Characterizing and quantifying trophic transfer and clearance rate of microplastics from the blue mussel (*Mytilus edulis*) to the Jonah crab (*Cancer borealis*)

Plastic pollution is widespread throughout the oceans. Plastic debris degrades into microplastics, plastics pieces less than 5 mm in size, which can become exposed to marine organisms through respiration and consumption. Once microplastics are within the body of an organism, predators that consume those organisms can acquire those same microplastics within their digestive system. This phenomenon is known as trophic transfer. This study quantified the number of microplastics within the stomach and hepatopancreas of Jonah crabs (*Cancer borealis*) over time after exposing crabs to approximately $1.5\ x\ 10^4$ uniform red spherical microplastics for 1 h and to determine the residence time of microplastics in the same organs. Jonah crabs were fed a formulated mussel diet with added microplastics and subsequently sacrificed at 2, 4, 24, 48, and 72 h after feeding. Crabs were dissected and the stomach and hepatopancreas dissolved in 30% hydrogen peroxide to isolate microplastics. Experimental microplastics were quantified by visual count of the red microspheres. Within the stomach, microplastics decreased significantly over time, while within the hepatopancreas, there was no significant differences among any of the sampling times. In both tissues, microplastics were observed at the last sampling period of 72 h; this observation led to the conclusion that microplastics reside in the digestive tract longer than a 12 h food digestion period. Clearance rates of the microplastics in the stomach and hepatopancreas were calculated using a best fit power function for the collected data. Ambient microplastics, those that were not fed directly to the crabs in the mussel diets, were discovered and documented, with blue microfibers being the most abundant. Future research should examine more sampling periods between 4 and 24 as well as after 72 h to better resolve microplastics transport through the crab and to determine how long it takes to fully process microplastic pieces.

Advisor: Jessica Muhlin