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New insights into the population genetics of partially clonal organisms: when seagrass data meet theoretical expectations

Diane Bailleul∗1,2 and Sophie Arnaud-Haond†1,2

1MARine Biodiversity, Exploitation and Conservation (MARBEC) – UMR 9190, Institut Français de Recherche pour l’Exploitation de la Mer (IFREMER) – Avenue Jean Monnet, CS 30171, 34203 Sete Cedex, France
2Observatoire de REcherche Méditerranéen de l’Environnement (OSU OREME) – CNRS : UMS3282, Institut de recherche pour le développement [IRD] : UMS223, Université Montpellier II - Sciences et techniques – UM2, Bât. 22 - CC 060, Place Eugène Bataillon - 34095 Montpellier Cedex 5, France

Abstract

Species structuring marine coastal ecosystems (as corals, phanerogams and algae) are strictly or partially clonal. Understanding the dynamics and evolutionary consequences of this life history trait is thus a major challenge to preserve these ecosystems.

For many years theorerical works on clonality predict that only almost exclusive clonal reproduction would significantly affect the expected genetic composition of populations, particularly the departure from Hardy Weinberg equilibrium (Fis) and the linkage disequilibrium. Departure from HWE toward an excess of heterozygotes thus tended to be considered as a clue for nearly exclusive clonal reproduction. Recent findings however suggest that with increasing clonality (c) even at intermediate rates, while the clonal richness (R) moves toward 0, the variance of the fixation index (Fis) increases and Fis itself has an increasing probability for exhibiting negative values, suggesting an incidence of even modest rates of clonal reproduction.

Here we considered four phanerogams: Posidonia oceanica, Cymodocea nodosa, Zostera marina and Zostera noltii, for which the ecological expectations are decreasing longevity and increasing turnover rates and thus, decreasing clonality. This meta-analysis gathered data from 141 populations.

From the longest-living species with the lowest turnover, so the more expected clonal, Posidonia oceanica, to the shortest-living with the highest turnover, the less clonal species, Zostera noltii, while the index R increases, departure from HWE is decreasing progressively from significant and negative to non-significant values. These empirical data support the more recent models suggesting an influence of partial clonality on the genetic composition of populations, even at intermediate rates of c.

Keywords: population genetics, clonality, Fis, phanerogams

∗Speaker
†Corresponding author: sophie.arnaud@ifremer.fr