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Could anyone survive Antarctic glaciations?: Evolution in the extreme environment and the effect of climatic changes on Antarctic biota

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Antarctica and the southern Ocean are important determinants of global climate and ocean currents. Yet, polar ecosystems, and Antarctic in particular, are assumed to be very vulnerable to climate changes. While lot of effort is put into modelling the impact of future climate changes on polar biota, we offer an alternative retrospective approach based on simultaneous population genetic analysis of several species with different ecological requirements. We perform comparative analysis of demographic histories of a dozen fish species belonging to the suborder Notothenioidei. These include high Antarctic as well as sub Antarctic species, specialised on both benthic and pelagic life styles. Based on previous analysis of few available data on fish species, we predict that affinity to benthic life style and high Antarctic occurrence promotes the vulnerability to ice sheet advances during glacial maxims. Such species should be characterised by rather recent signals of population expansion from unglaciated refuges as compared to pelagic species. In agreement with the hypothesis, we generally observed more recent signals of population expansions in benthic species but some notable exceptions clearly suggest the need of more fine-scale analysis taking into account other life history traits. Such multiparameter analysis, however, critically depends on large amount of studied taxa. Nevertheless, our data ameliorate the ability to determine the general impact of past glacial cycles on local biota as well as to identify the life-history traits affecting the organismal response to such events.

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