern Mediterranean rocky reefs environments

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The rocky reefs of the Israeli eastern Mediterranean shelf constitute a highly diverse marine ecosystem rich in macroalgae and calcareous organisms. The benthic foraminiferal community living in this ecosystem is rapidly changing due to massive invasion of symbiont bearing foraminifera (SBF) as well as other foraminiferal species of tropical origin. This trend facilitated by the ongoing increase in temperature enables more tropical species to adjust to the eastern Mediterranean habitats. In order to document the status of the benthic foraminiferal community structure rocky reefs at Akhziv (AK) and Carmel Head (CH), northern Israel were sampled by scuba diving. Different macroalgae species, including invasive ones, accommodating the live epiphytic benthic foraminifera were sampled twice a year at AK and in each season at CH in three depth intervals between 5-20 m, during 2013-4. The numerical abundance of the group ranges between 170-3500 #/10cc (wet macroalgae volume) without any significant difference in standing stocks within regions, water depths or macroalgae preference. In total 77 benthic foraminiferal species were identified 71 in CH and only 43 at AK. Species richness per site varied between 3 and 42 with higher values at CH. 25% of all species were aliens, mostly Lessepsian, that comprise on average 70% - 84% of the numerical abundance of AK and CH respectively. Cluster analysis using benthic foraminifera relative abundance data did not correlate with the different macroalgae species, water depths or seasonality, indicating that the foraminiferal community in the two regions is quite homogenous. *Amphistegina lobifera* a Lessepsian migrant is by far the most common species on the Israeli rocky reefs occurring in all samples and comprising 18-93% of the foraminiferal community. *Heterostegina depressa* behaves similarly to *A. lobifera* though it occurs in lower numbers. *Pararotalia calcariformata*, a recently arriving SBF occupies mainly shallow water sites at CH, with maximum of 63%, replacing apparently *A. lobifera*. *Peneroplis planatus* and *P. pertusus* occur in low numbers mainly at AK sites. *Sorites orbiculus*, another Lesspsian SBF recently found alive on pebbles at 0.2 m off Shikmona is quite rare in our material comprising $\leq$2% at CH and $\leq$1% at AK. This study indicates that the Israeli rocky reefs represent a dynamic ecosystem prone to rapid changes that did not reach yet equilibrium.