Special Study Proposal: Microplastics in San Francisco Bay Sport Fish

Summary: In summer 2019, as part of RMP Status and Trends monitoring, sport fish were collected and analyzed for a suite of contaminants. The digestive tracts of some of these fish were archived specifically for future microplastic analysis. This project proposes to make use of archived fish digestive tracts from three species to assess the level of exposure in the Bay food web to microplastics and associated pollutants. The cost of the study is $92,775, but this could be reduced by analyzing fewer samples.

Estimated Cost: $50,775–92,775

Oversight Group: Microplastic Workgroup

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PROPOSED DELIVERABLES AND TIMELINE

Deliverable	***Due Date***
Task 1. Laboratory analysis	January - October 2021
Task 2. Draft manuscript	April 2022
Task 3. Microplastic Workgroup presentation.	May 2022

Background

Microplastics have been found in the tissues of seafood, including tiger prawns (Abbasi et al., 2018), shellfish (Cho et al., 2019; Naji et al., 2018) and fish (Rochman et al., 2015). The literature shows a variety of adverse effects associated with microplastic exposure, including inflammation and oxidative stress, microbiome changes, altered swimming and feeding behavior, altered reproductive success, and decreased growth and body condition (Foley et al., 2018). Although the ingestion of microplastics by fish and shellfish is unlikely to cause acute toxicity or mortality, the effects of chronic exposure require further research (Rist et al., 2018). The minimal availability of data on this topic is a cause for concern for public health (Hantoro et al., 2019).

Currently, there is no information regarding the fate of microplastics in the human body upon ingestion (Rist et al., 2018). However, interactions between microplastics and the immune system have been postulated to cause immunotoxicity and trigger adverse effects (Wright and Kelly, 2017). Microplastics contain chemical additives that are intentionally added to achieve desired properties, many of which can be toxic to humans and wildlife, such as carcinogens, endocrine disruptors, and neurotoxins (Talsness et al., 2009; Thompson et al., 2009). In laboratory studies, microplastics or chemicals associated with microplastics have been shown to transfer out of the gut and accumulate in tissues (Carbery et al., 2018). A recent study found that wild fish that had ingested microplastics had higher concentrations of bisphenols (a common class of plastic additives) in their liver and muscle