

# INVESTIGATIONS OF HAMMERHEAD SHARK DAILY FOOD REQUIREMENTS

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## Introduction

Hammerhead sharks are found throughout the world. They use shallow coastal areas, such as Kaneohe Bay, as nursing grounds for their offspring. Approximately 9,000 scalloped hammerhead sharks are born into Kaneohe Bay every year. The pups stay in the bay for about one year, eating small fish and crustaceans. Despite the fact that the pups are top predators in the bay, most do not get enough to eat and die of starvation.

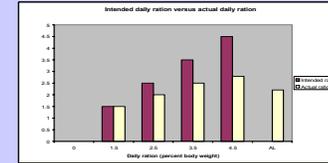
Our experiment is designed to find out how much food a scalloped hammerhead shark needs to maintain its weight. A previous experiment predicted that they need 3.5% of their body mass to maintain their weight. We are validating this experiment by feeding the sharks certain percentages of their body weight and determining which ones lose body mass and which ones gain body mass.



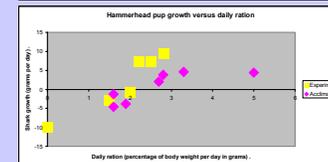
Left: Sheryl, Kanesa, and Jennifer prepare to weigh a shark



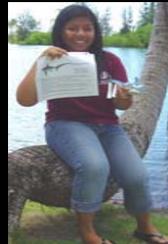
Right: Gemma and Kanesa weigh a shark



Top: Graph indicates the amount of food each shark was supposed to eat (red bars) compared to how much food each shark actually ate (white bars). The sharks with the low daily rations (0% and 1.5%) ate the correct amount of food. However, the sharks with the higher daily rations did not consume enough food.



Bottom: Graph shows the growth (change in body weight) per day versus the amount of food it ate (in percentage of body weight per day). The yellow squares show shark growth during the experiment phase. The pink diamonds show sharks during the all-you-can-eat acclimation phase.



Left: Map of Oahu showing Kaneohe Bay



Right: Coconut Island, Hawaii Institute of Marine Biology

## Hypothesis

We hypothesized that a scalloped hammerhead shark pup needs to eat 3.5% of its total body mass every day in order to maintain its body weight.

## Methods



Far Left: Shark tank separated in thirds for individual feeding  
Left: Scalloped hammerhead pup swimming in tank  
Above: Elorde and Raymond entering data on shark feeding and growth for analysis



Above: Scalloped hammerhead pup is held down on measuring board at the conclusion of the experiment phase. Sharks were individually identified during the experiment by clips on their pectoral fins. We used three patterns: 2 left pec clips, 2 right pec clips, and 1 left, 1 right clip. At the end of the experiment, after each shark was weighed and measured, it was released back into Kaneohe Bay.

## Results

We kept six scalloped hammerheads in captivity for five weeks. We kept them in two separate tanks (3 sharks per tank). Sharks were fed six times a week. During the first two weeks we fed the sharks as much as they could eat during a thirty minute period. The food was cut into five gram pieces and we recorded the number of pieces that each shark ate. We called this the acclimation phase. During the next three weeks we fed the pups individual daily rations: 0% (only starved for 8 days), 1.5%, 2.5%, 3.5%, 4.5%, and all-you-can-eat. Sharks were randomly assigned to each treatment. We called this the experiment phase. During this phase, the tank was sectioned in thirds so that each shark could be fed separately. The shark's daily ration was weighed out prior to feeding and any portion not eaten by the shark was removed and weighed after the thirty minute feeding period. Sharks were weighed and measured three times: at capture, after acclimation, and after the experiment. Growth was determined by change in weight.

## Discussion

Scalloped hammerhead pups in our experiment needed approximately 2.0% of their body weight per day to maintain their mass. This is lower than the 3.5% we predicted based on previous studies. This is possibly due to the fact that we fed high calorie food. We fed sardines whereas the previous calculations were based on shrimps and gobies. We also fed only the calorie dense portions of the sardines (no heads or tails). Therefore, it is possible that the 2.0% in our experiment is closer to the 3.5% predicted than it initially appears.

We also had a hard time getting the sharks to eat the higher daily rations. We would expect to see a slowing of growth rate at higher rations, but because the highest ration eaten in the experiment phase was only 2.9% we did not see this. In future experiments, we recommend feeding the sharks more frequently in order to obtain the intended rations. We also recommend determining the calorie content of the sardines, shrimp and gobies so that we can make a more accurate prediction and comparison.

## Acknowledgements

This experiment was conducted as part of the Upward Bound mentorship program. Our group was the first of five high school groups to conduct this experiment. Data from other high school researchers will be combined with ours to understand more about how scalloped hammerhead sharks impact their nursery.

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FINANCIAL SUPPORT: EECB NSF G-K12 grant, HIMB, NSF predoctoral fellowship  
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