ID: W2901340585

TITLE: Seeds in motion: Genetic assignment and hydrodynamic models demonstrate concordant patterns of seagrass dispersal

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ABSTRACT:

Movement is fundamental to the ecology and evolutionary dynamics within species. Understanding movement through seed dispersal in the marine environment can be difficult due to the high spatial and temporal variability of ocean currents. We employed a mutually enriching approach of population genetic assignment procedures and dispersal predictions from a hydrodynamic model to overcome this difficulty and quantify the movement of dispersing floating fruit of the temperate seagrass Posidonia australis Hook.f. across coastal waters in south-western Australia. Dispersing fruit cohorts were collected from the water surface over two consecutive years, and seeds were genotyped using microsatellite DNA markers. Likelihood-based genetic assignment tests were used to infer the meadow of origin for seed cohorts and individuals. A three-dimensional hydrodynamic model was coupled with a particle transport model to simulate the movement of fruit at the water surface. Floating fruit cohorts were mainly assigned genetically to the nearest meadow, but significant genetic differentiation between cohort and most likely meadow of origin suggested a mixed origin. This was confirmed by genetic assignment of individual seeds from the same cohort to multiple meadows. The hydrodynamic model predicted 60% of fruit dispersed within 20 km, but that fruit was physically capable of dispersing beyond the study region. Concordance between these two independent measures of dispersal provides insight into the role of physical transport for long distance dispersal of fruit and the consequences for spatial genetic structuring of seagrass meadows.

SOURCE: Molecular ecology

PDF URL: https://rss.onlinelibrary.wiley.com/doi/am-pdf/10.1111/mec.14939

CITED BY COUNT: 16

PUBLICATION YEAR: 2018

TYPE: article

CONCEPTS: ['Biological dispersal', 'Seagrass', 'Biology', 'Seed dispersal', 'Genetic structure', 'Posidonia oceanica', 'Ecology', 'Population', 'Habitat', 'Genetic variation', 'Genetics', 'Demography', 'Sociology', 'Gene']