Reef Relief

Microplastic Bioaccumulation

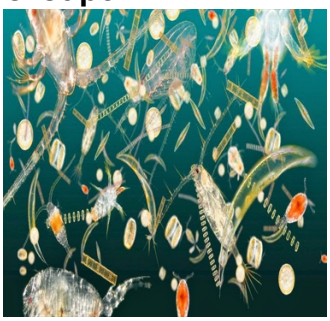
Purpose: To observe how contaminants can accumulate in organisms within a food web.

Materials: 1 cup labeled Plankton, 9 small cups labeled Crustacean, 3 medium cups labeled Yellowtail Snapper, 1 Black Grouper cup, 20 Skittles of the same color (non-contaminated), 10 Skittles of the same color (microplastics)

Introduction:

Plastic is made out of a variety of chemicals such as polyvinyl chloride and bisphenol A, both are found to be very dangerous for the environment and human consumption. The average American throws away approximately 185 pounds of plastic per year and more than 8 million tons of plastic are dumped into the ocean per year. Once in the ocean, it takes hundreds of years for a plastic item to break down, but it will never fully decompose back into the environment like a biodegradable item. Instead the plastic turns into what we call “microplastics”. Microplastics are simply, smaller pieces of plastic. These microplastics are accidentally consumed by small organisms. As we move up the food chain, the chemicals found in those microplastics will stay in the food chain. Although the initial level of these chemicals might be low, the concentration of these chemicals can increase as they move up food chains. This is known as bioaccumulation. Scientists have found that fish exposed to these materials during development show stunted growth, increased mortality, and change in behavior. Buildup of microplastics in digestive tracts can also cause mortality in fish, seabirds, and marine mammals. While little has been researched, it is suspected that humans are also affected by the microplastics when they eat seafood.

Plankton **Crustacean** **Yellow Tail Snapper** **Black Grouper**




Procedure: Place all of the skittles into the producer cup.

1. In the data table record the amounts of microplastics per plankton. (10 contaminants per 30 producers total = 1/3)
2. Carefully give the shaker cup a good shake.
3. Now simulate crustaceans eating some of the plankton. Randomly remove 3 of any color Skittle from the “shaker” cup and place them into one of the small cups.
4. Repeat step 4 for the remaining eight small cups. In your data table record the amount of microplastics in the crustaceans.
5. Now simulate the Yellowtail eating crustaceans. Each Yellowtail needs to eat 2 crustaceans. Empty the contents of 2 small cups into one of the medium cups. Repeat for the remaining medium size cups. In your data table record the amount of microplastics in the Yellowtail.
6. Finally simulate the Black Grouper eating yellowtail snapper. One grouper needs to consume 2 snappers. Empty the contents of the 2 medium size cups into the large cup. In your data table record the amount of microplastic in the black grouper.
7. Empty the contents of the grouper back into the plankton cup and repeat steps 3 through 7 two more times – for a total of 3 trials.
8. Calculate the average amount of microplastics for each organism.

Amount of microplastic per organism

Organism	**Trial 1**	**Trial 2**	**Trial 3**	**Average (microplastics/organism)**
Plankton	____ / 30	____ / 30	____ / 30	
Crustacean	____ / 27	____ / 27	____ / 27	
Yellowtail Snapper	____ / 18	____ / 18	____ / 18	
Black Grouper	____ / 12	____ / 12	____ / 12	

Analysis Questions:

1. In the space provided below, construct a food chain to illustrate the flow of energy between the organisms used in this simulation.

2. What happened to the amount of microplastic per organism as you move up the food chain?

3. Which organism contained the largest concentration of microplastics?

4. What is one organism that you would expect to have high concentrations of microplastics?

5. If the Black Grouper population were to decrease due to microplastics, what other populations would be affected and how?

6. How can we prevent our plastic problem?

Conclusion: