Prediction of the impact of projected climate change on hydrology and vegetation of temporary freshwater rockpools of the Maltese Islands

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The effect of projected climatic change on the hydrology and vegetation dynamics of the temporary freshwater rockpools of the Maltese Islands was investigated through the construction of three future outlooks ('Most optimistic', 'Optimistic' and 'Pessimistic') based on IPCC data for Southern Europe and the Mediterranean. The projected data were subsequently utilised as inputs into hydrodynamic equations that predicted the values of three hydroperiod indicators (number of hydroperiods each year, duration of longest hydroperiod and hydroperiod index).

The number of hydroperiods in all three projected outlooks was significantly higher than that recorded during 2007/2008 ($P < 0.05$) whilst the duration of the longest hydroperiod was projected to be significantly shorter in a warmer and drier climate ($P < 0.05$).

Predictions of hydroperiod duration from all three outlooks implied that pools with relatively shallow margins are likely to be subject to increased infiltration by 'opportunistic' species from the surrounding habitat. Communities dominated by submerged species would be expected to decline in abundance under warmer and drier climatic conditions as a decreasing hydroperiod index would be expected to favour a compositional shift away from such species and towards amphibious species. Application of this data to the known population dynamics of *Elatine gussonei*, an amphibious species, suggested that, in general, *Elatine gussonei* and species with similar ecological strategies will be expected to persist in the rockpools of the Maltese Islands under each of the three future outlooks of climate. In the case of the 'Most optimistic' outlook, a population that was reduced to 16 % of the carrying capacity by a possible intra-annual drought or other disturbance would potentially recover fully within three years. Conversely, the risk of population extinction under the 'Pessimistic' outlook was much higher, with a sustained climatically-unfavourable period of 11 years leading to extirpation.