Molecular Biodiversity under Ocean Warming: Proteomics and Fitness Data Provide Clues for a Better Understanding of Thermal Tolerance in Fish

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Abstract Ocean warming is known to alter the performance of marine organisms albeit the proteome underpinnings of thermal tolerance are still largely unknown. Following a 1-month exposure to elevated temperatures we assessed the vulnerability of the proteome in the sea bream *Sparus aurata* to ocean warming. Fish were exposed to 18°C (control), 24°C (nursery ground) and 30 °C (heat wave year 2100). Survival was impaired after 28 days, mainly at 30°C although fishes' condition was unaltered. Protein expression profiles (assessed at 14 and 21 days) were similar between fish exposed to 18 and 24ºC, differing substantially from fish exposed to 30ºC. Fish subjected to 24ºC showed enhanced glycolysis and decreased glycogenolysis mainly at 14 days of exposure. Fish subjected to 30ºC also showed enhanced glycolysis and up-regulated proteins related to gene expression, cellular stress response (CSR), and homeostasis. However, inflammatory processes were elicited at 21 days along with a down-regulation of the tricarboxylic acid cycle. Thus, juvenile fish acclimated to 24 but not to 30ºC as a result of increasing physiological constraints associated with metabolic scope available for performance at higher temperatures. Consequently, recruitment of sea breams may be in jeopardy with potential effects on population persistence and distribution.