We investigate the orbital evolution of an initially thin stellar disc around a supermassive black hole, considering various perturbative sources of gravity. By means of direct numerical N-body modelling, we first focus on the case when the disc is embedded in an extended spherically symmetric star cluster. We find that the gravitational influence of the disc triggers formation of macroscopic non-spherical substructure in the cluster which, subsequently, significantly affects the evolution of the disc itself. In another approximation, when the cluster is emulated by an analytic spherically symmetric potential, we further consider perturbative gravitational influence of a distant axisymmetric source. Using standard perturbation methods, we derive a simple semi-analytic model for such a configuration. It turns out that the additional axisymmetric potential leads to mutual gravitational coupling of the individual orbits from the disc. Consequently, the dense parts of the disc can, for some period of time, evolve coherently. Finally, we apply some of our results to the young stellar disc which is observed in the innermost parsec of the Galactic Centre.