

Long-term plant community patterns in temporary freshwater rockpools

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Temporary freshwater rockpools (TFR) are small-scale ecosystems in which fundamental ecological processes can be studied and modelled. We present the community-level patterns observed in TFR of the Maltese Islands over a 30-year period (1987-2017). Detailed records of plant populations are available for several pools throughout the whole period, providing an opportunity to assess the changes in community composition.

Preliminary analysis of the dataset suggests that the TFR community undergoes periods of relative stasis, often lasting for several years, followed by abrupt shifts in community composition. The periods of stasis may be attributable to reduced immigration rates of competing resident species, to the filtering effects of hydroperiod duration and water depth, and to the oxidising effects of the summer drought which prevents gradual infill by sediment. On the other hand, stochastic meteorological events, such as unseasonal rainfall episodes or occasional deluges can play a key role in causing abrupt shifts. Unseasonal rain can trigger germination at unfavourable times of year, leading to reproductive failure over a whole population, whilst heavy deluges can wash out sediment and seed banks from pools.

On a scale of decades, slower, more gradual patterns of directional community change were also observed in some pools, and these were generally correlated with infiltration of terrestrial vegetation from pool margins. The encroachment of terrestrial plants is often a consequence of shorter hydroperiod duration or of delayed initial flooding at the start of the wet season. This initiates a positive feedback mechanism where the presence of large terrestrial plants leads to higher rates of water loss due to transpiration which in turn reduces the hydroperiods further.

Over the same timescale, various species, including *Damasonium bourgaei*, *Crassula vaillantii*, and *Lythrum hyssopifolia* were characterised by unpredictable and long-term patterns of disappearance and reappearance that were not linked to any obvious environmental cues.