

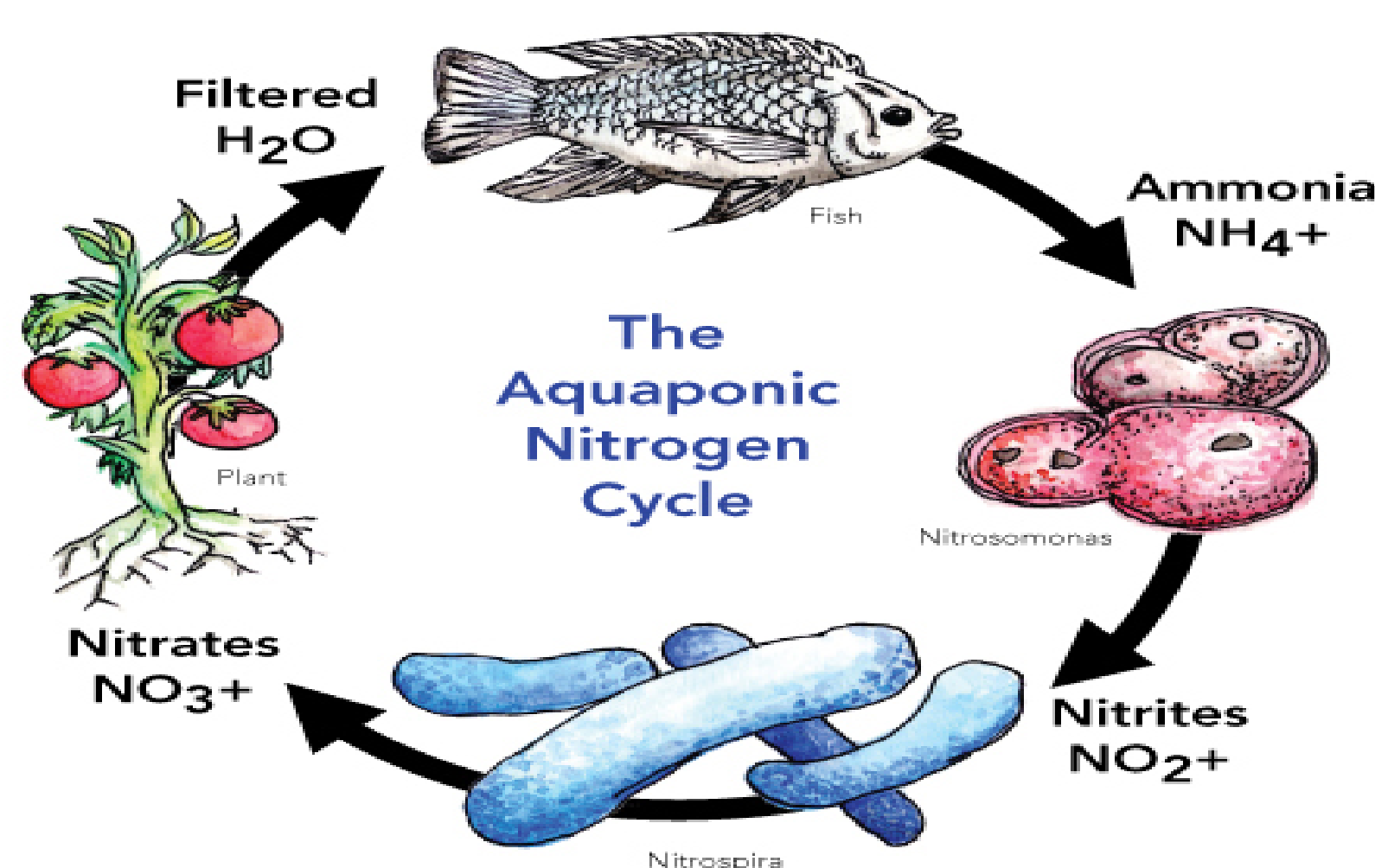
# Ammonia Production Rates of 3 Commonly Cultured Fish Species in Aquaponic Systems

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## Introduction

Nitrate is primarily introduced into an aquaponic system via protein in fish feed. Depending on the dietary requirements of each species, the protein is either assimilated or excreted across the gills as ammonia.



<http://aquaponichowto.com/wp-content/uploads/2014/04/aquaponics-nitrogen-cycle-1.jpg>

The manipulation of ammonia excretion through the regulation of dietary protein intake may potentially be used as a method for controlling nitrate levels in aquaponic systems.

## Objectives

To determine the daily amount of ammonia excreted per gram of each fish species using several feeds with differing protein concentrations.

