Introduction

Humans are emitting increasing levels of carbon dioxide into the atmosphere, which is drastically modifying the chemistry of the global ocean (Guinotte 2008). As carbon dioxide is absorbed by the oceans, we are seeing significant drops in ocean pH levels (Ocean Acidification, or OA) that will likely have serious consequences for marine organisms (Fabry 2008)(Onthank and Trueblood 2021). Historically, studies have focused on how OA affects calcifying organisms, as decreasing ocean pH hampers these animals' ability to form their CaCO2 shells and skeletons (Fabry 2008). However, dropping ocean pH can affect non-calcifying species as well. The impacts of OA on animal physiological status can be measured by observing changes in metabolic rates, and this method has been used in cephalopods (Birk 2018). *Muusoctopus leioderma* (Smoothskin octopus) is a virtually unstudied species of octopus found in Burrows Bay, WA. *Octopus rubescens,* the only octopus species in which OA’s effects on aerobic metabolism have been explored, was found to display a fairly robust tolerance to OA treatments following an acclimation period (Onthank and Trueblood 2021). However there is no literature on OA’s effects on metabolic rate in *Muusoctopus leioderma,* or in any other octopus species. In this study, we measured OA-treated *Muusoctopus leioderma* routine metabolic rate (RMR) and critical partial pressure (pCrit) to determine the impact of OA on this species’ physiological status.