Marine protected areas provide species with physiological resilience to the impacts of climate change

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Marine protected areas (MPA) are championed as a fisheries management tool to mitigate the effects of climate change on fishes, however little is known regarding the underlying mechanisms of how this may occur. To explore these mechanisms we compared the thermal physiology of a resident South African reef fish species; Chrysoblephus laticeps, between two areas with identical temperature profiles but variable levels of exploitation; the longstanding (53 years) Tsitsikamma National Park (TNP) and the Port Elizabeth linefishery (PE). We used intermittent flow respirometry to gather metabolic data across an ecologically relevant temperature gradient and develop aerobic scope curves (an indicator of the energy available for fitness related processes at various temperatures). Results showed that the TNP population had a lower standard metabolic rate, higher maximum metabolic rate and hence higher overall aerobic scope compared to the PE population. A higher aerobic scope provides an individual with a physiological advantage which is selected against in the PE linefishery but proliferated within the TNP due to higher levels of competition. Within the TNP C. laticeps’ metabolic process will be less compromised should temperatures exceed optimal ranges resulting in better capability for adaption to adverse conditions. This study provides some of the first evidence of how MPA’s may reduce species' sensitivity to climate change and suggests that they are important reservoirs of physiological resilience to the impacts of climate change.