Muller's ratchet with tournament selection: click rate and quasistationary type frequency profile

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Muller's ratchet is a prototype model in mathematical population genetics. In an asexual population of constant size N, individual lineages are thought to slowly acquire slightly deleterious mutations over the generations. Due to randomness, every once and a while the individuals with the currently smallest number of mutations disappear from the population; this is a click of the ratchet. The classical variant of the model, which assumes so-called proportional selection, so far has been forbidding against a fully rigorous asymptotic analysis of the clicking rate. We overcome this hurdle by considerng tournament (instead of proportional) selection, where selective competition by couples of individuals is won by the fitter individual. By means of a graphical representation we obtain a dual process which for a wide range of selection and mutation parameters allows to analyse (as N -> ∞) the click rates and the quasi-stationary type frequency profile. For the latter, an interesting connection with first passage percolation in Poisson decorated Yule trees turns out to be instrumental. The talk is based on joint work with Adrián González-Casanova, Charline Smadi and Jan Lukas Igelbrink, and also connects to previous work joint with Alison Etheridge and Peter Pfaffelhuber.