Risk reduction traits of Mediterranean temporary pool plants

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Abstract

Understanding the mechanisms reducing extinction risk for plant populations is crucial to foresee or prevent effects of environmental change. Plants can decrease their extinction risk by increasing seed mass, dispersal or soil seed banks to deal with unpredictable moisture. Since plants moisture niches influence how environmental variation translates into population fluctuations, we wanted to know how moisture niche position influences seed banks, seed sizes and spatial dispersal of plants. We also tested the theoretical prediction of these three risk reduction traits being negatively correlated. We studied 75 local plant communities in Southeastern France together with water levels in 15 temporary pools at three biogeographically contrasting sites with similar moisture gradients. We quantified soil seed banks, germination features, seed masses and local dispersal for plants species for which moisture niches could be charaterized using mean water level. Our results show increasing abundance of seeds in the soil with increasing water levels, decreasing seed size and higher dispersal at intermediate levels. This highlights that a species moisture niche critically influences its bet hedging traits: gradient end species increase seed size and soil seed bank – "stayer traits" contributing to local persistence whereas species with intermediate moisture requirements show increased spatial dispersal. We found no trade-off of seed size, dispersal and soil seed bank at fixed niche positions. Future studies of trait based community assembly and local extinction should consider that risk reduction traits interact with adaptations to mean hydrological niche positions of plants.

Keywords: bet hedging, vernal pools, seed size, dispersal, moisture gradient, hydrological niche

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