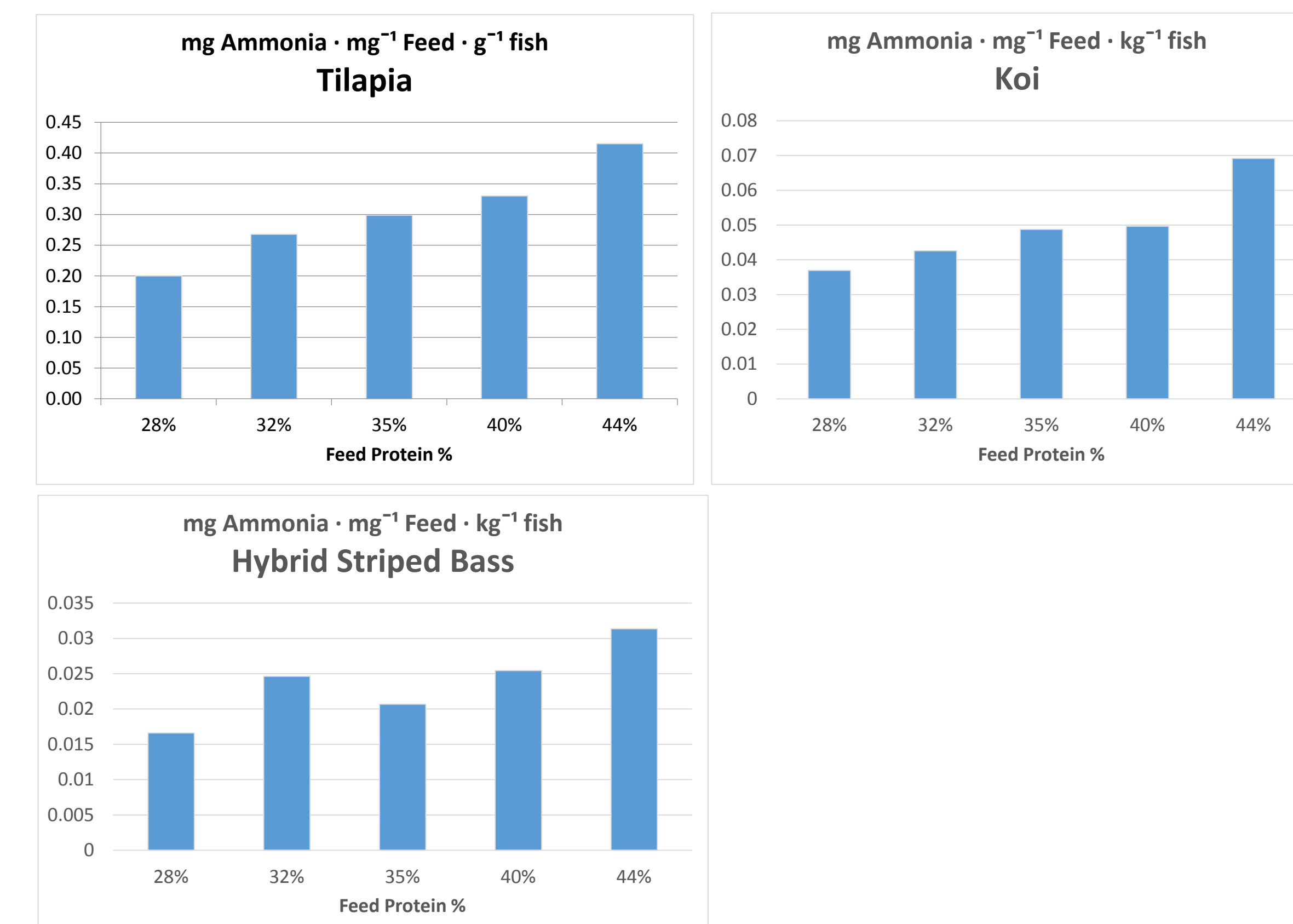
## Methods

- Fish were weighed before distributing equally among 18 tanks.
- Six groups of 3 tanks were fed different diets containing 28, 32, 35, 40, and 44 % protein plus an unfed control.
- Fish were fed daily to satiation for ~15 minutes.

- Ammonia, pH, and temperature were measured prior to feeding every 24 hours with a spectrophotometer, pH meter, & electronic thermometer.
- Hybrid striped bass, koi, and tilapia were selected for their tolerance to high-density culture.

## Results

- An increase in ammonia production paralleled the increase in protein content of feed.
- Although there were differences in amounts produced between fish species, all species experienced a similar trend of increased ammonia production correlated with an increase in dietary protein intake.
- These findings are important as they can help producers manipulate the diet of their fish stock to produce a level of nitrogen that is neither deficient nor excessive for their selected vegetable crops. This ensures that vegetable crops maintain adequate growth rates, and that excessive feeding does not occur to minimize overall expenses.



## Discussion

The collection of ammonia excretion values for each species may potentially allow aquaponic producers to better select combinations of fish species and feeding regimens that are tailored to specific vegetable crops. Raw data from the completed trials has not been statistically analyzed at this time.

## Future Studies

- Nitrate uptake rates of commonly cultivated vegetables in aquaponic systems can be collected for use in calculating necessary ammonia production levels, and vice versa.
- Nitrate accumulation rates for the same cultivars can be evaluated to determine their safety for human consumption.

## Acknowledgements

Special thanks to Drs. Todd Sink, Delbert Gatlin and Brian Ray of the Aquaculture Research & Training Facility at Texas A&M University.