SCIENTIFIC REPORT	
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STSM Title	"Limiting maximum metabolic rate: is osmorespiratory compromise playing a major role?"

1. Summary

The round goby (*Neogobius melanostomus*) is a benthic fish native to the brackish waters of the Black and Caspian Seas, however, it has invaded several brackish and freshwater areas in North America and northern Europe. Notably, there are no records of *Neogobius melanostomus* in high salinity marine habitats and, the physiological mechanisms constraining the invasion into this environment are largely unknown. The gills play major roles in both gas exchange and ionic regulation and it has been hypothesized that an osmorespiratory compromise impacts optimal performance of each process. The tradeoff of the large gill exchange capacity ideal for gas exchange is greater passive ion fluxes. Waters with high ionic contents (i.e. salt water) would result in greater passive ion uptake that would require greater active ion excretion. This osmoregulatory disturbance may interfere with fish invasion patterns by disrupting the regular activity of the gills, thus modifying the usual physiological mechanisms. To examine if the osmorespiratory compromise could constrain the invasion of *N. melanostomus* into high salinity environments, this study compared ion regulatory performance of metabolic phenotypes exposed to 0, 15 and 30 ppt water). More specifically, Na^+/K^+ATPase activity. Additionally, we examined variation in two important MO 2 measures, standard metabolic rate (SMR) and maximum metabolic rate (MMR) when *N. melanostomus* is exposed to increasing water salinities. Fish with an initially higher MMR (at the control salinity – 0ppt) are likely to be more challenged by environmental stressors than fish with a lower MMR. It is expected that differences in the ionic content of the water may interfere in the osmorespiratory compromise, altering the expression of the Na^+/K^+ATPase enzyme. Consequently, this deregulation will affect the round goby metabolism and change the maximum metabolic rate (MMR) values. Our results will provide a better understanding of the physiological mechanisms that may constrain invasive species in the aquatic environment.

Key words: Osmorespiratory compromise, respirometry, sodium-potassium ATPase.